preparatory commission for the comprehensive nuclear-test-ban treaty organization

REQUEST FOR PROPOSAL

To: ALL BIDDERS

CTBTO Ref. No.: **2023-0141/POGGIO**
(PLEASE QUOTE ON ALL COMMUNICATIONS)

Tel. No.: +43 (1) 26030-6350
E-mail: procurement@ctbto.org

Attn:
Phone:
Fax:
Email:

Date: 22 Sep 23

Subject: Maintenance and Enhancements for Verification Data and Products Messaging System (VDMS) and Acquisition Module (ACQ) Applications on a Call-off Basis

Deadline for Submission: 13 Oct 23 ***Vienna Local Time:*** 17:00

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (hereinafter referred to as the 'Commission') hereby invites you to submit a proposal that meets the requirements of the attached documents.

You are kindly requested to complete and return the acknowledgement form by email as soon as possible.

If you have any questions you should contact the email address indicated above.

Yours Sincerely,

For: Sally ALVAREZ DE SCHREINER
Chief, Procurement Services Section

CTBTO PREPARATORY COMMISSION | preparatory commission for the comprehensive nuclear-test-ban treaty organization

ACKNOWLEDGEMENT FORM

Solicitation No: 2023-0141 ***Title:*** Maintenance and Enhancements for Verification Data and Products Messaging System (VDMS) and Acquisition Module (ACQ) Applications on a Call-off Basis	***Closing Date:*** 13 Oct 23 ***Vienna Local Time:*** 17:00

Procurement Staff: Davide Poggio ***CTBTO Req. No.:*** 0010022823

Please complete 'A' or 'B' or 'C'
and Return

WITHIN FIVE (5) DAYS

THE PREPARATORY COMMISSION FOR THE
COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION (CTBTO)

by email to
procurement@ctbto.org

A: We shall submit our proposal

Company Name: ______________________

By: ______________________
(date)

Contact Name: ______________________

Email/Tel: ______________________

B: We may submit and will advise

Company Name: ______________________

By: ______________________
(date)

Contact Name: ______________________

Email/Tel: ______________________

C: We will not submit a proposal for the following reason(s)

___ our current workload does not permit us to take on additional work at this time;
___ we do not have the required expertise for this specific project;
___ insufficient time to prepare a proper submission;
___ other (please specify) ______________________

Company Name: ______________________

Contact Name: ______________________

Email/Tel: ______________________

INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF PROPOSALS

1. General

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (the Commission) with its headquarters in Vienna is the International Organization mandated to establish the global verification system foreseen under the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which is the Treaty banning any nuclear weapon test explosion or any other nuclear explosions. The Treaty provides for a global verification regime, including a network of 321 stations worldwide, a communication system, an International Data Centre and on-site inspections to monitor compliance with the Treaty.

This Request for Proposal (RFP) is for the provision of services and supply and delivery of equipment as described in the Terms of Reference.

The Proposal shall meet all requirements stated in the Terms of Reference and be submitted in accordance with these Instructions for Preparation and Submission of Proposals. For this project, the Commission is seeking capabilities, which will ensure that the services are delivered and the tasks are accomplished expeditiously and at a reasonable cost.

2. Documents included in this RFP

This RFP consists of the following documents:

(a) Letter of Invitation
(b) These Instructions for Preparation and Submission of Proposals with its Attachments:
- Bidder’s Statement
- Attachment 1: Evaluation Criteria and Method
- Attachment 2: Format of Technical Proposal
- Attachment 3: Format of Financial Proposal
- Attachment 4: Procedure for submission of electronic offers

(c) List of CTBT State Signatories
(d) Statement of Confirmation
(e) Vendor Profile Form
(f) The Commission’s Model Contract and its Annexes A – B;
  - The Commission’s General Conditions of Contract (Annex A)
  - Terms of Reference (Annex B), including the reference technical document: *IDC-ENG-SPC-103-Rev.8 “Formats and Protocols for Messages.*

Note: In the event of award, the Proposal will be incorporated as Annex C to the Contract.

3. Amendment of RFP Documents

At any time prior to the closing date for submission of Proposal, the Commission may, for any reason, modify the RFP documents by amendment. The Commission may consider extending the deadline in order to allow adequate time for considering the modifications in the preparation of the Proposal.

4. Language of the Proposal

The Proposal and all correspondence and documents relating to it shall be in English.

5. Format and Submission of the Proposal

The Proposal shall be typed, dated and signed by an official legally authorized to enter into contracts on behalf of your organization. The Proposal shall not contain any interlineation, erasures or overwriting except as necessary to correct errors, in which case such corrections shall be initialled by the authorized person(s) signing the Proposal.

The Proposal shall be submitted electronically according to the attached "Procedure for Submission of Electronic Offers in 2 Sealed Files" *(Attachment 4)*.

Proposals sent by regular e-mail (unless clearly submitted as electronically sealed offers as indicated above and following the instructions outlined in Attachment 4) will not be considered and may lead to the rejection of the bidder from the procurement process.

The Proposal shall be received not later than the closing date indicated in the Letter of Invitation.

6. Request for Clarifications and Contacting the Commission

The Commission will issue clarifications, if required. Bidders are requested to e-mail any questions pertaining to this RFP as soon as possible after receipt of the solicitation documents, but in any case no later than 7 business days prior to the Closing Date. No requests for clarifications will be entertained after this time. Questions will only be accepted via e-mail be sent to:

E-mail: procurement@ctbto.org
Subject: Request for Clarifications re: RFP No. 2023-0141/Poggio

The Commission will make all reasonable efforts to issue the clarifications not later than 4 business days prior to the Closing Date.

Except in case of responding to a RFP clarification, no bidder shall contact the Commission on any matter relating to the Proposal after its submission and until the award of the Contract. Any attempt to influence the Commission in its evaluation of the Proposal or the contract award decision may result in the rejection of the Proposal.

7. Eligible Goods and Services

The services and goods (if any) to be rendered under the Contract shall have their origin in the States Signatories of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), the list of which is attached to this RFP. For purposes of this paragraph, "the origin" means the place from where the materials, goods and/or the services are supplied.

8. Type of Contract and Payment

The Commission intends to conclude firm fixed unit prices Call-off Contract based on the attached Model Contract. The terms and conditions of payment for services are described in Clause 13 of the attached Model Contract.

Taxes: Applicable Taxes payable by the Supplier and/or its subcontractor(s) shall be invoiced separately or be separately identified on the invoice. Actual payment of the Taxes must primarily be supported by original documentation such as bank account statements, transfer orders, or receipts issued by the local tax or customs authorities. If submission of such original documentation is not possible for justifiable reasons, their copies could be accepted by the Commission provided that they are duly signed and certified by local tax or customs authorities. In case the currency in which the taxes are levied is not the currency of the Contract, bank statements (or equivalent) showing the exchange rate used for the conversion shall be submitted to the Commission, in addition to any other supporting documentation.

"Taxes" means all direct and indirect taxes (including value added tax, general sales tax or goods and services tax), assessments, fees, customs duties, liens and charges in as much as they are levied in conclusion or implementation of the Contract, including customs restrictions and charges of similar nature in respect of articles imported or exported for the Commission's official use.

9. Preparation of the Proposal

The Proposal shall contain, but not necessarily be limited to, the information described below.

The Proposal shall be composed of the following separate parts:

I. **Technical Proposal**; and
II. **Financial Proposal**;

providing, but not limited to, the following information:

PART I: TECHNICAL PROPOSAL

Please state the reference number and the date of this RFP in the Proposal and any correspondence relating to it.

Bidders are required to prepare the Technical Proposal using Attachment 2 ("Format of Technical Proposal") attached to these Instructions for Preparation and Submission of Proposals.

Personnel
The Proposal shall state the contact details and address (name, telephone and fax numbers, and e-mail address) of the person/point of contact in your company dealing with this RFP.

Statement of Confirmation
The attached Statement of Confirmation shall be duly signed and submitted together with the Proposal.

Description of Services
An explanation of the bidder's understanding of the services to be provided and an overall preliminary operational plan for the execution of the services.

Specifications of Equipment
The Proposal shall include a detailed description of the items proposed and include relevant technical literature.

The Proposal shall also provide any other relevant issue which the bidder would like to bring to the attention of the Commission whether or not having cost implications. This shall include details of warranties/manufacturer's guaranties in respect to any Equipment item.

Commission's Inputs
A description of the expected inputs/resources to be made available by the Commission and at what stage of the services.

Time Schedule
A bar chart indicating the estimation of the duration of the services, including the duration of each task required by the Terms of Reference and key staff to be involved in each task.

Qualifications
Documentary evidence of your qualifications to provide the Services, which shall establish to the Commission's satisfaction that the bidder has technical capability necessary to perform the Contract and other necessary ongoing services as required.

Personnel
Curriculum vitae of key personnel proposed for this contract, including technical experience to perform the Work.

Please note that it is the bidder's responsibility alone to obtain **work permits or visa or similar** for the personnel proposed to implement this project. The Commission will make no effort nor accept any responsibility for obtaining work permits or visa or similar for the Contractor's personnel.

Use of former Preparatory Commission for the CTBTO ("Commission") employees in the preparation of Quotations:

A bidder must <u>not</u>, in the absence of prior written approval from the Commission, permit a person to contribute to, or participate in, any process relating to the preparation of a Quotation or the procurement process if the person:

a. At any time during the 12 months immediately preceding the date of issue of the Solicitation was an official, agent, servant or employee of, or otherwise engaged by the Commission;
b. At any time during the 24 months immediately preceding the date of issue of the Solicitation was an employee of the Commission personally engaged, directly or indirectly, in the definition of the requirements, project or activity to which the Solicitation relates.

Sub-Contractors
Names, legal status, address and qualifications of subcontractor(s), if any, and the scope of the subcontracted services. The Proposal shall provide a statement that your organization shall be fully responsible for the performance of sub-contractors. All sub-contractors shall be legally established in one of the CTBTO Member States.

References

A description of similar maintenance services provided in large organizations, for systems similar to the ones described in the Terms of Reference. Provide at least three references.

Delivery Schedule
Delivery time shall be indicated in weeks after receipt of an order and shall be firm during the validity of the Proposal.

PART II: FINANCIAL PROPOSAL

In the financial Proposal, you are required to define the following:

Bidders are required to prepare the Price Schedule using ***Attachment 3 (Format of Financial Proposal)*** attached to these Instructions for Preparation and Submission of Proposals. In presenting the cost for each item, adequate justification and calculation must be included in the Financial Proposal.

(i) In presenting the cost for each item, adequate justification and calculation must be included in the cost Proposal. All individual costs shall be stated in EURO or US Dollars and be computed to constitute the total Contract Price.

(ii) Taxes

In principle the Commission is exempt from taxes. Since the arrangement under which such exemption is respected varies from country-to-country, the selected bidder will be informed by the Commission whether tax exemption will occur at source or whether taxes paid by the selected bidder will be reimbursed by the Commission upon submission of the original supporting documentation.

(1) For Austrian companies

The price quoted shall be net of Taxes. All applicable Taxes payable by the selected bidder at the conclusion or implementation of the Contract in respect of the goods/services shall be quoted separately or be separately identified on the Proposal together with information on the nature of the tax and its method of calculation.

(2) For European Union (EU) Companies

The price quoted shall be net of Taxes. All applicable Taxes payable by the selected bidder at the conclusion or implementation of the Contract in respect of the goods/services shall be quoted separately or separately identified on the Proposal together with information on the nature of the Tax and its method of calculation. Due to the VAT exemption applicable to the Commission, no VAT will be charged to the Commission by the EEC Suppliers under the Contract (Ref. EU VAT Council Directive 2006/112/EC, Article 151).

(3) For Non-EU Companies

The price quoted shall be net of Taxes. All applicable Taxes payable by the selected bidder at the conclusion or implementation of the Contract in respect of the goods/services shall be quoted separately or be separately identified on the Proposal together with information on the nature of the tax and its method of calculation. For deliveries to Vienna, Austria, and due to the tax exemption at source applicable to the Commission, no Taxes shall be charged to the Commission under the Contract.

(iii) Note that clear and detailed explanations would enable us to evaluate the Proposal promptly and proceed with fewer requests for clarifications/justifications in a later stage. This is also a factor influencing the decision for Contract award.

10. Completeness and Correctness of the Proposal

The Commission reserves the right to verify all information furnished by you in the Proposal through a source of its choice. Any inaccurate information so given may lead to the rejection of the Proposal.

11. Validity of the Proposal

The Proposal shall be valid for 90 (ninety) days after the deadline for its submission to the Commission, unless an extension of validity has been requested by the Commission.

12. Correction of Errors

The Commission will check the Proposal for any arithmetic errors. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected.

13. Evaluation of the Proposal

(a) The Commission will conduct the evaluation based on the criteria and method specified in Attachment 1 "*Evaluation Criteria and Method".*

(b) The Commission, based on the evaluation criteria and method given in Attachment 1 and will determine the Proposal that "most effectively satisfies the technical and operational requirements set out in the solicitation documents", subject to contractual and financial compliance.

(c) The Commission will award the Contract to the bidder receiving the highest combined score in the technical and financial evaluation, in line with the Best Value for Money-principle. The weight of the technical and financial components is 60% and 40% respectively.

14. Negotiations of the Proposal and Award

The Commission reserves the right to request clarifications on the Proposal and to enter into negotiations regarding technical or commercial aspects of the Proposal before awarding the contract under this RFP.

The Commission also reserves the right to split the award for this project if so deemed desirable.

15. Modification and Withdrawal of Proposal

Bidders may modify or withdraw their Proposals after their submission, provided that written notice of the modification or withdrawal is received by the Commission by the closing date for the submission of the Proposal. The Proposal may not be modified subsequent to the closing date.

16. The Commission's Right to Reject the Proposal

The Commission reserves the right to accept or reject a Proposal or to annul this procurement process at any time prior to the award of contract without having to inform the bidders of the grounds therefore, without thereby incurring any liability to the bidders.

17. Costs of preparation and submission of the Proposal

Bidders shall bear all the costs associated with the preparation and submission of their Proposal and the Commission will not be responsible or liable for those costs, regardless of the outcome of this RFP.

18. Proprietary Information

All documentation and information contained in this RFP are proprietary to the Commission and shall not be duplicated, used or disclosed -in whole or in part- for any purpose other than to evaluate them and respond to the Commission's request for Proposal or otherwise without prior written agreement of the Commission.

BIDDER'S STATEMENT
PLEASE STATE BELOW & SUBMIT WITH PROPOSAL

Delivery Time:

Shipping weight (kg) and Volume (m^3) – if applicable:

List of recommended consumables and spares including prices and details on local availability, if applicable (please tick):

☐ For one year period ☐ For a period of …………………………..

Warranty period applicable (it shall be for a **minimum of 24 months**, starting from the acceptance of the goods/services by the Commission) – please tick below:

☐ For a two year period ☐ For a period of …………………………..

Availability of local service in Vienna, Austria (if any):

State country of origin or assembly of all items quoted:

Quantity discount and early payment discount (if any):

Include documentary evidence of qualifications to perform the order, which shall establish to the Commission's satisfaction that the bidder has the financial, technical and production capability necessary to perform the order in its entirety and to provide spare parts and other necessary on-going services as required.

Included in this quotation : **Yes** ☐ **No** ☐

Confirmation that the bidder has reviewed the Commission's Model License Agreement (if attached), the Commission's General Conditions for Goods (if attached), the Commission's General Conditions of Contract (if attached), Draft Contract (if attached), and the Special Conditions (if attached), and agreed to all terms and conditions.

Yes ☐ **No** ☐

Remarks:

With regards to the software provided with the equipment, state and confirm whether the software licenses are transferable to third parties, i.e. the Commission or the Commission's State Signatories (Member States).

Yes ☐ No ☐ Not applicable ☐

Remarks:

Name:

Name & Title of Contact Person:

Signature & date:

RFP 2023-0141/Poggio
Maintenance and Enhancements for Verification Data and Products Messaging System (VDMS) and Acquisition Module (ACQ) Applications on a Call-off Basis

Attachment 1

Evaluation Criteria and Method

Ref No. in TOR	1.QUALIFICATION REQUIREMENTS (PASS/FAIL)	PASS/FAIL
	Requirements for the Contractor (PASS /FAIL)	**PASS/FAIL**
8.1	The Contractor provided a team of a minimum of three (3) people.	PASS/FAIL
8.1	The proposed team shall overall fulfill the staff requirements defined in Section 8.2 of the Terms of Reference	PASS/FAIL
	Requirement for the Contractor's Personel (PASS /FAIL)	**PASS/FAIL**
8.2	A university degree in a scientific/technical subject	PASS/FAIL
8.2	A minimum of five (5) years of experience implementing and testing software on Unix and Linux systems	PASS/FAIL
8.2	A minimum of three (3) years of experience with Python, Django and the SQLAlchemy	PASS/FAIL
8.2	A minimum of three (3) years of experience with Oracle databases	PASS/FAIL
9	Risk assesment plan provided	PASS/FAIL

Only bidders who pass all above criteria will be considered for the point system evaluation below (2nd stage)

No.	2.TECHNICAL REQUIREMENTS - EVALUATION CRITERIA AND METHOD	Points		
	Quality of the Proposal	**Max Points**	**Factor**	**Weigted score**
	Extent to which all aspects of the ToR have been addressed in sufficient detail and clarity.	5	1.5	7.5
	Understanding of the scope of work and the responsibilities of the Contractor	5	2	10
	Subtotal	**10**		**17.5**
	Requirements for the Contractor	**Max Points**	**Factor**	**Weigted score**
8.1	The proposed project management methodology follow the best practices	5	2	10
8.1	Demonstrated experience developing similar complex projects	5	2	10
8.1	The proposed software engineering methodology can align with Scrum	5	1.5	7.5
8.1	Experience working with a modern issue tracking and ticket management systems, preferably Jira and its use. At least 3 projects are listed as examples	5	1	5
8.1	Current CMMI level 3 or higher, or ISO 9001 certification	5	0.5	2.5
	Subtotal	**25**		**35**
	Required Experience Contractor's personel	**Max Points**	**Factor**	**Weigted score**
8.2	More than five (5) years of experience implementing and testing software on Unix and Linux systems	5	1.5	7.5
8.2	More than three (3) years experience with Python, Django and SQLAlchemy	5	1.5	7.5
8.2	More than three (3) years experience with Oracle databases	5	1.5	7.5
8.2	More than three (3) years experience with Git and GitLab CI	5	1.5	7.5
8.2	At least two (2) years experience with ElasticSearch, Logstash and Kibana	5	1.5	7.5
8.2	Effective communication skills in English with the ability to participate in meaningful and articulate verbal discussions. Each team member should have worked in a project in English.	5	1	5
	Subtotal	**30**		**42.5**
	Skills and experience of (key) personnel to be met at the team level	**Max Points**	**Factor**	**Weigted score**
8.2	At least two (2) years of experience building automation and continuous delivery pipelines in GitLab.	5	1	5
	Subtotal	**5**		**5**
	TOTAL - Technical Evaluation	**70**		**100**

5

The minimum acceptable Total Points is 42
The maximum number of points is 70 with 100 in scoring weight.

EVALUATION METHOD:

1. Technical Evaluation:

The technical evaluation process will be done in two stages:

1) Stage 1: Technical proposals will first be evaluated against the mandatory requirements outlined in section 1 above, on a PASS/FAIL basis.

Compliance with all mandatory requirements is required in order to pass stage 1 of the technical evaluation and to be further considered for stage 2 of the evaluation process;

2) Stage 2: The technical proposals that have passed stage 1 of the technical evaluation process, will be evaluated against the weighted criteria set forth in the evaluation matrix above.
In order to pass this stage, bidders must obtain a score of at least 42 and in accordance with the scoring table indicated below:

TABLE 2

Points	Explanation - to be considered when assigneing the points
0	Response incomplete, inadequate and/or non-responsive to the criterion. Bidder does not clearly understand the criterion.
1 - 2	Week - Does not covers the minimum technical, functional, or performance related criterion.
3	Good - Meets the criterion in *most* areas but is lacking details and responsiveness in some areas of the criterion.
4	Very good - Meets the criterion to minimum acceptable levels in all areas.
5	Excellent - Meets the criterion to minimum acceptable levels in all areas and exceeds it in some areas.

2. Financial and commercial evaluation

Once the technical evaluation is finalized, the financial offers of the technically compliant bidders will be evaluated in accordance with the formula given below:

X= Max Available Points * Y/Z

Legend:
X= points to be assigned to the offer being evaluated
Y= price of the lowest priced, technically compliant offer
Z= price of the offer being evaluated

The Contract will be awarded to the bidder who receives the highest combined score resulting from the technical and financial evaluations.
The weight of the technical and financial components is 60% and 40% respectively, subject to contractual acceptability

Attachment 2

Format of Technical Proposal

Technical Proposal - Mandatory Table of Contents and Format

Item	Minimum content
1. Executive Summary	• Provide an overview of proposal
2. Experience, Resources and Project Management	
2.1 Corporate Profile and Values	• Background of company (or consortium), ownership, size, location, profile • If a consortium, provide a clear explanation of the business relationship between the members and governance for execution of this project. Also discuss and show the relationship of any sub-contractors.
2.2 Corporate Experience	• Experience in managing and executing work of similar scope and complexity.
2.3 Project Management Team and Staffing	• Provide management structure and key personnel of the project.
2.4 Availability of resources	• Please address in as much detail as reasonable what resources you deem necessary for the successful implementation of the project and when they will be made available during the intended project implementation, in terms of: – key personnel; – hardware; – software; – other resources.
2.5 Quality Management Plan	• Provide a Quality Management Plan that describes how quality of services will be maintained throughout the Contract period. • Include QA certifications and applicable references
3. Meeting the Requirements	
3.1 Assumptions	• The bidder should detail key assumptions that may apply to the Technical Proposal.

3.2 Understanding of the project	• The bidder's response should demonstrate a good understanding of the tasks as described in the Terms of Reference and the additional software documentation, and describe in detail how the required tasks/services will be accomplished. • The bidder's response should describe in detail the expected inputs/resources to be made available by the Commission.
3.3 Software Development	Please address in as much detail as reasonable: • How you intend to address the tasks described in section 4 of the Terms of Reference; • How will you intend to implement a sound test strategy and provide us with good quality documentation (please provide test cases and examples); • Whether you have provided maintenance services for large and mission critical systems in large organizations for systems similar to the ones described in sections 2 and 3 of the Terms of Reference. Please provide a brief description of these services, their size in terms of lines of code, and how they were conducted in terms of planning, organization, reporting and execution.
4. Contractor's Requirements	
	• Provide a matrix that details how the requirements laid out in section 8.1 of the Terms of Reference are met (Annex B).
5. Skills and Experience of key staff	
	• Provide the resume of the proposed key personnel which describes in detail all qualifications and experience specified in section 8.2 of the Terms of Reference. • Provide a matrix that details how each of the proposed key personnel satisfies the requirements laid out in section 8.2 of the Terms of Reference (Annex B). •
6. Attachments (reference Section 2 of the *Instructions for the Preparation of Proposals*)	
Provide the following documents duly filled and signed:	• Bidder's Statement • Statement of Confirmation • Vendor Profile Form

RFP 2023-0141/Poggio “Maintenance and Enhancements for Verification Data and Products Messaging System (VDMS) and Acquisition Module (ACQ) Applications on a Call-off Basis”

Attachment 3: Format of Financial Proposal

Description		Year 1	Year 2	*Optional Year 3*	*Optional Year 4*
Work at Contractor's premises (max 660 working days in Year 1 and 2) Kindly indicated the staff proposed position		Daily Rate in ____ (EUR or USD kindly specify)	Daily Rate in ____ (EUR or USD kindly specify)	Daily Rate in ____ (EUR or USD kindly specify)	Daily Rate in ____ (EUR or USD kindly specify)
Staff 1					
Staff 2					
Staff 3					
Work at CTBTO's premises in Vienna (max 20 working days in Year 1 and 2) Kindly indicated the staff proposed position		Daily Rate in ____ (EUR or USD kindly specify)	Daily Rate in ____ (EUR or USD kindly specify)	Daily Rate in ____ (EUR or USD kindly specify)	Daily Rate in ____ (EUR or USD kindly specify)
Staff 1					
Staff 2					
Staff 3					
Travel (estimated cost) max 4 travel		Travel Cost _____ (EUR or USD)	Travel Cost _____ (EUR or USD)	Travel Cost _____ (EUR or USD)	Travel Cost _____ (EUR or USD)
Estimated cost for each trip to CTBTO - Vienna (see note 5 below) Kindly specify the type of travel applicable, such as: Air, train, etc…					
Other applicable costs (if any)					

NOTES:

1 The price table may be modified as appropriate

2 Prices shall be be firm and fixed for the duration of the contract (24 months + 24 months optional extension)

3 Prices shall be quoted in EUR or USD only.

4 All prices shall be net i.e. excluding any applicable taxes

5 For evaluation purposes, bidders shall provide the cost of a return travel to Vienna (Austria).Travel costs will be reimbursed by the Commission in accordance with the following rules:
- International/regional travel by air: simple economy return airfare for the most direct route between the place of establishment of the Contractor and the premises of the Commission in Vienna, Austria. In exceptional circumstances and with prior written approval of the Commission, the Contractor may be reimbursed for flexible economy return airfare but it remains for the Commission to approve the type of airfare that will be reimbursed.
- International travel by other means than air travel: the rate accepted by the Commission for the most direct route between the place of establishment of the Contractor and the premises of the Commission in Vienna, Austria.
- Reasonable terminal expenses, if any: at cost against supporting documents.
- The actual travel costs paid by the Commission shall not exceed the estimate by more than 10%

6 Bidders shal not quote for Daily Subsidiary Allowance (DSA). DSA shall be calculated based on the values provided by the International Civil Service Commission (ICSC) www.iscs.un.org.

Attachment 4

"Procedure for Submission of Electronic Offers in 2 Sealed Files"

The Commission invites you to submit your sealed offer (Bid, or Proposal) in response to the solicitation forming part of this request.

Please be sure to follow the instructions below very carefully, so that the documents you submit are encrypted, and cannot be opened without an encryption key (password). If the documents are not encrypted, they will not be accepted as part of this tender process.

CRITICAL INFORMATION:

Create separate zip files for the technical offer and the financial offer (labeling them clearly in the title) with different encryption keys. Instructions for how to do this are provided below.

Step 1: You provide the encryption key (password) for the *Technical Offer only* (in accordance with the below instructions)!

Step 2: After the Commission has performed the evaluation of the Technical Offer, if your Technical Offer is considered to be acceptable, the Commission will request the encryption key (password) for the Financial Offer you have already submitted by the tender Deadline.

Should you have any questions, please send an email to procurement@ctbto.org.

We recommend that you leave yourself plenty of time to complete the below process (including getting any necessary assistance from the Commission), as late offer will not be accepted.

INSTRUCTIONS:

1. In a **WINDOWS** environment, one way of meeting the requirements is as follows.

   We recommend using the open-source, free software **7-zip**, but if you are comfortable with other tools, the result should be the same, as long as you can apply encryption to the archive. In the below, we'll use 7-zip as an example.
   (You can download the 7-zip code for Windows at: 7-zip.org)

2. In **LINUX** environment, you can use, for instance, "sha1sum" on the command line.

Creating the archives for submission

Regardless of whether the offer is a single file, or a collection of files, the files are easier to manage if delivered as a single, compressed file. Compressing the archive is a common way to meet size limitations in email systems.

As an example of how to submit your offer in the required format: assuming you are supplier "SOFTCOMP" and have the following files related to the offer for "RFP 2020-0010/EDWALD". *(You will need to replace these elements with the real information for your actual offer in line with the relevant Instructions for Preparation and Submission of Proposals/Bids.)* Assuming further that you have installed the 7-zip software on the Windows system you are using.

We will only go through the creation of the Technical Offer (Proposal/Bid) component; the Financial Offer (Proposal/Bid) component is similar.

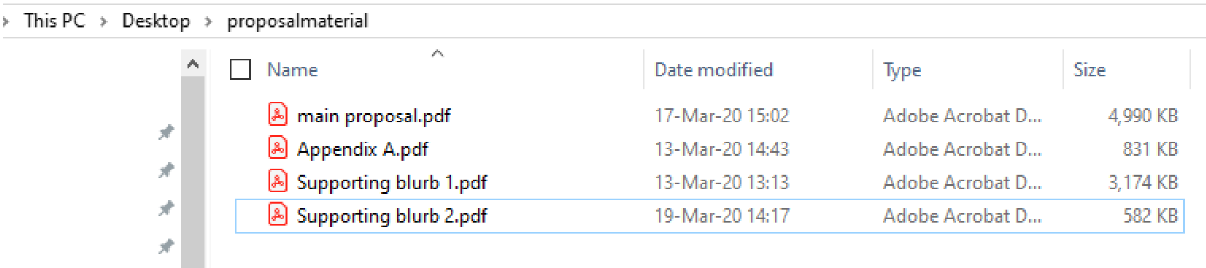


Figure 1 An example set of files to be submitted

Select the four files and right-click; a Dialog box pops up, with one of the options being "**7-ZIP >**". Hover your cursor over the " **>**" part and a few more options appear, select the "**Add to archive**" option.

Another dialog box pops up (see 'Figure 2, *Creating an Archive*', next page):

Using the standard Windows methods, select a suitable location for the archive (if you don't change it, the archive gets created right where the selected files are), and give it a name in the form of: "SOFTCOMP-2020-0010-EDWALD-TECHNICAL-BID", of course replacing all the elements with the true values for the offer in question: the actual company indicator, and the actual RFP/ITB identification string. Note that it is not possible to put a slash "/" in the filename, and therefore put a dash "-" instead. Leave the file extension ".zip' as is.

Leave all the other settings as is, except: **add a password to the encryption** (see figure 2 below). This is done by typing the same password (of your choosing) twice in the two text fields in the lower right hand corner.

Make a note of this password. You must choose different passwords for the two zip archives, that is, the Technical and the Financial Proposal/Bid.

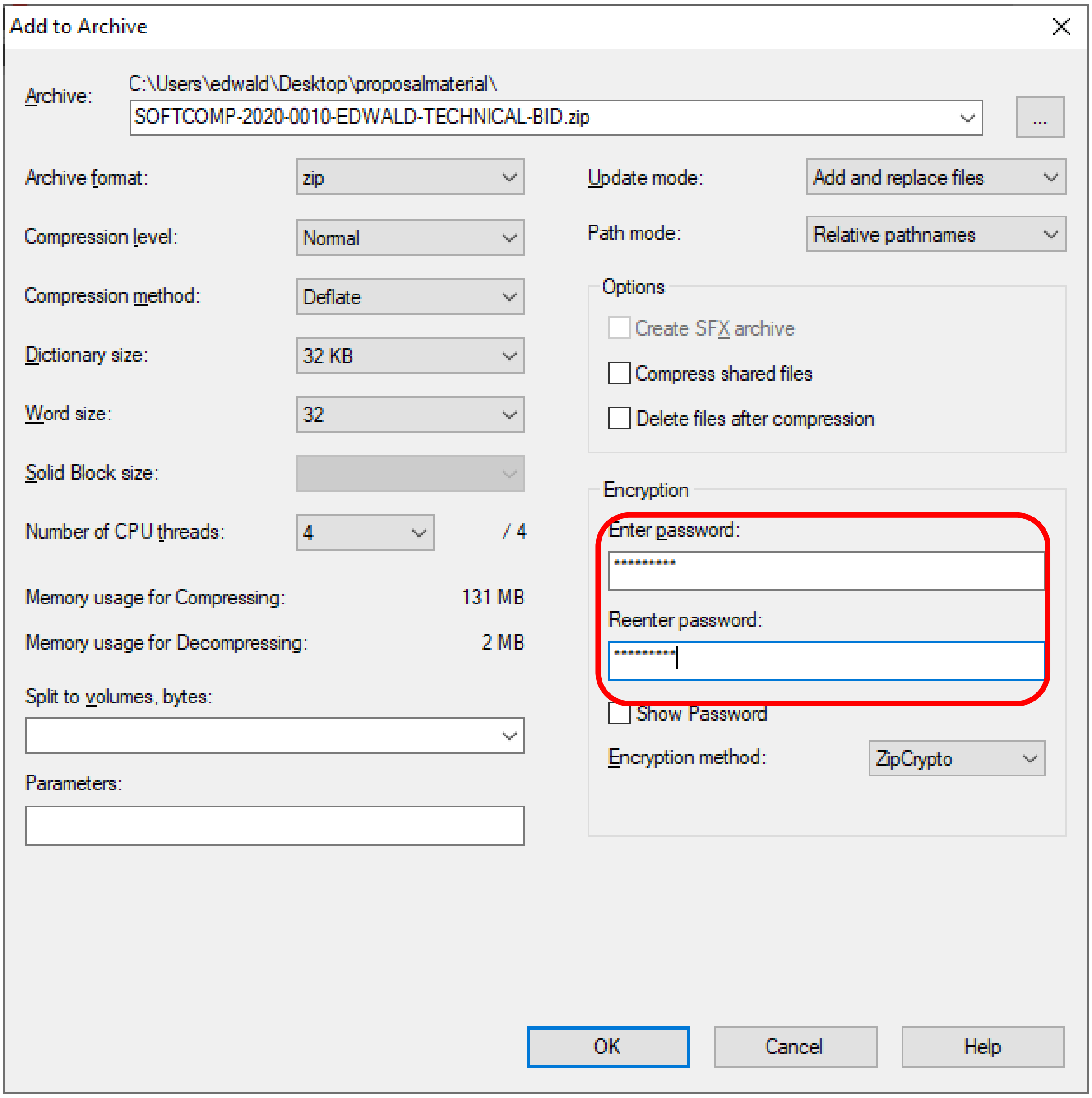


Figure 2 Creating an Archive

Now, we seek the "SHA1 Hash", and electronic fingerprint of the archive you have just created. The hash is a string calculated from your file(s) and can be used to guarantee that the file has not been modified since you created it. Any change to the file will result in a different hash value.

There are many ways of calculating this; two common options are decribed below.
If the appropriate functionality is available in your Windows environment: Select the compressed archive in the Windows file manager, (eg. SOFTCOMP-2020-0010-EDWALD-TECHNICAL-BID.zip) and right click. One of the options to select is "**CRC SHA >**". Hovering over the " **>**" brings a few more options to light, select the **SHA-1** option. A smaller dialog pops up: (see Figure 3, *SHA1* below).

Clicking Ctrl-C grabs the contents of this box. You can close the box after copying the contents. (You can paste the contents into a mail message, for instance.)

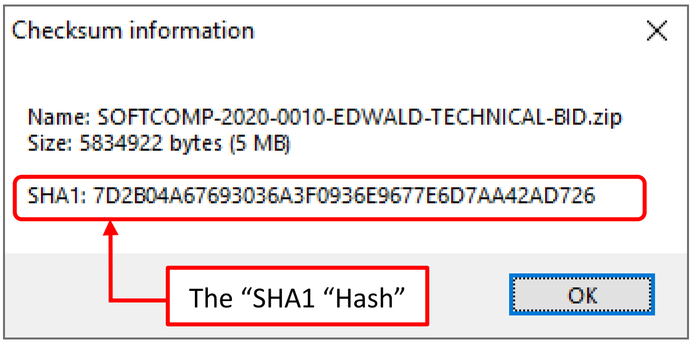


Figure 3 SHA1

If this CRC SHA function is not available by 'right-click' on your Windows version, you can also do this from 'the command line', a slightly more complicated way. Open a CMD window (see sidebar below), move to the folder where your archive is, and execute the command:
"`certutil -hashfile` *`SOFTCOMP-2020-0010-EDWALD-TECHNICAL-BID.zip`* `sha1`"
where you obviously replace the name of the file with your real file name. The output of this command is the SHA1 "hash". You can copy-and-paste the string for use in the email (below).

Sidebar: How to open a CMD window in Windows: The way to open a Command window (or 'terminal') depends on the version of Windows you have. The different methods are very clearly described in the following article, but a quick internet search will find multiple descriptions. https://www.lifewire.com/how-to-open-command-prompt-2618089

Finally,

1. Create a new email, Subject: example- "SOFTCOMP-2020-0010-EDWALD". Add the two compressed archives, that is, the Technical Offer and the Financial Offer archives as attachments. The text of the email should contain the SHA1 information for both archives. **SEND THIS TO:** sealed_bids@ctbto.org (note that there is an underscore "_" between "sealed" and "bids"). (Should the email become larger than your mail system allows, you can try sending the two archives in separate emails. Take care to include the right SHA1 information with each file.)

2. Create a new email, Subject: example- "SOFTCOMP-2020-2010-EDWALD-Technical Offer" the contents of which must contain the Encryption Key for the Technical Offer (the password you

used when creating the Technical Offer). (Again, note the underscore between 'bid' and 'keys'.)

SEND THIS TO: bid_keys@ctbto.org

IMPORTANT NOTE: As stated above, only send the Encryption Key for the Technical Offer to the bid_keys@ctbto.org mailbox when sending your Technical and Financial Offer to the sealed_bids@ctbto.org mailbox. You shall only send the Encryption Key for the Financial Offer to the Commission if and when informed by the Commission that your Technical Offer had been evaluated as "technically acceptable".

The Financial Offer Encryption Key will need to be provided by you to the same e-mail (bid_keys@ctbto.org) within 48 hours of the Commission's request, clearly marked in Subject: Encryption Key for (example):"SOFTCOMP 2020-2010 EDWALD-Financial Offer". If your Offer is not considered "technically acceptable", the Commission will not request an Encryption Key for your Financial Offer, and it will remain unopened.

As mentioned above, should you have questions or difficulties, please send an e-mail to procurement@ctbto.org.

CTBTO Member States

Afghanistan
Albania
Algeria
Andorra
Angola
Antigua and Barbuda
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahamas
Bahrain
Bangladesh
Barbados
Belarus
Belgium
Belize
Benin
Bolivia (Plurinational State of)
Bosnia and Herzegovina
Botswana
Brazil
Brunei Darussalam
Bulgaria
Burkina Faso
Burundi
Cambodia
Cameroon
Canada
Cabo Verde
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo
Cook Islands
Costa Rica
Cote d'Ivoire
Croatia
Cuba
Cyprus
Czech Republic
Democratic Republic of the Congo
Denmark
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Eswatini
Ethiopia
Fiji
Finland
France
Gabon
Gambia
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Holy See
Honduras
Hungary
Iceland
Indonesia
Iran (Islamic Republic of)
Iraq
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Kiribati
Kuwait
Kyrgyzstan
Lao People's Democratic Republic
Latvia
Lebanon
Lesotho
Liberia
Libya
Liechtenstein
Lithuania
Luxembourg
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Marshall Islands
Mauritania
Mexico
Micronesia, Federated States of
Monaco
Mongolia
Montenegro
Morocco
Mozambique
Myanmar
Namibia
Nauru
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Niue
North Macedonia
Norway
Oman
Palau
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Republic of Korea
Republic of Moldova
Romania
Russian Federation
Rwanda
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Samoa
San Marino
Sao Tome and Principe
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Slovakia
Slovenia
Solomon Islands
South Africa
Spain
Sri Lanka
Sudan
Suriname
Sweden
Switzerland
Tajikistan
Thailand
Timor-Leste
Trinidad and Tobago
Togo
Tunisia
Türkiye
Turkmenistan
Tuvalu
Uganda
Ukraine
United Arab Emirates
United Kingdom
United Republic of Tanzania
United States of America
Uruguay
Uzbekistan
Vanuatu
Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

STATEMENT OF CONFIRMATION

On behalf of (name of firm or organization):_________________________________, I hereby attest and confirm that:

a) The firm/organization possesses the legal status and capacity to enter into legally binding contracts with the Commission for the supply of equipment, supplies, services or work.

b) The firm/organization is not insolvent, in receivership, bankrupt or being wound up, and not under administration by a court or a judicial officer, and that it is not subject to the suspension of its business or legal proceedings for any of the foregoing reasons.

c) The firm/organization has fulfilled all its obligations to pay taxes and social security contributions.

d) The firm/organization has not, and that its directors and officers have not, within the last five years been convicted of any criminal offense related to professional conduct or the making of false statements or misrepresentations as to their capacity or qualifications to enter into a procurement or supply contract.

e) The Commission, in the event that any of the foregoing should occur at a later time, will be duly informed thereof, and in any event, will have the right to disqualify the firm/organization from any further participation in procurement proceedings.

f) The firm/organization did not/will not attempt to influence any other bidder, organization, partnership or corporation to either submit or not submit a proposal/bid/quotation.

g) The firm/organization will not, in the absence of a written approval from the Commission, permit a person to contribute to, or participate in, any process relating to the preparation of a Quotation/Bid/ Proposal or the procurement process if the person:

   a. at any time during the 12 months immediately preceding the date of issue of the Solicitation was an official, agent, servant or employee of, or otherwise engaged by the Commission;
   b. at any time during the 24 months immediately preceding the date of issue of the Solicitation was an employee of the Commission personally engaged, directly or indirectly, in the definition of the requirements, project or activity to which the Solicitation relates.

h) Neither the organization/firm, its parent entities (if any), nor any of its subsidiary or affiliated entities (if any) have been identified on, or associated with any individual, groups, undertakings and entities identified on, the list established pursuant to the UN Security Council Resolution 1267 (Consolidated Sanctions List).[1]

i) Neither the organization/firm, its parent entities (if any), nor any of its subsidiary or affiliated entities (if any) are subject to any form of sanction imposed by an organization or body within the United Nations System, including the World Bank.

---

[1] The Consolidated United Nations Security Council Sanctions List can be found on the following website: **https://www.un.org/securitycouncil/content/un-sc-consolidated-list**

j) Neither the organization/firm, its parent entities (if any), nor any of its subsidiary or affiliated entities (if any), is engaged in any practice inconsistent with the rights set forth in the Convention on the Rights of the Child, including Article 32 thereof, which, inter alia, requires that a child shall be protected from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.

k) Neither the organization/firm, its parent entities (if any), nor any of its subsidiary or affiliated entities (if any) will use the funds received under contracts/purchase orders with the Commission to provide support to individuals, groups, undertakings or entities associated with terrorism.

l) The prices in the firm/organization's proposal/bid/quotation have been arrived at independently, without consultation, communication or agreement with any other interested companies, competitor or potential competitor with a view to restricting competition.

m) The Commission shall have the right to disqualify the firm/organization from participation in any further procurement proceedings, if it offers, gives or agrees to give, directly or indirectly, to any current or former staff member of the Commission a gratuity in any form, an offer of employment or any other thing of service or value, as an inducement with respect to an act or a decision of, or a procedure followed by, the Commission in connection with a procurement proceeding.

n) The Commission shall have the right to disqualify the firm/organization from participation in any further procurement proceedings if it does not disclose to the Commission any situation that may appear as a conflict of interest, and if it does not disclose to the Commission if any official or professional under contract with the Commission have an interest of any kind in the firm/organization's business or any kind of economic ties with the firm/organization.

o) The firm/organization expressly agrees to abide by the United Nations Supplier Code of Conduct.[1]

Name (print):___________________________ Signature: ________________________

Title/Position: _________________________

Place (City and Country):_________________________ Date: _________________________

[1] https://www.un.org/Depts/ptd/about-us/un-supplier-code-conduct

VENDOR PROFILE FORM (VPF) – FOR PRODUCTS/SERVICES/WORK

1. Name of Company:

2. Street Address:	3. Telephone:
P.O. Box: City:	4. E-Mail:
Zip Code: Country:	5. Website:

6. Contact Person: Title:

7. Legal Status (e.g. Partnership, Private Limited Company, Government Institution)
PLEASE INCLUDE A COPY OF THE CERTIFICATE OF INCORPORATION

8. Year Established:	9. Number of Employees:
10. Gross Corporate Annual Turnover (US$m)*:	11. Annual Export Turnover (US$m)*:

12. Type of Business/Products: Manufacturer ☐ Sole Agent ☐ Supplier ☐
Other ☐ (please explain)

13. Type of Business/Services/Work: Engineering ☐ Civil Work ☐ Governmental Institution ☐
Other ☐ (please explain)

14. References (your main customers, country, year and technical field of products, services or work): **

15. Previous Supply Contracts with United Nations Organizations (over the last 3 years)**

Organization: Value in US$ Equivalent: Year:

Organization: Value in US$ Equivalent: Year:

16. Summary of any changes in your company's ownership during the last 5 years:

* Please provide a copy of the most recent audited annual report and accounts. Note: Export includes services or work performed abroad or for foreign clients.

** Please provide supplementary documentation on these items.

17. List of Products/Services/Work offered:

Product/Service/Work #	Product/Service/Work Description

18. This section shall be **signed and stamped** by an official legally authorized to enter into contracts on behalf of your organization:

Name: Title: Signature: Date:

Bank Details	**Beneficiary Details**
Bank Name:	Beneficiary Name: (exactly as stated on bank statements)
Bank Address:	IBAN: (if applicable)
Exact Account Holder Name:	Account number:
	SWIFT/BIC:
	ABA/Sort Code:

Additional Details (if applicable)

Correspondent bank:

Correspondent account number:

Correspondent SWIFT/BIC:

Tax Identification Number:

FOR CTBTO USE ONLY		
Evaluated By:	Initials	Date:
Updated By:	Initials	Date:
Remarks:		

* Please provide a copy of the most recent audited annual report and accounts. Note: Export includes services or work performed abroad or for foreign clients.
** Please provide supplementary documentation on these items.

preparatory commission for the comprehensive nuclear-test-ban treaty organization
CTBTO PREPARATORY COMMISSION

MODEL CONTRACT

(SAP No.)

between

THE PREPARATORY COMMISSION

FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY

ORGANIZATION

and

THE NAME OF THE CONTRACTOR

for

the provision of services pertaining to the

Maintenance and Enhancements for VDMS and ACQ Applications

on a Call-off Basis

This Contract comprises this cover page, a table of contents, 9 (nine) pages of text, a signatories page, a List of Annexes and 3 (three) Annexes (A to C)

[Month, year]

TABLE OF CONTENTS

[TO BE UPDATED ONCE SPECIFIC CONTRACT IS PREPARED]

MODEL CONTRACT

This CONTRACT is entered into between the PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION (hereinafter referred to as the "Commission"), having its office located at Wagramer Strasse 5, 1400 Vienna, Austria, and __________________________ (hereinafter referred to as the "Contractor"), having its registered office located at ___________________ [address] (both hereinafter individually referred to as the "Party" and collectively as the "Parties").

The Parties hereto mutually agree as follows:

1 DEFINITIONS

In this Contract, words and expressions shall have the same meanings as respectively assigned to them in the General Conditions of Contract and the Terms of Reference. In addition, the following words and expressions shall have the meanings hereby assigned to them:

"Annex A" means the Commission's General Conditions of Contract.

"Annex B" means the Commission's Terms of Reference.

"Annex C" means the Contractor's Proposal dated xx/xx/xxxx.

"Contract" means this document, its Annexes and any further modifications or such further documents as may be expressly incorporated in this Contract by the Parties in accordance with Clause 21 below.

"Contractor" means the legal entity named in the preamble of this Contract or its successors. The Contractor shall be the only interface for all matters pertaining to execution of the Work under this Contract.

"Goods" means the equipment to be supplied and delivered by the Contractor under the Contract as requested by the Commission under a WO.

"Services" means the activities or tasks to be performed by the Contractor under the Contract as requested by the Commission under a WO.

"Party(ies)" means the Commission and/or the Contractor, as the context requires.

"Rule(s)" means any regulation(s), official directive(s), ordinance(s), guideline(s), customs and practices.

"Work" means all the Goods and Services to be provided by the Contractor, including its affiliates and/or subcontractors, in order to fulfil all its obligations under the Contract, and the remedying of any defects therein.

"Work Orders ('WO')" mean orders issued by the Commission which specify the (parts or portions of) Work to be performed by the Contractor upon request by the Commission in accordance with Annexes B and C.

2 AIM OF THE CONTRACT

The aim of this Contract is to provide services namely "Maintenance and Enhancements for VDMS and ACQ Applications on a Call-off Basis" (hereinafter referred to as the "Services" or "Work") to the Commission.

3 ENTRY INTO FORCE AND DURATION OF THE CONTRACT

The Contract shall enter into force upon the date of the last signature by the authorized Representatives of the Parties (hereinafter referred to as the "**Effective Date**") and shall be valid until the Parties fulfill all their obligations hereunder.

4 COMMENCEMENT AND COMPLETION OF THE WORK

(i) The Commission shall have the right, but not the obligation, to call-off the Works in the form of WO within a period of 24 months from the Effective Date or the performance of a maximum of 660 (six hundred and sixty) person-days by the Contractor, whichever occurs first (hereinafter referred to as the "**Call-off Period**"). The commencement and completion date for the performance of the Work (hereinafter referred to as "**Commencement Date**" and "**Completion Date**", respectively) will be set out in the respective WO.

(ii) The Commission shall have the option to extend the Call-off Period one time (1) for another period of 24 months subject to the availability of funds, under the same terms and conditions as those of this Contract. The Commission will inform the Contractor about its intention to extend the Work at least one (1) month prior to the expiry of the Contract. The optional extensions will be implemented through a written notification to the Contractor by the Commission.

5 STANDARD OF WORK

The Contractor shall perform the Work in a workmanlike manner in conformity with standard professional practices, using qualified personnel and in strict accordance with the Contract. The Contractor shall furnish the highest skill and judgement and cooperate with the Commission, including all the Commission's consultants and agents, in best furthering the interests of the Commission and the aim of this Contract. The Contractor shall provide efficient business administration and supervision, and it shall perform the Work in the best way and in the most expeditious and economical manner consistent with the requirements of the Contract.

6 RESPONSIBILITIES OF THE CONTRACTOR

(a) The Contractor shall provide the Work described in Annex B.

(b) The Contractor shall provide qualified English-speaking personnel as necessary to perform the Work under this Contract. The key persons shall be available for possible tasks related to the Work throughout the duration of the Contract period. Any replacement of the key personnel shall be made in accordance with Clause 7 of Annex A.

(c) The Contractor acknowledges that after the completion of the Work under this Contract, the Commission shall own the Software and source code described in Annex B and the Contractor shall have no rights in that Software or source code unless granted by the Commission under Clause 24 of this Contract or in writing under a separate agreement.

7 ORGANISATION OF CONTRACT IMPLEMENTATION

(a) During the term of the Contract, the Commission has the right, but not the obligation, to initiate performance of the Work through the issuance of individual WOs in accordance with section 5 of Annex B based on the firm fixed unit prices set out in Annex C. The Contractor shall not perform any Work if not requested by the Commission through an WO. However, the Contractor may propose a WO for the Commission's evaluation.

(b) The WO issued by the Commission shall be the basis for acceptance, invoicing and payment of any Work performed by the Contractor.

(c) The performance of the Work shall be made in full in accordance with the respective WO. Partial service performance of a WO will not be accepted and reimbursed without prior written agreement by the Commission.

(d) The Work shall be performed at the place and within the approved Work Plan specified in the relevant WO.

(e) The Commission may revise a WO as and when it may deem necessary.

8 WARRANTY

(a) The provisions of Clause 28 of Annex A shall apply to the Work performed by the Contractor.

(b) The Contractor shall ensure that the Commission shall experience no loss of service or support level by sub-contractors or repair agents acting on behalf of the Contractor.

9 PERMITS, NOTICES, LAWS AND ORDINANCES

(a) The Contractor shall obtain and pay for all permits and inspections necessary for the proper execution and completion of the Work that are customarily obtained upon execution of this Contract and that are legally required at the time the Proposal is received by the Commission. This shall include, but not be limited to, work permits, visa, or similar.

(b) The Contractor shall give all notices required by the nature of the Work.

(c) If the Contractor notices that the Work or any part thereof required under this Contract is not in accordance with applicable laws and Rules, or with technical or safety standards, it shall promptly notify the Commission thereof in writing.

10 PROTECTION OF PERSONS AND PROPERTY

(a) The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programmes in connection with the Work.

(b) The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury and loss to:

(i) all employees on the Commission's premises and all other persons who may be affected thereby;

(ii) all the Work, equipment, its spare parts, materials and supplies to be incorporated therein, whether in storage on or off the Commission's premises, which are under the care, custody or control of the Contractor or any of its subcontractors; and

(iii) other property on the Commission's premises or adjacent thereto.

(c) The Contractor shall give all notices and comply with all applicable laws and Rules bearing on the safety of persons and property and/or their protection from damage, injury and loss.

(d) The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for the safety and protection of persons and property, including posting danger signs and other warnings against hazards and promulgating safety regulations.

(e) When the use or storage of combustible, explosive or other hazardous materials is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

(f) The Contractor shall be responsible for the prevention of accidents on the Commission's premises during the execution of the Work.

(g) In any emergency affecting the safety of persons or property, the Contractor shall promptly act to prevent threatened damage, injury and loss.

(h) The Contractor shall promptly remedy all damage and loss to any property, referred to in Sub-Clause (b) above, caused in whole or in part by the Contractor, any subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible under Sub-Clause (b) above, except damage and loss attributable to the acts or omissions of the Commission or anyone directly or indirectly employed by it, or of anyone for whose acts the Commission may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to its obligations under Clause 9 of Annex A.

11 RESPONSIBILITIES OF THE COMMISSION

The Commission shall designate members of its staff to act as points of contact for the Contractor to ensure that the Work is carried out in accordance with Annexes B and C and shall promptly notify the Contractor thereof. The Commission shall respond promptly to requests for information by the Contractor regarding the Work.

12 CONTRACT PRICE

(a) The Commission shall pay to the Contractor, in consideration of the full and proper performance of its obligations under the Contract, as follows:

(i) For each WO issued during the firm Call-off Period specified in Clause 4(i) above, the firm fixed unit prices pursuant to Annex C and, if applicable, the variable costs (travel costs and other expenditure) as specified in section 7. of Annex B;

(ii) subject to sub-clause (b) below, for each WO issued during the optional extension of the Call-off Period specified in Clause 4(ii) above, the firm fixed unit prices pursuant to Annex C and, if applicable, the variable costs (travel costs and other expenditure) mentioned in section 7. of Annex B;

hereinafter referred to as the "Contract Price".

(b) In the event that the Commission decides to extend the Call-off Period early, as foreseen in Clause 4(ii) of this Contract, the Contactor will be reimbursed for the person-days called off in this period as follows:

(i) until the expiry of the initial Call-off Period, the daily rate set out in subparagraph (a)(i) above;

(ii) after the expiry of the initial Call-off Period, the daily rate agreed for the respective extension (subparagraph (a)(ii) above).

(c) The unit prices set out in Annex C shall be held fixed for the entire duration of the Contract.

(d) The Contract Price shall cover all costs and expenses incurred by the Contractor for the full and proper performance of all relevant obligations under the Contract (including travel, allowances, management and remuneration of the personnel, national income tax, medical insurance, and social security contributions).

(e) **[PLEASE IDENTIFY WHETHER TAXES ARE APPLICABLE UNDER THIS CONTRACT AND SELECT ONE OF THE FOLLOWING OPTIONS AT THE TIME OF AWARD]:**

The Contractor shall be reimbursed by the Commission for such taxes on the basis of actual amounts paid and duly documented by the Contractor as per Clause 13(e) below.

OR

No Taxes are applicable under this Contract.

13 PAYMENT

(a) The Contract Price shall be paid upon satisfactory completion of each deliverable for the Work and satisfactory completion of each WO and submission of the following:

i) Invoice drawn up in accordance with this Clause 13;

ii) Any other documentation that might be required under the applicable WO.

(b) The Commission will make the payments to the Contractor on the basis of an invoice submitted by the Contractor as per Sub-Clause (d) below. All payments shall be made within 30 (thirty) days of the receipt and acceptance of the invoice, provided that the Work has been satisfactorily completed and has been accepted by the Commission.

(c) The making of any payment hereunder by the Commission shall not be construed as an unconditional acceptance by the Commission of the Work accomplished by the Contractor up to the time of such payment.

(d) The Contractor shall submit an invoice electronically, from the Contractor's official e-mail address in PDF format, duly signed and stamped by the Contractor and submitted to the Commission's email address specified in Clause 22 below. Each invoice shall contain the Contract number (CTBTO and SAP numbers), detailed banking instructions, including the name and address of the Contractor's bank, account number, account holder's name and SWIFT, IBAN and/or ABA codes for payment by electronic transfer.

[PARAGRAPH (e) BELOW ONLY APPLIES IF THERE ARE TAXES (SEE CLAUSE 11 (e) ABOVE). IF NO TAXES ARE APPLICABLE UNDER THIS CONTRACT, PARAGRAPH (e) BELOW SHOULD BE OMITTED.]

(e) Applicable Taxes payable by the Contractor and/or its subcontractor(s) in respect of the Work shall be invoiced separately or be separately identified on the invoice. Actual payment of the Taxes must primarily be supported by original documentation such as invoices, bank account statements, transfer orders, or receipts issued by the local tax or customs authorities. If submission of such original documentation is not possible for justifiable reasons, their copies could be accepted by the Commission provided that they are duly signed and certified by local tax or customs authorities. In case the currency in which the Taxes are levied is not the currency of the Contract, bank statements (or equivalent) showing the exchange rate used for the conversion should be submitted to the Commission, in addition to any other supporting documentation.

14 TEMPORARY SUSPENSION OF WORK

The Commission may, at any time, temporarily suspend the Work, in whole or in part, being performed by the Contractor under this Contract by giving 30 (thirty) days' advance notice in writing to the Contractor. The Work so suspended shall be resumed by the Contractor on the basis of a revised time schedule and on terms and conditions to be mutually agreed upon between the Parties.

15 DELAYS AND EXTENSION OF TIME

(a) If the Contractor is delayed at any time in the progress of the Work by any act or omission of the Commission or by any of its employees, or by any other contractor employed by the Commission, or by changes in the Work ordered by the Commission, or by any causes beyond the Contractor's reasonable control, or by any other cause which the Commission determines may justify the delay, then the time for completion of the Work shall be extended by an amendment to this Contract in accordance with Clause 21 below for such reasonable time as the Commission may determine.

(b) Any request for extension of the time for reasons referred to in Clause 15(a) above shall be submitted to the Commission not later than 20 (twenty) days after the commencement of the delay, otherwise said request shall be deemed to be waived. Such request shall state grounds for the delay and shall provide an estimate of the probable effect of such delay on the progress of the Work.

16 CONTRACTOR'S CLAIMS AND REMEDIES

In no event shall the Contractor make any claim against the Commission for or be entitled to additional costs or compensation resulting from any delays in the progress or completion of the Work or any portion thereof, whether caused by the acts or omissions of the Commission, including, but not limited to, damages related to overheads, loss of productivity, acceleration due to delay and inefficiency. The Contractor's sole remedy in such event shall be an extension of time for completion of the Work, provided the Contractor otherwise meets the requirements and conditions set forth in this Contract.

17 ENTIRE AGREEMENT

This Contract represents the final agreement in respect of the Work and shall supersede all prior agreements and representations between the Parties in this respect. Annexes A to C shall constitute integral parts of this Contract and shall be in full force and effect.

18 DISCREPANCIES

If there are discrepancies or conflicts between any of the documents that are part of this Contract, the document to prevail shall be given precedence in the following order:

(i) This document;

(ii) The Commission's General Conditions of Contract (Annex A);

(iii) The Commission's Terms of Reference (Annex B);

(iv) The Contractor's Proposal (Annex C);

(v) The relevant WO.

19 SEVERABILITY

If any term and/or provision of this Contract is or becomes invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions of this Contract shall not in any way be affected or impaired thereby.

20 NO WAIVER

Failure by a Party to enforce a right shall not be deemed to be a waiver of that right unless otherwise expressly provided in this Contract.

21 CONTRACT AMENDMENT

No modification of, or change in, this Contract, or waiver of any of its provisions, or additional contractual relationship with the Contractor shall be valid unless approved in the form of a written amendment to this Contract, signed by duly authorized Representatives of the Parties.

22 TRANSMISSION OF NOTICES AND OTHER DOCUMENTS

Notices, invoices, reports and other documentation under the Contract shall be delivered or sent to the relevant Party as follows (or to such person/title, address or email address as the Party may substitute by notice after the date of the Contract):

(a) The Commission:

For Contractual Issues:

Chief, Procurement Section
Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)
Vienna International Centre
Wagramerstrasse 5, P.O. Box 1200
1400 Vienna, Austria
Tel: + (43 1) 26030 6350
E-mail: procurement@ctbto.org

For invoices:

Accounts Payable
CTBTO Financial Services Section
Vienna International Centre
Wagramerstrasse 5, P.O. Box 1200
1400 Vienna, Austria
Tel: + (43 1) 26030 6292
E-Mail: payable_invoices@ctbto.org

For invoices related enquiries: *E-Mail: payments@ctbto.org*

(b) The Contractor:

For Contractual Issues and Invoices and Related Enquiries:

Name: …………….
Title ……………….
Address ………………
Tel: ……………………
Email: ………………..

23 EFFECTIVENESS

(a) Except as provided below, any communication in connection with the Contract will be deemed to be given as follows:

(i) if delivered in person, at the time of delivery;

(ii) if by registered mail or courier, when received;

(iv) if by electronic communication, when retrievable by the Commission in document form.

(b) A communication given under Clause 23(a) above that is received or becomes retrievable on a non-working day or after business hours at the seat of the Commission will only be deemed to be given on the next working day of the Commission.

24 SOFTWARE LICENCE

The Commission hereby grants the Contractor a non-exclusive, non-transferable, irrevocable license to use the Software described in the Terms of Reference (Annex B) for the duration of the Contract and for the purpose of performing the Work under the Contract. The use of the Software and the relevant source code is only for the duration of the Contract and for the Work required under the Contract. All title, ownership rights and intellectual property rights in and to the Software shall remain with the Commission. The Contractor acquires no title, right or interest in the Software, other than the license(s) specifically granted herein by the Commission.

IN WITNESS hereof, the duly authorized Representatives of the Parties have executed this Contract:

For and on behalf of **the PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION:**

____

Name, Position/Title

Date: ___________________ Place: Vienna, Austria

For and on behalf of **[REGISTERED NAME OF THE CONTRACTOR]:**

____

Name, Position/Title

Date: ____________________ Place: _______________

LIST OF ANNEXES

ANNEX A: THE COMMISSION'S GENERAL CONDITIONS OF CONTRACT

ANNEX B: THE COMMISSION'S TERMS OF REFERENCE

ANNEX C: THE CONTRACTOR'S PROPOSAL

CTBTO preparatory commission for the comprehensive nuclear-test-ban treaty organization
PREPARATORY COMMISSION

General Conditions of Contract

1. DEFINITIONS

(a) In these general conditions of contract the terms beginning with a capital letter shall have the meaning as defined in the Contract.
(b) "Services" means all services to be rendered under the Contract.
(c) "Goods" shall mean all goods, equipment, materials and/or other supplies to be provided under the Contract.
(d) "Taxes" shall mean all direct and indirect taxes (including value added tax, general sales tax or goods and services tax), assessments, fees, customs duties, liens and charges in as much as they are levied in conclusion or implementation of the Contract, including customs restrictions and charges of similar nature in respect of articles imported or exported for the Commission's official use.

2. LEGAL STATUS

The Contractor shall be considered as having the legal status of an independent contractor vis-à-vis the Commission. Neither the Contractor and any subcontractor, nor their personnel shall be considered to be an employee or an agent of the Commission.

3. ASSIGNMENT

The Contractor shall not assign, transfer, pledge or make other disposition of the Contract or any part thereof, or any of the Contractor's rights, claims or obligations under the Contract except with the prior written consent of the Commission.

4. SUBCONTRACTING

In the event the Contractor requires the services of one or more subcontractors, the Contractor shall obtain the prior written approval and clearance of the Commission for such subcontractor(s). The Commission's approval of a subcontractor shall not relieve the Contractor of any of his obligations under the Contract, and the terms of any subcontract shall be subject to and in conformity with the provisions of the Contract.

5. SOURCE OF INSTRUCTIONS

(a) The Contractor shall neither seek nor accept instructions from any authority external to the Commission in connection with the performance of its obligations under the Contract. The Contractor shall refrain from any action which may adversely affect the Commission and shall fulfil its commitments with the fullest regard to the interests of the Commission.
(b) While present at the Commission's premises, personnel of the Contractor shall, at all times, obey and conform to all requests and instructions of the Commission's officials and the United Nations Security Staff.

6. CONTRACTOR'S RESPONSIBILITY FOR EMPLOYEES

The Contractor shall be responsible for the professional and technical competence of its employees and will select, for the performance under the Contract, reliable individuals who will perform effectively in the implementation of the Contract, respect the local laws and customs and conform to a high standard of moral and ethical conduct.

7. ASSIGNMENT OF PERSONNEL

(a) The Contractor shall not replace or withdraw any personnel referred to in the Contract for the performance of the Services without the prior written approval of the Commission or unless requested by the Commission.
(b) Prior to assignment, replacement or withdrawal of personnel for the performance of the Services, the Contractor shall submit to the Commission for its consideration, the curriculum vitae or detailed justification to permit evaluation by the Commission of the impact which such assignment, replacement or withdrawal would have on the Services.
(c) In the event of withdrawal of personnel, all costs and additional expenses resulting from the replacement, for whatever reasons, of any of the Contractor's personnel shall be for the account of the Contractor. Such withdrawal shall not be considered as termination in part or in whole of the Contract.

8. CONFLICT OF INTEREST

No employee, officer, adviser, agent and/or subcontractor of the Contractor assigned to perform Services under the Contract shall engage, directly or indirectly, in any business, profession or occupation connected or related to the Services or Goods to be provided under the Contract if this constitutes a conflict of interest.

9. INSURANCES

(a) The Contractor shall provide and thereafter maintain appropriate insurance, or its equivalent, with respect to its employees to cover claims for personal injury or death in connection with the Contract.
(b) The Contractor shall provide and thereafter maintain insurance against all risk in respect of its property and any equipment used for the execution of the Contract.
(c) The Contractor shall also provide and thereafter maintain liability insurance in an adequate amount to cover third party claims for death, bodily injury, loss of and damage to property arising from any operations carried out by the Contractor in performing its obligations in connection with the Contract or from operation of any vehicles, boats, airplanes and other equipment owned or leased by the Contractor or its agents, servants, employees or subcontractors.
(d) Except for insurance mentioned in paragraph (a), the insurance policies under this clause shall:
  (i) Name the Commission as additional beneficiary;
  (ii) Include a waiver of subrogation of the Contractor's rights to the insurance carrier against the Commission.
(e) The Contractor shall, upon request, provide the Commission with satisfactory evidence of the insurance required under the Contract.
(f) Any amounts not insured, not recovered from or not claimed by the insurer shall be borne by the Contractor.
(g) Information concerning reduction of coverage shall be furnished by the Contractor to the Commission with at least thirty (30) days prior written notice.
(h) The Contractor undertakes that provisions to the same effect as the provisions in sub-clauses (a) through (c) above will be inserted in all subcontracts made in performance of the Contract, except sub-contracts exclusively for furnishing Goods.

10. ENCUMBRANCES/LIENS

The Contractor shall not cause or permit any lien, attachment or other encumbrance by any person to be placed on file in any public office or on file with the Commission against any monies due or to become due for any Services or Goods provided under the Contract, or by reason of any other claim or demand against the Contractor.

11. OBSERVANCE OF THE LAW

(a) The Contractor shall comply with all laws, ordinances, rules and regulations, including but not limited to health, environmental and labour laws bearing upon the performance of its obligations under the terms of the Contract.
(b) In particular, the Contractor shall comply with the labour laws of the country in which the Services or Goods are to be furnished providing for benefits covering injury or death in the course of employment.

12. CONFIDENTIALITY

(a) All technical, financial or other documentation and data the Contractor compiled for or received from the Commission under the Contract shall be treated as confidential and shall be delivered only to the Commission's authorized officials on completion of the Services or as requested by the Commission.
(b) Either Party acknowledges that all knowledge and information concerning the other Party that may be acquired in connection with the performance of its obligations under the Contract, including but not limited to, any information relating to its operations and procedures, are confidential and proprietary information of the other Party and it shall receive such confidential and proprietary information of the other Party in confidence and shall not disclose or permit disclosure of any such knowledge or information to any person and/or entity without the prior written consent of the other Party.
(c) The Contractor shall not, at any time, use such confidential information to its own advantage.
(d) The restrictions on confidentiality shall not apply to the information which:
  (i) presently is in the public domain;
  (ii) hereafter becomes part of the public domain without the other Party's fault;
  (iii) was in the possession of the other Party at the time of the disclosure, as shown by written evidence;
  (iv) is disclosed to the other Party at any time hereafter by a third Party.
  (v) is required to be disclosed to governing bodies, or to governmental authorities to the extent required by law or to obtain needed authorization to perform the Contract or pursuant to reporting requirements imposed by those governing bodies or the government of the State of the Contractor.
(e) These obligations do not lapse upon satisfactory completion of the Services, delivery of the Goods or termination of the Contract by the Commission.

13. LANGUAGES, WEIGHTS AND MEASURES

Unless otherwise specified in the Contract, the English language shall be used by the Contractor in all written communications to the Commission with respect to the Services or Goods to be provided and all documents procured or prepared by the Contractor. The Contractor shall use metric units, except when otherwise specified in the Contract.

14. PUBLICITY

(a) The Contractor shall not advertise or otherwise make public the fact that it is providing or has provided Services and Goods for the Commission. Also, the

Contractor shall not, in any manner whatsoever, use the name, emblem or official seal of the Commission or any abbreviation of the name of the Comprehensive Nuclear-Test-Ban Treaty Organization in connection with its business or otherwise.

(b) These obligations do not lapse upon satisfactory completion of the Services, delivery of the Goods or termination of the Contract.

15. OFFICIALS NOT TO BENEFIT/CONTINGENT FEES

(a) The Contractor warrants that:
   - (i) No person or selling agency has been employed or retained by it to solicit or secure the Contract upon an agreement or understanding for a commission, percentage, brokerage, contingent fee or retainer, except regular employees or bona fide and officially established commercial or selling agencies maintained by the Contractor for the purpose of securing business;
   - (ii) No official or servant or retired employee of the Commission who is not a regular employee of the Contractor, has been or shall be admitted by the Contractor to any direct or indirect benefit arising from the Contract or the award thereof.

(b) In case of breach by the Contractor of the warranties referred to in previous clauses, the Commission shall have the right to deduct from the Contract Price, or otherwise recover from the Contractor, the full amount of any such commission, percentage, brokerage, contingent fee or retainer so paid.

16. INTELLECTUAL PROPERTY AND OTHER PROPRIETARY RIGHTS

(a) Except to the extent the Contractor has granted a license to the Commission, the Commission, shall be entitled to all intellectual property, including but not limited to copyrights, patents and trademarks, with regard to products, documents or other materials which bear a direct relation to or are produced or collected under the Contract. The Contractor shall take all necessary steps, prepare and process all necessary documents and assist in securing such property rights and transferring them to the Commission and/or to the government where the Services or Goods are to be provided, in compliance with the requirements of the applicable law.

(b) The Contractor declares that it does not know of any intellectual property rights of third parties, which might be infringed in the execution of the Contract. Should, contrary to the Contractor's expectation, claims be raised against the Commission charging it with infringement of intellectual property rights, the Contractor shall hold harmless the Commission and shall indemnify it to the full extent of any damages or awards arising from such claims. This obligation of the Contractor shall continue to be in full force and effect up to the expiration of such intellectual property rights.

(c) The Commission shall give the Contractor due notice in writing of any charges of infringement brought against the Commission and of the filing of any suit for infringement of intellectual property rights of third parties due to the execution of the Contract, and, without prejudice to the immunity enjoyed by the Commission as an international organization from every form of legal process, including enforcement and execution, the Commission shall give the Contractor the opportunity to defend the Commission against the said suit at its discretion and shall not, without the Contractor's consent in writing, make any admission or consent to any claim of any third party, which might be prejudicial to the Contractor's position.

17. DEFAULT BY THE CONTRACTOR

(a) In case the Contractor fails to fulfil its obligations and responsibilities under the Contract and provided the Contractor has not remedied such failure(s) within thirty (30) days of having been given written notification by the Commission of the nature of the failure(s), the Commission may, at its entire discretion and without prejudice to its right to withhold payment(s), hold the Contractor in default under the Contract.

(b) When the Contractor is thus in default, the Commission may, by giving written notice to the Contractor, terminate the Contract as a whole or such part or parts thereof in respect of which the Contractor is in default. Upon such notice, the Commission shall have the right to seek completion, at the Contractor's expense, of that part or those parts of the Contract with respect to which the Contractor is in default.

(c) The Contractor shall, in this case, be solely responsible for any reasonable costs of completion of the Services and/or delivery of Goods, including such costs, which are incurred by the Commission over and above the originally agreed Contract Price.

18. WITHHOLDING OF PAYMENT

(a) The Commission may withhold any payment to the Contractor or, on account of subsequently discovered evidence, nullify the whole or part of any payment approval theretofore given, to such an extent as may be necessary to protect the Commission from loss under the Contract on account of:
   - (i) The Contractor's failure to carry out its obligations or to make adequate progress with the obligations, except for failure arising out of force majeure;
   - (ii) The Contractor's failure to remedy unsatisfactory performance, when such failure has been drawn to his attention by the Commission;
   - (iii) The Contractor's failure to submit on time the reports required.

(b) The withholding by the Commission of any interim payment shall not affect the Contractor's obligation to continue performance of his obligations under the Contract.

(c) No interest shall accrue on payments eventually withheld by the Commission in application of the stipulations of this paragraph.

19. LIQUIDATED DAMAGES

Subject to Clause 20 below (force majeure), if the Contractor fails to deliver any or all of the Services and/or Goods within the latest time period(s) specified in the Contract, the Commission may, without prejudice to its other remedies under the Contract, deduct from the Contract Price as liquidated damages, a sum equivalent to 0.2 per cent of the portion of the Contract Price for the delayed Services and/or Goods for each working day of delay until actual performance, up to a maximum of sixty (60) working days. The recovery by the Commission of proven damages shall not be excluded.

20. FORCE MAJEURE

(a) Force majeure as used herein shall mean acts of God, industrial disturbances, acts of the public enemy, civil disturbances, explosions and any other similar cause of equivalent force not caused by nor within the control of either party and which neither party is able to overcome.
(b) As soon as possible after the occurrence of any cause constituting force majeure, the Contractor shall give notice and full particulars in writing to the Commission of such force majeure if the Contractor is thereby rendered unable, wholly or in part, to perform its obligations and meet its responsibilities under the Contract.
(c) In this event, the following provisions shall apply:
   (i) The obligations and responsibilities of the Contractor under the Contract shall be suspended to the extent of its inability to perform them and for as long as such inability continues;
   (ii) The term of the Contract shall be extended for a period equal to the period of suspension taking, however, into account any special conditions which may cause the time for completion of the obligations to be different from the period of suspension;
   (iii) If the Contractor is rendered permanently unable, wholly or in part, by reason of force majeure to perform its obligations and meet its responsibilities under the Contract, the Commission shall have the right to terminate the Contract on the same terms and conditions as are provided for in the Termination Clause of the Contract, except that the period of notice may be seven (7) days instead of thirty (30) days;
   iv) For the purpose of the preceding sub-clause, the Commission may consider the Contractor permanently unable to perform in case of any period of suspension in excess of ninety (90) days. Any such period of ninety (90) days or less shall be deemed temporary inability to perform.

21. INSOLVENCY AND BANKRUPTCY

Should the Contractor be insolvent, adjudged bankrupt, or should the Contractor make a general assignment for the benefit of its creditors, or should a receiver be appointed on account of the Contractor's insolvency, the Commission may, without prejudice to any other right or remedy it may have under the terms of the Contract, terminate the Contract forthwith by giving the Contractor written notice of such termination.

22. INDEMNIFICATION

The Contractor shall indemnify, hold and save harmless and defend at its own expense the Commission, its officers, agents, servants and employees from and against all suits, claims, demands and liability of any nature or kind, including cost and expenses arising out of acts or omissions of the Contractor or its employees or subcontractors in the performance of the Contract. This requirement shall extend, inter alia, to claims or liabilities in the nature of workers' compensation and to claims or liabilities pertaining to intellectual property rights. The obligations under this clause do not lapse upon termination of the Contract.

23. AMICABLE SETTLEMENT

The parties shall use their best efforts to settle amicably through negotiation any dispute, controversy or claim arising out of, or relating to, the Contract or the breach, termination or invalidity thereof. If the parties cannot reach such amicable settlement through negotiations, the matter shall first be referred to conciliation, by a request by either party for conciliation procedures. The conciliation shall take place in accordance with the United Nations Commission on International Trade Law (UNCITRAL) Conciliation Rules then prevailing, or according to such other procedure as may be agreed between the parties, within a time period of ninety (90) days. There shall be one conciliator. The conciliation shall be in Vienna, Austria, and it shall be conducted in the English language.

24. ARBITRATION

(a) In the event of a failure to reach an amicable settlement in accordance with Clause 23 above (Amicable Settlement), any dispute arising out of the interpretation or application of the terms of the Contract or any breach thereof shall be settled in accordance with the arbitration rules established by UNCITRAL as at present in force. The number of arbitrators shall be one. The arbitration shall be in Vienna, Austria, and it shall be conducted in the English language.
(b) The arbitrator shall take into account the internationally recognized general principles of commercial transactions. The arbitrator shall have no authority to award punitive damages, nor to award interest in excess of five (5) per cent, and any such interest shall be simple interest only. The parties shall be bound by any arbitration award rendered as a result of such arbitration as the final adjudication of any such dispute.

25. PRIVILEGES AND IMMUNITIES

Nothing in or relating to the Contract shall be deemed a waiver, express or implied, of any of the privileges and immunities of the Commission and its employees.

25(a). TAX EXEMPTION

In principle, the Commission is exempt from all Taxes. Since the arrangement under which such exemption is respected varies from country-to-country, the Contractor shall collaborate with the Commission to achieve Tax exemption at source or to pursue reimbursement of Taxes paid by the Commission, as the case may be.

26. TERMINATION

The Commission may terminate the Contract in whole or in part, and at any time, upon thirty (30) days' notice of termination to the Contractor. In the event such termination is not caused by the Contractor's negligence or fault, the Commission shall be liable to the Contractor for payment in respect of Services already satisfactory accomplished or Goods delivered and accepted and in conformity with the terms of the Contract, for necessary terminal expenses of the Contractor, and for the cost of such urgent work as is essential and as the Contractor is asked by the Commission to complete. The Contractor shall keep expenses at a minimum and shall not undertake any forward commitment from the date of receipt of the Commission's notice of termination.

27. GOODS

In the event that the Contract requires the Contractor to supply Goods, Clauses 28-35 shall apply in addition to the above.

28. WARRANTY

(a) The Contractor warrants that the Goods, including packaging, conform to the specifications for the Goods ordered under the Contract and are fit for the purpose for which such Goods are ordinarily used and for purposes expressly made known to the Contractor by the Commission, and are new and free from defects in design, workmanship and materials.
(b) This warranty shall remain valid for twenty-four (24) months after the Goods or any part thereof have been delivered and accepted, whichever is later, unless the Contractor has granted a longer period. Should the Commission transfer the title of the Goods to a third party during the warranty period, the right to enjoy the warranty shall be transferable to the new title-holder.
(c) If, during the warranty period mentioned in sub-clause (b) above, the Goods or any part thereof are found to be defective or not in conformity with the specifications under the Contract, the Contractor shall, upon notification, promptly and at its own expense correct all such defects and non-conformities. If these defects and non-conformities cannot be corrected, the Commission shall have the right, at the Contractor's expense, to either demand replacement of the defective item, or receive appropriate reimbursement, or have the defective item repaired or otherwise procured from a third party.

29. INSPECTIONS AND TESTS

(a) The Commission shall have the right to inspect and/or to test the Goods to confirm their conformity to the technical specifications. The technical specifications shall specify what inspections and tests the Commission requires.
(b) The inspections and tests may be conducted on the premises of the Contractor or its subcontractor(s), at a point of delivery designated by the Commission and/or at the Goods' final destination. The Contractor shall give all reasonable facilities and assistance-including drawings and production data-to the Commission at no charge to the Commission.
(c) Should any inspected or tested Goods fail to conform to the technical specifications, the Commission reserves the right to reject them and the Contractor shall either replace the rejected Goods or make all alterations necessary to meet specification requirements free of cost to the Commission.
(d) The Commission's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival at the point of delivery designated by the Commission or at the Commission's offices, shall in no way be limited or waived by reason of the Goods' having previously been inspected, tested and passed by the Commission.
(e) Nothing in this Section on Inspections and Tests shall in any way release the Contractor from any warranty or other obligations under the Contract.
(f) All equipment/material supplied under the Contract may be subject to pre-shipment inspection by a third party to be specified by the Commission. The Contractor is not liable for cost of this inspection.

30. PACKING

The Contractor shall comply or ensure compliance with the following provisions concerning packing:

(a) The Goods shall be packed as is required to prevent their damage or deterioration during transit to their final destination. The packing shall be sufficient to withstand, without limitation, rough handling during transit.
(b) In the case of a cross-border shipment, the Goods shall have appropriate export packing. If necessary, all cases/crates must be wrapped inside with heavy-duty plastic lined paper, should be steel-strapped and must be able to withstand tough handling. Skids for truck handling are imperative if the gross weight is more than 30 kilograms.
(c) The consignment shall be marked and shipped as per address shown on the Purchase Order Form.
(d) Neither partial delivery nor transhipment shall be made unless specifically agreed by the Commission in writing.
(e) Each case/crate/package shall carry a consecutive number, dimensions, volume, and weight (i.e. Case No. X of Y cases, A x B x C cm, E m3, D Kg.) and shall be marked as follows:

EQUIPMENT FOR
THE PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION.
[point of delivery]

PURCHASE NO.__________________
GROSS WEIGHT __________________
NET WEIGHT _____________________

(f) Markings shall be done with weatherproof materials. All non-containerized Goods shall be shipped below deck.
(g) Each case/crate/carton shall carry (outside) a copy of the packing list describing the contents of the case/crate/carton. Outside Case No. 1 should be attached with invoice covering the actual delivery. The accompanying papers must be made out in the English language.
(h) Prior to delivery, a fax (or a letter by courier service) shall be sent to the consignee, if any, advising of the following:
- purchase order/Contract number;
- waybill number or equivalent reference number of the shipment (if any);
- number of boxes/cartons/crates/etc.;
- estimated time of departure (ETD);
- point of departure and name of freight carrier;
- estimated time of arrival (ETA) to final destination.

(i) The following documents shall be enclosed with the shipment in case of shipping by air:
- airway bill;
- proforma or commercial invoice;
- packing list.

(j) The above documents are indispensable and must reach the consignee, if any, on time to permit customs clearance and in order to avoid demurrage charges.

31. DELIVERY AND TRANSPORTATION

(a) Delivery of the Goods shall be made by the Contractor in accordance with the terms specified in the Contract, and the Goods shall remain at the risk of the Contractor until delivery has been completed.
(b) Transport of the Goods to the port of discharge or such other point in the country of destination and/or forwarding to the consignee, if any, (door-to-door) specified in the Contract shall be arranged and paid for by the Contractor and the cost thereof shall be included in the Contract Price.

32. TAKE-OVER/HAND-OVER

Upon successful completion of delivery or of installation and a testing and evaluation period, as specified in the Contract, responsibility for the Goods will be handed over to the consignee or other designated entity.

33. EXPORT LICENCES

If an export licence or any other governmental authorization is required for the Goods, it shall be the obligation of the Contractor to obtain such licence or governmental authorization. In the event of failure to obtain such licence or authorization within reasonable time, the Commission may declare the Contract null and void.

34. SPARE PARTS

In accordance with the Contract, the Contractor may be required to provide any or all of the following materials and notifications pertaining to spare parts manufactured and/or distributed by the Contractor:

(a) Such spare parts as the Commission may choose to purchase from the Contractor, provided that the Contractor is not relieved of any warranty obligations under the Contract;
(b) In the event of termination of production of the spare after delivery of the Goods:
  (i) advance notification to the Commission of the pending termination, in sufficient time to permit the Commission to place a final order;
  (ii) following such termination, furnishing at no cost to the Commission, the blueprints, drawings and specifications of the spare parts, if and when requested.

35. UNITED NATIONS CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS

Questions concerning matters arising under the Contract, but not settled in it, shall be settled in conformity with the United Nations Convention on Contracts for the International Sale of Goods (Vienna, 1980), which shall be applicable to the Contract. The applicable language version of the Convention shall be the version in which the Contract is written.

36. SUSTAINABLE BUSINESS PRACTICES

The Commission requires the Contractor and its personnel to:
(a) support and respect the protection of internationally proclaimed human rights[1] and to observe the highest standards of ethics and integrity throughout its supply chains.
(b) abide by the United Nations Supplier Code of Conduct[2].
(c) to take appropriate steps, whenever possible to perform its obligations in a manner that takes into account economic, environmental and social considerations.
(d) certify that they have not and will not engage in harassment or sexual harassment, proscribed practices or any further practice described in Clauses 37, 38, 39, 40

[1] UN Guiding Principles on Business and Human Rights, available at https://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf.

[2] Available at https://www.un.org/Depts/ptd/about-us/un-supplier-code-conduct.

and 41, during the procurement process and the performance of the Contract.

37. PREVENTION OF HARRASSMENT AND SEXUAL HARRASSMENT

(a) The Commission is committed to providing a professional work environment that upholds the highest standards of equality, respect and dignity for all. In this regard, and without limitation to any other provision contained herein:

(i) The Contractor shall adhere to zero tolerance for harassment and therefore accepts and agrees to refrain from any conduct which could, in the view of the Commission, meet the definition of harassment and/or sexual harassment. For the avoidance of doubt, “harassment” shall be understood as any improper or unwelcome conduct that might reasonably be expected or be perceived to cause offence or humiliation to another person when such conduct interferes with work, is made a condition of employment, or creates an intimidating, hostile or offensive work environment. “Sexual harassment” shall be understood as harassment of a sexual nature, and the above definition of harassment applies equally to sexual harassment. Sexual harassment may occur between persons of opposite sex or of the same sex.

(ii) The Contractor shall take all reasonable and appropriate measures to prevent and deter harassment and sexual harassment or abuse of anyone by its employees, agents, officials or any other persons engaged or controlled by the Contractor to perform the Services.

(iii) The Contractor shall promptly report to the Commission any actual, reported or suspected cases of harassment, sexual harassment or abuse of anyone by its employees, agents, officials or any other persons engaged or controlled by the Contractor to perform the Services of which the Contractor becomes aware. Such reports to the Commission may be on a no name basis, if necessary.

(iv) In addition to notifying the Commission pursuant to sub-clause (iii) above, on becoming aware of any allegation of harassment, sexual harassment or abuse of anyone, the Contractor shall take all reasonable and appropriate measures to address the matter, including engaging in good faith consultations with the Commission, while ensuring minimum impact and/or disruption of the Services.

(b) The Contractor acknowledges and agrees that any breach of the provisions of this Clause 37, as determined by the Commission, shall permit the Commission, at its sole discretion, to:

(i) Request the Contractor to remove, temporarily or permanently, from the relevant assignment, any Contractor’s personnel reported for having committed harassment, sexual harassment or abuse of anyone.

(ii) Terminate the Contract, and/or any other agreement, arrangement or partnership concluded by the Commission with the Contractor, immediately upon written notice to the Contractor, without any liability for termination charges or any other liability of any kind, on the terms and conditions as are provided for in Clause 26 (Termination) above; and/or

(iii) Exclude the Contractor from participating in any ongoing or future solicitations, and/or entering into any future contractual or collaborative relationships with the Commission and/or suspend the Contractor from the Commissions supplier roster.

(c) The Commission shall be entitled to report any breach of the provisions of this Clause 37, as determined by the Commission, to the Commission’s governing bodies, other UN agencies and/or donors.

38. PROSCRIBED PRACTICES

The Commission requires that the Contractor and its personnel certify that they have not and will not engage in proscribed practices and proscribed conduct during the procurement process and the performance of the Contract. The Commission defines Proscribed Practices as follows:

Fraudulent practice: is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

Corrupt practice is the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;

Coercive practice is the impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of any party in order to influence the actions of that party;

Collusive practice is the proposing or entering into an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party**;**

Unethical practice is conduct or behaviour that is contrary to the conflict of interest, gifts and hospitality, post-employment provisions or other published requirements of doing business with the Commission;

Obstructive practice is any act which deliberately and in an effort to compromise an investigation, destroys, falsifies, alters or conceals information or documents that may be relevant to a fraud and corruption investigation, or material that could become evidence as a result of such investigation; or the making of false statements to investigators during such an investigation.

39. CHILD LABOUR

The Contractor represents and warrants that neither it, its parent entities (if any), nor any of the Contractor’s subsidiary or affiliated entities (if any) is engaged in any practice inconsistent with the rights set forth in the Convention on the Rights of the Child, including Article 32 thereof, which, inter alia, requires that a child shall be protected from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development.

40. MINES

The Contractor represents and warrants that neither it, its parent entities (if any), nor any of the Contractor's subsidiaries or affiliated entities (if any) is engaged in the sale or manufacture of anti-personnel mines or components utilized in the manufacture of anti-personnel mines.

41. TERRORISM

The Contractor shall ensure that none of the funds received from the Commission under the Contract are used, directly or indirectly, to provide support to individuals or entities subject to sanctions or other measures promulgated by the United Nations Security Council and appearing in the Consolidated United Nations Security Council Sanctions List. This provision shall be included in all subcontracts or sub-agreements entered into under the Contract.

42. FULL DISCLOSURE

(a) The Contractor will immediately notify the Commission upon becoming aware of any Proscribed Practices or other prohibited practices or conduct or suspicion thereof, as per Clauses 37-41, by itself or its personnel during the procurement process or the performance of the Contract. The Contractor will take all appropriate measures to prohibit and prevent its personnel from engaging in Proscribed Practices or any other prohibited conduct, as well as to investigate allegations thereof, or to take corrective action when such a Proscribed Practice or any other prohibited conduct has occurred.

(b) The Contractor further warrants that it is not the subject of any sanctions, or otherwise identified as ineligible by any government, supranational organization (e.g., European Union), another entity of the United Nations System or multilateral development finance institution. The Contractor will disclose to the Commission if it becomes subject to any sanction or temporary suspension during the term of the Contract. The Contractor recognizes that a breach of this provision constitutes a fraudulent practice.

43. DATA PROTECTION

(a) **Use of the Commission's data:** Use (including accessing, processing, retention, storage) of the Commission's data is limited to the purposes contained in the Contract and such use will be limited to Contractor's personnel on a "need to know" basis. Use of the Commission's data for internal research, marketing, sales, or promotional purposes is strictly prohibited. Subject to Clause 12 (Confidentiality), the Contractor will treat the Commission's data as confidential and may neither disclose it nor make it available to any third-party except with the prior written authorization of the Commission.

(b) **Compliance:** The Contractor confirms that it has a data protection policy in place that meets applicable legal requirements and that it will apply such a policy to the Commission's data, without prejudice to the privileges and immunities of the Commission. The Contractor will implement technical and organisational measures to ensure appropriate protection of the Commission's data, in conformity with the abovementioned requirements and internationally recognised standards and best practices. In addition, the Contractor will:

   (i) at its sole expense and risk, return, delete, or destroy all the Commission's data, including data backups, upon written instruction of the Commission. The Commission will provide a reasonable period of time and take into account the Contractor's legitimate interests, as well as the termination or expiration date of the Contract;

   (ii) process, retain or store the Commission's data exclusively in countries that are signatories to the Comprehensive Nuclear-Test-Ban Treaty and that ensure adequate legal protection of the Commission's privileges and immunities; and

   (iii) be liable for any resulting damages or penalties for its failure to comply with its obligations.

(c) **Data security:** Upon discovery of a data security breach, the Contractor will immediately notify the Commission and undertake at its sole expense to:

   (i) propose immediate remedial actions (including containment);

   (ii) implement, as directed by the Commission, all necessary damage mitigation and remedial actions;

   (iii) where applicable, as directed by the Commission, restore the Commission's and end-users' access; and

   (iv) keep the Commission informed of its progress.

(d) The Contractor, at its sole expense, will cooperate fully with any Commission investigation, remediation steps and response to a data security breach.

44. ESSENTIAL TERMS

The Contractor acknowledges and agrees that each of the provisions in Clauses 36 to 43 above constitutes an essential term of the Contract and that any breach of any of these provisions shall entitle the Commission to terminate the Contract or any other contract the Contractor has with the Commission, immediately upon notice to the Contractor, without any liability for termination charges or any other liability of any kind. Furthermore, the Commission is entitled to exclude the Contractor from participating in future tenders should the Contractor breach any of the provisions included in Clauses 36 to 43.

Annex C

Terms of Reference

Maintenance and Enhancements for VDMS and ACQ Applications on a Call-off Basis

1. INTRODUCTION

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (hereinafter referred to as "the Commission") operates the International Monitoring System (IMS), a global network of seismic, hydroacoustic, infrasound, and radionuclide stations that send time-series (waveforms) and energy spectra data to the International Data Centre (IDC) in Vienna, Austria. More information can be found under [www.ctbto.org.](http://www.ctbto.org)

The Commission operates software that provides interfaces to external systems, possibly remote to the Commission location in Vienna, Austria.

This application uses a message-passing protocol, which has been re-designed and implemented and which is now known as the Verification Data and Products Messaging System (hereinafter referred to as "the VDMS"). The VDMS application processes and responds to requests for IMS data and IDC products from external authorized users.

The development of the VDMS Request and Subscription module began in 2008 and the first version of the requests and subscription software was released to external authorized users in November 2012. The latest version at the time of this writing (3.7.5) was released in February 2023.

A separate application, the Acquisition Module (ACQ), receives segmented data from seismic auxiliary stations and radionuclide stations via e-mail. The development of the Acquisition Module began in December 2011 and the current version (1.3.1) was deployed in Operations in May 2023.

The subject of this Contract is the provision of maintenance and enhancement services to VDMS and ACQ applications.

2. VDMS APPLICATION

The VDMS application is used for delivering IMS data and IDC products to authorized end users from State Signatories, through requests or subscriptions.
Requests and subscriptions are formatted using a specification called IMS2.0, defined in Formats and Protocols [Ref. Document IDC-ENG-SPC-103-Rev.8 attached hereto]. The responses from VDMS also follow the IMS2.0 specification.

VDMS is written in Python 2.7 and runs on CentOS 7 as a standalone application. It uses an Oracle database to maintain its state and record its actions. It reads data from two Oracle databases (EXTODB and EXTADB) and from the filesystem.
For authentication, an internal Single-Sign-On (SSO) server is used.

Requests for data and products can be sent to the VDMS via either e-mail or via a command line client, installed on the user's machine.

VDMS provides two similar APIs for requests, each with its own protocol: XML-RPC and REST.

Both APIs are available via a command line client written in Python 3.

The software also allows registered users to subscribe to IMS data and IDC products. Subscription deliveries are then sent to the subscribers via e-mail.

The software consists of the following components:

- *The User Services components* are the *Mail User Services*, also called the *Mail Adapter* (which retrieves e-mail requests from a RabbitMQ queue, parses them and queues them for processing) and the *HTTP User Services* (a component running inside the Apache web server that handles the XML-RPC and REST communication with the command line client). Both services also parse requests, verify signatures (if present) and call the Watch Dog component to create jobs.
- *The Watch Dog component* monitors the Production Engine components and restarts them if needed. It also creates jobs in an internal queue and centralizes publishing services.
- *The Production Engine components* are the most essential components. They know how to produce all IDC products and how to retrieve all IMS data. We have several instances running at any time to improve production times. The Production Engine components get jobs from the system's internal queue, retrieve data from IDC internal resources (Oracle databases and the filesystem), generate the requested data, format it, sign it and return results to the end user.

Here is a high-level overview of VDMS components:

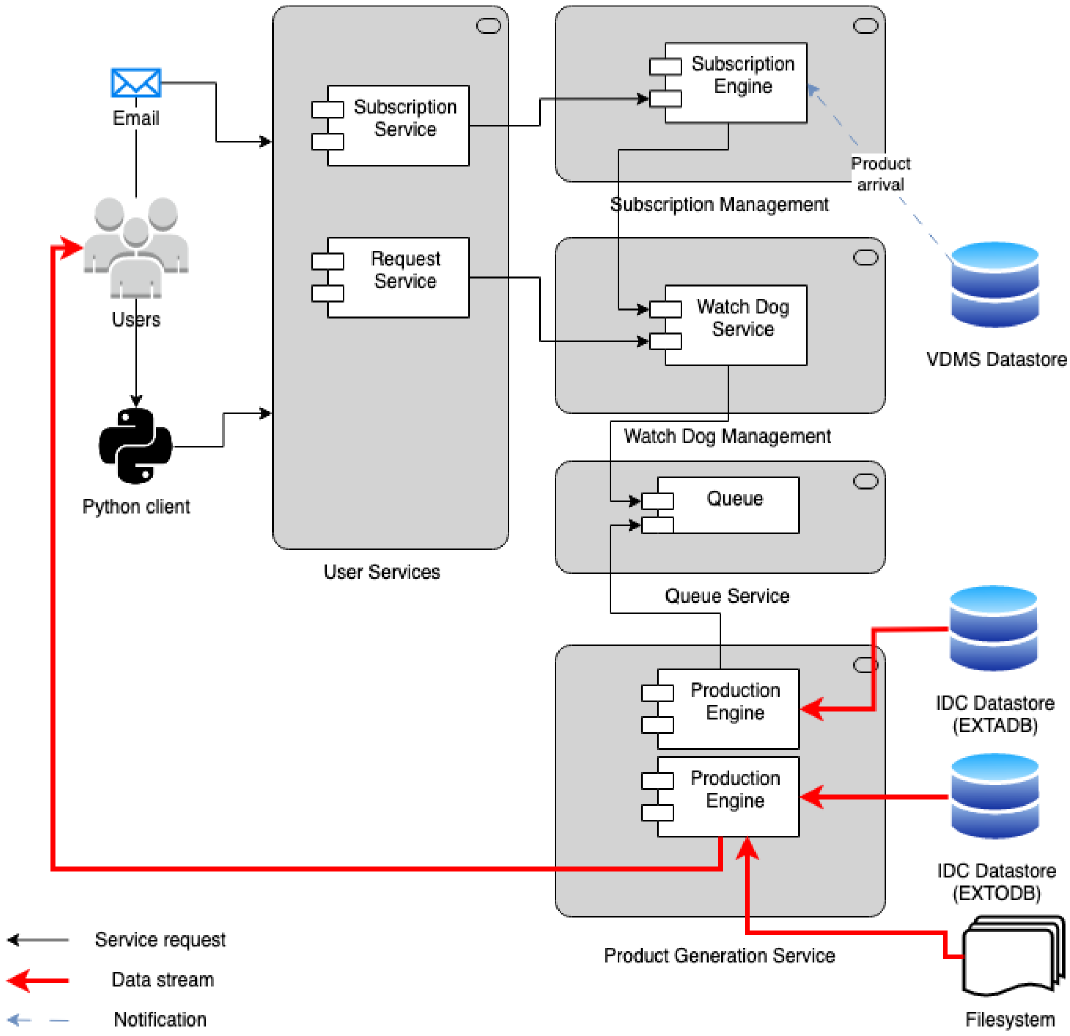


Figure 1: Logical components of the Requests and Subscriptions module

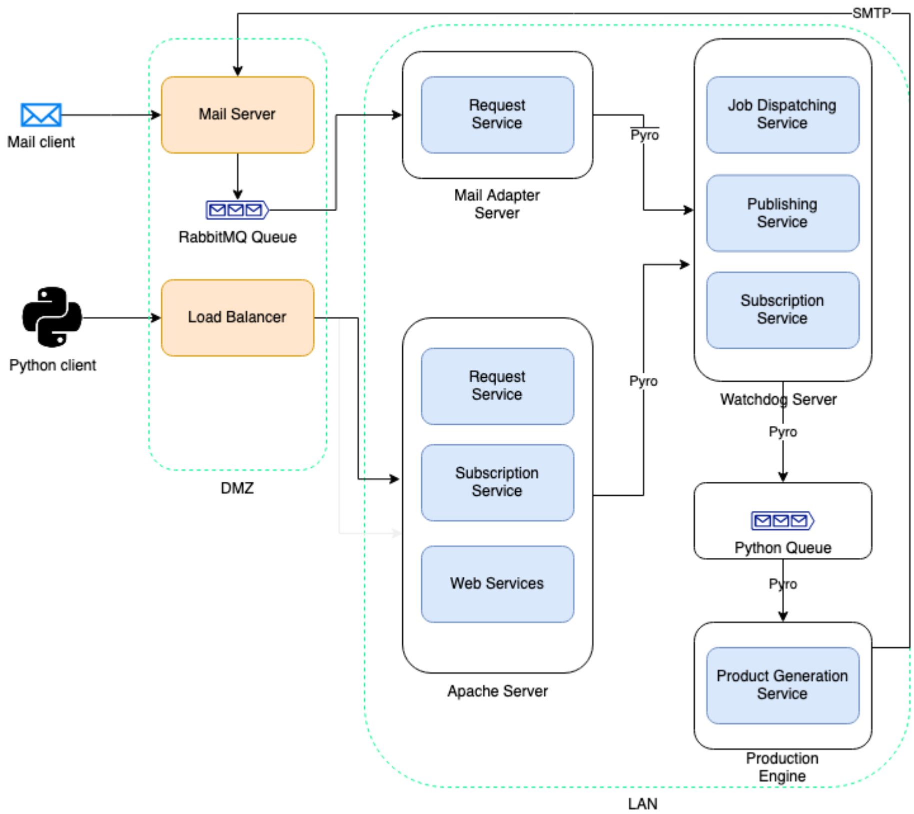


Figure 2: Physical components of the Requests and Subscription module

The following technologies are used in the VDMS application:

- Oracle databases (one database called PTS, or VDMS Datastore in Figure 1, to maintain a persistent state, and two databases called EXTODB and EXTADB, to retrieve the data needed to generate results). The SQLAlchemy library is used to access all databases used.
- All user information is stored and managed in the CTBTO Single-Sign-On platform (SSO) which is based on Oracle Identity Management. The SSO server creates user information in the respective table of the VDMS.
- The Jinja2 templating language for Python is used to format all the SHI products the system generates.
- SpringPython the Python implementation of the Spring application framework and its Inversion of Control paradigm are used to reduce object coupling and to easily swap objects and test stubs during unit testing.
- The Apache web server and the Django framework are used to implement and host the XML-RPC/REST server that receives requests from the command line client.

Here is a detailed view of how SSO is integrated with VDMS:

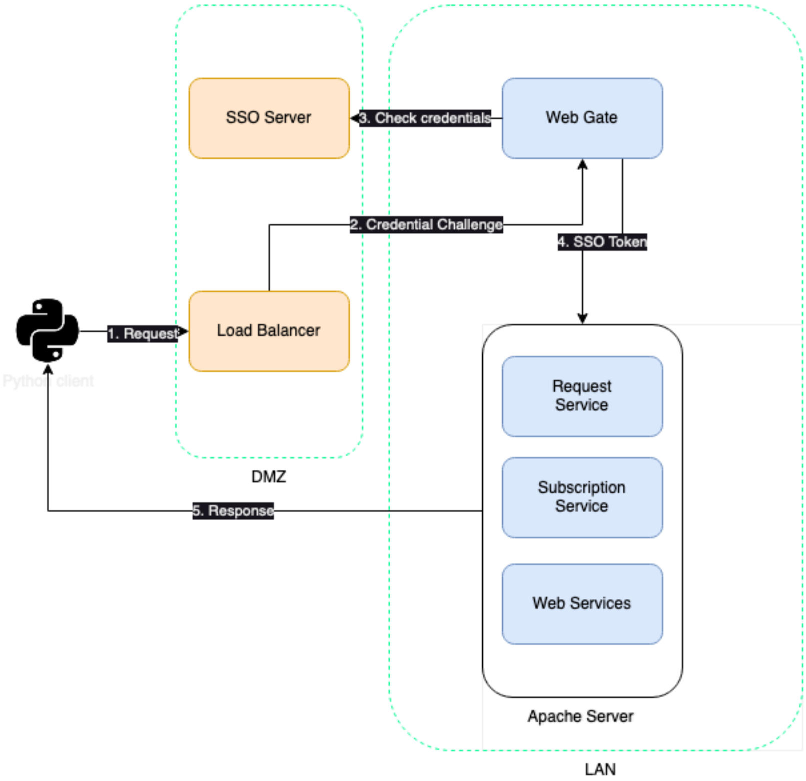


Figure 3: Single Sign On (SSO) integration

3. Acquisition Application (ACQ)

The purpose of the ACQ application is to acquire data from IMS auxiliary seismic stations and from IMS radionuclide stations. All data is received in the form of e-mail messages with content formatted according to the IMS2.0 specification. The acquisition module verifies the signature of the messages, parses them and processes them according to their type:

- Data from IMS auxiliary seismic stations is converted to the "Continuous Data" (CD) frame format 1.1 by calling a separate application called MessageAPI, which is part of CDtools. The result is stored in a specific directory for further processing by other CDtools applications.
- Data from IMS radionuclide stations is stored in specific directories for further processing by the radionuclide processing pipeline.

The components of the ACQ application are as follows:

- *the Station Registry component* centralizes all the information about stations and users.
- *the Acquisition Receiver component* receives acquisition data from all stations. It authenticates the senders, parses and validates the messages and finally copies the messages to the appropriate directory. If the message is valid and of type SHI, it creates jobs for that processing and puts them in the Acquisition Job Queue.
- *the Message Processor component* picks up processing jobs from the Acquisition Job Queue and executes them.

- *the Scheduler component* regularly requests acquisition data from SHI stations: this operation is known as the "normal" mode. In addition, it can request missing past data from SHI stations: this is called the "backfilling" mode.

Here is a high-level overview of the ACQ application:

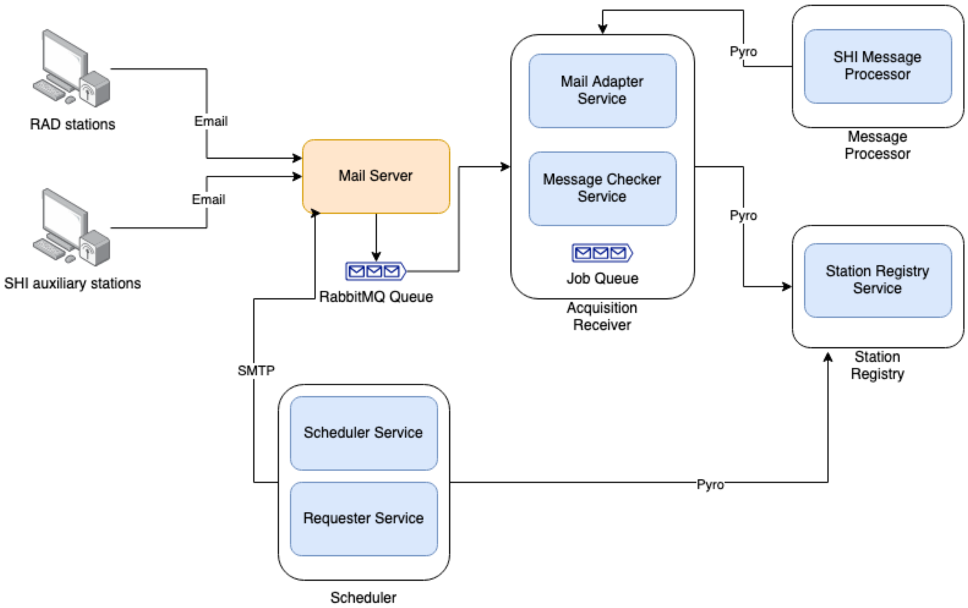


Figure 4 : Overview of the ACQ application

The following technologies are used in the ACQ application:

- an internal Oracle database to maintain a persistent state. It reads data from other IDC databases to generate results. The SQLAlchemy library is used to access all databases used.
- SpringPython, the Python implementation of the Spring application framework and its Inversion of Control paradigm are used to reduce object coupling and to easily swap objects and test stubs during unit testing.
- An OpenLDAP server is used to retrieve Certificate Revocation Lists (CRLs).

4. SCOPE OF WORK

This section breaks down the scope of Work into separate tasks. The Commission will call-off the performance of these tasks in the form of Work Orders (hereinafter referred to as "WO"). The Commission reserves the right to call-off these tasks in such a manner that performance may overlap and/or run in parallel. One WO may include only a subset of the work specified in the tasks below or may include work from several of the tasks below. This section lists the tasks as foreseen at the time of this writing. The Commission reserves the right to add and remove tasks from the list below as dictated by changes in its business case. Also, the below tasks are not listed as per their priority level.

4.1. Task 1. Containerize ACQ and VDMS applications

All VDMS and ACQ application components shall run as Docker containers. Docker images will have to be created, and this creation should be automated in the Commission's GitLabCI pipelines. The Commission's current approach is to have one container for each component, but a different architecture could be implemented if the Contractor can show clear benefits from it.

After VDMS and ACQ are moved to Docker containers, the following tasks shall be implemented:

- upgrade both VDMS and ACQ applications to Python 3
- upgrade the Python libraries used in the applications (upgrading cxOracle to Python-OracleDB is of particular interest, and shall be planned for)
- replace the inter-component Pyro calls with REST calls (JSON over HTTP)
- replace the Queue service with a standard RabbitMQ queue

The Contractor shall propose technical solutions to implement these changes.

4.2. Task 2. Provide Third Level Support for VDMS and ACQ applications running operationally.

VDMS and ACQ applications are run operationally by the CTBTO and used by State Signatories to request data and products. The Contractor will help to answer technical questions sent to the Commission by the end users.

4.3. Task 3. VDMS products as Web Services

The Production Engine components, at the heart of the VDMS application, know how to generate all IDC products. A lot of knowledge is locked in this code and exposed only through the VDMS interfaces.

The Commission would like to expose IDC products individually through a Web Service interface. As far as possible, the products should be exposed via a standard Web Service interface, which shall be defined.

The highest priority is to rewrite some of the IDC products that use non-Python libraries (usually C libraries). For example, Waveform products are created using an executable (written in C) called the WaveReader: this software would be a prime candidate for an external Web Service interface.

In addition, the Commission has implemented new Web Services based on the FDSN standards. The products from these Web Services shall be called from VDMS and made available through its interfaces.

Finally, the Commission has developed and is continuing to develop new products. Our priority shall be to implement and support these new products as Web Services and integrate them in VDMS.

4.4. Task 4. Monitor VDMS and ACQ applications

The Commission is engaged to improve the monitoring of the VDMS and ACQ applications. It includes monitoring the applications running in production, using tools such as Prometheus and Grafana.

Under this task, the Contractor shall help with monitoring the implementation: agent tuning, designing Grafana reports, etc.

This effort also includes improving log capture, storing and analysis. Tools such as the ELK stack (ElasticSearch, Logstash, Kibana) are used.

Under this task, the Contractor shall implement log capture, design Kibana queries and reports, etc.

4.5. Task 5. Tests and documentation

VDMS and ACQ source code includes extensive unit tests. Integration tests have also been written using Jenkins.

As part of this Contract, these tests will need to be maintained and extended. Keeping all tests green throughout the development is the Commission's top priority.

As new features are developed, and the software architecture is improved, the Contractor shall write appropriate documentation to explain what was done and to facilitate maintenance.

4.6. Task 6. Bug fixes and enhancements

As new versions of the VDMS and ACQ applications are deployed in operations, software defects and minor enhancements, not covered by other tasks, may be identified. These defects and enhancements will be addressed as time permits and in the order of priority assigned to them by the Commission. If insufficient time is available to implement and test a solution to a problem, as agreed with the Commission, the defects and enhancements shall be documented in order to be addressed at a later stage.

The existing design documents and user guides for the software shall be updated as necessary, to accurately describe the functionality in the software.

5. ORGANIZATION OF WORK

The Commission will initiate the Work in the form of Work Orders. These Work Orders will be the basis for initiating Work, the exact scope of Work, the deliverables, acceptance, invoicing and payment. The Contractor shall not perform any Work unless requested by the Commission in an officially issued Work Order. The Contractor may propose Work Orders for the Commission's evaluation.

5.1. Initiating Work

a) Before the issuance of a Work Order and upon receipt of a written Work Request, containing elaborations and definitions as to the nature of the particular Work(s), the Contractor shall provide, at a minimum, within one (1) week of receiving the written request, the following information in the form of a Work Plan for each Work identified in the written request:

   - Key schedule to accomplish the Work;
   - Assumptions, constraints, and key risks that could affect the Work completion;
   - Number of person-days to be allocated to the Work;
   - Estimated cost of travel and daily subsistence allowance (DSA), if applicable, based on the most cost-effective approach;
   - Place of work (on-site / off-site);
   - Commencement date and completion date of the Work.

   The time used by the Contractor to respond to a Work Order, including preliminary communications with representatives of the Commission, will not be considered performance of a Work Order, and will therefore not be reimbursed by the Commission.

b) After review of the work plan for each of the Work identified in the written request, and only after acceptance by the Commission, the Work Order will be issued to the Contractor.

c) Each Work Order shall be based on one (1) or more of the tasks described in section 4 above and on the approved work plan for each of the Work to be completed. The Commission will forward WOs to the Contractor with adequate advance notice and containing all necessary details, expected deliverables, and minimum requirements for satisfactory performance.

d) The Contractor shall perform work only after receipt of the WO. The Commission shall not be held liable for the payment of any Work(s) which have been performed before and/or without the issuance of a Work Order to the Contractor.

e) Upon signature of the Contract, the Contractor shall draft a Work Order work plan template for review and acceptance by the Commission.

5.2. Completion and Acceptance

a) At the end of a particular Work under the Work Order, the Contractor shall submit to the Commission the deliverable within the period of performance stated in the respective Work Order. The deliverables may include:
   - Updated Software Design Documents that accurately describes the functionality.
   - Updated Software Administration Guide for the work done under this contract which accurately describes changed functionality and operation procedures.
   - Description of how to use the programming interfaces developed under this contract.
   - Updated source code for software and common libraries.

b) The deliverables, after being evaluated and accepted as satisfactory by the Commission, will form the basis for invoicing and payment of a particular Work performed under a Work Order.

6. TERMS OF CONTRACT AND OPTIONAL EXTENSION

The Commission shall have the right, but not the obligation, to call-off Work in the form of Work Orders (Work Orders) during the Call-off Period. The volume of work under the Call-off Period will be limited up to a maximum of **660 person-days**. This is an upper limit, and the Commission reserves the right, at its sole discretion, to call-off fewer person-days or no person-days at all.

The Call-off Period starts on the day of the signature of the Contract and ends **24 months** thereafter or the performance of up to 660 person-days by the Contractor, whichever occurs first.

Optional Extension

The Commission shall have the option to extend the Call-off Period one (1) time for another period of 24 months, under the same terms and conditions as specified in this Terms of Reference. The extension will be exercised by mean of written communication to the Contractor.

7. LOCATION OF PERFORMANCE

The Work is expected to be performed at Contractor's premises.
The Contractor's staff may be required to spend up to 20 days (in total for all staff), for technical meetings and consultations, per Call-off Period at the premises of the Commission in Vienna, Austria. These days shall be agreed upon with the Commission. The Contractor's staff will be required to travel to Vienna up to 4 times per Call-off Period. The remaining Work may be performed at the Contractor's own premises for each Call off Period.

The Contractor shall make all the travel arrangement (visas, hotels, etc.) for their staff. Daily Subsistence Allowance (DSA) shall be calculated based on the values provided by the International Civil Service Commission (ICSC) www.iscs.un.org.

8. REQUIREMENTS FOR THE CONTRACTOR

8.1. General requirements

The Contractor shall satisfy the following mandatory requirements:

1. Provide a team of a least 3 people, meeting the requirements as defined in Section 8.2 below
2. Use of a formal project management methodology, in accordance with best practices.
3. Demonstrated experience in providing software development services using an Agile methodology, preferably Scrum.
4. Ability to align the Contractor's software engineering methodology with Scrum.

5. All documentation shall adhere to the IDC Documentation Standards, samples of which will be provided to the successful Contractor.
6. Use of the English language for all written and oral communication with the Commission.
7. Demonstrated use of a modern issue tracking and ticket management systems, preferably Jira
8. Warranty period of at least two years after the completion of the user acceptance testing. Terms and conditions of post-warranty support and bug fixes should be available and clearly specified.
9. Documented evidence, in the form of a plan, that the Contractor will be able to adjust the working hours of its relevant staff to overlap at least four hours with the Commission’s working hours (9am to 5pm CET).

The Contractor should preferably also satisfy the following optional requirement:

· Current CMMI level 3 or higher, or ISO 9001 certification is an asset.

8.2. Requirements for the Contractor’s staff

The Contractor’s staff performing the Work must have the following mandatory qualifications:

1. A university degree in a scientific/technical subject with a strong computing emphasis.
2. Proven hands-on project management experience as well as experience with agile software development methods like Scrum.
3. At least 5 years of recent professional experience implementing and testing software on Unix and Linux systems, with a strong emphasis on unit tests (using Python’s unittest, or similar library).
4. At least 3 years of recent professional experience with the Python programming language, the Django web application framework and the SQLAlchemy library.
5. At least 3 years of recent professional experience with Oracle databases (database design, SQL language, in-depth understanding of advanced concepts such as indexes and execution plans)
6. Fluency in written and spoken English.

The Contractor’s staff performing the Work should preferably also meet the following optional qualifications:

1. At least 3 years’ experience with Git and GitLab CI is highly desirable.
2. AT least 2 years’ experience with ELK stack (ElasticSearch, Logstash and Kibana) is desirable.

9. Risk Management

The Contractor shall provide a thorough risk assessment plan at the project's commencement to identify potential risks that could impact the successful execution of the outlined software development activities in these Terms of Reference (ToR) and propose adequate risk mitigation measures. Risks may include, but are not limited to, technical challenges, changes in project requirements/scope, resource constraints, schedule delays, integration difficulties, and third-party software dependencies. The risk assessment and mitigation measures plans shall be consistently updated, aligning with the delivery of project milestones or significant accomplishments. Upon the project's satisfactory completion, the Contractor shall perform a final assessment of the identified risks and the corresponding mitigation strategies. Risks that have been effectively mitigated or did not materialize should be officially closed, accompanied by appropriate documentation. The insights gained from the risk management process should be methodically documented and shared with the CTBTO, thereby contributing to the knowledge repository for forthcoming software development endeavours.

REFERENCES

IDC-ENG-SPC-103-Rev.8 “Formats and Protocols for Messages”

Specification

Formats and Protocols for Messages

8 June 2022 | IDC-ENG-SPC-103-Rev.8 | Distr.: GENERAL

Summary

This document describes the International Monitoring System 2.0 (IMS2.0) version of the formats and protocols used for discrete message exchange, including requests for subscriptions and data messages.

Contributors

- Thibault Arnal, Hakim Gheddou, Boxue Liu, Christos Saragiotis (IDC/SA)
- Richard Britton, Ashley Vaughn Davies, Herbert Gohla (IMS/ED)
- See previous revisions of this document.

Amendments

Major changes since the previous revision (Rev. 7.3) are:

- Regarding the specification:
  - ARR, RRR and SSREB for noble gas samples are now created in plain text format as well (in addition to HTML);
  - Activity and concentration results for noble gas samples are reported for non-detections (results below critical level (LC)) as well;
  - The analysis method (NCC, BGM) for β-γ sample spectra is specified in the new ARR and RRR
  - Activity at acquisition start has been added to ARR and RRR;
  - Noble gas RLR (both β-γ coincidence and HPGe) and related examples have been added;
- Regarding the content:
  - Added S/H/I station and instrument codes, and radionuclide station and certified laboratories codes in Appendix II;
  - Added list of acronyms and abbreviations;
  - Added glossary;
  - Added list of listings (message examples, software code);
  - Updated country codes in Appendix II.

Contents

Figures

Tables

Listings

Acronyms and abbreviations

2D two dimensional.
3-C three-component.

ADDINS Additional Instructions.
ANSI American National Standards Institute.
ARR Automated Radionuclide Report.
ASCII American Standard for Information Interchange.
AutoDRM *Automatic Data Request Manager*.

BGM Beta Gamma Matrix.
BIOT British Indian Ocean Territory.
BLANKPHD Blank Pulse Height Data.

CALIBPHD Calibration Pulse Height Data.
CE Conversion Energy.
CNF Contributing National Facility.
CR Carriage Return.
CRL Certificate Revocation List.
CTBT Comprehensive Nuclear-Test-Ban Treaty.
CTBTO Comprehensive Nuclear-Test-Ban Treaty Organization.

DETBKPHD Detector Background Pulse Height Data.
DSA Digital Signature Algorithm.

ECR Energy vs Channel Regression.
EER Efficiency vs Energy Regression.
EXECSUM Executive Summary.

FDSN Federation of Digital Seismic Networks.
FIR Finite Impulse Response.
FTP File Transfer Protocol.
FWHM Full Width at Half Maximum.

GASBKPHD Gas Background Pulse Height Data.
GCI Global Communications Infrastructure.
GSE Group of Scientific Experts.
GSETT-3 Group of Scientific Experts Third Technical Test.

HPGe High Purity Germanium.
HTML HyperText Markup Language.
HTTP HyperText Transfer Protocol.

IDC International Data Centre.
IEEE Institute of Electrical and Electronic Engineers.
IIR Infinite Impulse Response.
IMS International Monitoring System.
IMS2.0 International Monitoring System 2.0.
ISC International Seismological Centre.
ISO International Standards Organization.

LABSDN Laboratory Sample Dispatch Notification.
LF Line Feed.
LSB Least Significant Bit.

MCA Multi-Channel Analyser.
MDA Minimum Detectable Activity.
MDC Minimum Detectable Concentration.
MDI Minimum Detectable Intensity.
MESACK Message Receipt Acknowledgement.
MET Meteorological data.
MID Measurement Identification.
MIME Multipurpose Internet Mail Extensions.
MRP Most Recent Prior.
MSB Most Significant Bit.

NCC Net Count Calculation.
NDC National Data Centre.
NEB National Event Bulletin.
NEIC National Earthquake Information Centre.
NSEB National Screened Event Bulletin.

PEM Privacy Enhanced Mail.
PHD Pulse Height Data.
PRESDN Preliminary Sample Dispatch Notification.
PTS Provisional Technical Secretariat.

QC Quality Control.
QCPHD Quality Control Pulse Height Data.

RASA Radionuclide Aerosol Sampler/Analyser.
REB Reviewed Event Bulletin.
RER Resolution vs Energy Regression.
RFID Radio-Frequency Identification.
RLR Radionuclide Laboratory Report.
RMS Radionuclide Monitoring System.
RMSSOH Radionuclide Monitoring System State of Health.
RNPS Radionuclide Network Product Summary.
ROI Region of Interest.
RRR Reviewed Radionuclide Report.

S/H/I Seismic, Hydroacoustic and Infrasonic.
S/MIME Secure Multipurpose Internet Mail Extensions.
SAMACK Sample Receipt Acknowledgement.
SAMPLEPHD Sample Pulse Height Data.
SEB Standard Event Bulletin.
SEL1 Standard Event List 1.
SEL2 Standard Event List 2.
SEL3 Standard Event List 3.
SID Sample Identification.
SLSD Standard List of Signal Detections.
SNR Signal-to-noise ratio.
SOH State of Health.
SPHDF Full acquisition-time Sample Pulse Height Data.
SPHDP Preliminary Sample Pulse Height Data.
SPIKEPHD Spike Pulse Height Data.
SRID Sample Reference Identification.
SROI Spectral Region of Interest.
SSEB Standard Screened Event Bulletin.
SSREB Standard Screened Radionuclide Event Bulletin.
STP Standard Temperature and Pressure.

TCP/IP Transmission Control Protocol/Internet Protocol.

UPS Uninterruptible Power Supply.
UTC Universal Coordinated Time.

VDMS *Verification Data and products Messaging System.*

XML Extensible Markup Language.

1

About this Document

1.1 Purpose

This document describes the International Monitoring System 2.0 (IMS2.0) version of the formats and protocols used for discrete message exchange, including requests for subscriptions and data messages.

1.2 Scope

This document describes message exchange formats, some of which have not been implemented in International Data Centre (IDC) software. Formats that are not used at the IDC are included in Appendix IV "Unsupported commands at the IDC" on p. 385.

Software for receiving or generating messages or the formats and protocols for continuous data exchange are not described. These topics are described in sources cited below.

1.3 Audience

This document is intended for users, and software developers and engineers of the IDC *Verification Data and products Messaging System* (*VDMS*) Request and Subscription modules.

1.4 Related information

The following documents complement this document:

- Formats and Protocols for Continuous Data CD-1.0. (2002) Provisional Technical Secretariat of the CTBTO Preparatory Commission, Vienna, Austria (IDC/ENG/SPC/100/Rev.1, 2002).
- Formats and Protocols for Continuous Data CD-1.1. (2002) Provisional Technical Secretariat of the CTBTO Preparatory Commission, Vienna, Austria (IDC/ENG/SPC/101/Rev.3, 2002).

See Appendix V "History of "Formats and Protocols for Messages"" on p. 390 for a listing of all the sources of information consulted in preparing this document.

1.5 Using this Document

This document is part of the overall documentation architecture for the IDC and provides descriptions of IDC products and their formats.

This document is organized as follows:

- Chapter 2 - Overview: This chapter provides a high-level description of the protocol and formats for messages.
- Chapter 3 - Message structure: This chapter provides a high-level description of the structure of messages used to exchange data.
- Chapter 4 - Request messages: This chapter describes the formats for messages that are used to make requests for data and data products.
- Chapter 5 - Subscription messages: This chapter describes the formats for messages that are used to establish and manipulate subscriptions.
- Chapter 6 - S/H/I Data Messages: This chapter describes the formats for messages that contain Seismic, Hydroacoustic and Infrasonic (S/H/I) data and data products.
- Chapter 7 - Radionuclide messages: This chapter describes the formats for messages that contain radionuclide data and data products within the Radionuclide Monitoring System (RMS).
- Chapter 8 - Command request and response messages: This chapter describes the formats for messages that contain command request and command response messages.
- Chapter 9 - Summary messages: This chapter describes the formats for messages that contain summary data and data products.
- Chapter 10 - Station VDMS basics: This chapter describes the formats that must be supported by auxiliary seismic stations of the International Monitoring System (IMS).
- Appendix I - Data message examples: This appendix contains examples of formatted data messages.
- Appendix II - Codes: This appendix contains codes such as country, station, laboratory and instrument codes used in IDC *VDMS* messages.
- Appendix III - Computer code for CHK2 checksum: This appendix contains C and FORTRAN computer codes for computing the CHK2 checksum.
- Appendix IV - Unsupported commands at the IDC: This appendix contains a list of unsupported commands at the IDC.
- Appendix V - History of "Formats and Protocols for Messages": This appendix contains an outline of the development of the formats and protocols for messages.

1.6 Conventions

This document uses a variety of conventions, which are described in Tables 1 and 2. Table 1 shows the typographical conventions. Table 2 explains certain technical terms that are not part of the standard Glossary, which is located at the end of this document.

Table 1. Typographical conventions

Element	Font	Example
required environments	**bold**	**time**
computer code and output text that should be typed in exactly as shown	Courier	`msg_type data` `begin ims1.0`
processes and software units, user-defined arguments	*italics*	*VDMS* *msg_id id_string* [*source*]
key words of control lines, environment lines, request lines, data lines, and specific data message types when used in text	CAPITALS	E-MAIL, TIME, ARR, BULLETIN, LOG, UNASSOCIATED, SHORT

Formats in this document represent either ASCII (American Standard for Information Interchange) characters or binary fields, depending on the type of data being described. The conventions for ASCII formats include the following format types:

- a: alphanumeric character strings
- i: integers
- f: floating point numbers
- e: exponential numbers

Depending on the format type indicator (“a”, “i”, “f”, “e”), each is followed by either an integer or a decimal number. For alphanumeric character strings and integer numbers, the number following the format type is an integer that describes the maximum number of characters or digits allowed in a field. For example, the format “a5” indicates that the field is represented by five alphanumeric characters (for example, `SE001`), and the format “i4” indicates an integer number with four positions (for example, `4321`). For floating point and exponential numbers, the type indicator is followed by two numbers separated by a period as in “n.m”. In both formats, “n” describes the maximum number of characters that may be used to represent the number, including decimal points, exponential indicators, plus or minus signs, and so on. For floating point numbers, “m” is the recommended number of digits that follow the decimal point. The number of digits after the decimal point is allowed to *float* to accommodate anomalous data. For example, “`f5.2`” accommodates numbers from `.0001` to `99999`, but the preferred representation is two digits after the decimal point. For exponential number formats, “m” is the exact number of digits to the right of the decimal. For example, “e11.4” accommodates numbers like `-1.2345e+03`.

Some fixed formats allow combinations of the format types. Time and date formats combine the “a”, “f”, and “i” format types. A typical format for a date (such as `1998/04/15`) is “i4,a1,i2,a1,i2”.

Where binary data are part of a format description, the numbers and characters are expressed as the number of bytes that are used to store them along with the convention that is used for ordering the bytes. The Institute of Electrical and Electronic Engineers (IEEE) byte order convention is used throughout this document.

Table 2. Terminology

Term	Description
*	(asterisk) symbol indicating that any ASCII character(s) may be substituted
[ ]	(square brackets) symbols delineating optional parameters in a syntax description
. . .	(ellipsis) symbol indicating that lines of an example have been intentionally omitted
|	(vertical bar) symbol indicating “or” in a syntax or environment description
block	group of lines in a data message that constitutes a cohesive unit of information
compressed data	data that have been reduced significantly in size to make transmission more efficient
control lines	request or subscription message lines that specify how/when the response to the request or subscription will be sent
data message	message that contains data, usually sent in response to a request message or a subscription
data products	reports, bulletins, and other products that contain the results of processing
environment lines	request or subscription message lines that establish an environment within which requests or subscriptions are made
identification lines	*VDMS* message lines that identify the *VDMS* version, message type, and reference numbers
logical line	*VDMS* instruction or data line that is a complete unit as defined in this document. A logical line may consist of one or more physical lines
physical line	line terminated by a Line Feed (LF) or by a LF followed by a Carriage Return (CR)
request lines	request or subscription message lines that specify the data or data product being requested
request message	*VDMS* message that requests data or data products
subscription message	*VDMS* message that establishes or alters regular delivery of data or data products

2

Overview

This chapter provides an overview of the IMS2.0 formats and protocols for messages. It includes the following sections:

2.1 Introduction

The International Data Centre (IDC) is the international repository of data monitored under the Comprehensive Nuclear-Test-Ban Treaty (CTBT). It processes and provides the following to State Signatories of the CTBT:

Data Seismic, hydroacoustic, infrasonic (S/H/I) and radionuclide data produced by International Monitoring System (IMS) stations and certified radionuclide laboratories.
Products Reports, such as event lists and bulletins, produced by the IDC through the processing of S/H/I and radionuclide data received from IMS stations and certified radionuclide laboratories.

2.2 Message exchange

The IDC, National Data Centres (NDCs), IMS stations, and certified radionuclide laboratories can communicate with each other via e-mail messages.

The following types of messages are exchanged:

Request This message type contains a request for S/H/I data, radionuclide data, or IDC products.
Subscription This message type establishes (or alters) standing requests for S/H/I data, radionuclide data, or IDC products.
Data This message type contains S/H/I data, radionuclide data, or IDC products. When a request or subscription message is sent, the response consists of a data message. However, not all data messages are prompted by a request or subscription message. For example, data messages sent from an IMS radionuclide station to the IDC are not prompted by request or subscription messages.
Command Request This message contains a series of command lines that provide information about the return message (E-MAIL), set the environment for the requested command (TIME_STAMP) and specify the type of command that is requested.
Command Response This message is sent by the station in response to a command request. The response may include arguments and command parameters. More than one response may result from a single command request; for example an acknowledgement followed later by some required information or results. An acknowledgement of a command request is expected within one working day.

These message types are described in subsequent chapters.

2.3 Message protocols

Two standard low-level protocols are used for the exchange of messages: electronic mail (email) and HTTP. Differences exist, however, in the circumstances under which these protocols are used for transmitting radionuclide and S/H/I data messages.

For S/H/I-related messages, the use of the available message protocols depends on the message length and content. For example, email is used for exchanging shorter S/H/I-related messages. HTTP is used for exchanging longer S/H/I-related messages.

In contrast, all radionuclide-related messages are exchanged via email. HTTP is used only in extremely limited cases where large radionuclide data files are sent from, for example, the IDC to a National Data Centre (NDC).

At the application level, the message protocol requires that request and subscription messages be answered with data messages. Information controlling the format, low-level protocol, and destination for the data message are included in request and subscription messages

2.4 Message authentication

IMS2.0 messages are sent currently via email using the Secure Multipurpose Internet Mail Extensions protocol (see Housley (2002a), Housley (2002b), Rescorla (1999)Ramsdell (1999a), Ramsdell (1999b) . S/MIME is based on the Internet MIME standard (see Crocker et al. (1995a)). It provides a consistent method of sending and receiving secure MIME mail by adding authentication and privacy. S/MIME can be used by traditional mail user agents to add cryptographic security services to mail that is sent, or to interpret cryptographic security services to mail that is received.

Data and request messages in IMS2.0 may be authenticated using multipart/signed S/MIME format without altering the IMS2.0 format. The authentication mechanism encapsulates the message body and the digital signature within MIME boundaries. The multipart/signed S/MIME format has the advantage that the message can always be viewed by the receiver, whether the receiver software can verify the signature or not. The current industry standard for cryptographic format is the PKCS #7 (see Housley (1999)). This is a flexible message format for representing the results of cryptographic operations on messages.

Standard mail agents and open source applications have the capability to interpret or create digital signatures. With the appropriate digital certificate installed in sender equipment, a user can create a valid signed message. With the sender public key installed in the receiver equipment, the user can authenticate a digitally signed message.

The signature of the originating parties may be retained when data or products are forwarded from one site to another. In this case, any subsequent signatures would encapsulate the entire previously signed message including the signature into a message body with an additional signature.

3

Message structure

This chapter describes the structure of messages and includes the following sections:

3.1 Introduction

A message consists of a preface, body, and conclusion. A HELP message is the exception to this rule.

The message preface contains the first four lines of all messages. These are the BEGIN, MSG_-TYPE, MSG_ID, and, optionally, either the REF_ID, ACK or PROD_ID lines. Respectively, they provide information on:

- the message format version number,
- the message type,
- the message identification,
- the message identification of the referenced message, if any
- whether user wants to receive acknowledgement of receipt of request
- the product identification number and sequence number for the product subscribed to, if any.

The message preface is followed by a body containing requests, responses, subscriptions confirmations or data specific to the message type.

Finally, the message conclusion ends the message. It consists of the STOP line. The syntax of a message is as follows.

Listing 3.1. General message structure

```
begin version_identifier
msg_type request | subscription | data | labdata |
    command_request | command_response
msg_id id_string[ source]
[ref_id ref_str[ ref_src][ part seq_num[ of tot_num]]] |
[ack true|false] |
[prod_id product_id delivery_id]
...
stop
```

For example, the syntax of a subscription message is described line by line in Table 3.

Table 3. General structure of a subscription message

Line #	Syntax	Example of contents	Description
1	`begin` *message_format*	`begin ims2.0`	message version number
2	fixed (for subscription message)	`msg_type subscription`	specifies the type of message
3	`msg_id` *id_string*`[ source]`	`msg_id abc23 any_ndc`	assigns an identification code to the message for tracking
4	`e-mail address`	`e-mail name@domain_name`	the e-mail address to which the answer should be sent
5 to $N-1$	customizable	environmental lines and request lines	specifies how often responses will be sent, and what data or products will be sent
N	`stop`	`stop`	end of message

3.2 Message preface

3.2.1 BEGIN

The BEGIN line is the first line of a message. The BEGIN line contains the version identifier of the command syntax.

Syntax

```
begin IMS2.0
```

The argument in the BEGIN line of a request message is the default format of the body of the message. If a specific format string is given on a message line, that format specification will override the default.

3.2.2 MSG_TYPE

The MSG_TYPE line is the second line of a message. A message type is required for a distinction to be made between different types of messages. Only one MSG_TYPE is allowed per message. Combining different message types in the same message is prohibited.

Syntax

```
msg_type request | subscription | data | labdata |
   command_request | command_response
```

3.2.3 MSG_ID

The MSG_ID line is the third line of a message. A message identification code is required for tracking and identifying messages. The MSG_ID line contains the MSG_ID keyword followed by an *id_string* code and a *source* code separated by a blank.

The sender is responsible for providing a unique *id_string*, as well as a descriptive source code. The *id_string* may contain up to 20 alphanumeric characters[1]. The *source* code is optional and may contain up to 16 alphanumeric characters. Blanks or backslash (\) characters are not allowed in either the *id_string* or the *source* codes.

Syntax

```
msg_id id_string[ source]
```

id_string	unique identification code (up to 20 characters)
source	message source code (up to 16 characters)

The *source* of a message can be an IMS station, a certified radionuclide laboratory, an NDC, a Contributing National Facility (CNF), or the IDC. For radionuclide facilities, the radionuclide station or laboratory code must be used as the *source*. For S/H/I stations and data centres (NDC and the IDC) the *source* is the network code.

3.2.4 REF_ID

The REF_ID line is included in a message in two cases:

- when a message is generated and transmitted to a party in response to a message received from (sent by) the same party, and/or

[1] For tracking purposes, it is recommended to use sequential numbering for the *id_string*.

- when a very large message is split into several separate, smaller messages[2].

Syntax

`ref_id` *ref_str* `[` *ref_src* `] [ part` *seq_num* `[ of` *tot_num* `]]`

ref_str	the *id_string* from the MSG_ID line of the request message
ref_src	the message *source* code from the MSG_ID line of the request message
seq_num	sequence number beginning with 1
tot_num	total number of parts for this response

3.2.5 ACK

The ACK line is included in a message when the user decides whether to receive acknowledgement that the request has been received by the *VDMS*. The default is to send back an acknowledgement to the user.

3.2.6 PROD_ID

The PROD_ID line is the fourth line of a data message that is generated for a subscription request. The PROD_ID line is comprised of the PROD_ID keyword followed by a *product_-id* code and a *delivery_id* code, separated by a blank. These numbers help users receiving the subscription know if a delivery has been omitted.

Syntax

`prod_id` *product_id delivery_id*

product_id	product identification code
delivery_id	delivery identification

3.3 Message body

The body of a message depends on its type.

3.3.1 REQUEST

The body of a request message contains a series of free-format command lines that provide information about the return message (request control lines), set the environment for subsequent request lines (request environment lines), and specify the type of data that are to be returned within the limits of the environment (request lines). Some request lines must be preceded by environment lines that, by constraining the request, limit the size of the response. For details, see chapter 4 “Request messages” on p. 47.

[2] At the IDC, splitting messages is not implemented for outgoing messages.

3.3.2 SUBSCRIPTION

The body of a subscription message is formatted much the same way as a request message, but because subscription messages provide data on a scheduled basis rather than as a response to an individual request, they are given a separate message type and have additional capabilities that are not found in request messages.

A subscription message contains information about where to send the subscribed data, how often the subscribed data should be sent, and what data (or data products) to send. Like request messages, subscriptions are defined through environment variables that constrain the data to be sent and request lines that specify which data to send. Separate subscriptions are delimited by separate subscription request lines. In other words, each time a subscription request line is encountered, a corresponding subscription will be initiated for the user. For details, see chapter 5 "Subscription messages" on p. 99.

3.3.3 DATA

The body of a data message contains the data generated at an IMS station, CNF or radionuclide laboratory. Data sections must begin with a DATA_TYPE line. The arguments to DATA_TYPE are the type of data that follows (for example, WAVEFORM or BULLETIN) and the format (IMS2.0) and can include subformat depending on the format the requestor wants (for example SC3XML or MS_ST2_512 for miniSEED formats. For details, see chapter 6 "S/H/I Data Messages" on p. 131 and chapter 7 "Radionuclide messages" on p. 167.

3.3.4 LABDATA

The body of a laboratory data message contains additional data required for the analysis at radionuclide laboratories. For details, see chapter 7 "Radionuclide messages" on p. 167.

3.3.5 COMMAND_REQUEST

The body of a command request message contains a series of command lines that provide information about the return message (E-MAIL), set the environment for the requested command and specify the type of command that is requested.

3.3.6 COMMAND_RESPONSE

The body of a command response contains the message sent by the station in response to a command request. The response may include arguments and command parameters. More than one response may result from a single command request; for example an acknowledgement followed later by some required information or results. An acknowledgement of a command request is expected within one working day. The requestor can decide not to receive an acknowledgement by setting the ACQ environment to FALSE.

3.4 Message conclusion

3.4.1 STOP

The STOP line is the last line of an IMS2.0 message. Commands found on the same line after the STOP are ignored. If two or more messages with different MSG_ID *id_strings* are included in one e-mail or file, all lines between the STOP and subsequent BEGIN lines are ignored. A message without a STOP line is considered incomplete and is discarded.

3.5 Message conventions

Basic message conventions are used for both radionuclide- and S/H/I-related messages. However, some differences in conventions exist between the radionuclide- and S/H/I-related messages, including:

- fixed-format field justification
- case sensitivity
- blank lines
- missing data
- station naming
- comment conventions
- version format number

The basic message conventions are as follows.

3.5.1 Message size

The maximum size of a message is 100 MB[3]. The maximum message size depends on the bandwidth of the connection between the message source and recipient, as well as the space available on computers for storing messages.

Although certain sites may be constrained by system limitations to sending e-mail messages smaller than 400 KB, Transmission Control Protocol/Internet Protocol-based (TCP/IP) e-mail systems are generally reliable up to at least 1 MB. To accommodate data messages larger than these limits, a mechanism is provided for a single data message to be split into several parts that can be reconstructed by the recipient (see section 3.2 “Message preface” on p. 34).

Radionuclide-related messages larger than 1 MB should be broken into several smaller e-mails using the methods described in section 3.2 “Message preface” on p. 34. For S/H/I-related messages, the message size determines the protocol that is most appropriate for message transmission. Messages larger than 1 MB should be transferred via HTTP/FTP.

[3] This maximum size can vary from one organization to the other

3.5.2 Line length

A line may be up to 1,024 characters long, excluding the special characters Line Feed (LF) and Carriage Return (CR). An ASCII message line may be terminated by a LF or by a LF followed by a LF.

The format for a message line determines its logical line length. In S/H/I messages, a logical line may be broken into several physical lines. To break a logical line into several physical lines, a backslash (\) is inserted at the desired break point[4]. The logical line is then continued on the next physical line. The backslash may occur in any character position of the line and is counted as one of the physical line characters. The backslash does not hold the place of a blank or any other character. The character preceding the backslash is concatenated with the character in position one of the next physical line. If the logical line length for an ASCII line is longer than 1,024 (such as with ASCII waveform data), then the line break character (\) is not used. Data are simply continued on the next line. Breaking logical lines with backslashes is not allowed in radionuclide-related messages.

3.5.3 Free-format lines

Message lines that are not in fixed format are known as free-format lines. A free-format line may consist of a keyword followed by an argument list or it may contain unformatted free text. Free-format lines are left justified and case insensitive. Free-format lines must have one or more blank spaces between fields. All lines in request and subscription messages are free-format lines.

3.5.4 Fixed-format lines

Fixed-format lines differ from free-format lines in that they have explicitly defined character fields. Most data message lines are in fixed format (header and data lines are examples).

Although many fixed-format lines are case insensitive, some are not. Fixed-format lines that are case sensitive include message lines in waveform data messages after compression by the CM6 compression scheme (see subsubsection 6.3.2.3 "Subformat CM6" on p. 142). No fixed-format lines in radionuclide data messages are case sensitive.

Field contents in radionuclide data messages that are parsed into the IDC database are left justified. Otherwise, field contents are right or left justified according to the field and line formatting. Alphanumeric character fields in fixed-format lines (such as a field with format a12) must be left justified. Numeric fields and numeric/alphanumeric character combination fields (such as f10.4 or i4,a1,i2) must be right justified.

[4] The line break character (\) is not implemented at the IDC.

3.5.5 Blank lines

Blank lines are not permitted in radionuclide data messages. Blank lines are allowed in free text fields such as those found in a #Comment block and an ALERT data message (see Table 59 on p. 176 and section 7.7 "Alerts" on p. 209, respectively).

In all other message types, blank lines may be added to improve legibility where they do not cause ambiguity.

3.5.6 Splitting data messages

In data messages, the identification (ID) fields from the MSG_ID line of the request message are placed in the REF_ID line. If a data message must be split into smaller messages, the split(s) must occur only at DATA_TYPE boundaries[5]. This method has the following advantages:

- data sections are never broken in the middle; and
- each message split is headed by BEGIN, MSG_TYPE, MSG_ID, and REF_ID lines, and terminated by a STOP line.

Each *id_string* in the MSG_ID lines of the individual split messages must be unique. The REF_-ID lines, however, will have identical *ref_str* and *ref_src* codes. The part *seq_num* command is needed only when a message is split into parts. The of *tot_num* coding is optional for all but the last section of the split message.

Examples

To illustrate the use of REF_ID, suppose the following request for waveform data is sent from the NDC in country ABC to the IDC.

Listing 3.2. Example of request message with MSG_ID

```
begin ims2.0
msg_type request
msg_id 2002/05/21_0001 ABC_NDC
...
stop
```

The IDC's response to the request will have a REF_ID from the IDC and will use the request message MSG_ID string in the REF_ID line.

Listing 3.3. Example of data message with REF_ID

```
begin ims2.0
msg_type data
msg_id 00567023 ctbto_idc
ref_id 2002/05/21_0001 ABC_NDC
...
stop
```

[5] At the IDC, splitting messages is not implemented for outgoing messages.

The following example shows a data message with four distinct `DATA_TYPES`.

Listing 3.4. Example of data message with multiple DATA_TYPEs

```
begin ims2.0
msg_type data
msg_id 54965 ctbto_idc
ref_id 0002324 ANY_NDC
data_type type1 ims2.0
...
data_type type2 ims2.0
...
data_type type3 ims2.0
...
data_type type4 ims2.0
...
stop
```

The following example shows how a data message can be split. The single message in the previous example is split into two distinct messages using the `part` *seq_num*`[ of` *tot_num*`]` referencing mechanism.

Listing 3.5. Example of a data message split into distinct messages

```
begin ims2.0
msg_type data
msg_id 54965 ctbto_idc
ref_id 0002324 ANY_NDC part 1 of 2
data_type type1 ims2.0
...
data_type type2 ims2.0
...
stop
begin ims2.0
msg_type data
msg_id 54965 ctbto_idc
ref_id 0002324 ANY_NDC part 2 of 2
data_type type3 ims2.0
...
data_type type4 ims2.0
...
stop
```

3.5.7 Missing data

Some fields in a message are required, while others are not. Blank characters can be used for missing data in S/H/I data message but not in radionuclide data messages. For proper data parsing during automatic input processing, radionuclide fields that are not required and are missing data must be filled. The convention for missing radionuclide data depends on the data type.

If the missing data are in a pulse height data message (in other words SAMPLEPHD, GASBKPHD, BLANKPHD, DETBKPHD, QCPHD, CALIBPHD) missing data are zero filled (0). If the missing data are in any other message from a radionuclide station or a certified laboratory, then the following convention should be used. Missing radionuclide numerical data (that is, floating point, integer, and exponential numbers) are indicated by a negative sign followed by as many nines as the field formatting will allow. Missing radionuclide character data with formats such as a50 are designated with a single zero (0).

3.5.8 Comments

Comments for S/H/I-related messages are used primarily in LOG and ERROR_LOG data messages. In these messages the comments are free-format lines in which the first character is blank.

Some ISC extensions of the IMS2.0 formats use comment lines to include additional information for some data types. These comment lines are formatted, always including a left parenthesis in the second column, and either a hash (#) or plus (+) in the third column, depending on the usage (see *IASPEI Seismic Format (ISF)* (1999)).

Comments in radionuclide-related messages use a free-format line structure that begins with a #Comment line. The lines following the #Comment line contain the comment text. The end of the comment is designated by a STOP line or another line beginning with a #. The STOP line is interpreted as the end of the message. Comments may appear in all radionuclide data messages, however, only one #Comment block is allowed per message. #Comment blocks cannot occur within other data blocks, but instead must precede or follow a data block.

3.5.9 Date and time formats

The standard format for specifying the date and time contains two fields: one for the date and one for the time, with a blank separating the two fields. The date must always be present, but the time field may be omitted. When no time is specified, the field defaults to 00:00:00.000. Missing date fields are specified with a single zero.

The time field may have varying degrees of precision (that is, decimal places in the seconds attribute). The time format with the highest precision follows.

Syntax

```
yyyy/mm/dd hhmmsssss
```

yyyy	year
mm	month number
dd	day of the month
hh	hour in Universal Coordinated Time (UTC)
mm	minutes
ss.sss	seconds

The range of time over a day is from 00:00:00.000 up to (but not including) 00:00:00.000 of the next day. Leading zeros in any of the number fields may be dropped in free-format lines, but they must be present in fixed-format lines. In addition, some of the values may be dropped from the time field in free-format lines. If the seconds, or the minutes and seconds, are dropped, then they are assumed to be `0` (for example, `21:03` is interpreted as `21:03:00.000` and `9` is interpreted as `09:00:00.000`).

The following date-time formats are acceptable for free-format lines

```
1994/01/01 13:04:12.003
```

```
1994/12/23
```

```
1995/07/14   01:05
```

```
1995/09/10 2:15:3
```

3.5.10 Radionuclide station and laboratory codes

Radionuclide station and laboratory codes must consist of five characters. The first two characters are the country code for the country in which the site resides (see Appendix section II.1). The next character identifies the system type installed at the station. System types include `P` for particulate monitoring, `X` for xenon monitoring, and `L` for radionuclide laboratories. The last two characters are the two-digit numbers assigned to the station or laboratory in the text of the CTBT.

3.5.11 Radionuclide detector codes

The detector code enables easy identification of a unique detector and its location. Radionuclide detector codes contain nine characters. The first five characters are the site code. This code is followed by a `_` (underscore) and a three-digit integer identifier assigned to a specific detector setup.

3.5.12 S/H/I Network Codes

With the large number of S/H/I stations distributed globally, unique station names cannot be guaranteed. The S/H/I network naming format supports the concept of duplicate station names and thus requires that stations be affiliated with a network.

The network identifier can be up to nine characters in length and consists of two parts separated by an underscore. The first part is three or four characters in length and is the domain of the network. This code is either an internationally recognized affiliation (such as IDC) or a three-letter ISO standard country code, as shown in the Appendix section II.1 "Country codes". The second part of the network identifier is the network code (1–4 characters) within that domain.

An NDC sending data to the IDC may use the network code NDC. For example, the three-letter ISO code for the Czech Republic is CZE, so the default network code for the NDC of the Czech Republic is `CZE_NDC`.

3.5.13 S/H/I Station Codes

To guarantee that station names are unique and follow international naming conventions, S/H/I station codes should be registered with the International Seismological Centre (ISC) in the United Kingdom/the National Earthquake Information Centre (NEIC) in the United States.

All station codes must be three to five characters. Array stations have unique station codes for each element of the array as well as a unique array code that refers to the entire array. The code referencing the array should not be the same as the station code of any of the array elements.

3.5.14 S/H/I Channel Codes

The format for channel designators of S/H/I stations expands upon the format used by the Federation of Digital Seismic Networks (FDSN). Three upper-case characters are used to designate a channel. The first specifies the general sampling rate and the response band of the instrument, as shown in Table 4. The second character specifies the instrument code, as shown in Table 5. The third character specifies the physical configuration of the members of a multiple axis instrument package or other parameters as specified for each instrument, as shown in Table 6.

Table 4. S/H/I channel band codes

Band code	Band type	Sample rate (Hz)	Corner period (s)
E	extremely short period	≤ 80	< 10
S	short period	≤ 10 to < 80	< 10
H	high broadband	≤ 80	≤ 10
B	broadband	≤ 10 to < 80	≤ 10
M	mid period	> 1 to < 10	
L	long period	$= 1$	
V	very long period	$= 0.1$	
U	ultra long period	$= 0.01$	
R	extremely long period	$= 0.001$	
W	weather/environmental		
X	experimental		

3.5.15 S/H/I Auxiliary Codes

The auxiliary designator is used to distinguish between different instruments or data streams that have the same station and channel codes. This four-letter designator is used only when a

Table 5. S/H/I channel instrument codes

Instrument code	Description
H	high-gain seismometer
L	low-gain seismometer
G	gravimeter/accelerometer seismometer
M	mass position seismometer
D	pressure sensor
C	composite trace

Table 6. S/H/I channel orientation codes

Orientation code	Description
Z, N, or E	traditional (vertical, North-South, East-West)
A, B, or C	tri-axial (along the edges of a cube turned up on a corner)
T or R	for transverse and radial rotations
1, 2, or 3	orthogonal components but nontraditional orientations
U, V, or W	optional components
H	hydrophone
F	infrasonic pressure
C	coherent beam
I	incoherent beam
O	origin beam

conflict exists. When not needed, this field is left blank.

3.5.16 Latitude/longitude conventions

All latitudes and longitudes are written as floating point numbers. Latitudes in the southern hemisphere have negative values. Longitudes in the western hemisphere have negative values.

4

Request messages

This chapter describes the request message formats and includes the following sections:

4.1 Introduction

The request message format provides a framework in which data or products can be requested from the IDC. The data and products available include radionuclide pulse height data and analysis reports, S/H/I waveforms and bulletin products, and more.

Within a single request message, several types of data and products may be requested. For example, requests may be made for a bulletin and associated waveforms or for specific event information from several different regions. The order of the requests in the request message is preserved in the response (data) message.

The data and products that can be received will vary from site to site and will depend on the type of messages and information that is available from the site. The minimum required configuration for a station or NDC *VDMS* is outlined in chapter 10 “Station VDMS basics” (p. 257).

4.2 HELP line

The HELP line is considered a request message because it is used to request an *VDMS* User's Guide by email. Only the *VDMS* email address is required for this protocol to work properly. No other message lines are required in a HELP line message. The same result may be achieved by sending the *VDMS* an empty message with the word `help` as the email subject (see section I.20 "HELP" on p. 302).

4.3 Request format

With the exception of the HELP request, all request messages require the basic message structure described in section 3.2 "Message preface" on p. 34. If a message is a request message, the MSG_TYPE is set to `request`.

The body of a request message contains a series of command lines that provide information about the return message (request control lines), set the environment for subsequent request lines (request environment lines), and specify the type of data that are to be returned within the limits of the environment (request lines). Some request lines must be preceded by environment lines that, by constraining the request, limit the size of the response. The response to a request is contained in a data message. In the response data message, the identification (ID) fields from the MSG_ID line of the request message should be placed in the REF_ID line.

4.4 Request control lines

Request control lines are commands that specify the protocol of the response data message. The existing options for the response message protocol are only email. This option should be used in accordance with the guidelines described in section 2.3 "Message protocols" on p. 30 and section 3.5 "Message conventions" on p. 38.

If no E-MAIL line is included in the request message, the reply is sent to the address obtained from the mail header. Because the return address from an email header may not be reliable, it is highly recommended to specify the return email address using an E-MAIL line.

The syntax for the E-MAIL request control line is described in the following sections.

4.5 E-MAIL

The E-MAIL line indicates that the response message protocol is email. The argument for the E-MAIL command is the email address to which the response message should be sent.

Syntax

`e-mail` *address*

address email address to send reply to

If no E-MAIL line is included in the request message, the reply is sent to the address obtained from the mail header. Because the return address from an email header may not be reliable, it is highly recommended to specify the return email address using an E-MAIL line.

4.6 Request environment lines

Environment lines identify the variables to which the response to the request line is constrained (for example, TIME or STATION). An environment variable is set by arguments that follow a predetermined keyword and is reset with another environment line including the same keyword. An environment keyword with no arguments resets the constraint on that environmental parameter to the default value. Environment variables may be specified using either ranges or lists.

An environment range constrains the variable to limits specified by two values. The two range limits are separated by the word ` to ` (including the blank spaces).

Syntax

```
environment_keyword[[ low_limit] to[ high_limit]]
```

Open-ended ranges are specified by omitting the *low_limit* or the *high_limit*. A blank may also be used in the *low_limit* or the *high_limit* when a TIME environment variable is being specified.

Examples

All times from 23 February, 1999 at 00:00:00 up to (but not including) 10 March, 1999 at 14:37:02 are specified with the following environment line.

```
time 1999/02/23 to 1999/03/10 14:37:02
```

The following example specifies all magnitudes of 5.0 and above.

```
mag 5.0 to
```

List environment lines contain lists of comma-delimited parameters that specify discrete constraints, such as station names and channels. Some list environments are allowed only one parameter (for example, BULL_TYPE); others may have an unlimited number. Spaces after the commas are optional. The general syntax for a list environment follows.

Syntax

```
environment_keyword[ arg1[, arg2[, arg3[, \ldots]]]]
```

Lists can be long, so a wild card character * may be used as a substitute for any string of arguments and their content in some list environments.

Examples

The following environment line specifies all IMS stations.

```
sta_list *
```

The following environment line specifies all IMS stations beginning with A.

```
sta_list a*
```

The following environment line specifies all IMS channels ending with Z.

```
chan_list *Z
```

The following sections describe specific environment variables. Default settings and examples are given for each variable. Although many environment variables are listed, only certain ones may be applicable to a particular IMS2.0 implementation. Those variables that have been implemented are described in the *VDMS* User's Guide available through the HELP request line (see section 4.2 "HELP line").

The STA_LIST, TIME, and TIME_STAMP environments can be used in requesting either radionuclide or S/H/I data. All other environment variables are used exclusively for requesting S/H/I data.

4.6.1 ARRIVAL_LIST

A unique arrival identification code is assigned to each waveform arrival. This arrival identification number appears in the data types for arrivals and bulletins and may be used to obtain arrival information.

Syntax

```
arrival_list[ arid[, arid[, ... ]]]
```

arid arrival identification code

Default

```
arrival_list *
```

Example

The following environment line limits the arrivals to those with arids 8971234 or 90814.

```
arrival_list 8971234,90814
```

4.6.2 AUX_LIST

Station and channel are not always adequate to completely describe a specific data stream for some seismic stations. An auxiliary identification is supplied for completeness in handling these special cases. The instances in which the auxiliary identifications are necessary should be rare. The wildcard character * is allowed in specifying auxiliary codes.

Syntax

```
aux_list[ aux[, aux[, ... ]]]
```

aux auxiliary code

Default

```
aux_list *
```

Example

The following environment line limits the auxiliary code to chi and med.

```
aux_list chi, med
```

4.6.3 BEAM_LIST

Array station data may be delayed and summed (with weights) to form beams. The BEAM_-LIST environment specifies which beams are being requested.

Syntax

```
beam_list[ beam[, beam[, ... ]]]
```

beam beam code

Default

```
none
```

Example

The following line limits the beams to the frequency-wavenumber ($f-k$) beam.

```
beam_list fkb
```

4.6.4 BULL_TYPE

The BULL_TYPE environment provides a means to specify the type of S/H/I bulletin to retrieve. Only one bulletin type may be specified in any BULL_TYPE line. The bulletin types include SEL1 (Standard Event List 1), SEL2 (Standard Event List 2), SEL3 (Standard Event List 3), REB (Reviewed Event Bulletin), SEB (Standard Event Bulletin), SSEB (Standard Screened Event Bulletin), NEB National Event Bulletin), and NSEB (National Screened Event Bulletin). In addition, BULL_TYPE is used in a different context to specify an IDC_NEB (one-time NEB produced at the IDC) or an IDC_NSEB (one-time NSEB produced at the IDC).

Syntax

```
bull_type[ bulletin]
```

bulletin bulletin code (sel1, sel2, sel3, reb, seb, sseb, neb/nseb, idc_neb, or idc_-nseb)

Default

```
none
```

Example

The following environment line limits the bulletin type to SEL1.

```
bull_type sel1
```

4.6.5 CHAN_LIST

The S/H/I channel search list is given in the CHAN_LIST environment. The wildcard character (*) is allowed for specifying channel codes.

Syntax

```
chan_list[ chan[, chan[, ... ]]]
```

chan channel code

Default

```
chan_list *Z
```

Examples

The following environment line limits the channels to three short-period channels.

```
chan_list SHZ, SHN, SHE
```

The following environment line limits the channels to all short-period channels.

```
chan_list S*
```

4.6.6 COMM_LIST

The communications list is a list of communication links to include in status reports. Links are defined by the end of the link closest to the station. Thus, for the link between station ABC and the data centre collecting data from that station, the communications link would be designated as ABC.

Syntax

```
comm_list[ comm[, comm[, ... ]]]
```

comm communications link code

Default

```
comm_list *
```

Example

The following environment line limits the communications links to those links from stations ABC and DEF to the data centre.

```
comm_list ABC, DEF
```

4.6.7 DEPTH

S/H/I events may be constrained by their depth using the DEPTH environment. Depth is given in kilometres from the surface.

Syntax

```
depth[[ shallow] to[ deep]]
```

shallow	low depth range
deep	high depth range

Default

No constraint.

Example

The following environment line limits depths to a range from 0 to 10 Km depth.

```
depth 0.0 to 10.0
```

4.6.8 DEPTH_CONF

The DEPTH_CONF environment defines the confidence level for the seismic depth screening criterion, given as a number between 0.0 and 1.0. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
depth_conf[ conf]
```

conf confidence level of depth screening criterion

Default

```
depth_conf 0.975
```

Example

The following environment line sets the confidence level for the depth screening criterion at 99%.

```
depth_conf 0.990
```

4.6.9 DEPTH_KVALUE

The DEPTH_KVALUE environment defines the depth model uncertainty (Km). This value is added to the uncertainty used in the screening criterion for free-depth solutions. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
depth_kvalue[ kvalue]
```

kvalue depth model uncertainty

Default

```
depth_kvalue 20.0
```

Example

The following environment line sets the depth model uncertainty to 30 Km.

```
depth_kvalue 30.0
```

4.6.10 DEPTH_MINUS_ERROR

The DEPTH_MINUS_ERROR environment is used to obtain all S/H/I events that have a 90% probability of being within a certain depth range. The ranges must be given in kilometres of depth from the surface.

Syntax

```
depth_minus_error[[ shallow] to[ deep]]
```

shallow low depth range
deep high depth range

Default

No constraint.

Example

The following environment line limits the depth of events to a 90% probability of being within 10 Km of the surface.

```
depth_minus_error 0.0 to 10.0
```

4.6.11 DEPTH_THRESH

The DEPTH_THRESH environment defines the depth screening threshold in kilometres of depth from the surface. The value of DEPTH_THRESH must be non-negative. S/H/I events with depth confidence intervals deeper than this threshold are screened out. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
depth_thresh[ threshold]
```

threshold depth threshold

Default

```
depth_thresh 10.0
```

Example

The following environment line sets the depth screening threshold at 20.0 Km.

```
depth_thresh 20.0
```

4.6.12 EVENT_LIST

A unique event identification code is assigned to each S/H/I event. This number appears in S/H/I bulletins and may be used subsequently to request waveforms or comments associated with a specific event.

Syntax

```
event_list[ evid[, evid[, ... ]]]
```

evid event identification code

Default

```
event_list *
```

Example

The following environment line limits the event number to 87623495 and 87.

```
event_list 87623495, 87
```

4.6.13 EVENT_STA_DIST

The EVENT_STA_DIST environment is the distance in degrees between the S/H/I event and the S/H/I station. The environment is applied in context to the request. When requesting waveform data associated with specific S/H/I events, EVENT_STA_DIST helps determine the stations from which the data will be retrieved. When requesting bulletin-type information (bulletins, events, origins, or arrivals), EVENT_STA_DIST helps determine the S/H/I events for which the data will be retrieved.

Syntax

```
event_sta_dist[[ low_dist] to[ high_dist]]
```

low_dist low-distance range
high_dist high-distance range

Default

No constraint.

Examples

The following example limits the request for S/H/I bulletin information to events within 20 deg of stations ABC or DEF.

Listing 4.1. BULLETIN request message with EVENT_STA_DIST

```
sta_list ABC, DEF
event_sta_dist 0 to 20
bull_type REB
bulletin ims2.0
```

The following example limits the request for waveform data to stations within 20 deg of an event.

Listing 4.2. WAVEFORM request message with EVENT_STA_DIST

```
event_sta_dist 0 to 20
bull_type REB
relative_to bulletin
waveform ims2.0
```

4.6.14 GROUP_BULL_LIST

S/H/I events are often common between bulletins. Sometimes it is desirable to list the various solutions (origins) together. GROUP_BULL_LIST is a list of the bulletins that should be combined with the S/H/I bulletin specified in the BULL_TYPE environment. Origin information from these other bulletins will be included in the combined bulletin that is returned. The arrival information will be for the BULL_TYPE bulletin.

Events in the GROUP_BULL_LIST will be grouped with at most one S/H/I event in the BULL_TYPE bulletin. To be grouped, events must have locations within 3 deg and origin times within 60 s. If the initial criteria are met for more than one S/H/I event, all events within the range are reported.

Syntax

```
group_bull_list[ bulletin[, bulletin[, ... ]]]
```

bulletin bulletin code

Default

None (no grouping).

Example

The following environment lines group SEL3 origins with the SEL1.

```
bull_type SEL1
group_bull_list SEL3
```

4.6.15 HYDRO_CP_THRESH

The HYDRO_CP_THRESH environment defines the hydroacoustic cepstral peak screening threshold. An S/H/I event with a hydroacoustic cepstral peak value greater than this threshold is not screened out, regardless of the other hydroacoustic screening criteria. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
hydro_cp_thresh[ threshold]
```

threshold hydroacoustic total energy threshold

Default

```
hydro_cp_thresh 8.0
```

Example

The following environment line sets the hydroacoustic cepstral peak threshold to 7.

```
hydro_cp_thresh 7.0
```

4.6.16 HYDRO_TE_THRESH

The HYDRO_TE_THRESH environment defines the hydroacoustic total energy screening threshold, in decibels (dB). An S/H/I event with hydroacoustic total energy less than this threshold is screened out, provided it also satisfies additional criteria that the entire location error ellipse is offshore, with minimum water depth greater than the value of the MIN_WDEPTH_THRESH environment, and has a clear path to at least one IMS hydrophone. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
hydro_te_thresh[ threshold]
```

threshold hydroacoustic total energy threshold

Default

```
hydro_te_thresh 10.0
```

Example

The following environment line sets the hydroacoustic total energy threshold to 15.0.

```
hydro_te_thresh 15.0
```

4.6.17 LAT

The LAT environment specifies the range of latitude in degrees. Southern latitudes are negative. The low-range value must be smaller than the high-range value.

In cases where LAT can apply to origins or stations (for example, when requesting a S/H/I bulletin), the constraint will be applied to origins.

Syntax

```
lat[[ low_lat] to[ high_lat]]
```

low_lat	low-distance latitude
high_lat	high-distance latitude

Default

No constraint.

Example

The following environment line limits latitudes to a range from 12°S up to (and including) 17°N.

```
lat -12 to 17
```

4.6.18 LOC_CONF

The LOC_CONF environment sets the confidence level of location error ellipses, as a number between 0.0 and 1.0, used to

(1) assess whether the error ellipse for an S/H/I event was onshore, offshore, or mixed (in other words, partially onshore and offshore);
(2) estimate the minimum water depth within the error ellipse; and
(3) assess whether or not a hydroacoustic signal from any point within the error ellipse has a clear path to at least one IMS hydrophone.

This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
loc_conf[ conf]
```

conf	confidence level for location error ellipses

Default

```
loc_conf 0.90
```

Example

The following environment line sets the confidence level for location error ellipses at 99%.

```
loc_conf 0.99
```

4.6.19 LON

The LON environment specifies the range of longitude in degrees. Western longitudes are negative, and the range is interpreted from West to East. Either both or neither (to return to the default values) of the longitudes must be provided in the LON environment.

In cases where LON can apply to S/H/I origins or stations (for example, when requesting a S/H/I bulletin), the constraint will be applied to origins.

Syntax

```
lon[[ west_lon] to[ east_lon]]
```

West_lon	western longitude
East_lon	eastern longitude

Default

No constraint.

Examples

The following environment line limits the longitude range to the 350° swath from 175°W up to (and including) 175°E.

```
lon -175 to 175
```

The following environment line limits the longitude range to a 10° range spanning the international date line.

```
lon 175 to -175
```

4.6.20 MAG

The MAG environment specifies the range of magnitudes to include in the search for seismic events. The type of magnitude (m_b, M_S, and so on) is specified in the MAG_TYPE environment.

Syntax

```
mag[[ low_mag] to[ high_mag]]
```

low_mag	low-magnitude range
high_mag	high-magnitude range

Default

No constraint

Example

The following environment line limits magnitudes to those with magnitudes 4.5 and above.

```
mag 4.5 to
```

4.6.21 MAG_TYPE

The MAG_TYPE list environment specifies the type of magnitude to search when the MAG environment is provided. Standard accepted magnitude codes are m_b (body wave magnitude), M_S (surface wave magnitude), and M_L (local magnitude). Data centres may report other types of magnitudes, provided an explanation is given in the HELP message.

Syntax

```
mag_type[ mag_type[, mag_type[, ... ]]]
```

mag_type mb|Ms|ML

Default

No constraint.

Example

The following environment line limits the magnitude types to m_b and M_S.

```
mag_type mb, Ms
```

4.6.22 MAGPREF_MB

The MAGPREF_MB environment specifies the type of m_b magnitude measurement to use for screening. Valid settings are defined by the **netmag**.*magtype* database attribute. The most common m_b magtype are m_b mb_ave (average m_b), and mb_mle (maximum likelihood estimate). This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
magpref_mb[ magpref_mb]
```

magpref_mb type of m_b measurement to consider for screening

Default

```
magpref_mb mb_ave
```

Example

The following environment line sets the type of m_b measurement to use for screening to be the maximum likelihood estimate of m_b.

```
magpref_mb mb_mle
```

4.6.23 MAGPREF_MS

The MAGPREF_MS environment specifies the type of M_S magnitude measurement to use for screening. Valid settings are defined by the **netmag**. *magtype* database attribute. The most common M_S magtype are ms_ave (average M_S) and ms_mle (maximum likelihood estimate). This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
magpref_ms [ magpref_ms]
```

magpref_ms type of M_S measurement to consider for screening

Default

```
magpref_ms ms_ave
```

Example

The following environment line sets the type of M_S measurement to use for screening to be the maximum likelihood estimate of M_S.

```
magpref_ms ms_mle
```

4.6.24 MB_ERR

The MB_ERR environment defines the uncertainty term (standard deviation) for single-station m_b magnitude estimates, used in the computation of the confidence interval of the network estimate of m_b minus M_S. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
mb_err [ err]
```

err m_b uncertainty

Default

```
mb_err 0.34
```

Example

The following environment line sets the m_b uncertainty to 0.35.

```
mb_err 0.35
```

4.6.25 MB_MINUS_MS

The difference between m_b and M_S magnitude values specifies the range of magnitude differences to include in the search.

Syntax

```
mb_minus_ms[[ low_mag_diff] to[ high_mag_diff]]
```

low_mag_diff low-magnitude difference
high_mag_diff high-magnitude difference

Default

No constraint.

Example

The following environment line limits the difference of magnitudes to the range from 1 up to (and including) 2.

```
mb_minus_ms 1.0 to 2.0
```

4.6.26 MBMS_CONF

The MBMS_CONF environment defines the confidence level for the $Am_b - M_S$ screening criterion, given as a number between 0.0 and 1.0, where A is the slope. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
mbms_conf[ conf]
```

conf confidence level of the $Am_b - M_S$ screening criterion

Default

```
mbms_conf 0.975
```

Example

The following environment line sets the confidence level of the $Am_b - M_S$ screening criterion at 99%.

```
mbms_conf 0.99
```

4.6.27 MBMS_SLOPE

The MBMS_SLOPE environment defines the slope (A) of the $Am_b - M_S$ relation. The value should be a positive number (typically between 1.0 and 1.5). This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
mbms_slope[ slope]
```

slope the slope (A) of the $Am_b - M_S$ relation

Default

```
mbms_slope 1.25
```

Example

The following environment line sets the slope of the $Am_b - M_S$ relation at 1.50.

```
mbms_slope 1.50
```

4.6.28 MBMS_THRESH

The MBMS_THRESH environment defines the $Am_b - M_S$ screening threshold in units of magnitude. S/H/I events with confidence intervals for $Am_b - M_S$ less than this threshold are screened out. The value of MBMS_THRESH is not restricted. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
mbms_thresh[ threshold]
```

threshold threshold of the $Am_b - M_S$ screening criterion

Default

```
mbms_thresh 2.20
```

Example

The following environment line sets the $Am_b - M_S$ screening threshold at 3.5.

```
mbms_thresh 3.50
```

4.6.29 MIN_DP_SNR_PP

The MIN_DP_SNR_PP environment sets the minimum snr required for pP depth phases to be acceptable for use in event screening. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
min_dp_snr_pp[ dp_snr_pp]
```

dp_snr_pp pP depth phase snr

Default

```
min_dp_snr_pp  2.0
```

Example

The following environment line sets the minimum pP depth phase SNR to 1.5.

```
min_dp_snr_pp 1.5
```

4.6.30 MIN_DP_SNR_SP

The MIN_DP_SNR_SP environment sets the minimum snr required for sP depth phases to be acceptable for use in event screening. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
min_dp_snr_sp[ dp_snr_sp]
```

dp_snr_sp sP depth phase snr

Default

```
min_dp_snr_sp 2.0
```

Example

The following environment line sets the minimum sP depth phase SNR to 1.5.

```
min_dp_snr_sp 1.5
```

4.6.31 MIN_MB

The MIN_MB environment sets the minimum m_b magnitude cutoff for an event to be considered for application of the S/H/I event-screening criteria. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
min_mb[ mb]
```

mb event screening magnitude cutoff

Default

```
min_mb 3.5
```

Example

The following environment line sets the event screening magnitude cutoff to 4.0.

```
min_mb 4.0
```

4.6.32 MIN_MOVEOUT_PP

The MIN_MOVEOUT_PP environment sets the minimum depth phase move-out of pP–P (in s) in the distance range from 25° to 100° required for a depth-phase solution to be acceptable for use in event screening. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
min_moveout_pp[ moveout_pp]
```

moveout_pp minimum move-out of pP–P travel times

Default

```
min_moveout_pp 1.5
```

Example

The following environment line sets the minimum pP–P move-out to 2.0 s.

```
min_moveout_pp 2.0
```

4.6.33 MIN_MOVEOUT_SP

The MIN_MOVEOUT_SP environment sets the minimum depth phase move-out of sP–P (in s) in the distance range from 25° to 100° required for a depth-phase solution to be acceptable for use in event screening. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
min_moveout_sp[ moveout_sp]
```

moveout_sp minimum move-out of sP–P travel times

Default

```
min_moveout_sp 1.5
```

Example

The following environment line sets the minimum sP–P move-out to 2.0 seconds.

```
min_moveout_sp 2.0
```

4.6.34 MIN_NDEF

The MIN_NDEF environment sets the minimum number of defining phases required for an event to be considered for event screening. This environment applies only when the BULL_-TYPE is an NEB or an NSEB.

Syntax

```
min_ndef [ integer]
```

integer minimum number of time-defining phases

Default

```
min_ndef 3
```

Example

The following environment line sets the minimum number of time-defining phases to 6.

```
min_ndef 6
```

4.6.35 MIN_NDP_PP

The MIN_NDP_PP environment sets the minimum number of pP phases required for a depth-phase solution to be acceptable for use in event screening. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
min_ndp_pp [ integer]
```

integer minimum number of pP depth phases

Default

```
min_ndp_pp 3
```

Example

The following environment line sets the minimum number of pP depth phases to 4.

```
min_ndp_pp 4
```

4.6.36 MIN_NDP_SP

The MIN_NDP_SP environment sets the minimum number of sP phases required for a depth-phase solution to be acceptable for use in event screening. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
min_ndp_sp [ integer]
```

integer minimum number of sP depth phases

Default

```
min_ndp_sp 3
```

Example

The following environment line sets the minimum number of sP depth phases to 4.

```
min_ndp_sp 4
```

4.6.37 MIN_NSTA_MS

The MIN_NSTA_MS environment sets the minimum required number of seismic stations with $\mathrm{M_S}$ measurements for the $A\mathrm{m_b} - \mathrm{M_S}$ screening criterion to be applied. The value of MIN_-NSTA_MS must be a positive integer. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

min_nsta_ms[*integer*]

integer minimum number of seismic stations required with $\mathrm{M_S}$ measurements

Default

```
min_nsta_ms 1
```

Example

The following environment line sets the minimum number of seismic stations required with $\mathrm{M_S}$ measurements at 2.

```
min_nsta_ms 2
```

4.6.38 MIN_WDEPTH_THRESH

The MIN_WDEPTH_THRESH environment sets the minimum water depth threshold, in kilometres. The hydroacoustic screening algorithm will only be executed for S/H/I events with the minimum water depth within the location error ellipse greater than this value. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

min_wdepth_thresh[*threshold*]

threshold minimum water depth threshold, in kilometres

Default

```
min_wdepth_thresh 0.5
```

Example

The following environment line sets the minimum water depth threshold to 1.0.

```
min_wdepth_thresh 1.0
```

4.6.39 MS_ERR

The MS_ERR environment defines the uncertainty term (standard deviation) for single-station M_S magnitude estimates, used in the computation of the confidence interval of the network estimate of m_b minus M_S. This environment applies only when the BULL_TYPE is an NEB or an NSEB.

Syntax

```
ms_err[ err]
```

err M_S uncertainty

Default

```
ms_err 0.23
```

Example

The following environment line sets the M_S uncertainty to 0.35.

```
ms_err 0.35
```

4.6.40 ORIGIN_LIST

A unique origin identification code is assigned to each origin. This origin identification code appears in S/H/I bulletins and may be used subsequently to request waveforms or comments associated with a specific origin.

Syntax

```
origin_list[ orid[, orid[, ... ]]]
```

orid origin identification code

Default

```
origin_list *
```

Example

The following environment line limits the origins to those with orids 132456 or 190672.

```
origin_list 132456,190672
```

4.6.41 REG_CONF

The REG_CONF environment defines the confidence level for the regional P/S screening criterion, given as a number between 0.0 and 1.0. This environment applies only when the BULL_-TYPE is an NEB or an NSEB.

Syntax

```
reg_conf[ conf]
```

conf confidence level of the regional screening criterion

Default

```
reg_conf 0.995
```

Example

The following environment line sets the confidence level of the regional P/S screening criterion at 99.0%.

```
reg_conf 0.990
```

4.6.42 RELATIVE_TO

The concept of association provides the ability to tie or associate one S/H/I data type with another. The most common association is between waveforms and events and allows a user to request waveforms associated with a particular set of origins. Note that the current version of *VDMS* does not support this data_type.

RELATIVE_TO has all of the characteristics of a list environment, except that it is active only for the subsequent request line, and the arguments are request keywords.

Syntax

```
relative_to origin|event|bulletin
```

The data type given in the RELATIVE_TO environment line is not returned in the response. That data type must be explicitly requested on another line, which typically precedes the RELATIVE_TO environment line.

Examples

The following message requests the associated waveforms in CM6 subformat for events found in the bulletin between 1:00 and 1:15 on 9 January, 1999.

Listing 4.3. WAVEFORM request message RELATIVE_TO the REB

```
begin ims2.0
msg_type request
msg_id example any_ndc
```

```
e-mail name@my.computer
time 1999/1/9 1:00 to 1999/1/9 1:15
bull_type reb
relative_to bulletin
waveform ims2.0:cm6
stop
```

To also request the REB bulletin for the time period in the example given above, the line `bulletin ims2.0` must be added.

Listing 4.4. WAVEFORM request message RELATIVE_TO the REB with BULLETINBULLETIN request message and WAVEFORM request message RELATIVE_TO the REB

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1999/1/9 1:00 to 1999/1/9 1:15
bull_type reb
bulletin ims2.0
relative_to bulletin
waveform ims2.0:cm6
stop
```

4.6.43 STA_LIST

The STA_LIST environment provides the station search list. This variable may be used for specifying radionuclide and/or S/H/I stations. If a S/H/I array station is specified, then all elements of the array are implied. Specific array elements may be referenced individually. The wildcard character (*) is allowed in specifying station codes.

When S/H/I bulletins are requested, STA_LIST can be used to specify the events to be included. If an event in the S/H/I bulletin contains at least one of the stations in the STA_LIST, that event, and all arrivals available for that event, will be included in the bulletin.

Syntax

```
sta_list[ sta[, sta[, ...]]]
```

sta station or array code

Default

```
sta_list *
```

Examples

The following environment line limits the station list to four specific S/H/I stations.

```
sta_list WRA, YKA, BOSA, LPAZ
```

The following environment line limits the returned data to that from radionuclide station CAP17.

```
sta_list CAP17
```

The following environment line limits the stations to those beginning with the character A.

```
sta_list A*
```

4.6.44 TIME

The TIME environment is expressed as a range with date and decimal time entries. The time entries are optional. Unlike most range environments, a space is allowed between the date and time entries of the limits. In addition, this environment variable is translated according to the context of the requested data product. For example, TIME applies to the collection start date and time for Standard Screened Radionuclide Event Bulletins (SSREBs), Sample Pulse Height Data (SAMPLEPHD), Automated Radionuclide Reports (ARRs), and Reviewed Radionuclide Reports (RRRs), but applies to acquisition date and time for Gas Background Pulse Height Data (GASBKPHD), Blank Pulse Height Data (BLANKPHD), Meteorological data (MET), Calibration Pulse Height Data (CALIBPHD), Detector Background Pulse Height Data (DETBKPHD), and Quality Control Pulse Height Data (QCPHD). TIME also applies to the creation date for the Radionuclide Network Product Summary (RNPS), the Radionuclide Laboratory Report (RLR), and ALERT messages, and the period date for Radionuclide Monitoring System State of Health (RMSSOH) messages. This convention is used only for request messages.

In requests for S/H/I data, only the date and time fields that are necessary to obtain the resolution must be specified; all other fields are assumed to be 0 or 1 as appropriate (1 for month and day, 0 for hour, minute, and second).

Syntax

time[*date1*[*time1*]] to[*date2*[*time2*]]

date1 time1	low-range date and time
date2 time2	high-range date and time

Default

time *(current date and time)* to *(current date and time)*

Examples

The following environment line limits the time to a range from 1999/02/01 00:00:00.0 up to (but not including) 1999/03/01 00:00:00.0.

```
time 1999/02/01 to 1999/03/01
```

Either of the following environment lines limits the time to a range from 1999/02/01 23:14:19.7 up to (but not including) 1999/03/01 12:00:00.0.

```
time 1999/02/01 23:14:19.7 to 1999/03/01 12
```

```
time 1999/2/1 23:14:19.7 to 1999/3/1 12
```

4.6.45 TIME_STAMP

The TIME_STAMP environment is used to request that data messages be time stamped. If requested, time stamps will appear at the beginning and end of each data type. Time stamps record the start time and end time that the message entered and exited the processing system.

Syntax

```
time_stamp
```

Default

None (do not time stamp the returned message).

Example

The following environment line turns on the time stamp utility.

```
time_stamp
```

4.7 Request lines

Request lines specify the type of information to be retrieved from the IMS2.0 implementation. All arguments in a request line are optional and include the format for the return message. The format is specified as a generic term, such as `ims2.0`. The arguments *subtype* and *sub_format* are used only in requests for S/H/I data. Radionuclide data are returned in the format specified on the BEGIN line.

Syntax

request_keyword[:*subtype*] [*format*[:*sub_format*]]

request_keyword	The request_keyword specifies the requested data type.
subtype	The S/H/I subtype specifies which subtype to use with this data type. The subtype allows a more precise data selection. The subtype is used primarily for arrival requests.
format	The format specifies the data format to use in the return message (for example, `ims2.0`).
sub_format	The S/H/I sub_format further specifies the precise format to use with this data type.

If the format of the S/H/I return data is not specified, the default format in the BEGIN line will be used.

The subtype argument is concatenated to the request_keyword with a colon (:) (for example, `arrival:automatic`). In addition, sub_format is concatenated to the format with a colon (for example, `ims2.0:cm6`).

For each request, a subset of the environments described in section 4.6 "Request environment lines" must be specified (see Table 7 and Table 8). All required environments are enforced for each request. If an environment is not specified explicitly, then the default is used. Because the default values for some environments specify a zero length range (for example, `time`), a request made without explicitly defining these environments will result in no data being returned. Descriptions of the request lines include the applicable environment variables.

The order of the request lines is significant because the environment established prior to the request line is used to constrain the request. The environment can be changed between request lines to allow multiple requests for the same type of information within the same request message.

Example

The following message requests S/H/I bulletin information for all events in January 1999 within the areas defined by 10°N to 20°N and 120°E to 160°E and 55°S to 45°S and 25°W to 15°W.

Listing 4.5. Multiple BULLETIN request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1999/01/01 to 1999/02/01
lat 10.0 to 20.0
lon 120.0 to 160.0
bull_type reb
bulletin ims2.0
lat -55.0 to -45.0
lon -25.0 to -15.0
bulletin ims2.0
stop
```

Table 7. S/H/I data request environment variables

	Request lines															
Environments	ARRIVAL/SLSD	BULLETIN	BULLETIN†	CHANNEL	CHAN_STATUS	COMMENT	COMM_STATUS	EVENT	EXECSUM	NETWORK	ORIGIN	OUTAGE	RESPONSE	STATION	STA_STATUS	WAVEFORM
arrival_list	o	o	o			o										
aux_list				o	o							o	o		o	o
beam_list	o															o
bull_type	r	r	r					r			r					
chan_list	o			o	o							o	o			o
comm_list							o									
depth		o	o					o	o		o					

Continues on next page

Table 7. S/H/I data request environment variables (cont.)

Environments	Request lines: ARRIVAL/SLSD	BULLETIN	BULLETIN†	CHANNEL	CHAN_STATUS	COMMENT	COMM_STATUS	EVENT	EXECSUM	NETWORK	ORIGIN	OUTAGE	RESPONSE	STATION	STA_STATUS	WAVEFORM
depth_conf			o													
depth_kvalue			o													
depth_minus_error		o	o					o	o		o					
depth_thresh			o													
event_list		o	o			o		o	o							
event_sta_dist		o	o					o	o		o					
group_bull_list		o						o								
hydro_cp_thresh			o													
hydro_te_thresh			o													
lat		o	o	o				o	o		o			o		
loc_conf			o													
lon		o	o	o				o	o		o			o		
mag		o	o					o	o		o					
magpref_mb			o													
magpref_ms			o													
mag_type		o	o					o	o		o					
mbms_conf			o													
mbms_slope			o													
mbms_thresh			o													
mb_err			o													
mb_minus_ms		o	o					o			o					
min_dp_snr_pp			o													
min_dp_snr_sp			o													
min_mb			o													
min_moveout_pp			o													
min_moveout_sp			o													
min_ndef			o													
min_ndp_pp			o													
min_ndp_sp			o													
min_nsta_ms			o													
min_wdepth_thresh			o													
ms_err			o													
origin_list		o	o			o			o		o					

Continues on next page

Table 7. S/H/I data request environment variables (cont.)

Environments	ARRIVAL/SLSD	BULLETIN	BULLETIN†	CHANNEL	CHAN_STATUS	COMMENT	COMM_STATUS	EVENT	EXECSUM	NETWORK	ORIGIN	OUTAGE	RESPONSE	STATION	STA_STATUS	WAVEFORM
	Request lines															
reg_conf			o													
relative_to																o
sta_list	o	o	o	o	o	o		o	o	o	o	o	o	o	o	r
time‡	r	r	r		r	o	r	r	r		r	r	o		r	r
time_stamp	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

r = required, o = optional

Bulletin†: Custom event screening bulletins IDC_NEB and IDC_NSEB

‡ Minimum precision is days at the IDC

Table 8. Radionuclide data request environment variables

Environments	ALERT_*	ARR	BLANKPHD	CALIBPHD	DETBKPHD	GASBKPHD	MET	QCPHD	RLR	RMSSOH	RNPS	RRR	SPHDF	SPHDP	SSREB	SAMPML	REVSAMP
	Request lines																
sta_list	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
time	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r
time_stamp	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

r = required, o = optional

The following sections describe the possible request lines and include the applicable environment variables. The variables that must be explicitly specified to obtain a result are in **bold** type.

4.7.1 ALERT_FLOW

This data type is one of several radionuclide data products available from the IDC. The ALERT_FLOW indicates that a sampler flow rate is above or below a specified threshold. See section 7.7 "Alerts" on p. 209 for a complete description and subsection I.1.1 "ALERT_FLOW" on p. 263 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests time-stamped ALERT_FLOW messages for all radionuclide stations during the year 1999. Because the STA_LIST environment is not specified, the default (all stations) is used.

Listing 4.6. ALERT_FLOW request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 1999/01/01 to 2000/01/01
alert_flow
stop
```

4.7.2 ALERT_SYSTEM

This data type is one of several radionuclide data products available from the IDC. The ALERT_-SYSTEM indicates a problem with major components of the station and is specific to a station type. See section 7.7 "Alerts" on p. 209 for a complete description and subsection I.1.2 "ALERT_SYSTEM" on p. 263 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests ALERT_SYSTEM messages for all radionuclide stations in the Russian Federation from January 1996 through August 2000.

Listing 4.7. ALERT_SYSTEM request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1996/01/01 to 2000/09/01
sta_list RU*
alert_system
stop
```

4.7.3 ALERT_TEMP

This data type is one of several radionuclide data products available from the IDC. The ALERT_-TEMP indicates that a system temperature is outside the required IMS temperature range for that parameter. See section 7.7 "Alerts" on p. 209 for a complete description and subsection I.1.3 "ALERT_TEMP" p. 264 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests ALERT_TEMP messages from station ARP01 from 22 November, 2000 through 31 December, 2000.

Listing 4.8. ALERT_TEMP request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 2000/11/22 to 2001/01/01
sta_list ARP01
alert_temp
stop
```

4.7.4 ALERT_UPS

This data type is one of several radionuclide data products available from the IDC. The ALERT_UPS indicates a problem with the power supply. See section 7.7 "Alerts" on p. 209 for a complete description and subsection I.1.4 "ALERT_UPS" on p. 264 for an example

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests time-stamped ALERT_UPS messages from all radionuclide stations in Australia from 25 April, 1999 to 15 October, 1999.

Listing 4.9. ALERT_UPS request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 1999/04/25 to 1999/10/16
sta_list AU*
alert_ups
stop
```

4.7.5 ARR

This data type is one of several radionuclide data products available from the IDC. The ARR includes results from the automated analysis of a radionuclide sample. See subsection 7.8.1 “ARR” on p. 210 for a complete description and section I.2 “ARR—Noble gas version”, and section I.3 “ARR—Particulate version” on pp. 265 and 281, respectively, for examples.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests time-stamped ARR messages from radionuclide stations FRP27 and RUP54 for the month of March 2001.

Listing 4.10. ARR request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2001/03/01 to 2001/04/01
sta_list FRP27, RUP54
arr
stop
```

4.7.6 ARRIVAL/SLSD

The ARRIVAL and SLSD (Standard List of Signal Detections) requests are synonymous. An arrival is defined by excess energy that is identified in S/H/I waveform data. The amount of information about an arrival depends on the amount of processing that has been applied to the data. The different stages of processing are expressed using subtypes to the ARRIVAL or SLSD request lines as follows:

arrival:automatic | *slsd:automatic*	The AUTOMATIC subtype provides the result of the automatic detection process run on waveforms.
arrival:reviewed | *slsd:reviewed*	The REVIEWED subtype provides the arrivals that have been automatically or manually reviewed to the extent that phase names have been assigned.
arrival:grouped | *slsd:grouped*	The GROUPED subtype provides the arrivals that have been assigned phase names and that have also been grouped together with the assumption that they belong to the same event.
arrival:associated | *slsd:associated*	The ASSOCIATED subtype provides the arrivals that have been run through a location program and are associated to an event. ASSOCIATED is the default subtype for ARRIVAL/SLSD.

arrival:unassociated | *slsd:unassociated*	The UNASSOCIATED subtype provides the arrivals that have been detected but not associated with any event.

A specific bulletin type must be specified through the BULL_TYPE environment for associated and unassociated arrivals.

Environment

bull_type, **time**, `arrival_list`, `beam_list`, `chan_list`, `sta_list`, `time_stamp`

Examples

The following message requests automatically determined arrivals from stations ABC and DEF for the month of March 1999.

Listing 4.11. ARRIVAL/SLSD request message (automatic arrivals in the SEL1)

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1999/03/01 to 1999/04/01
sta_list ABC, DEF
bull_type SEL1
arrival:automatic ims2.0
stop
```

The following message requests associated arrivals from the REB from stations ABC and DEF for the month of March 1999.

Listing 4.12. ARRIVAL/SLSD request message (automatic arrivals in the REB)

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1999/03/01 to 1999/04/01
sta_list ABC, DEF
bull_type REB
arrival:automatic ims2.0
stop
```

4.7.7 BLANKPHD

BLANKPHD is one of several Pulse Height Data (PHD) types available for particulate radionuclide samples. It contains the PHD of an unexposed air filter as well as other important information. See section 7.2 “Pulse Height Data” on p. 170 for a description of the various PHD types and section I.6 “BLANKPHD” on p. 287 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests time-stamped BLANKPHD messages from all radionuclide stations acquired during the year 2000. Note that the STA_LIST environment is not explicitly specified and therefore defaults to all stations.

Listing 4.13. BLANKPHD request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2000/01/01 to 2001/01/01
blankphd
stop
```

4.7.8 BULLETIN

Bulletins are composed of S/H/I origin, event, and associated arrival information. The SSREB cannot be obtained using BULLETIN; it is requested using a SSREB request line.

The IMS2.0 format bulletins, as implemented by the IDC, have two subformats: `ims2.0:short` and `ims2.0:long`. If the subformat is not specified, the SHORT subformat is used.

The environment for BULLETIN is also used to constrain waveforms when the RELATIVE_TO environment is used.

Environment

bull_type, **time**, `arrival_list`, `depth`, `depth_minus_error`, `event_list`, `event_sta_dist`, `group_bull_list`, `lat`, `lon`, `mag`, `mag_type`, `mb_minus_ms`, `sta_list`, `time_stamp`

When requesting a custom screened event bulletin, the BULL_TYPE environment defines the contents of the results (IDC_NEB or IDC_NSEB) and not the source of the bulletin information (REB). The following event screening environments are valid when BULL_TYPE is IDC_NEB or IDC_NSEB.

Environment

bull_type, **time**, `arrival_list`, `depth`, `depth_conf`, `depth_kvalue`, `depth_minus_error`, `depth_thresh`, `event_list`, `event_sta_dist`, `hydro_cp_thresh`, `hydro_te_thresh`, `lat`, `loc_conf`, `lon`, `mag`, `mag_type`, `magpref_mb`, `magpref_ms`, `mb_err`, `mb_minus_ms`, `mbms_conf`, `mbms_slope`, `mbms_thresh`, `min_dp_snr_pp`, `min_dp_snr_sp`, `min_mb`, `min_moveout_pp`, `min_moveout_sp, min_ndef, min_ndp_pp, min_ndp_sp, min_nsta_ms, min_wdepth_thresh, ms_err, reg_conf, sta_list, time_stamp`

Examples

The following message requests the REB for 25 December, 1998.

Listing 4.14. BULLETIN request message (REB)

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
bull_type reb
bulletin ims2.0
stop
```

The following message requests the REB and associated Standard Event List 2 origins for 25 December, 1998.

Listing 4.15. BULLETIN request message (REB with associated Standard Event List 2 origins)

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
bull_type reb
group_bull_list sel2
bulletin ims2.0
stop
```

The following message requests the REB and associated Standard Event List 2 origins whose DEPTH_MINUS_ERROR is less than 10 Km in the LONG subformat for 25 December, 1998.

Listing 4.16. BULLETIN request message specifying depth and subformat

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
depth_minus_error to 10
bull_type reb
group_bull_list sel2
bulletin ims2.0
stop
```

The following message requests the REB and associated SEL2 origins for 25 December, 1998 with DEPTH_MINUS_ERROR less than 10 Km and MB_MINUS_MS 0.5 or greater.

Listing 4.17. BULLETIN request message specifying depth and MB_MINUS_MS

```
begin ims2.0
msg_type request
```

```
msg_id example any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
depth_minus_error to 10
mb_minus_ms 0.5 to
bull_type reb
group_bull_list sel2
bulletin ims2.0
stop
```

The following message requests a custom screened event bulletin (IDC_NEB) for events in the REB on 10 June 1998, between magnitudes 4.0 and 6.0, within an area defined by latitude and longitude ranges, and using custom depth and m_b minus M_S screening criteria.

Listing 4.18. BULLETIN request message using custom screening criteria

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/06/10 to 1998/06/11
bull_type idc_neb
mag_type mb
mag 4.0 to 6.0
lat 60 to 90
lon 45 to 75
depth_thresh 20.0
depth_conf 0.99
mbms_slope 1.5
mbms_thresh 3.5
mbms_conf 0.99
min_nsta_ms 2
bulletin ims2.0
stop
```

4.7.9 CALIBPHD

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of a standard calibration source, as well as other important information. See section 7.2 "Pulse Height Data" on p. 170 for a description of the various PHD types and section I.9 "CALIBPHD" on p. 291 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests time-stamped CALIBPHD messages from all radionuclide stations acquired during the year 2000. Because the STA_LIST environment is not specified the default (all stations) is used.

Listing 4.19. CALIBPHD request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2000/01/01 to 2001/01/01
calibphd
stop
```

4.7.10 CHANNEL

Channel is a complete set of information about the location, emplacement, and type of seismometers at a station.

Environment

`aux_list, chan_list, lat, lon, sta_list, time_stamp`

Example

The following message requests the short-period channel information for stations in South America using the appropriate LAT and LON environment range. Note that the STA_LIST environment is not explicitly specified; the default for this variable is all stations.

Listing 4.20. CHANNEL request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
lat -60 to 10.0
lon -81 to -34
chan_list s*
channel ims2.0
stop
```

4.7.11 CHAN_STATUS

Channel status is given for the channels in the CHAN_LIST environment for the stations in the STA_LIST environment. The TIME environment defines the report period. The minimum report period is one day.

Environment

time[1], `aux_list, chan_list, sta_list, time_stamp`

[1] The minimum precision of the TIME environment for CHAN_STATUS requests is days.

Example

The following message requests the channel status reports over a four-day period.

Listing 4.21. CHAN_STATUS request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/11/14 to 1998/11/18
chan_status ims2.0
stop
```

4.7.12 COMMENT

Comments may be associated with a S/H/I station, a S/H/I event, an origin, or an arrival. To retrieve comments, the station code or the identifications (IDs) of the arrival, origin, or event can be used. These codes or IDs are listed in the bulletins and are obtained with a request (or subscription to) a bulletin or event list.

Environment

arrival_list | **event_list** | **origin_list** | **sta_list**, `time`, `time_stamp`

Example

The following message requests the comments for events 510 and 512.

Listing 4.22. COMMENT request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
event_list 510, 512
comment ims2.0
stop
```

4.7.13 COMM_STATUS

Communications status is given for the communications links listed in the COMM_LIST environment. The TIME environment defines the report period. The minimum report period is one day. The sub_format field is used to indicate a verbose communications status report.

Syntax

```
comm_status[ ims2.0[:verbose]]
```

Environment

time, `comm_list`, `time_stamp`

Example

The following message requests the verbose communications status reports for the link from any_ndc over a one-week period.

Listing 4.23. COMM_STATUS request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/11/14 to 1998/11/21
comm_list any_ndc
comm_status ims2.0:verbose
stop
```

4.7.14 DETBKPHD

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of an empty detector chamber as well as other important information. See section 7.2 "Pulse Height Data" on p. 170 for a description of the various PHD types and section I.15 "DETBKPHD" on p. 296 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests time-stamped DETBKPHD messages acquired during the year 2000 from radionuclide stations DEP33, SEP63, and GBP66.

Listing 4.24. DETBKPHD request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2000/01/01 to 2001/01/01
sta_list DEP33, SEP63, GBP66
detbkphd
stop
```

4.7.15 EVENT

An S/H/I event is the physical occurrence that was detected through the network of S/H/I sensors. S/H/I events can have many estimates of their time and location; these estimates are known as origins. Only those estimates given in the BULL_TYPE and GROUP_BULL_LIST environments are provided. The origin estimates in BULL_TYPE provide the basis for associating the origins in the GROUP_BULL_LIST.

Environment

bull_type, **time**, `depth`, `depth_minus_error`, `event_list`, `event_sta_dist`, `group_bull_list`, `lat`, `lon`, `mag`, `mag_type`, `mb_minus_ms`, `sta_list`, `time_stamp`

Example

The following message requests all of the March 1998 REB events within regional distance (20 deg) of stations ABC and/or DEF. The list is also requested to include the Standard Event List 2 events that can be grouped with the REB events.

Listing 4.25. EVENT request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/03/01 to 1998/04/01
bull_type reb
group_bull_list sel2
sta_list abc, def
event_sta_dist 0.0 to 20.0
event ims2.0
stop
```

4.7.16 EXECSUM

The Executive Summary (EXECSUM) contains summary statistics of the number of events in the SEB and those in the various event-screening categories, the number of radionuclide detections and those categorized as Level 4 or Level 5, and the number of events with cross-referenced radionuclide and seismic-acoustic data. It also contains status metrics regarding the IMS network.

Environment

time, `depth`, `depth_minus_error`, `event_list`, `event_sta_dist`, `lat`, `lon`, `mag`, `mag_type`, `origin_list`, `sta_list`, `time_stamp`

Example

The following message requests the EXECSUM for 25 December, 1998.

Listing 4.26. EXECSUM request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/12/25 to 1998/12/26
execsum ims2.0
stop
```

4.7.17 GASBKPHD

This data type is one of several radionuclide data products available from the IDC. The GASBKPHD contains the pulse height data of an empty plastic scintillation gas cell from stations that observe a memory effect. At present, only noble gas monitoring systems that utilize β-γ coincidence counting have plastic scintillation gas cells. The GASBKPHD is acquired after a sample has been evacuated from the gas cell and before the next sample acquisition. The purpose of the GASBKPHD is to enable the quantification of radio-xenon atoms that are adsorbed onto the walls of the plastic scintillation gas cell. See section 7.2 "Pulse Height Data" on p. 170 for a complete description and section I.19 "GASBKPHD" on p. 299 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests GASBKPHD messages for station DEX33 for 22 January, 2001.

Listing 4.27. GASBKPHD request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 2001/01/22 to 2001/01/23
sta_list DEX33
gasbkphd
stop
```

4.7.18 MET

This data type is one of several radionuclide data products available from the IDC. The MET message contains meteorological data recorded at a radionuclide station. See section 7.6 "Meteorological data" on p. 208 for a complete description and section I.22 "MET" on p. 303 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests time-stamped MET messages for station CAP14 for the month of January 2000.

Listing 4.28. MET request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2000/01/01 to 2000/02/01
sta_list CAP14
met
stop
```

4.7.19 NETWORK

The NETWORK request line is used to obtain network information for stations in the STA_-LIST environment.

Environment

`sta_list`, `time_stamp`

Example

The following example requests time-stamped network information for station ARCES.

Listing 4.29. NETWORK request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
sta_list ARCES
network
stop
```

4.7.20 ORIGIN

Origins are solutions to the location and time of a S/H/I event. Several origins may be determined for any one S/H/I event.

Environment

bull_type, **time**, `depth`, `depth_minus_error`, `event_sta_dist`, `lat`, `lon`, `mag`, `mag_type`, `mb_minus_ms`, `origin_list`, `sta_list`, `time_stamp`

Examples

The following message requests origin information for the REB origins for 8 August, 1998.

Listing 4.30. ORIGIN request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/08/08 to 1998/08/09
bull_type reb
origin ims2.0
stop
```

The following message limits the previous request to a specific magnitude and depth range by including more environment lines.

Listing 4.31. ORIGIN request message with depth and magnitude requirements

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/08/08 to 1998/08/09
mag_type mb
mag 4.5 to 5.5
depth 0 to 10
bull_type reb
origin ims2.0
stop
```

4.7.21 OUTAGE

OUTAGE requests reports on S/H/I data that are not available for the specified time range.

Environment

time, `chan_list`, `sta_list`, `time_stamp`

Example

The following message requests the outage reports for all S/H/I stations and channels for the month of March 1998. If the station and channels of interest are not explicitly specified, then the default station list (*) and channel list (*Z) are used.

Listing 4.32. OUTAGE request message

```
begin ims2.0
```

```
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/03/01 to 1998/04/01
outage ims2.0
stop
```

4.7.22 QCPHD

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of the daily quality control measurement as well as other important information. See section 7.2 "Pulse Height Data" on p. 170 for a description of the various PHD types and section I.26 "QCPHD" on p. 306 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests QCPHD messages from KWP40 acquired on 14 December, 1999.

Listing 4.33. QCPHD request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1999/12/14 to 1999/12/15
sta_list KWP40
qcphd
stop
```

4.7.23 RESPONSE

The response is the instrument response of the specified S/H/I network/station/channel identification code. Responses are valid at any given time and may change through time.

Environment

`chan_list`, `sta_list`, `time`, `time_stamp`

Example

The following message requests all the instrument responses for the broadband vertical channel of station ABC used in January 1999.

Listing 4.34. RESPONSE request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1999/01/01 to 1999/02/01
sta_list abc
chan_list bhz
response ims2.0
stop
```

4.7.24 RLR

This data type is one of several radionuclide data products available from the IDC. The RLR contains sample analysis results from a certified radionuclide laboratory. See section 7.3 "Radionuclide laboratory reports" on p. 185 for a complete description and subsection I.29.1 "β-γ coincidence systems", subsection I.29.2 "HPGe systems" and section I.30 "RLR—Particulate version" on pp. 318, 320 and section I.30 "RLR—Particulate version", respectively, for examples.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests time-stamped RLR messages for the month of September 2001 from radionuclide lab AUL02.

Listing 4.35. RLR request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2001/09/01 to 2001/10/01
sta_list AUL02
rlr
stop
```

4.7.25 RMSSOH

This data type is one of several radionuclide data products available from the IDC. The message describes the state of health of the collection, processing, and acquisition equipment at the IMS radionuclide stations. See section 7.5 "State of Health data" on p. 203 for a complete description and section I.31 "RMSSOH" on p. 326 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests RMSSOH messages from all radionuclide stations in the United Kingdom of Great Britain and Northern Ireland for the period 6 February, 2001 to 5 March, 2001.

Listing 4.36. RMSSOHrequest message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 2001/02/06 to 2001/03/06
sta_list GB*
rmssoh
stop
```

4.7.26 RNPS

This data type is one of several radionuclide data products available from the IDC. The RNPS is a compilation of the status of collection, processing, and analysis of particulate and noble gas data from all radionuclide stations, (PrepCom, 2020). The RNPS is produced daily and summarizes the results for each station over the past three days. See subsection 7.8.4 "RNPS" on p. 232 for a complete description and section I.32 "RNPS" on p. 327 for an example.

Environment

time, `sta_list`, `time_stamp`

Example

The following example requests time-stamped RNPSs from all radionuclide stations from January 2001 through June 2001. Because the STA_LIST environment is not specified, the default (all stations) is used.

Listing 4.37. RNPS request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2001/01/01 to 2001/07/01
rnps
stop
```

4.7.27 RRR

This data type is one of several radionuclide data products available from the IDC. The RRR, or Reviewed Radionuclide Report, is a revised version of the ARR, or Automated Radionuclide Report, and is generated after manual review of a radionuclide sample is complete. See subsection 7.8.2 "RRR" on p. 229 for a complete description, and section I.33 "RRR—Noble gas version" and section I.34 "RRR—Particulate version" on pp. 328 and 345, respectively, for examples.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests time-stamped RRRs messages from all U. S. radionuclide stations for the month of June 2000.

Listing 4.38. RRR request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time_stamp
time 2000/06/01 to 2000/07/01
sta_list US*
rrr
stop
```

4.7.28 SAMPML/REVSAMP

This data type is one of several radionuclide data products available from the IDC. The SAMPML/REVSAMP contains the sample PHDs as well as IDC analysis results in XML format. There are two types, i.e., SAMPML and REVSAMP, pertaining to the Automated Radionuclide Report, Reviewed Radionuclide Report respectively. See section I.28 "REVSAMP/SAMPML—Noble gas systems" on p. 308 for examples.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests time-stamped REVSAMP messages from all U. S. radionuclide stations for the month of June 2000.

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
```

```
time_stamp
time 2000/06/01 to 2000/07/01
sta_list US*
revsamp
stop
```

4.7.29 SLSD

SLSD is a synonym for arrival. See subsection 4.7.6 “ARRIVAL/SLSD” on p. 78.

4.7.30 SPHDF/P

The Sample Pulse Height Data (SAMPLEPHD) is one of several PHD types available for radionuclide samples and has two different qualifiers, e.g., FULL (SPHDF) or PREL (SPHDP). The PREL SAMPLEPHD contains PHD from a sample acquired for a time shorter than that of the full acquisition time. The FULL SAMPLEPHD contains PHD from a sample acquired for the IDC-defined full acquisition time. Like the other PHD types, the PREL and FULL SAMPLEPHD also include other important information. See section 7.2 “Pulse Height Data” on p. 170 for a description of the various PHD types and subsection I.35.1 “SAMPLEPHD—β-γ coincidence data version” on p. 349, and section I.36 “SAMPLEPHD—Particulate systems” on p. 352 for examples.

The data_type SPHDP and SPHDF should be used when users request the PREL and FULL SAMPLEPHDs, respectively.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests SPHDP messages and SPHDF messages from all Australian radionuclide stations for 22 June, 2000.

Listing 4.39. SPHD request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 2000/06/22 to 2000/06/23
sta_list AU*
sphdp
sphdf
stop
```

4.7.31 SSREB

This data type is one of several radionuclide data products available from the IDC. The SSREB, or Standard Screened Radionuclide Event Bulletin, is generated by the IDC when fission or activation products are detected at a radionuclide station above normal limits. An SSREB contains RRRs messages from the samples in which fission products were detected, information identifying the fission product(s), an estimate of the source location and time, as well as any sample analysis results from certified laboratories. See subsection 7.8.3 “SSREB” on p. 230 for a description of the SSREB and section I.37 “SSREB—Noble gas systems” and section I.38 “SSREB—Particulate version” on pp. 353 and 356, respectively, for examples.

Environment

time, `sta_list`, `time_stamp`

Example

The following message requests all SSREB messages generated by the IDC during the first quarter of 2000.

Listing 4.40. SSREB request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 2000/01/01 to 2000/04/01
ssreb
stop
```

4.7.32 STATION

S/H/I station information includes station codes, locations, elevations, station type (array, 3-C), and dates for which waveform or arrival data are available from an IMS2.0 implementation. Additional station codes may be reported for which neither waveform nor arrival data are available, but this can present problems.

Environment

`lat`, `lon`, `sta_list`, `time_stamp`

Examples

The following message requests station information for all S/H/I stations serviced by this IMS2.0 implementation.

Listing 4.41. STATION request message (all stations)

```
begin ims2.0
msg_type request
msg_id example any_ndc
```

```
e-mail name@my.computer
station ims2.0
stop
```

The following message requests station information for S/H/I stations in the southern hemisphere.

Listing 4.42. STATION request message (selected stations)

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
lat -90 to 0.0
station ims2.0
stop
```

4.7.33 STA_STATUS

Station status is given for the S/H/I stations in the STA_LIST environment. The TIME environment defines the report period. The minimum report period is one day.

Environment

time[2], `aux_list`, `sta_list`, `time_stamp`

Example

The following message requests the S/H/I station status reports for all stations over a one-week period.

Listing 4.43. STA_STATUS request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/11/14 to 1998/11/21
sta_status ims2.0
stop
```

4.7.34 WAVEFORM

Waveforms are digital time series data (S/H/I). The WAVEFORM request format will typically accept subformats that specify how the digital data are formatted within the general format of the waveform data type. The subformats include int, cm6, cm8, and csf for IMS2.0 data.

[2] The minimum precision of the TIME environment for STA_STATUS requests is days.

Environment

time, `aux_list`, `beam_list`, `chan_list`, `sta_list`, `time_stamp`

Example

The following message requests data in six-bit compressed subformat from all channels of station ABC from 03:25 up to (but not including) 03:40 on 1 March, 1998.

Listing 4.44. WAVEFORM request message

```
begin ims2.0
msg_type request
msg_id example any_ndc
e-mail name@my.computer
time 1998/03/01 03:25 to 1998/03/01 03:40
sta_list abc
chan_list *
waveform ims2.0:CM6
stop
```

5

Subscription messages

This chapter describes the formats for subscription messages and includes the following sections:

5.1 Introduction

Subscription messages can be used as follows:

- to initiate a subscription,
- to change a subscription,
- to request an inventory of personal subscriptions,
- to request that an issue(s) of a subscription be resent,
- to terminate a subscription, or
- to establish national bulletin products (NEBs and NSEBs).

The messages containing the subscription data are sent as data messages.

Subscriptions allow authorized users to have IMS data and IDC products automatically forwarded to them on a regular basis. The S/H/I products available through subscriptions include continuous data from primary S/H/I stations. The radionuclide products available through subscriptions include all those available by request:

ALERT_FLOW, ALERT_SYSTEM, ALERT_TEMP, ALERT_UPS, ARR, BLANKPHD, CALIBPHD, DETBKPHD, GASBKPHD, MET, QCPHD, RLR, RMSSOH, RNPS, RRR, SPHDF, SPHDP, and SSREB.

Subscriptions may be established for continuous delivery (for continuous data), when immediately available at the IDC (for example, discrete waveform or radionuclide data and data products), on a daily basis (for example, daily S/H/I bulletins and status reports or radionuclide data and data products), or at a user-specified frequency/time.

5.2 Subscription procedures

A subscription is made by sending a subscription message to the IDC *VDMS*. Upon receipt, the source of a subscription message is first validated for its authenticity. Next the volume of data to be generated by the request is checked. Subscription messages that are not sent by an authorized user are rejected. After validation, the new subscription is added to the existing subscriptions for that user, and notification of the new subscription is sent to the subscriber in the form of a LOG data message. (See subsection 6.6.2 “LOG” on p. 166 for a description of the LOG message and section I.21 “LOG” on p. 302 for an example.) Each subscription is assigned a unique identification number at the IDC for internal tracking purposes.

Examples

A subscription message is sent to the IDC requesting the daily REB

Listing 5.1. BULLETIN subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
bull_type reb
bulletin ims2.0
stop
```

The subscriber receives the following LOG data message as confirmation of the subscription. The subscription ID and product ID numbers are included in the message.

Listing 5.2. LOG data message, response to the message of Listing 5.1

```
begin ims2.0
msg_type data
msg_id response_example ctbto_idc
ref_id example any_ndc
data_type log ims2.0
subscription id: 52
product id: 74
```

```
added at 1997/01/12 19:36:00
freq daily
bull_type reb
bulletin ims2.0
stop
```

After the subscription begins, data messages sent to the subscriber include the PROD_ID line that includes the product identification (ID) and a delivery ID number along with the subscription data.

5.3 Subscription format

All subscription messages require the basic message structure described in section 3.2 "Message preface" on p. 34. If a message is a request for subscription, the MSG_TYPE must be set to `subscription`.

A subscription message contains information about where to send the subscribed data, how often the subscribed data should be sent, and what data (or products) to send. Like request messages, subscriptions are defined through environment variables that constrain the data to be sent and request lines that specify which data to send. Separate subscriptions are delimited by separate subscription request lines. In other words, each time a subscription request line is encountered, a corresponding subscription will be initiated for the user.

5.4 Subscription control lines

Subscription control lines specify

- the protocol of the response data message,
- the time duration and frequency of the subscription, and
- whether or not a message should be sent if there are no data to send.

Like request messages, the existing options for the response message protocol is email. This option should be used in accordance with the guidelines described in section 2.3 "Message protocols" on p. 30 and subsection 3.5.1 "Message size" on p. 38. The formats for E-MAIL control line is identical to that in request messages and can be found in section 4.4 "Request control lines" on p. 48.

As in request messages, only one response message protocol can be specified in a subscription message. If different protocols are desired for the response data, separate subscription messages must be submitted. A subscription message that does not specify a response message protocol will be answered by email using the return address of the sender.

Control lines that are unique to subscription messages are described below.

5.4.1 FREQ

The FREQ control line specifies how often the data or products should be sent to the subscriber. The FREQ line may appear only once in a subscription message.

Three frequencies are allowed: `continuous`, `immediate`, `daily`. When requesting continuous waveform data, FREQ is set to `continuous`[1]. If it is desired for data or products to be delivered as soon as they become available, FREQ is set to `immediate`. When FREQ is set to `daily`, data and products are delivered once every day.

Syntax

```
freq[ continuous|immediate|daily]
```

Default

```
freq daily
```

5.4.2 TIME

In a subscription message, the TIME control line refers to the active time of a subscription. The active time is given as a range. The format of TIME is similar to that in the request environment line (see subsection 4.6.44 "TIME" on p. 71). In a subscription control line, however, the start time may have the value `now` (the current date and time), and the end time may have the value `forever` (the subscription will run indefinitely). These time limits are not valid for use in request messages.

Default

```
time now to forever
```

In the event that a subscription includes a start time before `now`, a request message will be generated for the data or product from `time` *start time* `to now`, and the actual subscription will run from `now` to the specified end date.

5.5 Subscription environment lines

Subscription environment lines are used to define and limit the response to subscription request lines (see Subscription Request Lines) and to establish national bulletin products such as an NEB or NSEB. Many of the request environment variables in section 4.6 "Request environment lines" on p. 49 are also used as general subscription environment variables. These environment lines include:

[1] Special arrangements between Member States and the IDC are required due to the hardware and communications requirements of continuous data transmission.

BULL_TYPE, CHAN_LIST, DEPTH, DEPTH_MINUS_ERROR, EVENT_STA_DIST, LAT, LON, MAG, MAG_TYPE, MB_MINUS_MS, RELATIVE_TO, and STA_LIST.

Environment variables that define screening criteria for national bulletins (NEBs and NSEBs) and national executive summaries include:

DEPTH_CONF, DEPTH_KVALUE, DEPTH_THRESH, HYDRO_CP_THRESH, HYDRO_TE_THRESH, LOC_CONF, MAGPREF_MB, MAGPREF_MS, MB_ERR, MBMS_CONF, MBMS_SLOPE, MBMS_THRESH, MIN_DP_SNR_PP, MIN_DP_SNR_SP, MIN_MB, MIN_MOVEOUT_PP, MIN_MOVEOUT_SP, MIN_NDEF, MIN_NDP_PP, MIN_NDP_SP, MIN_NSTA_MS, MIN_WDEPTH_THRESH, MS_ERR, and REG_CONF

Some environment variables for request messages are not used in subscription messages. These include ARRIVAL_LIST, BEAM_LIST, EVENT_LIST, ORIGIN_LIST, and TIME (for subscriptions, TIME is a control line). Still other environment variables are unique to subscription messages, and the formats for these environment variables are provided in the following sections. Environment variables used in both request and subscription messages are not repeated in this chapter. See section 4.6 “Request environment lines” on p. 49 for descriptions of these environment variables.

Of the environment variables unique to subscriptions, four are used when manipulating existing subscriptions or establishing subscriptions to standard products (DELIVID_LIST, SUBSCR_LIST, SUBSCR_NAME, and PRODID_LIST). The other environment variable unique to subscriptions is the BULL_TYPE environment, which has a dual nature for subscriptions. BULL_TYPE either defines the bulletin to use in constraining data, or it is used to establish the name of the NEB or NSEB that is being created.

5.5.1 DELIVID_LIST

The DELIVID_LIST environment is a list of delivery identifiers. The delivery identifier is a number that appears as the third argument in the PROD_ID line for each message sent to a user for a given subscription. The second argument in the PROD_ID line is the product identifier, which denotes a specific product. These numbers are consecutive. This feature allows a user to identify a missing issue to a subscription. This environment is used only with the command SUBSCR_RESEND.

Syntax

```
delivid_list[ deliv_id[, deliv_id[, ... ]]]
```

attrDescrdeliv_iddelivery identification number

Default

None.

Example

The following subscription example demonstrates how delivery identification numbers are provided through the PROD_ID line.

Three consecutive messages received by a subscriber over three days contain sequential delivery identification numbers: 30, 31, and 32.

Listing 5.3. BULLETIN data messages with consecutive delivery identification numbers

```
begin ims2.0
msg_type data
msg_id example_a ctbo_idc
prod_id 74 30
data_type bulletin ims2.0:short
...
(bulletin information)
...
stop

begin ims2.0
msg_type data
msg_id example_b ctbo_idc
prod_id 74 31
data_type bulletin ims2.0:short
...
(bulletin information)
...
stop

begin ims2.0
msg_type data
msg_id example_c ctbo_idc
prod_id 74 32
data_type bulletin ims2.0:short
...
(bulletin information)
...
stop
```

5.5.2 PRODID_LIST

The PRODID_LIST environment is a list of product ID numbers. A product ID number is a unique identifier for a certain IDC product and may be shared by multiple subscribers. All of the products identified in the PRODID_LIST will be processed for a subscription when the subscription request line is reached.

Syntax

```
prodid_list[ prod_id[, prod_id[, ... ]]]
```

prod_id identification number of the product

Default

The default values for this subscription environment variable depends on the subscription request line. The subscription request lines are as follows:

- none for `unsubscribe` (see UNSUBSCRIBE)
- all for `subscr_prod` (see SUB)
- all for `subscr_log` (see SUB)

5.5.3 SUBSCR_LIST

The SUBSCR_LIST environment lists subscription ID numbers. A subscription ID is a unique identifier for a particular subscription. All of the subscriptions specified in the SUBSCR_LIST will be processed for a subscription when the subscription request line is reached.

Syntax

```
subscr_list [ subscr_id[, subscr_id[, ... ]]]
```

subscr_id identification number of the subscription

Default

The default values for this subscription environment variable depends on the subscription request line. The subscription request lines are as follows:

- none for `unsubscribe` (see UNSUBSCRIBE)
- all for `subscr_prod` (see SUB)
- all for `subscr_log` (see SUB)

5.5.4 SUBSCR_NAME

The SUBSCR_NAME environment lists the names of certain IDC data products. All IDC data products specified in the SUBSCR_NAME line will be processed for a subscription when the subscription request line is reached. These names may be used instead of subscription identifiers or product identifiers.

Syntax

```
subscr_name [ name[, name[, ... ]]]
```

name name of the subscription

Default

None.

5.5.5 BULL_TYPE

The BULL_TYPE environment provides a means to specify the name of a bulletin. In the context of subscribing to a bulletin product, BULL_TYPE is the name of the bulletin and can be the name of any standard bulletin (for example, `sel1`, `sel2`, `sel3`, `reb`, `seb`, or `sseb`) or a previously established NEB or NSEB. In the context of establishing a national bulletin, BULL_TYPE sets the name for the new national bulletin product. NEB and NSEB bulletin types must include either `neb_` (for National Event Bulletin) or `nseb_` (for National Screened Event Bulletin) as the first characters of the bulletin code. Only one name may be specified in the BULL_TYPE line.

The following syntax is used to subscribe to an existing bulletin product.

Syntax

```
bull_type[ bulletin]
```

bulletin	bulletin code (`sel1`, `sel2`, `sel3`, `reb`, `seb`, `sseb`, `neb_`*identifier*, `nseb_`*identifier*)
identifier	NEB or NSEB identifier

The following syntax is used to establish a NEB or NSEB.

Syntax

```
bull_type n[s]eb_identifier
```

identifier	two-letter country code (see Appendix section II.1 "Country codes" on p. 359) and number (for example, FR for a national bulletin of France)

Default

None.

Example

The following environment line sets the bulletin name to NSEB_FR.

```
bull_type NSEB_FR
```

5.6 Subscription request lines

Subscription message request lines specify the information to send in the return data message. The general formats used for request lines are described in section 4.3 "Request format" on p. 48.

Some subscription request lines are the same as those used in request messages. NETWORK, STATION, CHANNEL, BEAM, RESPONSE, OUTAGE, and COMMENT are not used at all in subscriptions. SUBSCRIBE, UNSUBSCRIBE, SUBSCR_PROD, CHANGE, SUBSCR_RESEND, and SUBSCR_LOG are unique to subscriptions. Tables 9–11 give the applicable environments for the subscription request lines.

Table 9. S/H/I subscription request environments

Environments	Request lines													
	ARRIVAL	BULLETIN	CHANGE	CHAN_STATUS	COMM_STATUS	EVENT	ORIGIN	STA_STATUS	SUBSCRIBE	SUBSCR_LOG	SUBSCR_PROD	SUBSCR_RESEND	UNSUBSCRIBE	WAVEFORM
BULL_TYPE	r	r				r	r							
CHAN_LIST														o
DELIVID_LIST												r		
DEPTH		o†				o	o							
DEPTH_CONF		o‡												
DEPTH_KVALUE		o‡												
DEPTH_MINUS_ERROR		o†				o	o							
DEPTH_THRESH		o‡												
EVENT_STA_DIST		o†				o	o							
HYDRO_CP_THRESH		o‡												
HYDRO_TE_THRESH		o‡												
LAT		o†				o	o							
LOC_CONF		o‡												
LON		o†				o	o							
MAG		o†				o	o							
MAGPREF_MB		o‡												
MAGPREF_MS		o‡												
MAG_TYPE		o†				o	o							
MBMS_CONF		o‡												
MBMS_SLOPE		o‡												
MBMS_THRESH		o‡												
MB_ERR		o‡												
MB_MINUS_MS		o†				o	o							
MIN_DP_SNR_PP		o‡												
MIN_DP_SNR_SP		o‡												
MIN_MB		o‡												
MIN_MOVEOUT_PP		o‡												
MIN_MOVEOUT_SP		o‡												
MIN_NDEF		o‡												
MIN_NDP_PP		o‡												
MIN_NDP_SP		o‡												

Continues on next page

Table 9. S/H/I subscription request environments (cont.)

Environments	ARRIVAL	BULLETIN	CHANGE	CHAN_STATUS	COMM_STATUS	EVENT	ORIGIN	STA_STATUS	SUBSCRIBE	SUBSCR_LOG	SUBSCR_PROD	SUBSCR_RESEND	UNSUBSCRIBE	WAVEFORM
MIN_NSTA_MS		o‡												
MIN_WDEPTH_THRESH		o‡												
MS_ERR		o‡												
PRODID_LIST			*							o	o	*	*	
REG_CONF		o‡												
RELATIVE_TO														o
STA_LIST	r	o†				o	o	o						r
SUBSCR_LIST			*							o	o	*	*	
SUBSCR_NAME			*						r	o	o	*	*	

r: required, *: one required, o: optional

† Used only for subscribing to NEB or NSEB products.

‡ Used only to establish a NEB or NSEB.

Table 10. Radionuclide-related subscription request environments (pt. 2)

Environments	ALERT_*	ARR	BLANKPHD	CALIBPHD	CHANGE	DETBKPHD	GASBKPHD	QCPHD	RMSSOH	RNPS	RLR	RRR	SPHDF	SPHDP	SSREB	SAMPML	REVSAMP
DELIVID_LIST																	
PRODID_LIST					*												
STA_LIST	o	o	o	o		o	o	o	o	o	o	o	o	o	o	o	o
SUBSCR_LIST					*												
SUBSCR_NAME					*												

r = required, * = one required, o = optional

Table 11. Radionuclide-related subscription request environments (pt. 2)

	Request lines				
Environments	SUBSCRIBE	SUBSCR_LOG	SUBSCR_PROD	SUBSCR_RESEND	UNSUBSCRIBE
DELIVID_LIST				r	
PRODID_LIST		o	o	*	*
STA_LIST					
SUBSCR_LIST		o	o	*	*
SUBSCR_NAME	r	o	o	*	*

r = required, * = one required, o = optional

The following sections describe the possible request lines and the applicable environment variables. The environment variables that must be explicitly specified to obtain a result are in **bold** type.

5.6.1 ALERT_FLOW

This data type is one of several radionuclide products available from the IDC. The ALERT_FLOW indicates that a sampler flow rate is above or below a specified threshold. See section 7.7 "Alerts" on p. 209 for a complete description and subsection I.1.1 "ALERT_FLOW" on p. 263 for an example.

Environment

```
sta_list
```

Example

The following example requests ALERT_FLOW messages for all radionuclide stations. Because the STA_LIST environment is not specified, the default (all stations) is used.

Listing 5.4. ALERT_FLOW subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
alert_flow
stop
```

5.6.2 ALERT_SYSTEM

This data type is one of several radionuclide products available from the IDC. The ALERT_-SYSTEM indicates a problem with major equipment. See section 7.7 "Alerts" on p. 209 for a complete description and subsection I.1.2 "ALERT_SYSTEM" on p. 263 for an example.

Environment

sta_list

Example

The following example requests ALERT_SYSTEM messages for all radionuclide stations in the Russian Federation.

Listing 5.5. ALERT_SYSTEM subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list RU*
alert_system
stop
```

5.6.3 ALERT_TEMP

This data type is one of several radionuclide products available from the IDC. The ALERT_-TEMP indicates that a system temperature is outside the required IMS temperature range for that parameter. See section 7.7 "Alerts" on p. 209 for a complete description and subsection I.1.3 "ALERT_TEMP" on p. 264 for an example.

Environment

sta_list

Example

The following example requests ALERT_TEMP messages from station ARP01.

Listing 5.6. ALERT_TEMP subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list ARP01
alert_temp
stop
```

5.6.4 ALERT_UPS

This data type is one of several radionuclide products available from the IDC. The ALERT_UPS indicates a problem with the power supply. See section 7.7 “Alerts” on p. 209 for a complete description and subsection I.1.4 “ALERT_UPS” on p. 264 for an example.

Environment

`sta_list`

Example

The following example requests time-stamped ALERT_UPS messages from all radionuclide stations in Australia.

Listing 5.7. ALERT_UPS subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list AU*
alert_ups
stop
```

5.6.5 ARR

This data type is one of several radionuclide products available from the IDC. The ARR, or Automated Radionuclide Report, includes results from the automated analysis of a radionuclide sample. See subsection 7.8.1 “ARR” on p. 210 for a complete description and section I.2 “ARR—Noble gas version” and section I.3 “ARR—Particulate version” on pp. 265 and 281, respectively, for examples.

Environment

`sta_list`

Example

The following message requests ARR messages with no restraints.

Listing 5.8. ARR subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
ARR
stop
```

5.6.6 ARRIVAL

An ARRIVAL line requests arrival information from specific S/H/I stations relative to events in a S/H/I bulletin. The amount of information that is returned depends on the amount of processing that has been applied to the data. The different stages of processing are expressed using subtypes to the arrival request lines as follows: `arrival:automatic`, `arrival:reviewed`, `arrival:associated`, `arrival:grouped`, and `arrival:unassociated` (see subsection 4.7.6 "ARRIVAL/SLSD" on p. 78 for definitions).

Environment

bull_type, **sta_list**

Example

The following subscription message requests automatic arrivals from S/H/I stations ABC and DEF from the SEL1 bulletin each day.

Listing 5.9. ARRIVAL subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list ABC, DEF
bull_type sel1
arrival:automatic ims2.0
stop
```

5.6.7 BULLETIN

A BULLETIN request line in a subscription message can either request bulletin information for S/H/I events satisfying the environmental conditions or establish the screening parameters for an NEB or NSEB.

When subscribing to an existing bulletin product (with the exception of NEBs and NSEBs), the following environments are valid.

Environment

bull_type, `depth`, `depth_minus_error`, `event_sta_dist`, `lat`, `lon`, `mag`, `mag_type`, `mb_minus_ms`, `sta_list`

When subscribing to a NEB or NSEB, only the BULL_TYPE environment is valid.

Environment

bull_type

When establishing an NEB or NSEB bulletin product, the following environments are valid.

Environment

bull_type, `depth`, `depth_conf`, `depth_kvalue`, `depth_minus_error`, `depth_thresh`, `event_sta_dist`, `hydro_cp_thresh`, `hydro_te_thresh`, `lat`, `loc_conf`, `lon`, `mag`, `mag_type`, `magpref_mb`, `magpref_ms`, `mb_err`, `mb_minus_ms`, `mbms_conf`, `mbms_slope`, `mbms_thresh`, `min_dp_snr_pp`, `min_dp_snr_sp`, `min_mb`, `min_moveout_pp`, `min_moveout_sp`, `min_ndef`, `min_ndp_pp`, `min_ndp_sp`, `min_nsta_ms`, `min_wdepth_thresh`, `ms_err`, `reg_conf`, `sta_list`

Examples

The following subscription message requests the daily REB with no constraints.

Listing 5.10. BULLETIN subscription message (REB)

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
bull_type reb
bulletin ims2.0
stop
```

The following subscription message requests the immediate SEL1 and SEL2. Soon after an event has been located (about two hours after real time for the SEL1 and about 6 h after real time for the SEL2), the subscription software forwards the results to the user. In the example, messages would be sent to the user as often as once every 20 min, because the request has no constraints. This arrangement would be appropriate for a Member State that processes the data automatically.

Listing 5.11. BULLETIN subscription message (SEL1 and SEL2)

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
bull_type sel1
bulletin ims2.0
bull_type sel2
bulletin ims2.0
stop
```

The following subscription message requests the daily REB for events with depths less than 30 Km, between magnitudes 3.5 and 4.5, and within the two areas defined by the latitude and longitude ranges.

Listing 5.12. BULLETIN subscription message with depth and magnitude constraints

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
```

```
freq daily
bull_type reb
mag 3.5 to 4.5
depth to 30
lat -30 to -20
lon -180 to -140
bulletin ims2.0
lat 75 to 79
lon 110 to 140
bulletin ims2.0
stop
```

The following subscription message establishes a national event bulletin for France (NEB_FR). Event characterization parameters will be based on the environments given in this message and the default values of the environments not listed.

Listing 5.13. BULLETIN subscription message (NEB)

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
depth_conf 0.990
depth_kvalue 30.0
depth_thresh 20.0
loc_conf 0.99
mb_err 0.35
mbms_conf 0.99
mbms_slope 1.50
mbms_thresh 3.50
min_dp_snr 1.5
min_mb 4.0
min_moveout 2.5
min_ndef 1
min_ndp 1
min_nsta_ms 2
min_wdepth_thresh 0.7
ms_err 0.35
reg_conf 0.990
reg_min_psnr 1.5
reg_min_ssnr 1.5
time_stamp
bull_type NEB_FR
bulletin ims2.0
stop
```

5.6.8 CALIBPHD

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of a standard calibration source as well as other information. See section 7.2 "Pulse Height Data" on p. 170 for a description of the PHD types and section I.9 "CALIBPHD" on p. 291 for an example.

Environment

sta_list

Example

The following message requests CALIBPHD messages from all radionuclide stations to be sent as they become available.

Listing 5.14. CALIBPHD subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
calibphd
stop
```

5.6.9 CHANGE

After a subscription is established, it can be modified through the CHANGE request line. The subscription being changed is specified in the SUBSCR_LIST, PRODID_LIST, or SUBSCR_-NAME environment. This line is followed by the CHANGE request line, then a listing of the changed environments and new values, and finally the applicable product. After the change, the subscription identifier will remain the same, but the product identifier and the delivery identifier will change.

Environment

prodid_list | subscr_list | subscr_name

Example

The following subscription message requests a change to the LAT and LON environments for the BULLETIN subscription number 52.

Listing 5.15. CHANGE subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
subscr_list 52
```

```
change
lat 12 to 22
lon 18 to 28
bulletin ims2.0
stop
```

5.6.10 CHAN_STATUS

CHAN_STATUS requests channel status information.

Environment

`chan_list, freq, sta_list`

Example

The following subscription message requests the daily channel status reports.

Listing 5.16. CHAN_STATUS subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
chan_status ims2.0
stop
```

5.6.11 COMM_STATUS

COMM_STATUS requests communications status information for the S/H/I communications links. A verbose communications status report listing individual circuit dropouts is obtained by using the verbose subformat.

Environment

`freq, sta_list`

Example

The following subscription message requests the verbose communications status reports for all links.

Listing 5.17. COMM_STATUS subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
```

```
comm_status ims2.0:verbose
stop
```

5.6.12 DETBKPHD

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of an empty detector chamber as well as other important information. See section 7.2 "Pulse Height Data" on p. 170 for a description of the PHD types and section I.15 "DETBKPHD" on p. 296 for an example.

Environment

`sta_list`

Example

The following message requests DETBKPHDs from all Russian stations to be sent as they become available.

Listing 5.18. DETBKPHD subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list RU*
detbkphd
stop
```

5.6.13 EVENT

EVENT requests S/H/I event information for preferred origins satisfying the environmental constraints.

Environment

`bull_type`, `depth`, `depth_minus_error`, `event_sta_dist`, `lat`, `lon`, `mag`, `mag_type`, `mb_minus_ms`, `sta_list`

Example

The following subscription message requests all of the REB events within regional distance (20 deg) of stations ABC and DEF.

Listing 5.19. EVENT subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
```

```
e-mail name@my.computer
freq daily
bull_type reb
sta_list ABC, DEF
event_sta_dist 0.0 to 20.0
event ims2.0
stop
```

5.6.14 GASBKPHD

This data type is one of several radionuclide products available from the IDC. The GASBKPHD contains the pulse height data of an empty plastic scintillation gas cell from a station that observes a memory effect. At present, only noble gas monitoring systems that utilize β-γ coincidence counting have plastic scintillation gas cells. The GASBKPHD is acquired after a sample has been evacuated from the gas cell and before the next sample acquisition. The purpose of the GASBKPHD is to enable the quantification of radio-xenon atoms that are adsorbed onto the walls of the plastic scintillation gas cell. See section 7.2 "Pulse Height Data" on p. 170 for a description of the PHD types and section I.19 "GASBKPHD" on p. 299 for an example.

Environment

`sta_list`

Example

The following example requests GASBKPHD messages for station DEX33.

Listing 5.20. GASBKPHD subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list DEX33
gasbkphd
stop
```

5.6.15 MET

This data type is one of several radionuclide products available from the IDC. The MET message contains meteorological data recorded at a radionuclide station. See section 7.6 "Meteorological data" on p. 208 for a complete description and section I.22 "MET" on p. 303 for an example.

Environment

`sta_list`

Example

The following example requests MET messages for station CAP14.

Listing 5.21. MET subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list CAP14
met
stop
```

5.6.16 ORIGIN

Origins are solutions to the location and time of a S/H/I source. Several origins may be determined for any one source. The ORIGIN line requests information for those origins that satisfy the environment constraints.

Environment

`bull_type`, `depth`, `depth_minus_error`, `event_sta_dist`, `lat`, `lon`, `mag`, `mag_type`, `mb_minus_ms`, `sta_list`

Examples

The following subscription message requests origin information for the daily REB delivered when the REB is ready for distribution.

Listing 5.22. ORIGIN subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
bull_type reb
origin ims2.0
stop
```

The following subscription message requests origin information for events in the daily REB limited to a specific geographic region.

Listing 5.23. ORIGIN subscription message limited in space

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
lat -60 to 10.0
```

```
lon -81 to -34
bull_type reb
origin ims2.0
stop
```

5.6.17 QCPHD

This data type is one of several PHD types available for radionuclide samples. It contains the PHD of the daily quality control measurement as well as other important information. See section 7.2 "Pulse Height Data" on p. 170 for a description of the PHD types and section I.26 "QCPHD" on p. 306 for an example.

Environment

`sta_list`

Example

The following message requests QCPHD messages from TZP64 to be sent as they become available.

Listing 5.24. QCPHD subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list TZP64
qcphd
stop
```

5.6.18 RLR

This data type is one of several radionuclide products available from the IDC. The RLR contains sample analysis results from a certified radionuclide laboratory. See section 7.3 "Radionuclide laboratory reports" on p. 185 for a complete description and subsection I.29.1 "β-γ coincidence systems", subsection I.29.2 "HPGe systems" and section I.30 "RLR—Particulate version" on pp. 318, 320 and section I.30 "RLR—Particulate version", respectively, for examples.

Environment

`sta_list`

Example

The following example requests time-stamped RLR messages from radionuclide lab AUL02.

Listing 5.25. RLR subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
sta_list AUL02
rlr
stop
```

5.6.19 RMSSOH

This data type is one of several radionuclide products available from the IDC. The RMSSOH message describes the state of health of the collection, processing, and acquisition equipment at the IMS radionuclide stations. See section 7.5 "State of Health data" on p. 203 for a complete description and section I.31 "RMSSOH" on p. 326 for an example.

Environment

`sta_list`

Example

The following example requests RMSSOH messages from all radionuclide stations in the United Kingdom of Great Britain and Northern Ireland.

Listing 5.26. RMSSOH subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
sta_list GB*
rmssoh
stop
```

5.6.20 RNPS

This data type is one of several radionuclide products available from the IDC. The RNPS is a compilation of the status of collection, processing, and analysis of particulate and noble gas data from all radionuclide stations (PrepCom, 2000). The RNPS is produced daily and summarizes the results for each station over the past three days. See subsection 7.8.4 "RNPS" on p. 232 for a complete description and section I.32 "RNPS" on p. 327 for an example.

Environment

`sta_list`

Example

The following example requests RNPSs from all radionuclide stations. Because the STA_LIST environment is not specified, the default (all stations) is used.

Listing 5.27. RNPS subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
rnps
stop
```

5.6.21 RRR

This data type is one of several radionuclide products available from the IDC. The RRR, or Reviewed Radionuclide Report, is a revised version of the Automated Radionuclide Report, or Automated Radionuclide Report, and is generated after manual review of a radionuclide sample is complete. See subsection 7.8.2 "RRR" on p. 229 for a complete description, and section I.33 "RRR—Noble gas version" and section I.34 "RRR—Particulate version" on pp. 328 and section I.34 "RRR—Particulate version", respectively, for examples.

Environment

```
sta_list
```

Example

The following subscription message requests daily RRRs messages from stations in New Zealand. The frequency is not specifically identified because the default transmittal rate is daily.

Listing 5.28. RRR subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
sta_list NZ*
RRR
stop
```

5.6.22 SAMPML/REVSAMP

This data type is one of several radionuclide data products available from the IDC. The SAMPML/REVSAMP contains the sample PHDs as well as IDC analysis results in XML format. There are two types, i.e., SAMPML and REVSAMP, pertaining to the Automated Radionuclide Report and Reviewed Radionuclide Report, respectively. See section I.28 "REVSAMP/SAMPML—Noble gas systems" on p. 308 for examples.

Environment

sta_list

Example

The following subscription message requests daily SAMPML messages from stations in New Zealand. The frequency is not specifically identified because the default transmittal rate is daily.

Listing 5.29. SAMPML subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
sta_list NZ*
SAMPML
stop
```

5.6.23 SPHDF/P

The Sample Pulse Height Data (SAMPLEPHD) is one of several PHD types available for radionuclide samples and has two different qualifiers, e.g., FULL (SPHDF) or PREL (SPHDP). The PREL SAMPLEPHD contains PHD from a sample acquired for a time shorter than that of the full acquisition time. The FULL SAMPLEPHD contains PHD from a sample acquired for the IDC-defined full acquisition time. Like the other PHD types, the FULL and PREL SAMPLEPHDs also include other important information. See section 7.2 "Pulse Height Data" on p. 170 for a description of the PHD types and subsection I.35.1 "SAMPLEPHD—β-γ coincidence data version" on p. 349, and section I.36 "SAMPLEPHD—Particulate systems" on p. 352 for examples.

The data_type SPHDP and SPHDF should be used when users request the PREL and FULL SAMPLEPHDs, respectively.

Environment

sta_list

Example

The following message requests SPHDF messages from radionuclide stations located in Australia.

Listing 5.30. SPHDF subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list AU*
sphdf
```

```
stop
```

5.6.24 SSREB

This data type is one of several radionuclide products available from the IDC. The SSREB (Standard Screened Radionuclide Event Bulletin) is generated by the IDC when fission or activation products are detected at a radionuclide station above normal limits. An SSREB contains RRRs from the stations that detect the fission product(s), information identifying the fission product(s), an estimate of the source location and time, as well as any sample analysis results from certified laboratories. See subsection 7.8.3 “SSREB” on p. 230 for a description of the SSREB and section I.37 “SSREB—Noble gas systems” and section I.38 “SSREB—Particulate version” on pp. 353 and 356, respectively, for examples.

Environment

```
sta_list
```

Example

The following message requests all SSREB messages to be sent immediately.

Listing 5.31. Subscription message requesting immediate sending of SSREB

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
ssreb
stop
```

5.6.25 STA_STATUS

STA_STATUS requests the station status for the S/H/I stations in the STA_LIST environment.

Environment

```
sta_list
```

Example

The following subscription message requests the daily station status report for all S/H/I stations.

Listing 5.32. Subscription message requesting daily station status report

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq daily
```

```
sta_list *
sta_status ims2.0
stop
```

5.6.26 SUBSCRIBE

SUBSCRIBE is a request to initiate a new subscription for each standard product given by the SUBSCR_NAME environment.

Environment

```
subscr_name
```

Example

The following subscription message requests a subscription to the standard product SEB.

Listing 5.33. Subscription message requesting subscription to SEB

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
subscr_name seb
subscribe
stop
```

5.6.27 SUBSCR_LOG

SUBSCR_LOG requests a log of all of the user's changes to the subscriptions. The subscriber's email address determines the subscriptions to which a user is subscribed. Based on the email address, a log of all changes is sent out. The SUBSCR_LOG can be further constrained by use of the environments SUBSCR_LIST, PRODID_LIST, or SUBSCR_NAME.

Environment

```
subscr_list | prodid_list | subscr_name
```

Examples

The following subscription message requests a log of subscription 74.

Listing 5.34. Subscription message requesting the log of subscriptions

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
subscr_list 74
e-mail name@my.computer
subscr_log
stop
```

The response to the preceding message is as follows.

Listing 5.35. Data message response to the message of Listing 5.34

```
begin ims2.0
msg_type data
msg_id response_example ctbo_idc
ref_id example any_ndc
data_type log ims2.0
  subscription id: 74
  product id: 52
      was added at 1997/01/09 19:36:00
      freq immediate
      bull_type reb
      bulletin ims2.0
  subscription id: 74
  product id: 94
      was changed at 1997/01/21 15:24:13
      the new product constraints are:
      freq immediate
      lat 12.00 to 22.00
      lon 18.00 to 28.00
      bull_type reb
      bulletin ims2.0
stop
```

5.6.28 SUBSCR_PROD

SUBSCR_PROD requests a list of the products currently subscribed to by the user. The response to this request includes the subscription identifier, product identifier, subscription name (where applicable), and a listing of the environment and request lines that define the specific product. The response is sent as a LOG data message. If SUBSCR_LIST, PRODID_LIST, or SUBSCR_-NAME environments are not specified, then all products currently subscribed to by the user are provided.

Environment

```
subscr_list | prodid_list | subscr_name
```

Examples

The following subscription message requests the current list of subscriptions that are in effect for the user.

Listing 5.36. Subscription message requesting the current list of subscriptions

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
subscr_prod
```

```
stop
```

The response to this message is a LOG data message from the IDC.

Listing 5.37. LOG data message, response to the message of Listing 5.36

```
begin ims2.0
msg_type data
msg_id response_example ctbo_idc
ref_id example any_ndc
data_type log ims2.0
 the following data products are subscribed
 to by name@my.computer:
 subscription id: 52
 product id: 74
   freq daily
   bull_type reb
   bulletin ims2.0
 subscription id: 57
 product id: 78
   freq immediate
   lat 0.0 to 10.0
   lon 120.0 to 140.0
   bull_type sel2
   bulletin ims2.0
stop
```

5.6.29 SUBSCR_RESEND

The SUBSCR_RESEND request causes a subscribed product to be re-delivered. This command gives the subscriber the ability to re-request delivery of a product.

Environment

```
delivid_list, prodid_list | subscr_list | subscr_name
```

Example

The following subscription message requests that delivery 32 of subscription 52 be resent to the user.

Listing 5.38. Subscription message requesting a delivery to be resent

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
subscr_list 52
delivid_list 32
subscr_resend
stop
```

5.6.30 UNSUBSCRIBE

The UNSUBSCRIBE request informs the IDC that the user wishes to remove the subscriptions referenced by the SUBSCR_LIST, PRODID_LIST, or SUBSCR_NAME environments. A LOG data message is sent confirming that the subscription has been cancelled.

Environment

`subscr_list | prodid_list | subscr_name`

Examples

The following subscription message requests that subscriptions 52 and 57 be discontinued.

Listing 5.39. UNSUBSCRIBE subscription message

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
subscr_list 52, 57
unsubscribe
stop
```

A confirming LOG data message from the IDC to the subscription user will be sent verifying that the subscription has been terminated.

Listing 5.40. LOG data message, response to the message of Listing 5.39

```
begin ims2.0
msg_type data
msg_id response_example ctbo_idc
ref_id example any_ndc
data_type log ims2.0
 the following data products have been removed
 by name@my.computer:
 subscription id: 52
 product id: 94
   freq daily
   bull_type reb
   bulletin ims2.0
 subscription id: 57
 product id: 101
   freq immediate
   bull_type sel2
   bulletin ims2.0
stop
```

5.6.31 WAVEFORM

Waveforms are digital time series data. WAVEFORM requests will typically accept subformats that specify the format of digital data within the general format of the waveform data type.

The available formats for waveform data from the IDC subscription service are continuous data format for continuous data and IMS2.0 format for all other waveform data. The available subformats are `int`, `cm6`, `cm8`, and `csf`.

Environment

`chan_list, sta_list, relative_to`

Examples

The following subscription message requests continuous data[2] from the short-period, high-gain, vertical channels of the ABAR array and from the central site (CDA0) of the CDAR array.

Listing 5.41. WAVEFORM subscription message requesting continuous data waveforms

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq continuous
sta_list ABAR, CDA0
chan_list shz
waveform ims2.0
stop
```

The following subscription message requests any waveform segments from auxiliary station ABC as soon as they are received by the IDC.

Listing 5.42. WAVEFORM subscription message requesting waveform segments

```
begin ims2.0
msg_type subscription
msg_id example any_ndc
e-mail name@my.computer
freq immediate
sta_list ABC
waveform ims2.0
stop
```

[2] Special arrangements between States Signatories and the IDC are required due to the hardware and communications requirements of continuous data transmission.

6

S/H/I Data Messages

This chapter describes the request message formats and includes the following sections:

6.1 Introduction

IMS2.0 data formats provide a common format for data and data product exchange. The data formats all contain ASCII options that allow the exchange of information via email (even for waveforms). Waveforms in binary format may also be sent using the IMS2.0 message format, but the transmission of data messages with binary information must be via HTTP or as attachment to the message.

All data messages require the basic message structure described in section 3.2 “Message preface” on p. 34. If a message is a data message, the MSG_TYPE is set to `data`. Within the message body, several data types may be present. The type of data included in a data section is designated with a DATA_TYPE line. Each data section is composed of distinct data blocks that contain required and supplemental data.

6.1.1 DATA_TYPE

Data sections must begin with a DATA_TYPE line. The arguments to DATA_TYPE are the type of data that follows (for example, WAVEFORM or BULLETIN) and the format (IMS2.0). The *subtype* and *sub_format* allow more precise selection of the data type and format, respectively.

Syntax

```
data_type data_type[:subtype] format[:sub_format]
```

data_type	type of data that follows; typical examples are WAVEFORM, BULLETIN, and RESPONSE
subtype	subtype to use with this data type. subtype is used primarily for ARRIVAL data types.
format	general format of the data (IMS2.0)
sub_format	internal format to use with this data type. sub_format is used primarily for BULLETIN and WAVEFORM data types. Supported subformats are MS_ST2_512 form WAVEFORM in miniSEED format and SC3XML for STA_INFO and BULLETIN.

Examples

```
data_type waveform IMS2.0:cm6
```

```
data_type waveform ims2.0:ms_st2_512
```

```
data_type bulletin IMS2.0:SC3XML
```

The end of a data section is implied by another DATA_TYPE line or a STOP line.

The following sections give the formats for data messages. Examples of these data formats are provided in Appendix I "Data message examples" on p. 263.

6.2 Station information

Data types for S/H/I stations describe the stations through their locations, instrumentation, channels, and so on.

6.2.1 CHANNEL

The CHANNEL data type contains information describing the sensors and their emplacement. Table 12 gives the format for the CHANNEL data message, and an example is provided in section I.11 "CHANNEL" on p. 294.

Table 12. Channel format

Record	Position	Format	Description
1 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	16–19	a4	`Chan`
	21–23	a3	`Aux`
	27–34	a8	`Latitude`
	37–45	a9	`Longitude`
	47–55	a9	`Coord Sys`
	61–64	a4	`Elev`
	66–70	a5	`Depth`
	74–77	a4	`Hang`
	80–83	a4	`Vang`
	85–95	a11	`Sample_Rate`
	97–100	a4	`Inst`
	107–113	a7	`On Date`
	118–125	a8	`Off Date`
2–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–19	a3	FDSN channel code
	21–24	a4	auxiliary code
	26–34	f9.5	latitude (°, South is negative)
	36–45	f10.5	longitude (°, West is negative)
	47–58	a12	coordinate system (for example, WGS-84)
	60–64	f5.3	elevation (Km)
	66–70	f5.3	emplacement depth (Km)
	72–77	f6.1	horizontal angle of emplacement (positive degrees clockwise from North, `-1.0` if vertical)
	79–83	f5.1	vertical angle of emplacement (° from vertical, 90.0° if horizontal)
	85–95	f11.6	sample rate (samples/sec)
	97–102	a6	instrument type
	104–113	i4,a1,i2,a1,i2	start date of channel operation (*yyyy/mm/dd*)
	116–125	i4,a1,i2,a1,i2	end date of channel operation (*yyyy/mm/dd*)

6.2.2 NETWORK

The NETWORK data type provides a descriptive name for each network code. Table 13 shows the format for the NETWORK data message. An example is provided in section I.23 “NETWORK” on p. 304.

Table 13. Network format

Record	Position	Format	Description
1 (header)	1–3	a3	`Net`
	11–21	a11	`Description`
2–n (data)	1–9	a9	network code
	11–74	a64	descriptive network name

6.2.3 STATION

The STATION data type describes the site, location, and dates of operation. For arrays, the unique array code that defines a reference point (used for beam) is given along with the information from each element. Table 14 shows the format for the STATION data message. An example is provided in section I.39 "STATION" on p. 357.

Table 14. Station format

Record	Position	Format	Description
1 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	17–20	a4	`Type`
	23–30	a8	`Latitude`
	33–41	a9	`Longitude`
	43–51	a9	`Coord Sys`
	57–60	a4	`Elev`
	64–70	a7	`On Date`
	74–81	a8	`Off Date`
2–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–20	a4	`1C`: single-component `3C`: three-component `hfa`: high-frequency array `lpa`: long-period array
	22–30	f9.5	latitude (°, South is negative)
	32–41	f10.5	longitude (°, West is negative)
	43–54	a12	coordinate system (e.g., WGS-84)
	56–60	f5.3	elevation (Km)
	62–71	i4,a1,i2,a1,i2	start of station operation (*yyyy/mm/dd*)
	73–82	i4,a1,i2,a1,i2	end of station operation (*yyyy/mm/dd*)

6.3 Waveform data

Data types for waveforms include the response of the instrumentation and the waveform data formats.

6.3.1 RESPONSE

The RESPONSE data type allows the complete response to be given as a series of response groups that can be cascaded. Modern instruments are composed of several different components, each with its own response. This format mimics the actual configuration of the instrumentation.

A complete response description is made up of the CAL2 block (Table 15) plus one or more of the PAZ2, FAP2, GEN2, DIG2, and FIR2 response blocks in any order (Tables 16–20). The response blocks should be given sequential stage numbers (beginning with 1) in the order that they occur in the system response.

Each response block is comprised of a header line and sufficient occurrences of the values lines to provide all required coefficients. The DIG2 block may occur only once per response. Comments may be inserted after the CAL2 block and after any response section as desired, provided that they are enclosed with parenthesis beginning in column 2. Successive channel responses should also be separated by blank lines for readability.

The input of the Earth to seismic stations is in nanometres of displacement (all of the responses are displacement responses). For hydroacoustic and infrasonic, the input is pressure (in μPa). The RESPONSE data describes the response as output units/ input units (e.g., counts/nm for a seismic recording system; V/nm for a seismic sensor; counts/V for a digitizer). Velocity or acceleration responses can be obtained by dividing the response curve by $i\omega$ or $-\omega^2$, respectively. An example of a RESPONSE data message is provided in section I.27 "RESPONSE" on p. 307.

The CAL2 block gives general information about the response information that follows (see Table 15).

Table 15. Calibration identification block format

Record	Position	Format	Description
1 (data)	1–4	a4	`CAL2`
	6–10	a5	station code
	12–14	a3	FDSN channel code
	16–19	a4	auxiliary identification code
	21–26	a6	instrument type

Continues on next page

Table 15. Calibration identification block format (cont.)

Record	Position	Format	Description
	28–42	e15.8	system sensitivity (nm/count) at calibration reference period†
	44–50	f7.3	calibration reference period (seconds)
	52–62	f11.5	system output sample rate (Hz)
	64–73	i4,a1,i2,a1,i2	effective start date (*yyyy/mm/dd*)
	75–79	i2,a1,i2	effective start time (*hh:mm*)
	81–90	i4,a1,i2,a1,i2	effective end date (*hh:mm:ss.s*)‡
	92–96	i2,a1,i2	effective end time (*hh:mm*)

† System sensitivity, calibration reference period, and sample rate should be the same as in the wid2 block.

‡ The start/end date/times specify the time period for which the response is valid. If the response is still valid, the end date/time should be left blank.

A Poles and Zeros block (PAZ2) can be used for either an analogue filter or an Infinite Impulse Response (IIR) filter. In the data section, poles are always given first followed by zeros (see Table 16).

Table 16. Poles and Zeros lock format

Record	Position	Format	Description
1 (data)	1–4	a4	`PAZ2`
	6–7	i2	stage sequence number
	9	a1	output units code (`V`: Volts, `A`: amps, `C`: counts)
	11–25	e15.8	scale factor
	27–30	i4	decimation (blank if analogue)
	32–39	f8.3	group correction applied (seconds)
	41–43	i3	number of poles
	45–47	i3	number of zeros
	49–73	a25	description
2–n (data)	2–16	e15.8	real part of pole or zero
	18–32	e15.8	imaginary part of pole or zero

Like PAZ2, the Frequency, Amplitude, Phase (FAP2) block can be used to specify the response of analogue or digital filters, or some combination of them including a complete system response (see Table 17).

Table 17. Frequency, amplitude, and phase block format

Record	Position	Format	Description
1 (data)	1–4	a4	`FAP2`

Continues on next page

Table 17. Frequency, amplitude, and phase block format (cont.)

Record	Position	Format	Description
	6–7	i2	stage sequence number
	9	a1	output units code (`V`: Volts, `A`: amps, `C`: counts)
	11–14	i4	decimation (blank if analogue)
	16–23	f8.3	group correction applied (seconds)
	25–27	i3	number of frequency, amplitude, phase triplets
	29–53	a25	description
2–n (data)	2–11	f10.5	frequency (Hz)
	13–27	e15.8	amplitude (output units/input units)
	29–32	i4	phase delay (deg)

The generic response block (GEN2) can specify the response of analogue or digital filters, or some combination of them, including a complete system response (see Table 18).

Table 18. Generic response block format

Record	Position	Format	Description
1 (data)	1–4	a4	`GEN2`
	6–7	i2	stage sequence number
	9	a1	output units code (`V`: Volts, `A`: amps, `C`: counts)
	11–25	e15.8	section sensitivity (input units/output units)
	27–32	f7.3	calibration reference period (seconds)
	35–38	i4	decimation (blank if analogue)
	40–47	f8.3	group correction applied (seconds)
	49–51	i3	number of corners
	53–77	a25	description
2–n (data)	2–12	f11.5	corner frequency (Hz)
	14–19	f6.2	slope above corner (dB/decade)

The digitizer block (DIG2) specifies the digitizer sample rate and sensitivity. It also provides a description field to identify the model of digitizer being used (Table 19).

Table 19. Digitizer response block format

Record	Position	Format	Description
1 (data)	1–4	a4	`DIG2`
	6–7	i2	stage sequence number
	9–23	e15.8	sensitivity (counts/input unit)
	25–35	f11.5	digitizer sample rate (Hz)
	37–61	a25	description

The finite impulse response block (FIR2) is used to describe the response of Finite Impulse Response (FIR) digital filters (Table 20).

Table 20. Finite impulse response block format

Record	Position	Format	Description
1 (data)	1–4	a4	`FIR2`
	6–7	i2	stage sequence number
	9–18	e10.2	filter gain (relative factor, not in dB)
	20–23	i4	decimation (blank if analogue)
	25–32	f8.3	group correction applied (seconds)
	34	a1	symmetry flag (`A`: asymmetric, `B`: symmetric [odd], `C`: symmetric [even])
	36–39	i4	number of factors
	41–65	a25	description
	2–16	e15.8	factor(i)
	18–32	e15.8	factor(i+1)
2–n (data)	34–48	e15.8	factor(i+2)
	50–64	e15.8	factor(i+3)
	66–80	e15.8	factor(i+4)

Comments on the response of an instrument are enclosed in parentheses (Table 21).

Table 21. Response comment block format

Record	Position	Format	Description
1	2	a1	(
	3–n	a{−1}	comment
	n+1	a1	)

6.3.2 WAVEFORM

The format for WAVEFORM data messages consists of a waveform identification (WID2) block (Table 22), followed by the station (STA2) block (Table 23), the waveform data (DAT2) block (Table 24), and a checksum (CHK2) block (Table 25). Each DAT2 block should be followed by a CHK2 block so that the validity (or otherwise) of the data can be verified.

Table 22. Waveform identification block format

Record	Position	Format	Description
1	1–4	a4	`WID2`
	6–15	i4,a1,i2,a1,i2	date of the first sample (*yyyy/mm/dd*)

Continues on next page

Table 22. Waveform identification block format (*cont.*)

Record	Position	Format	Description
	17–28	i2,a1,i2,a1,f6.3	time of the first sample (*hh* : *mm* : *ss* . *sss*)
	30–34	a5	station code
	36–38	a3	FDSN channel code
	40–43	a4	auxiliary identification code
	45–47	a3	`INT`, `CM`*n*, or `CSF` `INT` is free-format integers as ASCII characters. `CM` denotes compressed data, and *n* is either `6` (6-bit compression), or `8` (8-bit binary compression) `CSF` is a signed format
	49–56	i8	number of samples
	58–68	f11.6	data sampling rate (Hz)
	70–79	e10.2	system sensitivity (nm/count) at the calibration reference period, the ground motion in nanometres per digital count at calibration period (calper)
	81–87	f7.3	calibration reference period; the period in seconds at which the system sensitivity is valid; calper should be near the flat part of the response curve (in most cases, 1 s)
	89–94	a6	instrument type
	96–100	f5.1	horizontal orientation of sensor, measured in positive degrees clockwise from North (`-1.0` if vertical)
	102–105	f4.1	vertical orientation of sensor, measured in degrees from vertical (90.0° if horizontal)

Table 23. Station block format

Record	Position	Format	Description
1	1–4	a4	`STA2`
	6–14	a9	network identifier
	16–24	f9.5	latitude (°, South is negative)
	26–35	f10.5	longitude (°, West is negative)
	37–48	a12	reference coordinate system (e.g., WGS-84)
	50–54	f5.3	elevation (Km)
	56–60	f5.3	emplacement depth (Km)

Table 24. Waveform data block format

Record	Position	Format	Description
1	1–4	a4	DAT2
2–n (data)	1–1024 variable	i, a, or f	data values

Table 25. Checksum block format

Record	Position	Format	Description
1 (data)	1–4	a4	CHK2
	6–13	i8	checksum

The WID2 block gives the following information:

- date and time of the first data sample
- station, channel, and auxiliary codes
- subformat of the data
- number of samples and sample rate
- calibration of the instrument represented as the number of nanometres per digital count at the calibration period
- type of instrument
- horizontal and vertical orientation of the instrument

The auxiliary code will be blank in most cases; the code is only used when two data streams with the same station and channel codes conflict. Instrument response information must be obtained separately using a RESPONSE request.

Data following the DAT2 block may be in any of four different subformats recognized in the IMS2.0 waveform format: int, cm6, cm8, and csf. int in a simple ASCII subformat; the cm6 and cm8 subformats are for compressed data, and the csf subformat is for authenticated data. All of the IMS2.0 formats represent the numbers as integers.

A checksum must be computed for the waveform data in the IMS2.0 waveform format. The checksum is computed from integer data values prior to converting them to any of the subformats. A Fortran and a C subroutines for computing CHK2 checksum can be found in Appendix III "Computer code for CHK2 checksum" on p. 383. To prevent overflow, the checksum is computed modulo 100,000,000 and stored as an eight-digit integer without a sign.

The line length limits for messages are enforced for the IMS2.0 data formats; no line may be longer than 1,024 bytes. The line continuation character (\) is not used in waveform data lines.

Examples of the cm6 and int subformats of the WAVEFORM data message are provided in section I.39 "STATION" on p. 357 and section I.42 "WAVEFORM (IMS2.0:int format)" on p. 358.

Using the OUT2 and DLY2 blocks, the WAVEFORM data type can also be used to respond that no data are available for a request or that the response to the request will be delayed. Table 26 shows how the blocks are used (see also Table 27 and Table 28). In addition, the STA2 block contains station information. This block is mandatory and must immediately follow the WID2, OUT2, and DLY2 blocks.

Table 26. Applicable blocks for waveform messages

	Blocks							
Waveform message	**WID2**	**OUT2**	**DLY2**	**STA2**	**EID2**	**BEA2**	**DAT2**	**CHK2**
waveform data message	r			r	o	o	r	r
no data message		r		r				
data delayed message			r	r				

r = required, o = optional

Table 27. OUT2 block format

Record	Position	Format	Description
1	1–4	a4	OUT2
	6–15	i4,a1,i2,a1,i2	date of the first missing sample (*yyyy/mm/dd*)
	17–28	i2,a1,i2,a1,f6.3	time of the first missing sample (*hh:mm:ss.sss*)
	30–34	a5	station code
	36–38	a3	FDSN channel code
	40–43	a4	auxiliary identification code
	45–55	f11.3	duration that data are unavailable (seconds)

Table 28. DLY2 block format

Record	Position	Format	Description
1	1–4	a4	DLY2
	6–15	i4,a1,i2,a1,i2	date of the first delayed sample (*yyyy/mm/dd*)
	17–28	i2,a1,i2,a1,f6.3	time of the first delayed sample (*hh:mm:ss.sss*)
	30–34	a5	station code
	36–38	a3	FDSN channel code
	40–43	a4	auxiliary identification code
	45–55	f11.3	estimated duration of queue (seconds)

The optional EID2 block specifies to which event(s) a waveform is associated (see Table 29). This block is used when waveforms are requested from a bulletin with the RELATIVE_TO environment. The EID2 block may be repeated for each event to which a waveform is associated.

Table 29. EID2 block format

Record	Position	Format	Description
1	1–4	a4	EID2
	6–13	a8	event identification of associated event
	15–23	a9	bulletin type

The optional BEA2 block specifies how a beamed waveform was formed (see Table 30). This block is only used when the waveform is the result of beaming.

Table 30. BEA2 block format

Record	Position	Format	Description
1	1–4	a4	BEA2
	6–17	a12	beam identification for the waveform
	19–23	f5.1	azimuth used to steer the beam (measured in positive degrees clockwise from North)
	25–29	f5.1	slowness used to steer the beam (s/deg, `-999.0`, if vertical beam)

6.3.2.1 Subformat INT

The INT waveform subformat represents integer data as blank or newline delimited ASCII characters. The number of blank spaces between samples is unspecified, and an individual sample value may not be continued on the next line.

6.3.2.2 Waveform compression schemes

Two different compression schemes are used in the IMS2.0 standard: CM6 and CM8. IMS2.0 waveform formats, however, include the CM6 subformat and a subformat for signed data (CSF) based on the continuous data format for channel subframes.

For waveform data, the difference between data samples is usually much smaller than the instantaneous magnitudes. The difference of the differences (the second difference) is even smaller. Transmitting the second difference requires fewer significant bits. Reductions in the message length can be achieved if the number of bits to convey the information is reduced when the signal level is small and expanded when the signal level rises. Because samples will take a variable number of bits, an index is required to specify the number of bits in each sample.

Both compression schemes use second differences as a first step in reducing the number of significant bits required to convey the information in the time series. A first difference is computed as the difference between successive samples. A second difference is the difference between the differences. The first value in both steps keeps its absolute value (see the following sections).

The following paragraphs describe the compression schemes to reduce the number of bits and/or to make transmission easy.

6.3.2.3 Subformat CM6

The CM6 compression scheme is a six-bit compression of second differences. The advantage of this method is in its conversion of binary integer data to ASCII characters that can be successfully transmitted using email. The compression algorithm converts waveforms into a set of printable ASCII characters carefully avoiding those that have been found to cause problems to either communications circuits or the computers connected to them. The algorithm uses only the 64 characters +, −, 0–9, A–Z and a–z.

Initially, all data samples in the packet are represented as 32-bit, 2's complement integers, with a range of $-(2^{31})$ to $2^{31}-1$. Second difference samples are encoded as the difference between the first differences and can be computed for the j-th sample using the following formula.

$$D_2(j) = S(j) - 2S(j-1) + S(j-2) \tag{1}$$

where zero and negative indices are ignored. Thus, the second difference data for N samples are as follows:

$$S(1), S(2) - 2S(1), S(3) - 2S(2) + S(1), \ldots, S(N) - 2S(N-1) + S(N-2) \tag{2}$$

To compress the numbers, the second differences are converted from 2's complement to sign and magnitude. These numbers are then fit into a variable number of bytes in which only the six Most Significant Bits (MSBs) are used. The most significant usable bit of each byte is used as a flag or control bit, which, if set, signifies that the following byte also contains information relating to the same sample. The second MSB is used as a sign bit in the first byte pertaining to a sample and as a data bit in all following bytes of the sample. All other bits are used to represent the value of the second difference of the sample. These numbers are then fit into a variable number of bytes in which only the six MSBs are used (see Table 31).

Table 31. Bit positions for CM6

MSB							LSB
control	sign/data	data	data	data	data	unused	unused

These six-bit bytes are then used to refer to a lookup table (Table 32) from which one of 64 different ASCII characters (+, −, 0–9, A–Z, a–z) is extracted.

Table 32. ASCII representation of bit patterns for CM6

Bit pattern	Char	Bit pattern	Char
000000	+	100000	U
000001	–	100001	V
000010	0	100010	W
000011	1	100011	X
000100	2	100100	Y
000101	3	100101	Z
000110	4	100110	a
000111	5	100111	b
001000	6	101000	c
001001	7	101001	d

Continues on next page

Table 32. ASCII representation of bit patterns for CM6 (cont.)

Bit pattern	Char	Bit pattern	Char
001010	8	101010	e
001011	9	101011	f
001100	A	101100	g
001101	B	101101	h
001110	C	101110	i
001111	D	101111	j
010000	E	110000	k
010001	F	110001	l
010010	G	110010	m
010011	H	110011	n
010100	I	110100	o
010101	J	110101	p
010110	K	110110	q
010111	L	110111	r
011000	M	111000	s
011001	N	111001	t
011010	O	111010	u
011011	P	111011	v
011100	Q	111100	w
011101	R	111101	x
011110	S	111110	y
011111	T	111111	z

6.3.2.4 Subformat CM8

The CM8 subformat is similar to the CM6 subformat. The same algorithm is used, but the compression is more efficient than the 6-bit subformat because all bits are used. The 8-bit scheme is a binary format that cannot be transmitted using email; FTP must be used.

The second-difference integers are first converted from 2's complement to sign and magnitude. These numbers are then fit into a variable number of bytes in which all eight significant bits are used. The most significant usable bit of each byte is used as a flag or control bit, which, if set, is used to signify that the following byte also contains information relating to the same sample. The second most significant bit is used as a sign bit in the first byte pertaining to a sample and as data in all following bytes. All other bits are used to represent the value of the second difference (Table 33).

Table 33. Bit positions for CM8

MSB	LSB

control	sign/data	data	data	data	data	data	data

6.3.2.5 Subformat CSF

Waveform data that have been signed for data verification must contain the raw data that were authenticated along with the digital signatures. To deliver the data as authenticated at the station (or sensor), the incoming continuous data format for channel subframes (see SAIC (1999)) must be used. To send the channel subframes in an email message, the sequence of channel subframes are sent as base-64 representation of the binary data.

6.4 Processing products

Data types used for the processing products include the results of the various stages of S/H/I processing from arrivals through events.

6.4.1 ARRIVAL

The ARRIVAL data types are divided into five subtypes (AUTOMATIC, REVIEWED, GROUPED, ASSOCIATED, and UNASSOCIATED) to reflect the different processing stages.

Automatic arrivals

The AUTOMATIC subtype provides the result of a detection process run on waveforms. The format for the AUTOMATIC data subtype are given in Table 34, and an example is provided in subsection I.4.2 "ARRIVAL:AUTOMATIC" on p. 285.

Table 34. Automatic arrival format

Record	Position	Format	Description
1 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	17–22	a6	`BeamID`
	33–36	a4	`Date`
	44–47	a4	`Time`
	54–58	a5	`Phase`
	64–67	a4	`Azim`
	70–73	a4	`Slow`
	77–79	a3	`SNR`
	87–89	a3	`Amp`

Continues on next page

Table 34. Automatic arrival format (cont.)

Record	Position	Format	Description
	93–95	a3	`Per`
	99–101	a3	`STA`
	105–107	a3	`Dur`
	109–114	a6	`Author`
	122–126	a5	`DetID`
2–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–28	a12	beam identifier
	30–39	i4,a1,i2,a1,i2	detection date (*yyyy/mm/dd*)
	41–52	i2,a1,i2,a1,f6.3	detection time (*hh:mm:ss.sss*)
	54–61	a8	preliminary phase code
	63–67	f5.1	observed azimuth (°)
	69–73	f5.1	observed slowness (s/deg)
	75–79	f5.1	signal-to-noise ratio
	81–89	f9.1	amplitude (nm)
	91–95	f5.2	period (seconds)
	97–101	f5.1	short-term average
	103–107	f5.1	detection duration (seconds)
	109–117	a9	author of the detection
	119–127	a9	detection identifier

Reviewed arrivals

The REVIEWED subtype is used for arrivals that have been reviewed and assigned phase names. Phase names are not expected to have been verified by location. Table 35 gives the format for the REVIEWED data subtype, and an example is provided in subsection I.4.4 “ARRIVAL:REVIEWED” on p. 286.

Table 35. Reviewed arrival format

Record	Position	Format	Description
1 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	16–19	a4	`Chan`
	22–24	a3	`Aux`
	30–33	a4	`Date`
	40–43	a4	`Time`
	50–54	a5	`Phase`
	60–63	a4	`Azim`

Continues on next page

Table 35. Reviewed arrival format (cont.)

Record	Position	Format	Description
	66–69	a4	`Slow`
	73–75	a3	`SNR`
	83–85	a3	`Amp`
	89–91	a3	`Per`
	93–96	a4	`Qual`
	98–103	a6	`Author`
	110–114	a5	`ArrID`
2–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–19	a3	FDSN channel code
	21–24	a4	auxiliary identification code
	26–35	i4,a1,i2,a1,i2	arrival date (*yyyy/mm/dd*)
	37–48	i2,a1,i2,a1,f6.3	arrival time (*hh:mm:ss.sss*)
	50–57	a8	phase code
	59–63	f5.1	observed azimuth (°)
	65–69	f5.1	observed slowness (s/deg)
	71–75	f5.1	signal-to-noise ratio
	77–85	f9.1	amplitude (nm)
	87–91	f5.2	period (seconds)
	93–95	a1,a1,a1	type of pick (`a`: automatic, `m`: manual) ; direction of short period motion (`c`: compression, `d`: dilatation, `_`: null); detection character (`i`: impulsive, `e`: emergent, `q`: questionable, `_`: null [see Table 36])
	97–105	a9	author of the arrival
	107–115	a9	arrival identification

Table 36. Detection character from uncertainty

Detection character	Uncertainty for local phases	Uncertainty for regional/teleseismic phases
`i`	< 0.05 sec	< 0.2 sec
`e`	< 0.25 sec	< 1.0 sec
`q`	> 0.25 sec	> 1.0 sec

Grouped arrivals

The GROUPED subtype is used for arrivals that have phase names and have been grouped together, with the implication that they were generated by the same seismic event. Table 37 gives the format for the GROUPED data subtype, and an example is provided in subsection I.4.3 "ARRIVAL:GROUPED" on p. 285.

Table 37. Grouped arrival format

Record	Position	Format	Description
1 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	16–19	a4	`Chan`
	21–23	a3	`Aux`
	29–32	a4	`Date`
	39–42	a4	`Time`
	50–54	a5	`Phase`
	60–63	a4	`Azim`
	66–69	a4	`Slow`
	73–75	a3	`SNR`
	83–85	a3	`Amp`
	89–91	a3	`Per`
	93–96	a4	`Qual`
	100–104	a5	`Group`
	106	a1	`C`
	108–113	a6	`Author`
	121–125	a5	`ArrID`
2–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–19	a3	FDSN channel code
	21–24	a4	auxiliary identification code
	26–35	i4,a1,i2,a1,i2	arrival date ($yyyy/mm/dd$)
	37–48	i2,a1,i2,a1,f6.3	arrival time ($hh:mm:ss.sss$)
	50–57	a8	phase code
	59–63	f5.1	observed azimuth (°)
	65–69	f5.1	observed slowness (s/deg)
	71–75	f5.1	signal-to-noise ratio
	77–85	f9.1	amplitude (nm)
	87–91	f5.2	period (seconds)
	93–95	a1,a1,a1	type of pick; (`a`: automatic, `m`: manual) ; direction of short period motion (`c`: compression, `d`: dilatation, `_`: null); detection character (`i`: impulsive, `e`: emergent, `q`: questionable, `_`: null see Table 36])
	97–104	a8	group identification
	106	i1	conflict flag (number of times an arrival belongs to more than one group; blank if arrival only belongs to one group)

Continues on next page

Table 37. Grouped arrival format (cont.)

Record	Position	Format	Description
	108–116	a9	author of the arrival
	118–126	a9	arrival identification

Associated arrivals

The ASSOCIATED subtype is used for arrivals that have been run through a location program and have formed a seismic event. If multiple magnitude measurements have been made on an arrival, the subsequent magnitudes will appear on lines immediately after the arrival. Table 38 gives the format for the ASSOCIATED data subtype, and an example is provided in subsection I.4.2 "ARRIVAL:AUTOMATIC" on p. 285.

Table 38. Associated arrival format

Record	Position	Format	Description
1 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	19–22	a4	`Dist`
	25–28	a4	`EvAz`
	34–38	a5	`Phase`
	41–44	a4	`Date`
	53–56	a4	`Time`
	64–67	a4	`TRes`
	70–73	a4	`Azim`
	75–79	a5	`AzRes`
	82–85	a4	`Slow`
	88–91	a4	`SRes`
	93–95	a3	`Def`
	99–101	a3	`SNR`
	109–111	a3	`Amp`
	115–117	a3	`Per`
	119–122	a4	`Qual`
	124–132	a9	`Magnitude`
	136–141	a6	`OrigID`
	143–148	a6	`Author`
	156–160	a5	`ArrID`
2–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–22	f6.2	station to event distance (deg)
	24–28	f5.1	event to station azimuth (°)

Continues on next page

Table 38. Associated arrival format (cont.)

Record	Position	Format	Description
	30–37	a8	phase code
	39–48	i4,a1,i2,a1,i2	arrival date (*yyyy/mm/dd*)
	50–61	i2,a1,i2,a1,f6.3	arrival time (*hh:mm:ss.sss*)
	63–67	f5.1	time residual (seconds)
	69–73	f5.1	observed backazimuth (°)
	75–79	f5.1	azimuth residual (°)
	81–85	f5.1	observed slowness (s/deg)
	87–91	f5.1	slowness residual (s/deg)
	93–95	a1,a1,a1	time defining flag (T or _), azimuth defining flag (A or _), slowness defining flag (S or _)
	97–101	f5.1	signal-to-noise ratio
	103–111	f9.1	amplitude (nanometres)
	113–117	f5.2	period (seconds)
	119–121	a1,a1,a1	type of pick (a: automatic, m: manual) ; direction of short period motion (c: compression, d: dilatation, _: null); detection character (i: impulsive, e: emergent, q: questionable, _: null [see Table 36])
	123–127	a5	magnitude type (mb, Ms, ML, mbmle, msmle)
	128	a1	min max indicator (<, >, or blank)
	129–132	f4.1	magnitude value
	134–141	a8	origin identification
	143–151	a9	author of the arrival
	153–161	a9	arrival identification

Unassociated arrivals

The UNASSOCIATED subtype is used for arrivals that have been detected and reviewed, but have not been not associated with a seismic origin. The format of the UNASSOCIATED subtype line is the same as the format for the AUTOMATIC subtype as shown in Table 34. An example is provided in subsection I.4.5 "ARRIVAL:UNASSOCIATED" on p. 286.

6.4.2 BULLETIN

Bulletins are composed of origin and arrival information. The information is provided in a series of data blocks as shown in Table 39[1]bulletin title block (Table 40), event title block (Table 41), origin block (Table 42), phase block[2] (Table 43), event screening block (Table 44),

[1] The International Seismological Centre (1999) defines additional block formats including effects and reference.
[2] *IASPEI Seismic Format (ISF)* (1999) defines a phase information sub-block to compliment the phase block.

and event characterization arrival block (Table 45). The verbosity of a bulletin can be controlled by specifying the subformat, which can be SHORT or LONG. The default is SHORT.

The BULL_TYPE environment and the subformat control the blocks of information that appear in a bulletin. Table 39 lists the blocks that are included for each BULL_TYPE and subformat.

A BULLETIN data message contains one bulletin title block and one set of the other block types for each event. The blocks in a BULLETIN data message appear in the order given in Table 39. Examples of the SHORT and LONG subformats for bulletins are provided in section I.7 "BULLETIN (IMS2.0:short format)" on p. 289 and section I.8 "BULLETIN (IMS2.0:long Format)" on p. 290.

Table 39. Blocks used in bulletin formats

	SEL1, SEL2, SEL3, REB subformats		SEB, SSEB, NEB, NSEB subformats	
Block name	**short**	**long**	**short**	**long**
bulletin title block	r	r	r	r
event title block	r	r	r	r
origin block	r	r	r	r
phase block	r	r	r	r
phase correction block		r		r
event screening block			r	r
event characterization arrival block				r

Table 40. Bulletin title block format

Record	Position	Format	Description
1	1–136	a136	bulletin title

Table 41. Event title block format

Record	Position	Format	Description
1	1–5	a5	`EVENT`
	7–15	a9	event identification
	17–80	a64	geographic region

Table 42. Origin block format

Record	Position	Format	Description
Origin sub-block			
1 (header)	4–7	a4	`Date`
	15–18	a4	`Time`

Continues on next page

Table 42. Origin block format (cont.)

Record	Position	Format	Description
	27–29	a3	`Err`
	33–35	a3	`RMS`
	37–44	a8	`Latitude`
	46–54	a9	`Longitude`
	57–60	a4	`Smaj`
	63–66	a4	`Smin`
	69–70	a2	`Az`
	72–76	a5	`Depth`
	80–82	a3	`Err`
	84–87	a4	`Ndef`
	89–92	a4	`Nsta`
	94–96	a3	`Gap`
	99–103	a5	`mdist`
	106–110	a5	`Mdist`
	112–115	a4	`Qual`
	119–124	a6	`Author`
	131–136	a6	`OrigID`
2–n (data)	1–10	i4,a1,i2,a1,i2	epicentre date (*yyyy/mm/dd*)
	12–22	i2,a1,i2,a1,f5.2	epicentre time (*hh:mm:ss.ss*)
	23	a1	fixed flag (`f`: fixed origin time solution, blank if not a fixed origin time)
	25–29	f5.2	origin time error (seconds; blank if fixed origin time)
	31–35	f5.2	root mean square of time residuals (seconds)
	37–44	f8.4	latitude (negative for South)
	46–54	f9.4	longitude (negative for West)
	55	a1	fixed flag (`f`: fixed epicentre solution, blank if not a fixed epicentre solution)
	56–60	f5.1	semi-major axis of 90% ellipse or its estimate (Km, blank if fixed epicentre)
	62–66	f5.1	semi-minor axis of 90% ellipse or its estimate (Km, blank if fixed epicentre)
	68–70	i3	strike ($0 \leq x < 360$) of error ellipse clockwise from North (°)
	72–76	f5.1	depth (Km)
	77	a1	fixed flag (`f`: fixed depth station, `d`: depth phases, blank if not a fixed depth)
	79–82	f4.1	depth error 90% (Km; blank if fixed depth)
	84–87	i4	number of defining phases
	89–92	i4	number of defining stations
	94–96	i3	gap in azimuth coverage (°)

Continues on next page

Table 42. Origin block format (cont.)

Record	Position	Format	Description
	98–103	f6.2	distance to closest station (deg)
	105–110	f6.2	distance to furthest station (deg)
	112	a1	analysis type: (a: automatic, m: manual, g: guess)
	114	a1	location method: (i: inversion, p: pattern recognition, g: ground truth, o: other)
	116–117	a2	event type: ke: known earthquake, ki: known induced event, km: known mine explosion, kn: known nuclear explosion, kr: known rock burst, kx: known experimental explosion, ls: landslide, se: suspected earthquake, si: suspected induced event, sm: suspected mine explosion, sn: suspected nuclear explosion, sr: suspected rock burst, sx: suspected experimental explosion, uk: unknown
	119–127	a9	author of the origin
	129–136	a8	origin identification
Magnitude sub-block			
1 (header)	1–9	a9	Magnitude
	12–14	a3	Err
	16–19	a4	Nsta
	21–26	a6	Author
	33–38	a6	OrigID
2–n (data)	1–5	a5	magnitude type (e.g., mb, Ms, ML, mbmle, msmle)
	6	a1	min max indicator (<, >, or blank)
	7–10	f4.1	magnitude value
	12–14	f3.1	standard magnitude error
	16–19	i4	number of stations used to calculate magnitude
	21–29	a9	author of the origin
	31–38	a8	origin identification
Comment sub-block			
1	2	a1	(
	3–m	a{m-2}	comment
	m+1	a1	)

Table 43. Phase block format

Record	Position	Format	Description
1 (header)	1–3	a3	`Sta`
	9–12	a4	`Dist`
	15–18	a4	`EvAz`
	20–24	a5	`Phase`
	33–36	a4	`Time`
	43–46	a4	`TRes`
	49–52	a4	`Azim`
	54–58	a5	`AzRes`
	62–65	a4	`Slow`
	69–72	a4	`SRes`
	74–76	a3	`Def`
	80–82	a3	`SNR`
	90–92	a3	`Amp`
	96–98	a3	`Per`
	100–103	a4	`Qual`
	105–113	a9	`Magnitude`
	118–122	a5	`ArrID`
2–n (data)	1–5	a5	station code
	7–12	f6.2	station-to-event distance (deg)
	14–18	f5.1	event-to-station azimuth (°)
	20–27	a8	phase code
	29–40	i2,a1,i2,a1,f6.3	arrival time (*hh*:*mm*:*ss*.*sss*)
	42–46	f5.1	time residual (seconds)
	48–52	f5.1	observed azimuth (°)
	54–58	f5.1	azimuth residual (°)
	60–65	f6.1	observed slowness (s/deg)
	67–72	f6.1	slowness residual (s/deg)
	74–76	a1,a1,a1	time defining flag (`T` or `_`), azimuth defining flag (`A` or `_`), slowness defining flag (`S` or `_`)
	78–82	f5.1	signal-to-noise ratio
	84–92	f9.1	amplitude (nm)
	94–98	f5.2	period (s)
	100–102	a1,a1,a1	type of pick (`a`: automatic, `m`: manual); direction of short period motion (`c`: compression, `d`: dilatation, `_`: null); onset quality (`i`: impulsive, `e`: emergent, `q`: questionable, `_`: null)
	104–108	a5	magnitude type (e.g., `mb`, `Ms`, `ML`, `mbmle`, `msmle`)
	109	a1	min max indicator (<, >, or blank)

Continues on next page

Table 43. Phase block format (cont.)

Record	Position	Format	Description
	110–113	f4.1	magnitude value
	115–123	a9	arrival identification

The format of the EVENT SCREENING block follows in Table 44. The block has been extended to include station-specific hydroacoustic and regional measurements. In the table, assume n: number of hydro measurement stations, m: number of regional measurement stations.

Table 44. Event screening block format

Record	Position	Format	Description
Event screening summary sub-block			
1 (title)	1–15	a15	`EVENT SCREENING`
2 (header)	1–8	a8	`Category`
	11–15	a5	`Score`
	17–22	a6	`Dscore`
	24–29	a6	`Mscore`
	31–36	a6	`Rscore`
	38–43	a6	`Hscore`
	45–51	a7	`Smaj_sc`
	53–59	a7	`Smin_sc`
	61–65	a5	`Depth`
	68–71	a4	`Sdep`
	74–77	a4	`mbms`
	79–83	a5	`Smbms`
	91–96	a6	`Foffsh`
	98–102	a5	`MinWD`
	104–106	a3	`Clr`
3 (data)	1–2	a2	screening category: `NC`: not considered, `IS`: insufficient data, `NS` not screened out, `SO`: screened out
	3	a1	`/`
	4–8	a5	`Offsh`: Offshore, `Onsh`: Onshore, `Mixed`: Mixed onshore and offshore
	10–15	f6.2	combined screening score
	17–22	f6.2	depth screening score
	24–29	f6.2	$Am_b - M_S$ screening score
	31–36	f6.2	regional seismic score
	38–43	f6.2	hydroacoustic screening score
	45–51	f7.1	scaled semi-major axis of location error ellipse
	53–59	f7.1	scaled semi-minor axis of location error ellipse
	61–65	f5.1	depth estimate (Km)

Continues on next page

Table 44. Event screening block format (cont.)

Record	Position	Format	Description
	67–71	f5.1	depth confidence interval (Km)
	73–77	f5.2	$Am_b - M_S$ (including slope term, A)
	79–83	f5.2	$Am_b - M_S$ confidence interval
	93–96	f4.2	fraction of scaled location error ellipse offshore
	98–102	f5.0	minimum water depth in scaled error ellipse
	106	i1	clear path flag for hydroacoustic signal(s) (clear = `1`, not clear = `0`)
4			(blank line)
Hydroacoustic screening sub-block			
1 (title)	1–23	a23	`HYDROACOUSTIC SCREENING`
2 (header)	1–3	a3	`sta`
	8–11	a4	`cps8`
	15–18	a4	`snr7`
	22–25	a4	`noi7`
3–n (data)	1–5	a5	station name
	8–13	f6.2	cepstral peak from band 8 (2–80 Hz)
	15–20	f6.2	SNR of hydroacoustic total energy measurement
	22–27	f6.2	noise of hydroacoustic total energy measurement
n+1			(blank line)
Regional screening sub-block			
1 (title)	1–18	a18	`REGIONAL SCREENING`
2 (header)	1–3	a3	`sta`
	8–13	a6	`pnsmax`
	17–20	a4	`corr`
	25–27	a3	`err`
3–n (data)	1–5	a5	station name
	8–13	f6.2	pnsmax value in the 6–8 Hz band
	15–20	f6.2	pnsmax correction value in the 6–8 Hz band
	22–27	f6.2	pnsmax error estimate in the 6–8 Hz band
n+1			(blank line)

Table 45. Event characterization arrival block format

Record	Position	Format	Description
Cepstral peak analysis sub-block			
1 (title)	1–22	a22	`CEPSTRAL PEAK ANALYSIS`
2 (header)	1–3	a3	`Sta`
	8–14	a7	`PeakAmp`
	16–23	a8	`PeakQuef`

Continues on next page

Table 45. Event characterization arrival block format (cont.)

Record	Position	Format	Description
3–n (data)	1–5	a5	station code
	8–14	f7.5	peak amplitude
	16–23	f8.4	peak quefrency
Energy ratio sub-block			
1 (title)	1–37	a37	`SHORT-PERIOD/LONG-PERIOD ENERGY RATIO`
2 (header)	1–3	a3	`Sta`
	13–17	a5	`Ratio`
3–n (data)	1–5	a5	station code
	8–17	f10.8	short-period/long-period energy ratio
Frequency-dependent phase amplitude sub-block			
1 (title)	1–41	a41	`FREQUENCY-DEPENDENT PHASE AMPLITUDE BLOCK`
	44–46	i3	block number (ith block)
	48–49	a2	`of`
	51–53	i3	total number of frequency-dependent phase amplitude sub-blocks
2 (header)	1–3	a3	`Sta`
	7–11	a5	`Phase`
	18–20	a3	`Amp`
	28–30	a3	`SNR`
	38–40	a3	`Amp`
	48–50	a3	`SNR`
	58–60	a3	`Amp`
	68–70	a3	`SNR`
	78–80	a3	`Amp`
	88–90	a3	`SNR`
3 (header)	17–22	f6.1	min(FreqBand(i-1)*4+1)
	24–25	a2	`to`
	27–32	f6.1	max(FreqBand(i-1)*4+1)
	37–42	f6.1	min(FreqBand(i-1)*4+2)
	44–45	a2	`to`
	47–52	f6.1	max(FreqBand(i-1)*4+2)
	57–62	f6.1	min(FreqBand(i-1)*4+3)
	64–65	a2	`to`
	67–72	f6.1	max(FreqBand(i-1)*4+3)
	77–82	f6.1	min(FreqBand(n-1)*4+4)
	84–85	a2	`to`
	87–92	f6.1	max(FreqBand(n-1)*4+4)
4–n (data)	1–5	a5	station code
	7–10	a8	associated phase (Note: an `!` indicates that reported values are based on predicted values instead of observed values)

Continues on next page

Table 45. Event characterization arrival block format (cont.)

Record	Position	Format	Description
	12–20	f9.1	amplitude in FreqBand(i-1)*4+1
	26–30	f5.1	SNR in FreqBand(i-1)*4+1
	32–40	f9.1	amplitude FreqBand(i-1)*4+2
	46–50	f5.1	SNR in FreqBand(i-1)*4+2
	52–60	f9.1	amplitude in FreqBand(i-1)*4+3
	66–70	f5.1	SNR in FreqBand(i-1)*4+3
	72–80	f9.1	amplitude in FreqBand(i-1)*4+4
	86–90	f5.1	SNR in FreqBand(i-1)*4+4
Spectral variance sub-block			
1 (title)	1–47	a47	`SPECTRAL VARIANCE OF THE DETRENDED LOG SPECTRUM`
2 (header)	1–3	a3	`Sta`
	7–11	a5	`Phase`
	13–19	a7	`MinFreq`
	21–27	a7	`MaxFreq`
	35–41	a7	`SpecVar`
3–n (data)	1–5	a5	station code
	7–11	a5	associated phase
	13–19	f7.2	minimum frequency
	21–27	f7.2	maximum frequency
	30–41	f12.6	spectral variance of detrended log spectrum
Complexity sub-block			
1 (title)	1–10	a10	`COMPLEXITY`
2 (header)	1–3	a3	`Sta`
	7–11	a5	`Phase`
	14–23	a10	`Complexity`
	32–34	a3	`SNR`
3–n (data)	1–5	a5	station code
	7–11	a5	associated phase
	13–23	f11.4	complexity
	25–34	f10.4	SNR of complexity
Third moment of frequency sub-block			
1 (title)	1–25	a25	`THIRD MOMENT of FREQUENCY`
2 (header)	1–3	a3	`Sta`
	12–14	a3	`TMF`
3–n (data)	1–5	a5	station code
	7–14	f8.1	third moment of frequency
Time-frequency sub-block			
1 (title)	1–25	a25	`TIME FREQUENCY PARAMETERS`
2 (header)	1–3	a3	`Sta`

Continues on next page

Table 45. Event characterization arrival block format (cont.)

Record	Position	Format	Description
	9–14	a6	`zavpct`
	20–25	a6	`zavcep`
	31–36	a6	`zavcor`
3–n (data)	1–5	a5	station code
	9–14	f6.4	average ratio of bad points to the total of the vertical component traces
	20–25	f6.1	average maximum value of the 2D cepstrum of the vertical component traces
	31–35	f5.3	average autocorrelation along the time axis across all frequencies excluding randomized points of the vertical component traces

6.4.3 COMMENT

The first line of the COMMENT data type provides a mechanism for associating the comment to a station, arrival, origin, event, and so on. If no association is needed, then this line may be left blank. The comment is written in free format and can be up to 1,024 characters. Table 46 gives the format for the COMMENT data message, and an example is provided in section I.13 “COMMENT” on p. 295.

Table 46. Comment format

Record	Position	Format	Description
1	1–10	a10	identification type (`Station, Arrival, Origin, Event`)
	12–19	a8	identification string of the identification type
2	1–1024	a1024	free-format comment

6.4.4 EVENT

Any S/H/I event can have several estimates of the location, origin time, and size (origins). The format for events places these different origins into separate origin blocks. The bulletin title block at the beginning of the data section must include the name of the bulletin used as the basis for associating the separate origin estimates. The events data messages include:

- one bulletin title block (Table 40)
- *n* origin blocks (Table 42)

An example of an EVENT data message is provided in section I.17 “EVENT” on p. 297

6.4.5 ORIGIN

The ORIGIN data type consists of a number of origin blocks (Table 42). Multiple magnitudes may be given for the same origin. An example of an ORIGIN data message is provided in section I.24 “ORIGIN” on p. 304.

6.5 Status information

Several data types provide status information. Status information is available for authentication, stations, channels, communications, and data availability.

6.5.1 AUTH_STATUS

Some data channels contain authentication signatures that are verified at the IDC. The AUTH_-STATUS data type provides statistics on the authentication process over the time of the report. The first block of the report gives the number of packets tested, the number that passed, and the number that failed by station (Table 47). The second block contains a list of the failures grouped as intervals for each data channel that failed to verify the authentication signature (Table 48). An example of an AUTH_STATUS data message is provided in section I.5 “AUTH_STATUS” on p. 287.

Table 47. Report period block format

Record	Position	Format	Description
1	1–18	a18	`Report period`
	20–29	i4,a1,i2,a1,i2	date (*yyyy*/*mm*/*dd*)
	31–40	i2,a1,i2,a1,f4.1	time (*hh*:*mm*:*ss*.*s*)
	42–43	a2	`to`
	45–54	i4,a1,i2,a1,i2	date (*yyyy*/*mm*/*dd*)
	56–65	i2,a1,i2,a1,f4.1	time (*hh*:*mm*:*ss*.*s*)
2 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	16–19	a4	`Chan`
	21–23	a3	`Aux`
	27–40	a14	`Packets_Tested`
	43–56	a14	`Packets_Failed`
3–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–19	a3	FDSN channel code
	21–24	a4	auxiliary identification code
	22–40	i8	number of packets tested

Continues on next page

Table 47. Report period block format (cont.)

Record	Position	Format	Description
	49–56	i8	number of packets failing verification

Table 48. Authentication list block format

Record	Position	Format	Description
1 (title)	1–23	a23	`Failed Packet Intervals`
2 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	16–19	a4	`Chan`
	21–23	a3	`Aux`
	31–40	a10	`Start_Time`
	55–61	a8	`End_Time`
	71–77	a7	`Comment`
3–n (data)	1–9	a9	network code
	17–19	a3	channel code
	21–24	a4	auxiliary identification code
	26–35	i4,a1,i2,a1,i2	start date of failure interval (*yyyy/mm/dd*)
	37–46	i2,a1,i2,a1,f4.1	start time of failure interval (*hh:mm:ss.s*)
	49–58	i4,a1,i2,a1,i2	end date of failure interval (*yyyy/mm/dd*)
	60–69	i2,a1,i2,a1,f4.1	end time of failure interval (*hh:mm:ss.s*)
	71–132	a62	comment

6.5.2 CHAN_STATUS

The CHAN_STATUS data type gives specific information on the data that have been received at the IDC by station and channel. Detailed statistics on data gaps and timeliness are included (see Table 49).

An example of a CHAN_STATUS data message is provided in section I.12 “CHAN_STATUS” on p. 294.

Table 49. Channel status block format

Record	Position	Format	Description
1	1–18	a18	`Report period from`
	20–29	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	31–40	i2,a1,i2,a1,f4.1	time (*hh:mm:ss.s*)
	42–43	a2	`to`
	45–54	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)

Continues on next page

Table 49. Channel status block format (cont.)

Record	Position	Format	Description
	56–65	i2,a1,i2,a1,f4.1	time (*hh*:*mm*:*ss*.*s*)
2 (title)	1–14	a14	`Channel Status`
3 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	17–20	a4	`Chan`
	22–28	a7	`%_Recvd`
	30–36	a7	`%_AvaUA`
	38–44	a7	`%_Avail`
	47–50	a4	`Gaps`
	54–60	a7	`Samples`
	63–70	a8	`Constant`
	79–82	a4	`Mean`
	92–94	a3	`RMS`
4–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–20	a4	FDSN channel code
	22–28	f7.3	% of data received
	30–36	f7.3	% of data available (unauthenticated)
	38–44	f7.3	% of data available that passed authentication
	46–50	i5	number of data gaps
	52–60	i9	number of samples
	62–70	i9	number of constant values
	72–82	f11.1	mean amplitude (nm)
	84–94	f11.1	root mean square amplitude (nanometres)

6.5.3 COMM_STATUS

Communications status is given over the time interval specified in the TIME or FREQ environments for IMS2.0 or subscription requests, respectively. The report is comprised of a communications statistics block giving the report period and a summary section in which each link is described with statistics of link performance for the reporting period (Table 50). The next block is a list of the link outages for each link (Table 51). The link outages block is included only in the long subformat. An example of a COMM_STATUS data message is provided in section I.14 “COMM_STATUS” on p. 295.

Table 50. Communications statistics block format

Record	Position	Format	Description
1	1–18	a18	`Report period from`

Continues on next page

Table 50. Communications statistics block format (cont.)

Record	Position	Format	Description
	20–29	i4,a1,i2,a1,i2	start date (*yyyy/mm/dd*)
	31–40	i2,a1,i2,a1,f4.1	start time (*hh:mm:ss.s*)
	42–43	a2	`to`
	45–54	i4,a1,i2,a1,i2	end date (*yyyy/mm/dd*)
	56–65	i2,a1,i2,a1,f4.1	end time (*hh:mm:ss.s*)
2 (header)	1–4	a4	`Link`
	22–29	a8	`Nom_kbps`
	32–35	a4	`Mode`
	38–41	a4	`%_up`
	44–47	a4	`From`
	54–57	a4	`Util`
	60–63	a4	`From`
	70–73	a4	`Util`
3–n (data)	1–9	a9	link code (farthest from IDC)
	11	a1	-
	13–21	a9	link code (closest to IDC)
	24–29	f6.1	nominal speed of link in Kbps
	32–35	a4	full for full-duplex or half for half-duplex
	37–41	f5.1	% uptime
	44–52	a9	link code (farthest from IDC)
	54–57	f4.2	use of link (dat_rate/speed)
	60–68	a9	link code (closest to IDC)
	70–73	f4.2	use of link (dat_rate/speed)

Table 51. Communications outage block format

Record	Position	Format	Description
1 (title)	1–9	a8	link code (farthest from IDC)
	11	a1	-
	13–21	a9	link code (closest to IDC)
	23–34	a12	`link outages`
2 (header)	10–13	a4	`From`
	30–36	a7	`Through`
	50–57	a8	`Duration`
3–n (data)	1–10	i4,a1,i2,a1,i2	date of beginning of outage (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	time of beginning of outage (*hh:mm:ss.s*)
	24–33	i4,a1,i2,a1,i2	date of end of outage (*yyyy/mm/dd*)
	35–44	i2,a1,i2,a1,f4.1	time of end of outage (*hh:mm:ss.s*)
	47–60	i3,a1,i2,a1,i2,a1,f4.1	duration of outage (*ddd hh:mm:ss.ss*)

6.5.4 OUTAGE

The OUTAGE data type provides information on the dates and times of data gaps. Table 52 gives the format for the OUTAGE data message, and an example is provided in section I.25 “OUTAGE” on p. 305.

Table 52. Outage format

Record	Position	Format	Description
1 (title)	1–18	a18	`Report period from`
	20–29	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	31–42	i2,a1,i2,a1,f6.3	time (*hh:mm:ss.sss*)
	44–45	a2	`to`
	47–56	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	58–67	i2,a1,i2,a1,f6.3	time (*hh:mm:ss.sss*)
2 (header)	1–3	a3	`Net`
	11–13	a3	`Sta`
	16–19	a4	`Chan`
	21–23	a3	`Aux`
	30–44	a15	`Start Date Time`
	55–67	a13	`End Date Time`
	76–83	a8	`Duration`
	85–91	a7	`Comment`
3–n (data)	1–9	a9	network code
	11–15	a5	station code
	17–19	a3	FDSN channel code
	21–24	a4	auxiliary identification code
	26–35	i4,a1,i2,a1,i2	date of last sample before outage interval or start date of report period†
	37–48	i2,a1,i2,a1,f6.3	time of last sample before outage interval
	50–59	i4,a1,i2,a1,i2	date of first sample after outage interval‡
	61–72	i2,a1,i2,a1,f6.3	time of first sample after outage interval or end time of the report period
	74–83	f10.3	duration of interval (seconds)
	85–132	a48	comment

† Time of last available sample preceding the outage or the start time of the report period.

‡ Time of first available sample after the outage or the end time of the report period.

6.5.5 STA_STATUS

Station status is given over the time interval specified in the TIME or FREQ environments for IMS2.0 or subscription requests, respectively. The report is comprised of statistics that can be used to evaluate the overall performance of one or more stations. The first record of the report gives the report period.

The status records give the station code, the maximum data time (the cumulative amount of time for which data are expected for this station), followed by the station capability entries for the minimum set of channels necessary to maintain mission capability as well as for the geophysical channels. Definitions for the statistics can be found in the Operational Manual for the International Data Centre (PrepCom, 2020). Table 53 gives the station status format, and an example is provided in section I.39 “STATION” on p. 357.

Table 53. STA_STATUS format

Record	Position	Format	Description
1	1–18	a18	`Report period from`
	20–29	i4,a1,i2,a1,i2	start date (*yyyy*/*mm*/*dd*)
	31–40	i2,a1,i2,a1,f4.1	start time (*hh*:*mm*:*ss*.*s*)
	42–43	a2	`to`
	45–54	i4,a1,i2,a1,i2	end date (*yyyy*/*mm*/*dd*)
	56–65	i2,a1,i2,a1,f4.1	end time (*hh*:*mm*:*ss*.*s*)
2 (title)	1–14	a14	`Station Status`
3 (header)	1–3	a3	`Sta`
	7–18	a12	`Max_Exp_Time`
	21–67	a47	`__________ Minimum Channels ___________`
	69–115	a46	`________ Geophysical Channels _________`
4 (header)	26–63	a38	`Data Timely Data Mission`
	74–109	a36	`Data Data Data`
5 (header)	22–66	a45	`Availability Availability Capability (%)`
	70–113	a44	`Received (%) Availability Availability`
6 (header)	27–45	a19	`(%) (%)`
	85–109	a25	`Unauthenticated (%)`
7 (header)	91–93	a3	`(%)`
8–n (data)	1–5	a5	station code
	7–19	i4,a1,i2,a1,i2,a1,i2	maximum data time possible (*dddd* *hh*:*mm*:*ss*.*s*)
	25–31	f7.3	data availability of the minimum channels (% of report period)
	41–47	f7.3	timely data availability of the minimum channels (% of report period)
	57–63	f7.3	mission capability of the minimum channels (% of report period)
	73–79	f7.3	data received percentage of the geophysical channels (% of report period)
	89–95	f7.3	data availability (unauthenticated) of the geophysical channels (% of report period)

Continues on next page

Table 53. STA_STATUS format (cont.)

Record	Position	Format	Description
	105–111	f7.3	data availability of the geophysical channels (% of report period)

6.6 Logs

LOG data types are used primarily as administrative messages.

6.6.1 ERROR_LOG

The ERROR_LOG data type are reserved for responses to request messages that contain errors. Specific formats have not been defined at this time, although the request message can be given with the line or lines causing the error identified. The information is provided in free-format comment lines in which the first character is blank. An example of an ERROR_LOG is provided in section I.16 "ERROR_LOG" on p. 296.

6.6.2 LOG

The LOG data type includes free-format comment lines in which the first character of the line is blank. The exact content of the logs is unspecified. An example of a LOG data message is provided in section I.21 "LOG" on p. 302.

7

Radionuclide messages

This chapter describes the radionuclide message formats and includes the following sections:

7.1 Introduction

IMS2.0 data formats provide a common format for IMS data and IDC product exchange. Many different types of radionuclide data and products may be exchanged using the message formats described herein.

Radionuclide messages can be generated at a radionuclide station, a certified laboratory, or at the Provisional Technical Secretariat (PTS). Data types for radionuclide messages and their sources are described in Table 54, Table 55 and Table 56. Descriptions of formats for each data type are included in this chapter. Examples of each data type can be found in Appendix I.

Table 54. IMS Data types for radionuclide messages from stations

Data type	Data message	Section	Msg type
ALERT_FLOW	airflow alert	alert	D
ALERT_SYSTEM	system alert	alert	D
ALERT_TEMP	temperature alert	alert	D
ALERT_UPS	power supply alert	alert	D
BLANKPHD	blank spectrum	Pulse Height Data	D
CALIBPHD	calibration spectrum	Pulse Height Data	D
DETBKPHD	detector background spectrum	Pulse Height Data	D
GASBKPHD	gas background spectrum	Pulse Height Data	D
MET	Meteorological data	Meteorological data	D
QCPHD	quality control spectrum	Pulse Height Data	D
RMSSOH	State of Health data	State of Health	D
SAMPLEPHD	sample spectrum	Pulse Height Data	D
SPIKEPHD	spike spectrum	Pulse Height Data	D

D: Data message type

Table 55. IMS Data types for radionuclide messages from laboratories

Data type	Data message	Section	Msg type
ADDINS	request for additional instructions	other laboratory messages	L
BLANKPHD	blank spectrum	Pulse Height Data	D
CALIBPHD	calibration spectrum	Pulse Height Data	D
DETBKPHD	detector background spectrum	Pulse Height Data	D
RLR	Radionuclide Laboratory Report	Radionuclide Laboratory Reports	D
MESACK	Message Receipt Acknowledgement	other laboratory messages	L
MISC	message does not fit any other type	other laboratory messages	L
QCPHD	quality control spectrum	Pulse Height Data	D
SAMACK	Sample Receipt Acknowledgement	other laboratory messages	L
SAMPLEPHD	sample spectrum	Pulse Height Data	D
TECSDN	sample dispatch notification to the PTS	other laboratory messages	L

D: data, L: lab data message type

Table 56. Data types of IMS data and IDC products for radionuclide messages from the PTS

Data type	Data message	Principal recipient	Section
ADDINS	Additional instructions	Laboratory	Other laboratory messages [L]

Continues on next page

Table 56. Data types for radionuclide messages from the PTS (cont.)

Data type	Data message	Principal recipient	Section
ARR	Automated Radionuclide Report	States Signatories	IDC Product [D]
DATREQ	Request for missing report or other information	Laboratory	Other Laboratory Messages [L]
LABSDN	Laboratory Sample Dispatch Notification	Laboratory	Other Laboratory Messages [L]
MISC	Message does not fit any other type	Laboratory	Other Laboratory Messages [L]
PRESDN	Preliminary Sample Dispatch Notification	Laboratory	Other Laboratory Messages [L]
RNPS	Radionuclide Network Product Summary	States Signatories	IDC Product [D]
RRR	Reviewed Radionuclide Report	States Signatories	IDC Product [D]
SAMACK	Sample Receipt Acknowledgement	Laboratory	Other Laboratory Messages [L]
SAMPML	Sample PHDs plus Automated Radionuclide Report	States Signatories	IDC Product [D]
REVSAMP	Sample PHDs plus Reviewed Radionuclide Report	States Signatories	IDC Product [D]
SSREB	Standard Screened Radionuclide Event Bulletin	States Signatories	IDC Product [D]

D: data, L: lab data message type

All IMS data messages require the basic message structure described in section 3.2 “Message preface” on p. 34.

Within the message body, several data types may be present. The type of data included in a data section is designated with a DATA_TYPE line. The argument of the DATA_TYPE command designates the type of data that are included in the message section:

Syntax

```
data_type data_type
```

data_type the type of IMS data that follows

Each data section is composed of distinct data blocks that contain required and supplemental data. The start of a data block is designated by a line containing the block name. All data block names begin with the pound (#) sign. Additional data can be included in a radionuclide message through the addition of new blocks. The name of any new block must start with a pound sign, followed by any combination of characters not already used for a predefined block.

The #Header block must be the first data block in any radionuclide message because it specifies the system type. No requirements on the order of the remaining data blocks are necessary. Data blocks may require several records for completion, for example, at least five records must be present in a #g_Energy block for it to be valid.

All uncertainties shall be reported with a coverage factor k=1 unless specified otherwise.

If a required data block is shown as having an undetermined number of possible records (denoted by, for example, `2-n`), the minimum number of records is one, unless specified otherwise.

7.2 Pulse Height Data

The different types of Pulse Height Data (PHD) are:

- SAMPLEPHD: This data type contains PHD acquired by counting a noble gas or particulate sample.
- BLANKPHD: This data type contains pulse height data acquired by counting an unexposed filter on a particulate monitoring system.
- DETBKPHD: This data type contains PHD acquired by performing a background measurement of a detector system.
- GASBKPHD: This data type is sent by a noble gas monitoring system that is subject to memory effects during sample acquisition due to nuclide from the previous sample adsorbed onto the walls of the gas cell.
- CALIBPHD: This data type contains PHD acquired by counting a known standard source with a detector system.
- QCPHD: This data type contains PHD acquired from a brief count of a known standard source with a detector system for quality control purpose.
- SPIKEPHD: This data type contains PHD acquired from a spiked sample for example at a noble gas monitoring system.

Each PHD type is composed of a number of data blocks. Depending on the DATA_TYPE and the detector acquisition system, some data blocks are required, and some are optional.

If a data message does not contain the required data blocks, it cannot be processed. Table 57 lists the required and optional data blocks for PHD messages from both particulate and noble gas systems employing high-resolution γ-spectrometry and noble gas systems reporting β-γ coincidence data.

Table 57. PHD data blocks from sites sending spectrometry data

	γ-spectroscopy						β-γ coincidence					
Data blocks	SAMPLEPHD	BLANKPHD	DETBKPHD	CALIBPHD	QCPHD	SPIKEPHD	SAMPLEPHD	GASBKPHD	DETBKPHD	CALIBPHD	QCPHD	SPIKEPHD
#Header	r	r	r	r	r	r	r	r	r	r	r	r
#Comment	o	o	o	o	o	o	o	o	o	o	o	o

Continues on next page

Table 57. PHD data block for γ-spectrometry data (cont.)

	γ-spectroscopy						**β-γ coincidence**					
Data blocks	SAMPLEPHD	BLANKPHD	DETBKPHD	CALIBPHD	QCPHD	SPIKEPHD	SAMPLEPHD	GASBKPHD	DETBKPHD	CALIBPHD	QCPHD	SPIKEPHD
#Collection	r					r	r					r
#Acquisition	r	r	r	r	r	r	r	r	r	r	r	r
#Processing[†]	r[†]	r[†]				r[†]	r	r				r
#Sample	o	o		o	o	o	o	o		o	o	o
#g_Energy	r	r	r	r	r	r	r	r	r	r	r	r
#b_Energy							r	r	r	r	r	r
#g_Resolution	r	r	r	r	r	r	r	r	r	r	r	r
#b_Resolution							r	r	r	r	r	r
#g_Efficiency	r	r	r	r	r	r	o	o	o	o	o	o
#ROI_Limits							r	r	r	r	r	r
#b-gEfficiency							r	r	r	r	r	r
#g_TotalEfficiency	o	o	o	o	o	o	o	o	o	o	o	o
#Ratios							r	r	r	r	r	r
#g_Spectrum	r	r	r	r	r	r	r[‡]	r[‡]	r[‡]	r[‡]	r[‡]	r[‡]
#b_Spectrum							r[‡]	r[‡]	r[‡]	r[‡]	r[‡]	r[‡]
#Histogram							r	r	r	r	r	r
#Calibration	o	o	o	r	r	o	o	o	o	r	r	o
#Certificate				r	r	o				r	r	o

r = required, o = optional

[†] This data block only applies to noble gas systems

[‡] This data block should contain singles spectrum including coincident and non-coincident β or γ.

The formats of the data blocks listed in Table 57 are described in Tables 58–79. Clarifications of parameters and records are included after each table when necessary. Examples of each PHD message type are included in Appendix I.

Table 58. #Header block format for PHD message types

Record	**Position**	**Format**	**Description**
1	1–7	a7	`#Header`
	9–18	a10	designator (format version identifier from the IDC)
2	1–5	a5	system code, see subsection 3.5.10
	7–15	a9	detector code (unique for each detector)[†], see subsection 3.5.11

Continues on next page

Table 58. #Header block format for PHD message types (cont.)

Record	Position	Format	Description
	17	a1	system type: P for particulate; B for noble gas with β-γ coincidence detection; and G for noble gas with high-resolution γ-spectrometry
	19–35	a17	sample geometry
	37–40	a4	spectral qualifier: preliminary (PREL) or full (FULL)
3	1–16	a16	sample reference identification (see below)
4	1–31	a31	measurement identification (see below)
	33–63	a31	detector background measurement identification‡
	65–95	a31	gas background measurement identification (memory effect)*
5	1–10	i4,a1,i2,a1,i2	transmit date (*yyyy*/*mm*/*dd*)
	12–21	i2,a1,i2,a1,f4.1	transmit time (*hh*:*mm*:*ss*.*s*)

† For β-γ coincidence systems with multiple gas cells, each gas cell is considered a separate detector and should be assigned a unique detector code.

‡ The detector background measurement identification specifies the MID of the PHD message containing the relevant background counting data. If no relevant detector background exists, this field should be filled with a zero. For particulate systems, this should be the latest blank filter measurement identification.

* This field is required only for β-γ coincidence systems that have memory effect. To account for the activity remained in the gas cell, a detector acquisition is performed upon sample evacuation and before the next sample counting. The data from this acquisition is reported in the GASBKPHD. The gas background measurement identification field contains the MID of the GASBKPHD associated with the current sample.

The Measurement Identification (MID) describes the detector acquisition. The first nine characters are the detector code, the tenth character is a dash, and the remaining characters are the date and time of the acquisition start combined by a dash.

The Sample Reference Identification (SRID) aids in the identification of a sample. This allows the matching of a physical entity to the data that describes it. For radionuclide stations equipped with bar-coding systems, Radio-Frequency Identification (RFID) systems or any other coding system, the code for each sample must match the SRID reported in radionuclide messages.

The format of the SRID is a 14 or 15-character code, depending on the source of the PHD (either a particulate system, noble gas system or laboratory). The first two numbers of the SRID are the CTBT number as defined in the CTBT text. The syntax for the remaining digits differs for samples, blanks, detector background, gas background, Quality Control (QC) check sources, calibration sources, spike samples and special IMS samples sent to laboratories. The various SRID syntaxes are described below.

7.2.1 SAMPLEPHD

Syntax

ccyyyymmddhhPpT

cc	CTBT station/laboratory number
yyyymmddhh	year, month, date, and nearest full hour of collection start
Pp	split identifier: *P*: split number, *p*: total number of splits
T	system type: `X` for xenon noble gas systems[1], for particulate systems leave blank

The split identifier (*Pp*) is coded 11 for the whole radionuclide sample before any splitting is performed. When a sample is split into multiple parts, the split number *P* is the part number and *p* is the total number of pieces. For example, a sample split into two parts is assigned the following split identifiers: 12 for the first piece and 22 for the second piece. If all the sample splits are counted together, the split number *P* is assigned the number 9. Therefore, if the two sample splits from the previous example are counted together, the split identifier reported in the SRID field is 92.

7.2.2 GASBKPHD

Syntax

ccyyyymmddhh00X

cc	CTBT station/laboratory number
yyyymmddhh	year, month, date, and nearest full hour of collection start
00X	identifier that indicates a xenon gas background

7.2.3 BLANKPHD

Syntax

cc`00000000`*xxxx*

cc	CTBT station/laboratory number
`00000000`	identifier that indicates a blank filter
xxxx	a sequential number (0001, 0002, ...)

7.2.4 DETBKPHD

Syntax

cc`11111111`*xxxxT*

[1] The previously used `G` code describing noble gas samples is being replaced gradually as `X` as of 2016.

cc	CTBT station/laboratory number
`11111111`	identifier that indicates a detector background
xxxx	a sequential number (0001, 0002, . . .)
T	system type: `X` for noble gas system, otherwise leave blank

7.2.5 SPIKEPHD

Syntax

ccyyyymmddhhPp`K`

cc	CTBT station/laboratory number
yyyymmddhh	year, month, date, and nearest full hour of collection start
Pp	split identifier. *P*: split number, *p*: total number of splits
`K`	identifier that indicates spike[2]

7.2.6 Special IMS samples

Syntax

cc`77777777`*xxxx*

cc	CTBT station/laboratory number
`77777777`	identifier that indicates a special IMS sample
xxxx	a sequential number (0001, 0002, . . .)

For noble gas samples from a CTBT laboratory, such as intercomparison or proficiency test sample, the SRID is defined as following.

cc`7777`*YYMMSPBNX*

where

cc	lab code (01, 02, 03, . . . , 16 for IMS labs and for non-IMS labs 31 . . . 99)
`7777`	identifier that indicates a special IMS sample
YY	year, e.g., 16 for 2016
MM	month, e.g., 12 for December
S	system type for labs with more than 1 system (e.g., HPGe and β-γ coincidence counting system)
P	provider of the reference samples
B	batch to which a sample belongs
N	sample number in the batch.

[2] The identifier for a spike sample was `G` describing noble gas originally but is replaced as `K`.

7.2.7 QC check sources, QCPHD

Syntax

```
cc88888888xxxxT
```

cc	CTBT station/laboratory number
88888888	identifier that indicates a QC check source
xxxx	a sequential number (0001, 0002, . . .)
T	system type: X for noble gas system, otherwise leave blank

7.2.8 Calibration sources, CALIBPHD

Syntax

```
cc99999999xxxxT
```

cc	CTBT station/laboratory number
99999999	identifier that indicates a calibration source
xxxx	a sequential number (0001, 0002, . . .)
T	system type: X for noble gas system, otherwise leave blank

7.2.9 SRID examples

The following is a SRID for a particulate sample sampled at the IMS station in Rio de Janeiro, Brazil. The collection start time and date is 1 April, 2001 at 06:00 UTC.

```
04200104010611
```

The following is a SRID for a blank filter counted at the IMS station in Quezon City, Philippines, and is the third blank counted at that station.

```
52000000000003
```

The following is a SRID for a QC check source counted by a xenon noble gas system at the IMS station in Reunion, France, and is the first unique QC check source counted at that station.

```
29888888880001X
```

The following is a SRID for a calibration source counted by a xenon noble gas system at the IMS station at Oahu, Hawaii, and is the third unique calibration source counted at that station.

```
79999999990003X
```

7.2.10 MID examples

The following is a possible MID for a noble gas sample from the IMS station in Rio de Janeiro, Brazil. The sample acquisition start is 6 February, 2000 at 20:00 UTC.

```
BRX11_001-2000/02/06-20:00
```

The following is a possible MID for a calibration count performed on a HPGe detector at AWE Blacknest in Chilton, England. The acquisition start is 2 November, 2010 at 9:37:30.0 UTC.

```
GBL15_005-2010/11/02-09:37:30
```

7.2.11 Block formats

The `#Comment` block (Table 59) is optional for all radionuclide messages.

Table 59. #Comment block format

Record	Position	Format	Description
1	1–8	a8	`#Comment`
2–n	1–80	a80	free text

Table 60. #Collection block format

Record	Position	Format	Description
1	1–11	a11	`#Collection`
2	1–10	i4,a1,i2,a1,i2	collection start date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	collection start time (*hh:mm:ss.s*)
	23–32	i4,a1,i2,a1,i2	collection stop date (*yyyy/mm/dd*)
	34–43	i2,a1,i2,a1,f4.1	collection stop time (*hh:mm:ss.s*)
	45–54	f10	total air volume sampled (m^3 at STP)

Table 61. #Acquisition block format

Record	Position	Format	Description
1	1–12	a12	`#Acquisition`
2	1–10	i4,a1,i2,a1,i2	acquisition start date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	acquisition start time (*hh:mm:ss.s*)
	23–36	f14	acquisition real time (s)
	38–51	f14	acquisition live time (s)

For noble gas systems, the sample volume of stable xenon (Xe) must be used to calculate the total air volume sampled. This is because some of the collected air may be used for unit processes. The following equation determines the total air volume from the sample Xe volume:

$$V_{air} = \frac{V_{Xe}}{0.087} \tag{3}$$

where V_{air} is the total air volume in m^3 at STP (273.15 K and 101.325 KPa, unless otherwise specified) and V_{Xe} is the sample volume of ambient Xe in cm^3 (see #Processing block in Table 62 for sample volume of Xe).

Table 62. #Processing block format

Record	Position	Format	Description
1	1–11	a11	`#Processing`
2	1–8	f8.5	sample volume of Xe (cm^3)
	10–17	f8.5	uncertainty (cm^3)
3†	1–8	f8.5	Xe collection yield
	10–17	f8.5	uncertainty of the Xe collection yield
4	19–20	a2	archive bottle identification

† The fields of this record are optional and may be zero-filled if the information is unavailable.

The #Sample Block (Table 63) is optional and describes the physical dimensions of the sample during measurement as instructed in Table 64. Other relevant sample information can be included in the #Comment block. Counting geometry is reported in the #Header block.

Table 63. #Sample block format

Record	Position	Format	Description
1	1–7	a7	`#Sample`
2	1–5	f5.2	dimension 1 (cm)
	7–11	f5.2	dimension 2 (cm)

Table 64. Sample dimension matrix

Sample geometry	Dimension 1	Dimension 2
cylindrical filter samples	diameter	height
unpressed filter samples	width	length
noble gas samples	cell inner diameter	cell length

The #g_Energy data block (Table 65) is required for all detector systems, regardless of sample type. The g prefix indicates that this block contains the energy/channel pairs required to formulate a relationship between channel and γ-energy. The data contained in this block should be actual peak energies with their corresponding centroid channels or PTS validated data points as appropriate. These may include both empirical and numerical elements.

Table 65. #g_Energy block format

Record	Position	Format	Description
1	1–9	a9	`#g_Energy`
2–n†	1–16	f16	γ-energy (KeV)
	18–33	f16	centroid channel
	35–50	f16	uncertainty (channels)

† There should be at least five records for γ spectroscopy samples and at least three records for β-γ coincidence samples in a #g_Energy block.

The #b_Energy block (Table 66) is required only for systems reporting β-γ coincidence data. Contained within the block are the energy/channel pairs needed to create a relationship between channel and β-energy.

Table 66. #b_Energy block format

Record	Position	Format	Description
1	1–9	a9	`#b_Energy`
2–n†	1–16	f16	electron energy (KeV)
	18	a1	decay mode descriptor: `B` for β-particle, `C` for Conversion Energy (CE)
	20–35	f16	channel corresponding to β energy
	37–52	f16	uncertainty (channels)

† There must be at least five records in a #b_Energy block.

The #g_Resolution block (Table 67) is required for all detector systems, regardless of sample type. The g prefix indicates that this block contains the energy/FWHM pairs required to formulate a relationship between resolution and γ-energy. These must be original data pairs or PTS validated data points as appropriate. These may include both empirical and numerical elements.

Table 67. #g_Resolution block format

Record	Position	Format	Description
1	1–13	a13	`#g_Resolution`
2–n†	1–16	f16	γ-energy (KeV)
	18–33	f16	FWHM (KeV)
	35–50	f16	uncertainty (KeV)

†There should be at least five records for γ spectroscopy samples and at least three records for β-γ coincidence samples in a #g_Energy block.

The #b_Resolution block (Table 68) is required only for systems reporting β-γ coincidence data. Contained within the block are the energy/FWHM pairs needed to create a relationship between resolution and β-energy. These must be original data pairs and not points from a fitted calibration equation.

Table 68. #b_Resolution block format

Record	Position	Format	Description
1	1–13	a13	`#b_Resolution`
2–n†	1–16	f16	electron energy (KeV)
	18–33	f16	FWHM (KeV)
	35–50	f16	uncertainty (KeV)

† There must be at least five records in a #b_Resolution block.

The #g_Efficiency block (Table 69) is required for all detector systems, regardless of sample type, except those reporting β-γ coincidence data. The g prefix indicates that this block contains the energy/efficiency pairs required to formulate a relationship between full photopeak efficiency and γ-energy. These must be original data pairs or PTS validated data points as appropriate. These may include both empirical and numerical elements.

Table 69. #g_Efficiency block format

Record	Position	Format	Description
1	1–13	a13	`#g_Efficiency`
2–n†	1–16	f16	γ-energy (KeV)
	18–33	f16	efficiency (counts in peak/photon emitted)
	35–50	f16	uncertainty (counts in peak/photon emitted)

† There must be at least five records in a #g_Efficiency block for γ systems.

The #ROI_Limits block inTable 70 is required only for systems reporting β-γ coincidence data. Counts from such systems are primarily recorded in the #Histogram block.

Table 70. #ROI_Limits

Record	Position	Format	Description
1	1–14	a14	`#ROI_Limits`
2–n†	1–2	a2	ROIs number
	4–13	f10	2D ROI β-range start, x1 (KeV)
	15–24	f10	2D ROI β-range stop, x2 (KeV)
	26–35	f10	2D ROI γ-range start, y1 (KeV)
	37–46	f10	2D ROI γ-range stop, y2 (KeV)

† There must be six records for the numbered ROIs.

The activity concentration can be determined from the net counts in a 2D ROI. The #ROI_-Limits block contains the 2D coordinates that define the ROIs, that is, the equivalents of x1, x2, y1, and y2 in Figure 1.

In Table 71, the ROI number is a unique identifier for the required ROI. These numbers are assigned and illustrated in Figure 2.

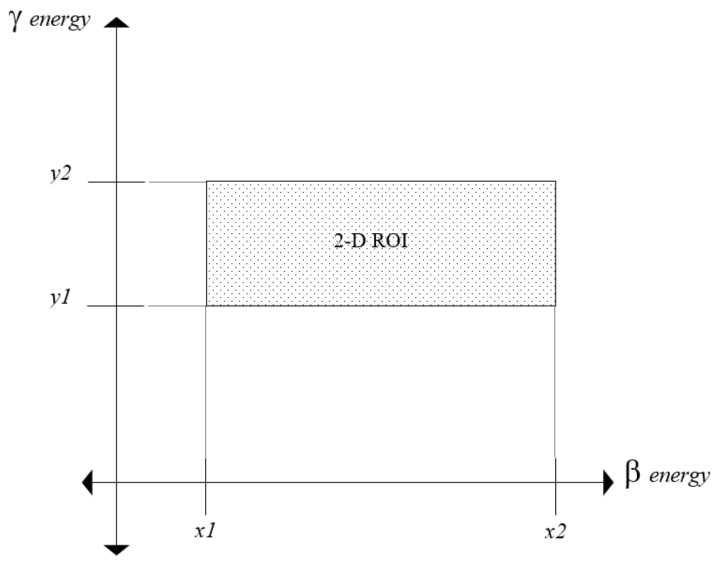


Figure 1. Two-dimensional ROI in β-γ energy space.

Table 71 summarizes the possible nuclide signals in each ROI and the nuclide quantified by determining the net counts. The exact values for the ROI γ- and β-energy ranges are not defined explicitly in this document because they depend on each detector's calibration, capabilities and characteristics (for example, resolution). The ROI limits specified in the #ROI_Limits block must be the same as those used for determining the β-γ coincidence efficiencies reported in the #b-gEfficiency block (Table 72).

Table 71. ROI characterization

ROI no.	Nuclides possible	Quantification use	Centroid γ-energy (KeV)	Centroid β-energy (KeV)
1	^{214}Pb	n/a†	351.9	671 (End point)
2	^{214}Pb, ^{135}Xe	^{135}Xe	249.8	901 (End point)
3	^{214}Pb, ^{133}Xe	^{133}Xe	81.0	346 (End point)
4	^{131m}Xe, ^{133m}Xe, ^{133}Xe, ^{135}Xe	^{133}Xe‡	30.0	391 (End point)
5	^{131m}Xe, ^{133}Xe	^{131m}Xe	30.0	129.4
6	^{133m}Xe, ^{133}Xe	^{133m}Xe	30.0	198.7
7	^{131m}Xe, ^{133}Xe	^{133}Xe‡	30.0	n/a
8	^{133m}Xe, ^{133}Xe	^{133}Xe‡	30.0	n/a
9	^{133m}Xe, ^{133}Xe	^{133}Xe‡	30.0	n/a
10	^{131m}Xe, ^{133}Xe	^{133}Xe‡	30.0	n/a

† The number of counts in this ROI is used only for determining interference from ^{214}Pb in ROIs 2 to 10.
‡ This ROI is probably used with ROIs 3 and 5 to 10 for quantification of ^{133}Xe.

The #b-gEfficiency block is required only for β-γ coincidence systems. It contains efficiency values for the detection of specific β-γ pairs within the predefined 2D ROI energy bounds. This information is required to quantify radio-xenon activity concentrations from the net 2D ROI counts.

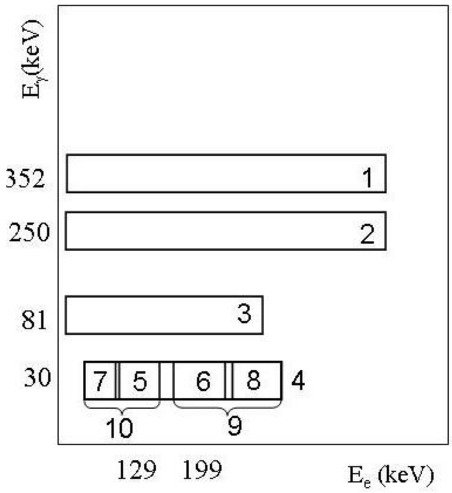


Figure 2. Region of Interest (ROI) with their unique ROI numbers (not to scale) for β-γ coincidence systems.

Table 72. #b-gEfficiency block format

Record	Position	Format	Description
1	1–14	a14	`#b-gEfficiency`
2–n†	1–10	a10	nuclide name‡
	12–19	a8	ROI number
	21–30	f10	β-γ coincidence efficiency (counts in the ROI/β-γ pair emitted)
	32–41	f10	uncertainty (counts in the ROI/β-γ pair emitted)

† There must be 4 records for the ROIs associated with four CTBT xenon isotopes in a #b-gEfficiency block.
‡ The nuclide name is the xenon isotope which is associated with the ROI and its activity is estimated by the number of counts in the ROI.

The #g_TotalEfficiency block (Table 73) is optional. The *total efficiency* is the ratio of the number of pulses in the entire energy spectrum due to a photon of a given energy to the number of photons emitted by a source for a specified measurement geometry. The data pairs can be the results of an empirical or non-empirical process.

Table 73. #g_TotalEfficiency block format

Record	Position	Format	Description
1	1–9	a9	`#g_TotalEfficiency`
2–n†	1–16	f16	γ-energy (KeV)
	18–33	f16	total efficiency (counts/photon emitted)
	35–50	f16	uncertainty (counts/photon emitted)

† There must be at least five records in a #g_TotalEfficiency block.

The #Ratios block (Table 74) is required only for β-γ coincidence systems. It contains the information necessary for stripping counts due to interfering isotopes from the signals of interest.

Table 74. #Ratios block format

Record	Position	Format	Description
1	1–7	a7	`#Ratios`
2–n	1–15	a15	ratio identifier
	17–18	a2	ROI number of the higher γ-energy ROI
	20–21	a2	ROI number of the lower γ-energy ROI
	23–32	f10	count ratio (counts in the lower γ-energy ROI/counts in the higher γ-energy ROI)
	34–39	f6	count ratio uncertainty (%)

The ratio identifier is the unique name for the count ratio, and is composed of the interfering nuclide followed by the higher γ-energy and the lower γ-energy that characterize the ROIs. The two γ-energies are separated by a colon while the nuclide name is separated from the γ-energies by an underscore. In cases where a nuclide has more than one interference ratio for the same set of γ-energies but different γ/β-energies (for example, ^{133}Xe interference from 80 KeV to 30 KeV), the number of the lower energy ROI is affixed after an underscore to distinguish between them.

For HPGe systems, the #g_Spectrum block contains the γ-spectrum acquired during counting (Table 76). For β-γ coincidence systems, this block contains the singles spectrum, including the non-coincident and coincidence γ both, e.g., the total γ-spectrum.

Table 75. #g_Spectrum block format

Record	Position	Format	Description
1	1–11	a11	`#g_Spectrum`
2	1–5	i5	number of γchannels
	7–10	i4	γ-energy span (KeV)†
3–n	1–5	i5	channel‡
	7–16	i10	count at channel + 0
	18–27	i10	count at channel + 1
	29–38	i10	count at channel + 2
	40–49	i10	count at channel + 3
	51–60	i10	count at channel + 4

† The maximum photon energy that the γ-spectrum represents.

‡ The spectrum should start with channel 0 for noble gas β-γ coincidence systems. The channel could start with 1 for particulate sample spectra.

For β-γ coincidence systems, the singles spectrum (including both non-coincident β and coincidence β) is reported in the #b_Spectrum data block (Table 76).

Table 76. #b_Spectrum block format

Record	Position	Format	Description
1	1–11	a11	#b_Spectrum
2	1–5	i5	number of β channels
	7–10	i4	β-energy span (KeV)
3–n	1–5	i5	channel†
	7–16	i10	count at channel + 0
	18–27	i10	count at channel + 1
	29–38	i10	count at channel + 2
	40–49	i10	count at channel + 3
	51–60	i10	count at channel + 4

† The spectrum should start with channel 0.

The #Histogram data block (Table 77) is required for systems reporting β-γ coincidence data. This block contains the counts (up to 10 characters) in each β-γ energy bin within a 2D matrix format. Each row consists of a single γ-channel over the entire span of the β-channel axis. Each column consists of a single β-channel over the entire span of the γ-channel axis. To reduce the size of the PHD message, only one blank space is required between reported counts in consecutive energy bins (β-channels) within the same row (γ-channel). See the examples in subsection I.35.1 "SAMPLEPHD—β-γ coincidence data version" on p. 349 for reference. Do not include non-coincident data in the #Histogram block. All non-coincident data should be reported using the #g_Spectrum or #b_Spectrum data blocks.

Table 77. #Histogram block Format

Record	Position	Format	Description
1	1–10	a10	#Histogram
2	1–5	i5	γ-channels (=b)
	7–11	i5	β-channels (=a)
	13–16	i4	γ-energy span (KeV)
	18–21	i4	β-energy span (KeV)
3	1- variable†	i1-i10	counts at channels (x,y) = (1,1)‡
	variable	i1–i10	counts at channels (2,1)
	variable	i1–i10	counts at channels (3,1)
	variable	i1–i10	. . .
	variable	i1–i10	counts at channels (a,1)
4	1- variable†	i1-i10	counts at channels (1,2)
	variable	i1–i10	counts at channels (2,2)
	variable	i1–i10	counts at channels (3,2)
	variable	i1–i10	. . .
	variable	i1–i10	counts at channels (a,2)

Continues on next page

Table 77. #Histogram block Format (cont.)

Record	Position	Format	Description
b+2	1- variable†	i1-i10	counts at channels (1,b)
	variable	i1–i10	counts at channels (2,b)
	variable	i1–i10	counts at channels (3,b)
	variable	i1–i10	...
	variable	i1–i10	counts at channels (a,b)

No requirements on the number of γ and β channels to be reported are currently mandated.

† Fields are separated by at least one blank space. Records are ended with a carriage return.

‡ `x`: β-channel ordinate, `y`: γ-channel ordinate. β and γ channels should start at 1.

The #Calibration block (Table 78) allows the reporting of calibration references for various systems/components. Where a reference to a particular calibration measurement is possible (e.g., the CALIBPHD for γ detectors), the MID of this measurement is to be reported as well. Possible system/components to be reported include:

- γ detector
- β-γ detector
- Stable xenon measurement system
- Airflow meter

For radionuclide PHDs, this block contains the date and time when the calibration calculation was performed during the latest detector calibration instead of the acquisition date and time of the calibration spectra. For example, there are more than one calibration spectra during the calibration of β-γ coincidence systems.

Table 78. #Calibration block format

Record	Position	Format	Description
1	1–12	a12	`#Calibration`
2	1–10	i4,a1,i2,a1,i2	date of last calibration (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	time of last calibration (*hh:mm:ss.s*)

The #Certificate block (Table 79) allows the reporting of information on the standard radioactive source used in the acquisition of energy, resolution, efficiency, ratios and total efficiency calibration data. This block is required in QCPHD and CALIBPHD data messages; it is optional for SPIKEPHD data messages.

For γ-only sources, the last three fields in records 3–n should be zero-filled. For β-only sources, the γ-energy and γ-intensity fields in records 3–n should be zero-filled. For β-γ coincidence sources, all fields should be filled with data.

Table 79. #Certificate block format

Record	Position	Format	Description
1	1–15	a15	`#Certificate`
2	1–10	i10	total source activity (Bq)
	12–21	i4,a1,i2,a1,i2	assay date (*yyyy*/*mm*/*dd*)
	23–32	i2,a1,i2,a1,f4.1	assay time (*hh*:*mm*:*ss*.*s*)
3–n	1–8	a8	nuclide name
	10–22	a13	half-life of the nuclide (value and time unit)†
	24–31	f8.3	activity of nuclide at assay time
	33–39	f7.3	uncertainty (%)
	41–48	f8.3	γ-energy (KeV)
	50–56	f7.3	γ-intensity (%)
	58	a1	electron decay mode descriptor: `B` for β particle or `C` for conversion electron, `0` for none (that is, γ-only source)
	60–67	f8.3	maximum β-particle energy or CE energy (KeV)
	69–75	f7.3	intensity of β-particle (%)

† Half-lives are reported with the time value followed by the time unit (`S` for seconds, `H` for hours, `D` for days, or `Y` for years), with the two separated by a single space (i.e., `34 Y`, `12.345 D`, `1.89E+05 S`, etc.).

The nuclide name is formed by listing the 2-character element symbol from the periodic table of the elements followed by a dash (`-`), and then the mass number. An `M` may be placed at the end to designate a metastable state. For example, `XE-131M`, `XE-133`, `XE-133M`, `XE-135`, `PB-214`.

7.3 Radionuclide laboratory reports

The two types of radionuclide laboratory reports are:

- Preliminary Radionuclide Laboratory Report (PRE)
- Final Radionuclide Laboratory Report (FIN)

The RLR is comprised of 32 block types. The required number of blocks in a RLR is described in Table 80. Blocks marked in **bold** are provided to the laboratories by the PTS in LABSDN messages. They are sent back to the PTS in the RLRs so that those subscribed to that message type will have all of the information necessary to interpret the analysis. Blocks with a prefix of P or X refer to particulate or noble gas samples respectively while blocks without any prefix refer to both particulate and noble gas samples.

Table 80. Data blocks required in RLR (PRE & FIN)

Block name	**Particulate (P)**	**Noble gas** γ **(X)**	**Noble gas** β-γ **(X)**
#Header	r	r	r
#LabDataVersion	r	r	r
#Objective	**r**	**r**	**r**
#IDCActivitySummary†	**o**	**o**	**o**
#IDCEventScreeningFlags†	**o**	**o**	**o**
#Collection	**r**	**r**	**r**
#StationSample†	**r**	**r**	**r**
#Split†,‡	**o**	**o**	**o**
#SampleReceipt	r	r	r
#LabSample†	r	r	r
#Test	r	r	r
#EnergyCalibrationEquation	r	r	o
#ShapeCalibrationEquation	r	r	o
#EfficiencyCalibrationEquation	r	r	o
#TotalEfficiencyCalibrationEquation	r	o	o
#PeaksMethod	r	r	o
#PeakSearch	r	r	o
#PeakFitPart1	r	r	o
#PeakFitPart2	r	r	o
#AnalysisMethods	r	r	r
#PeakAssociation	r	r	o
#References	r	r	r
#InteractiveAnalysisLog	r	r	r
#Results†	r	r	r
#NuclideRatios	r	r	r
#X_Processing	n/a	r	r
#CoincidenceCorrection	r	o	o
#UncertaintyBudget	r	r	r
#Lc	o	o	r
#MDA/MDC†	r	r	r

r = required, o = optional

† Blocks will be prefixed with `P_` for particulate, and `X_` for noble gas

‡ #Split block will only be present if the sample has been split.

Formats for the data blocks listed in Table 80 are described in Tables 81–118. If a required data block is shown as having an undetermined number of possible records (denoted by, for example, `4-n`), the minimum number of records is one, unless specified otherwise.

The SRID given in the #Header block is for the entire sample before any splitting. The SRID given by the PTS in the #Recipient block (which could be from a split sample and therefore different) must be cross-checked by the laboratory when the sample is received to ensure that the station sent the correct sample. The SRID on the sample, as actually received by the laboratory, must be reported in the #SampleReceipt block.

The sample category is given by a full string, `Category n` for particulate samples and `Category Xn` for noble gas samples, where *n* is a letter that denotes the category:

For particulate samples:

- A: network quality control sample
- B: sample from IMS network categorized by IDC as Level 5 or other sample of interest
- C: proficiency test sample
- D: station back-up sample (measured by a lab)
- E: other (e.g., station parallels)
- K: radioactive spikes

For noble gas samples:

- XA: network quality control sample
- XC: intercomparison or proficiency test sample
- XD: station back-up sample (measured by a lab)
- XE: other (e.g., station certification sample, special analysis including samples categorized as Level C)
- XK: radioactive xenon spikes

Table 81. #Header block format of RLR

Record	Position	Format	Description
1	1–7	a7	`#Header`
2	1–7	a7	priority level [`Urgent`|`Routine`]
3	1–5	a5	system code of the station at which the sample was collected
	7–22	a16	Sample Reference Identification (SRID) of the sample
4	1–5	a5	code of the laboratory selected for analysis [`ARL01`, ..., `USL16`]
	7–15	a9	laboratory detector code
5	1–3	a3	report type (`FIN`|`PRE`)
	5–6	i2	report number
6	1–11	a11	sample category (`Category A`, ..., `Category XK`)
7	1–10	i4,a1,i2,a1,i2	message transmission date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	message transmission time (*hh:mm:ss.s*)

Table 82. #LabDataVersion block format

Record	Position	Format	Description
1	1–15	a15	`#LabDataVersion`
2	1–12	a12	format version code (IMS2.0 for this revision)
3–n	1–80	a80	free text notes regarding the format version (optional)

Table 83. #Objective block format

Record	Position	Format	Description
1	1–10	a10	`#Objective`
2	1–16	a16	`~AnalysisPurpose`
3–n	1–80	a80	free text comment describing the purpose of analysis (Level 5, intercomparison, network QC, etc.)
n+1	1–16	a16	`~TestsAuthorized`
n+2–m	1–80	a80	free text describing the tests authorized (high-resolution γ spectrometry, β-γ coincidence counting etc.)
m+1	1–20	a20	`~SpecialInstructions`
m+2–l	1–80	a80	free text describing any special instructions (optional).)

n, m and l are the undetermined numbers of possible records if applicable.

Table 84. #P_IDCActivitySummary block format

Record	Position	Format	Description
1	1–21	a21	`#P_IDCActivitySummary`
2	1–22	a22	`~NuclidesNotQuantified`
3–n	1–80	a80	list of nuclide identified and not quantified
n+1	1–16	a16	`~NaturalNuclides`
n+2–m	1–8	a8	quantified natural nuclide name
	10–22	a13	half-life of the nuclide (value and time unit)†
	24–34	e11.4	concentration (Bq/m^3)
	36–40	f5.2	relative uncertainty (%)
m+1	1–19	a19	`~ActivationProducts`
m+2–l	1–8	a8	activation product name
	10–22	a13	half-life of the nuclide (value and time unit)†
	24–34	e11.4	concentration (Bq/m^3)
	36–40	f5.2	relative uncertainty (%)
l+1	1–16	a16	`~FissionProducts`
l+2–p	1–8	a8	fission product name
	10–22	a13	half-life of the nuclide (value and time unit)†
	24–34	e11.4	concentration (Bq/m^3)

Continues on next page

Table 84. #P_IDCActivitySummary block format (cont.)

Record	Position	Format	Description
	36–40	f5.2	relative uncertainty (%)

n, m, l and p are the undetermined numbers of possible records if applicable.

† Half-lives are reported with the time value followed by the time unit, with the two separated by a single space (i.e., `3.627 D`, `12.345 D`, `0.45623 S`, etc.).

Table 85. #X_IDCActivitySummary block format

Record	Position	Format	Description
1	1–21	a21	`#X_IDCActivitySummary`
2	1–16	a16	`~other`
3–n	1–8	a8	name of other isotope (such as radon)
	10–20	e11.4	counts
	24–28	f5.2	relative uncertainty (%)
n+1	1–16	a16	`~Radio-xenon`
n+2–m	1–8	a8	name of the xenon isotope
	10–22	a13	half-life of the xenon (value and time unit)†
	24–34	e11.4	activity (mBq)
	36–40	f5.2	relative uncertainty (%)
	42–52	e11.4	concentration (mBq/m^3)
	54–58	f5.2	relative uncertainty (%)

n and m are the undetermined numbers of possible records if applicable.

† Half-lives are reported with the time value followed by the time unit, with the two separated by a single space (i.e., `3.627 D`, `12.345 H`, `0.45623 S`, etc.).

Table 86. #P_IDCEventScreeningFlags block format

Record	Position	Format	Description
1	1–25	a25	`#P_IDCEventScreeningFlags`
2	1	a1	activation products present in the sample [`Y` or `N`]
	3–12	a10	number of days since last activation product seen†
3	1	a1	only one fission product in the sample [`Y` or `N`]
	3–12	a10	number of days since last fission product†
4	1	a1	two or more fission products in the sample [`Y` or `N`]
	3–12	a10	number of days since two or more fission products last seen†
5	1	a1	^{137}Cs present in the sample [`Y` or `N`]
	3–12	a10	number of times ^{137}Cs was seen in the last 30 days†

† The number of days/number of times fields in the records above will be reported with different types of data depending on the state of the sample. A number in decimal format will be used to report the number of days or number of times. the text `Never Seen` will indicate that the fission product was not seen at that location previously. A `0` will indicate that this field is blank and does not apply for the sample in question.

Table 87. #X_IDCEventScreeningFlags block format

Record	Position	Format	Description
1	1–25	a25	`#X_IDCEventScreeningFlags`
2	1	a1	xenon isotopes present in the sample (Y or N)
3	1	a1	only one xenon isotope in the sample (Y or N)
4	1–10	i10	number of days since last xenon detection
5	1	a1	two or more xenon isotopes in the sample (Y or N)
6	1	a1	^{133}Xe present in the sample (Y or N)
	3–12	i10	number of times ^{133}Xe was seen in the last 365 days
7	1	a1	short term flag (Y or N)
8	1	a1	`Xe-133m/131m > 2` (Y or N)
9	1	a1	`Xe-135/133 > 5` (Y or N)
10	1	a1	`Xe-133m/133 > 0.3` (Y or N)

The #Collection block in RLR is the same as defined in Table 60.

Table 88. #X_Processing block format

Record	Position	Format	Description
1	1–13	a13	`#X_Processing`
2	1–8	f8.5	Xe volume in the archive bottle (STP corrected, cm^3) measured at the lab†
	10–17	f8.5	relative uncertainty (%)
3	1	i1	number of volume measurements
4–n	1–8	f8.5	Xe volume in the lab detector measurement cell (STP corrected, cm^3)
	10–17	f8.5	relative uncertainty (%)
	19–26	f8.5	Xe transfer efficiency from the station archive bottle to the lab detector measurement cell‡ (%)
	28–35	f8.5	relative uncertainty (%)
n+1	1–2	a2	station archive container identification (optional)
	4–11	f8	archive bottle pressure (Pascal) (optional)
	13–32	a20	gas composition (optional)

† This can be a quantity derived from Xe volume in the lab measurement cell and transfer efficiency.

‡ A description of how this is calculated shall be provided in the #AnalysisMethod block.

Table 89. #P_StationSample block format

Record	Position	Format	Description
1	1–14	a14	`#P_StationSample`

Continues on next page

Table 89. #P_StationSample block format (cont.)

Record	Position	Format	Description
2	1–30	a30	activity category of the sample (according to international shipping regulations)
3	1–5	f5.2	diameter | length (cm)†
	7–11	f5.2	thickness (cm)
	13–17	f5.2	width (cm) (optional for some sample geometries)
4	1–5	f5.2	mass of the sample (g)
5	1–8	f8.4	container density (if one is used; optional for some samples)
	10–14	f5.2	container thickness (if one is used; optional for some samples)
	16–55	a40	container material (if one is used; optional for some samples)
6	1–60	a60	short text description of the sample geometry [RASA, Cinderella, compressed cylinder]

† Diameter is reported for cylindrical samples (e.g., those that have been compressed) and width is not reported. For rectangular samples (e.g., RASA and other uncompressed samples), length is reported along with the width of the sample. These dimensions are based on the standard sample geometries but may slightly differ from station the actual sample.

Table 90. #X_StationSample block format

Record	Position	Format	Description
1	1–14	a14	`#X_StationSample`
2	1–30	a30	activity category of the sample (according to international shipping regulations)
3	1–5	f5.2	reported stable xenon volume measured at station (cm^3)
	7–11	f5.2	relative uncertainty (%)
4	1–15	a15	container type [SAUNA, SPALAX, etc.]
	17–56	a40	short text description of the sample archive bottle (e.g., system version number, etc.)

Table 91. #P_Split block format

Record	Position	Format	Description
1	1–6	a6	`#P_Split`
2	1–5	f5.2	mass of the split sample (g)
	7–16	f10	calculated air volume of the split sample (m^3 at STP)
	18–22	f5.2	relative uncertainty (%)
3–n	1–80	a80	free text description of how the sample was split

Table 92. #X_Split block format

Record	Position	Format	Description
1	1–6	a6	`#X_Split`
2	1–5	f5.2	stable xenon volume of split sample (cm^3)
	7–11	f5.2	uncertainty of stable xenon (cm^3)
	13–17	f5.2	calculated air volume of the split sample (standard cubic metres)
	19–23	f5.2	relative uncertainty (%)
3–n	1–80	a80	free text description of how the sample was split

Table 93. #SampleReceipt block format

Record	Position	Format	Description
1	1–14	a14	`#SampleReceipt`
2	1–16	a16	sample reference identification
3	1–14	a14	seal number
4	1–10	i4,a1,i2,a1,i2	sample receipt date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	sample receipt time (*hh:mm:ss.s*)
5	1–17	a17	`~PackageCondition`
6–n	1–80	a80	general free text comment describing package condition
n+1	1–14	a14	`~SealCondition`
n+2-m	1–80	a80	general free text comment describing seal condition
m+1-p	1–16	a16	`~SampleCondition`
p+1-q	1–80	a80	general free text comment describing sample condition

On Tables 94 and 95, the sample dimensions and mass are to report the sample's state after any geometry modifications at the laboratory.

Table 94. #P_LabSample block format

Record	Position	Format	Description
1	1–12	a12	`#P_LabSample`
2	1–11	e11.4	overall activity level of the sample (Bq) (for proper handling during shipment and receipt)
3	1–5	f5.2	diameter | length (cm)†
	7–11	f5.2	thickness (cm)
	13–17	f5.2	width (cm) (optional for some sample geometries)
4	1–5	f5.2	mass of the sample (g) repeated for each equation in the same calibration
5	1–8	f8.4	container density (if one is used) (optional for some samples)
	10–14	f5.2	container thickness (if one is used) (optional for some samples)

Continues on next page

Table 94. #P_LabSample block format (cont.)

Record	Position	Format	Description
	16–55	a40	container material (if one is used) (optional for some samples)
6–n	1–80	a80	free text description of how the sample was prepared for analysis

† Diameter is reported for cylindrical samples (e.g., those that have been compressed) and width is not reported. For rectangular samples (e.g., RASA and other uncompressed samples), length is reported along with the width of the sample.

Table 95. #X_LabSample block format

Record	Position	Format	Description
1	1–12	a12	`#X_LabSample`
2	1–11	e11.4	overall activity level of the sample (Bq) (for proper handling during shipment and receipt)
3	1–5	f5.2	stable xenon volume measured at the lab (cm^3)
4–n	1–80	a80	free text description of how the sample was prepared for analysis

Table 96. #Test block format

Record	Position	Format	Description
1	1–5	a5	`#Test`
2	1–40	a40	type of test performed (high-resolution γ spectrometry, β-γ coincidence, etc.)
3	1–10	i4,a1,i2,a1,i2	test completion date (*yyyy/mm/dd*)
4–n	1–80	a80	free text describing the purpose of the test

Table 97. Codes for calibration equations

Code	Type	Description
1	interpolation	no fitting
2	polynomial	$y(x) = a_0 + a_1 x + a_2 x^2 + \dots$
3	square root polynomial	$y(x) = a_0 + a_1 x^{1/2} + a_2 x + \dots$
4	square root of polynomial	$y(x) = \sqrt{a_0 + a_1 x + a_2 x^2 + \dots}$
5	exponential efficiency function	$\varepsilon(E) = A f_1(E) f_2(E)$
6	polynomial in $\log \varepsilon$ against $\log E_\gamma$	$\log \varepsilon = a_0 + a_1 \log E_\gamma + a_2 (\log E_\gamma)^2 + \dots + a_n (\log E_\gamma)^n$
7	polynomial in $\log \varepsilon$ against E_γ	$\log \varepsilon = a_1 E_\gamma + a_2 + a_3 E_\gamma^{-1} + a_4 E_\gamma^{-2} + \dots$
8	polynomial in $\log \varepsilon$ against $\log \frac{1}{E_\gamma}$	$\log \varepsilon = a_0 + a_1 \log \frac{c}{E_\gamma} + a_2 \left(\log \frac{c}{E_\gamma}\right)^2 + \dots$
9	inverse exponential	$\varepsilon = \frac{1}{a E_\gamma^{-x} + b E_\gamma^{-y}}$
99	other	description

Table 98. #EnergyCalibrationEquation block format

Record	Position	Format	Description
1	1–28	a28	`#EnergyCalibrationEquation`
2	1	i1	number of equations used
3	1–2	i2	equation type code, see Table 97
	4–5	i2	number of parameters in equation
	7–13	f7.2	start of energy range
	15–21	f7.2	end of energy range
4–n	1–11	e11.4	parameter 1
	13–23	e11.4	parameter 2
	25–35	e11.4	parameter 3
	37–47	e11.4	parameter 4

Records 3 and 4–n are repeated for each equation used in the calibration.

Table 99. #ShapeCalibrationEquation block format

Record	Position	Format	Description
1	1–28	a28	`#ShapeCalibrationEquation`
2	1	i1	number of equations used
3	1–2	i2	equation type code, see Table 97
	4–5	i2	number of parameters in equation
	7–13	f7.2	start of energy range
	15–21	f7.2	end of energy range
4–n	1–11	e11.4	parameter 1
	13–23	e11.4	parameter 2
	25–35	e11.4	parameter 3
	37–47	e11.4	parameter 4

Records 3 and 4–n are repeated for each equation used in the calibration.

Table 100. #EfficiencyCalibrationEquation block format

Record	Position	Format	Description
1	1–28	a28	`#EfficiencyCalibrationEquation`
2	1	i1	number of equations used
3	1–2	i2	equation type code, see Table 97
	4–5	i2	number of parameters in equation
	7–13	f7.2	start of energy range
	15–21	f7.2	end of energy range
4–n	1–11	e11.4	parameter 1

Continues on next page

Table 100. #EfficiencyCalibrationEquation block format (cont.)

Record	Position	Format	Description
	13–23	e11.4	parameter 2
	25–35	e11.4	parameter 3
	37–47	e11.4	parameter 4

Records 3 and 4–n are repeated for each equation used in the calibration.

Table 101. #TotalEfficiencyCalibrationEquation block format

Record	Position	Format	Description
1	1–28	a28	`#TotalEfficiencyCalibrationEquation`
2	1	i1	number of equations used
3	1–2	i2	equation type code, see Table 97
	4–5	i2	number of parameters in equation
	7–13	f7.2	start of energy range
	15–21	f7.2	end of energy range
4–n	1–11	e11.4	parameter 1
	13–23	e11.4	parameter 2
	25–35	e11.4	parameter 3
	37–47	e11.4	parameter 4

Records 3 and 4–n are repeated for each equation used in the calibration.

Table 102. #PeaksMethod block format

Record	Position	Format	Description
1	1–13	a13	`#PeaksMethod`
2	1–30	a30	software used (SWGenie-2000 v3.3, *Interwinner 5.0*, etc.)
3–n	1–80	a80	free text description of the peak location algorithm, peak search threshold, baseline type, etc.

Table 103. #PeakSearch block format

Record	Position	Format	Description
1	1–11	a11	`#PeakSearch`
2–n	1–5	i5	peak index
	7–14	f8.3	centroid channel
	16–20	f5.2	centroid channel uncertainty (%)
	22–29	f8.3	energy (KeV)

Continues on next page

Table 103. #PeakSearch block format (cont.)

Record	Position	Format	Description
	31–41	f5.2	energy uncertainty (%)
	43–49	f7.3	peak search sensitivity (not present for inserted peaks)
	51–52	a2	peak comment (`A` for automatic, `I` for inserted, `M` for multiplet, `IM` for inserted peak in a multiplet)†

† It is acceptable to use `M` to indicate the first peak in a multiplet and `m` for each additional peak in that multiplet.

Table 104. #PeakFitPart1 block format

Record	Position	Format	Description
1	1–13	a13	`#PeakFitPart1`
2–n	1–5	i5	peak index
	7–11	f5.2	FWHM (KeV)
	13–20	f8.3	start of ROI (channel number)
	22–29	f8.3	end of ROI (channel number)
	31–41	e11.4	mean baseline at the location of the peak (counts/channel)
	43–47	f5.2	uncertainty in mean baseline (%)
	49–60	a12	background type (`Detector, Blank`, etc.)
	62–72	e11.4	background net count rate (counts/s) (optional)†
	74–78	f5.2	background net count rate uncertainty (%) (optional)

† The background net count rate is the peak count rate in the relevant background spectrum, which may be subtracted from the peak count rate in the sample spectrum as necessary.

Table 105. #PeakFitPart2 block format

Record	Position	Format	Description
1	1–13	a13	`#PeakFitPart2`
2–n	1–5	i5	peak index
	7–17	e11.4	peak area (counts)†
	19–23	f5.2	peak area uncertainty (%)
	25–35	e11.4	net count rate‡
	37–41	f5.2	net count rate uncertainty (%)
	43–53	e11.4	critical level (LC)
	55–60	f6.2	peak significance (area / LC)
	62–72	e11.4	efficiency
	74–78	f5.2	efficiency uncertainty (%)

† The peak area in the sample spectrum is the number of counts reported by the analysis software for use in calculating activity and is reported without background correction (subtraction).

‡ The net count rate is the peak area divided by the live time with background correction (subtraction) applied as necessary.

Table 106. #AnalysisMethods block format

Record	Position	Format	Description
1	1–18	a18	`#AnalysisMethods`
2	1–30	a30	software used (`Genie-2000`, etc.)
3	1–12	a12	`~NuclidesMethod`
4–n	1–80	a80	free text description of the nuclide identification algorithm, threshold, tolerance, etc
n+1	1–15	a15	`~BaselineMethod`
n+2-m	1–80	a80	free text description of the mean baseline calculation method
m+1	1–9	a9	`~LcMethod`
m+2-p	1–80	a80	free text description of the LC method
p+1	1–18	a18	`~CalibrationMethod`
p+2-q	1–80	a80	free text description of the calibration method

Table 107. #PeakAssociation block format

Record	Position	Format	Description
1	1–16	a16	`#PeakAssociation`
2–n	1–5	i5	peak index
	7–13	f7.3	percentage | fraction (peak explanation level)
	15–22	a8	nuclide name

Optional for β-γ coincidence systems.

Table 108. #References block format

Record	Position	Format	Description
1	1–8	a8	`#References`
2	1–10	a10	`~SAMPLEPHD`
3	1–31	a31	MID of the sample spectrum for this RLR†
4	1–9	a9	`~CALIBPHD`
5–n	1–31	a31	MID of the efficiency calibration spectrum or spectra (relevant spectrum or spectra for the geometry used in the test), if applicable†
n+1	1–18	a18	`~PhysicalConstants`
n+2-m	1–80	a80	physical constants reference (ENSDF-Brookhaven National Laboratory, revision number, year, etc.)

† The MID fields indicate the measurement identification for the sample and calibration spectra as assigned by the laboratory. See the format of the MID code (subsection 7.2.10 "MID examples" on p. 176).

Table 109. #InteractiveAnalysisLog block format

Record	Position	Format	Description
1	1–23	a23	`#InteractiveAnalysisLog`
2–n	1–80	a80	free text description of all actions taken during the interactive analysis process (list of rejected peaks, etc.)

Table 110. #P_Results block format

Record	Position	Format	Description
1	1–8	a8	`#P_Results`
2	1–10	i4,a1,i2,a1,i2	activity reference date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	activity reference time (*hh:mm:ss.s*)
	23–32	i4,a1,i2,a1,i2	concentration reference date (*yyyy/mm/dd*)
	34–43	i2,a1,i2,a1,f4.1	concentration reference time (*hh:mm:ss.s*)
3–n	1–8	a8	nuclide name
	10–20	e11.4	activity (Bq) (decay-corrected to acquisition start of the lab)
	22–26	f5.2	activity uncertainty (%)
	28	i1	coverage factor, e.g., k=2, k=3 (optional, only used if the reported activity uncertainty is an expanded uncertainty)
	30–40	e11.4	concentration (Bq/m^3) (decay-corrected to sampling period, taking into account decay during spectral acquisition, sampling and during the period between sampling and acquisition; assume constant concentration and deposition during sampling)
	42–46	f5.2	concentration uncertainty (%)
	48	i1	coverage factor, e.g., k=2, k=3 (optional, only used if the reported concentration uncertainty is an expanded uncertainty)

Table 111. #X_Results block format

Record	Position	Format	Description
1	1–8	a8	`#X_Results`
2	1–10	i4,a1,i2,a1,i2	activity reference date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	activity reference time (*hh:mm:ss.s*)
	23–32	i4,a1,i2,a1,i2	concentration reference date (*yyyy/mm/dd*)
	34–43	i2,a1,i2,a1,f4.1	concentration reference time (*hh:mm:ss.s*)
3–n	1–8	a8	nuclide name
	10–20	e11.4	activity (mBq) (decay-corrected to acquisition of the lab)
	22–26	f5.2	activity uncertainty (%)
	28	i1	coverage factor, e.g., k=2, k=3 (optional, only used if the reported activity uncertainty is an expanded uncertainty)

Continues on next page

Table 111. #X_Results block format (cont.)

Record	Position	Format	Description
	30–40	e11.4	concentration (mBq/m^3) (decay-corrected to sampling period, taking into account decay during spectral acquisition, sampling and during the period between sampling and acquisition; assume constant concentration and deposition during sampling)
	42–46	f5.2	concentration uncertainty (%)
	48	i1	coverage factor, e.g., k=2, k=3 (optional, only used if the reported concentration uncertainty is an expanded uncertainty)

Table 112. #NuclideRatios block format

Record	Position	Format	Description
1	1–14	a14	`#NuclideRatios`
2–n	1–8	a8	nuclide 1
	10–17	a8	nuclide 2
	19–26	f8.3	activity ratio of nuclide 2 to 1
	28–32	f5.2	activity ratio uncertainty (%)
	34–43	i4,a1,i2,a1,i2	reference date for ratio (*yyyy/mm/dd*)
	45–54	i2,a1,i2,a1,f4.1	reference time for ratio (*hh:mm:ss.s*)
	56–65	i4,a1,i2,a1,i2	zero date (*hh:mm:ss.s*) (optional in some cases)†
	67–76	i2,a1,i2,a1,f4.1	zero time (*hh:mm:ss.s*) (optional in some cases)
	78–85	f8.3	zero date/time uncertainty (in days)

† The zero date and time are the start of in-growth of the daughter nuclide when nuclide 1 and nuclide 2 are a mother-daughter pair, respectively. These data are reported only when applicable and only for particulate samples. Its uncertainty should be expressed in days.

Table 113. #CoincidenceCorrection block format

Record	Position	Format	Description
1	1–24	a24	`#CoincidenceCorrection`
2–n	1–8	a8	nuclide name
	10–17	f8.3	energy
	19–26	f8.3	peak correction factor†
	28–32	f5.2	uncertainty of the peak correction factor (%)

† Peak correction factor defined as $A \sim \frac{1}{C_p}$. (PrepCom, 2019).

Table 114. #UncertaintyBudget block format

Record	Position	Format	Description
1	1–20	a20	`#UncertaintyBudget`
2	1–14	a14	`~Uncertainties`

Continues on next page

Table 114. #UncertaintyBudget block format (cont.)

Record	Position	Format	Description
3–n	1–8	a8	nuclide name (not needed for some descriptors)
	10–14	f5.2	uncertainty (%)
	16–55	a40	descriptor†
n+1	1–30	a30	`~UncertaintyCalculationMethods`
n+2-m	1–80	a80	free text description of the methods used for calculating uncertainties and combined uncertainty, and a description of the method for determining the level of confidence

† The Description field in records 3–n will be filled according to the categories for uncertainty, e.g., `Net-Count Rate` or Rn.

Table 115. #Lc block format

Record	Position	Format	Description
1	1–4	a4	`#LC`
2–n	1–8	a8	nuclide name
	10–20	e11.4	critical level (LC) in activity (mBq) (decay corrected to acquisition start of the lab)

Table 116. #P_MDA/MDC block format

Record	Position	Format	Description
1	1–4	a4	`#P_MDA/MDC`
2–n	1–8	a8	nuclide name
	10–20	e11.4	MDA (Bq) (decay corrected to acquisition start)
	22–32	e11.4	MDC (Bq/m^3) (decay-corrected to sampling period, taking into account decay during spectral acquisition, sampling and during the period between sampling and acquisition; assume constant concentration and deposition during sampling)

Table 117. #X_MDA/MDC block format

Record	Position	Format	Description
1	1–10	a10	`#X_MDA/MDC`
2–n	1–8	a8	nuclide name
	10–20	e11.4	MDA (mBq) (decay corrected to acquisition start)
	22–32	e11.4	MDC (mBq/m^3) (decay-corrected to sampling period, taking into account decay during spectral acquisition, sampling and during the period between sampling and acquisition; assume constant concentration and deposition during sampling)

Table 118. #Conclusions block format

Record	Position	Format	Description
1	1–12	a12	`#Conclusions`
2	1–11	a11	`~IDCSummary`
3–n	1–80	a80	free text summary of IDC findings
n+1	1–11	a11	`~LabSummary`
n+2-m	1–80	a80	free text summary of lab findings and conclusions
m+1	1–17	a17	`~ResultComparison`
m+2-p	1–80	a80	free text comparison of IDC and laboratory results

Table 119. #Comment block format

Record	Position	Format	Description
1	1–8	a8	`#Comment`
2–n	1–80	a80	free text

7.4 Other laboratory messages

The eight other laboratory messages are:

- PRESDN: Notification that a sample will be sent to a laboratory from station.
- TECSDN: Notification that a sample was sent from the laboratory to the PTS.
- LABSDN: Notification that a sample has been sent to a laboratory.
- MESACK: Acknowledgement that a message was received and read.
- SAMACK: Notification that a sample was received and an indication of its condition.
- DATREQ: Request for analysis results or any additional information.
- ADDINS: Instructions for the laboratory or a request for additional instructions from the PTS.
- MISC: Free format to cover any message that does not fit one of the other types.

Table 120. Data blocks in other laboratory messages

Data blocks	PRESDN	TECSDN	LABSDN	MESACK	SAMACK	DATREQ	ADDINS	MISC
#Header	r	r	r	r	r	r	r	r
#LabDataVersion	r	r	r	r	r	r	r	r
#Recipient		r	r				o	
#Transport		r	r				o	
#Collection			r				o	
#StationSample			r				o	

Continues on next page

Table 120. Data blocks in other laboratory messages (cont.)

Data blocks	PRESDN	TECSDN	LABSDN	MESACK	SAMACK	DATREQ	ADDINS	MISC
#IDCActivitySummary			o				o	
#IDCEventScreeningFlags			o				o	
#Split			o				o	
#Objective			r				o	
#MessageReceipt				r			o	
#SampleReceipt					r		o	
#Comment	o	o	o	o	o	o	o	o

r = required, o = optional

Formats for data blocks of #LabDataVersion, #Collection, #StationSample, #IDCActivitySummary, #IDCEventScreeningFlags, #Split, #Objective and #Comment are the same as those described in section 7.3 “Radionuclide laboratory reports”, respectively. Formats for the other data blocks listed in Table 120 are described in Tables 121–124.

Table 121. #Header block format for other laboratory messages

Record	Position	Format	Description
1	1–7	a7	`#Header`
2	1–7	a7	priority level [`Urgent`|`Routine`]
3	1–5	a5	code of the laboratory selected for analysis [`ARL01, ..., USL16`]
	7–22	a16	Sample Reference Identification (SRID) of the sample
4	1–11	a11	sample category (`Category A...XK`)
5	1–10	i4,a1,i2,a1,i2	message transmission date (*yyyy*/*mm*/*dd*)
	12–21	i2,a1,i2,a1,f4.1	message transmission time (*hh*:*mm*:*ss*.*s*)

Table 122. #Recipient block format

Record	Position	Format	Description
1	1–10	a10	`#Recipient`
2	1–16	a16	sample reference identification
3	1–60	a60	point of contact
4	1–30	a30	point of contact phone number
5	1–60	a60	organization
6–n	1–60	a60	address

Table 123. #Transport block format

Record	Position	Format	Description
1	1–10	a10	`#Transport`
2	1–20	a20	courier company
3	1–10	i4,a1,i2,a1,i2	date of handover (*yyyy/mm/dd*)
	12–21	i2,a1,i2	time of handover (*hh:mm*)
4	1–10	i4,a1,i2,a1,i2	estimated date of arrival (*yyyy/mm/dd*)
	12–21	i2,a1,i2	estimated time of arrival (*hh:mm*)
5	1–30	a30	airway bill number
6	1–14	a14	seal number

Table 124. #MessageReceipt block format

Record	Position	Format	Description
1	1–10	a10	`#MessageReceipt`
2	1–10	i4,a1,i2,a1,i2	date of receipt (*yyyy/mm/dd*)
	12–21	i2,a1,i2	time of receipt (*hh:mm*)

7.5 State of Health data

Data messages of DATA_TYPE RMSSOH contain blocks of data that describe or allow the evaluation of the State of Health (SOH) of the collection, processing, and acquisition equipment at an IMS radionuclide station.

Each RMSSOH data message is composed of a number of data blocks. The start of a data block is designated by a line containing the block name. Like PHD messages, all RMSSOH data block names begin with the pound (#) sign. The specific data blocks required in an RMSSOH message depend on the configuration of the radionuclide system. RMSSOH messages that do not contain all required data blocks cannot be processed by the IDC software. Table 125 summarizes the data blocks required in a RMSSOH message according to the equipment inventory at a site.

The #Header block (Table 126) must be the first data block in any RMSSOH message; however, no requirements on the order of the remaining data blocks are necessary. See I.31 on p. 326 for an example of an RMSSOH message.

Table 125. Data blocks for RMSSOH messages

Data blocks	Particulate data	Noble gas data
#Header	r	r
#AirSamplerFlow	r	r
#AirSamplerEnv†	r	
#Comment	o	o

Continues on next page

Table 125. Data blocks for RMSSOH messages (cont.)

Data blocks	Particulate data	Noble gas data
#DetEnv	r	r
#PowerSupply	r	r
#EquipStatus	r	r
#TamperEnv	o	o
#ProcessSensors		r
#Chromatogram		o

r = required, o = optional

† This data block is required for stations where air is heated at the inlet.

Table 126. #Header block format for state of health data

Record	Position	Format	Description
1	1–7	a7	`#Header`
	9–18	a10	designator
2	1–5	a5	station code
	7–15	a9	detector code or `NA` if there is none or more than one detector
3	1–10	i4,a1,i2,a1,i2	SOH data sampling period start date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	SOH data sampling period start time (*hh:mm:ss.s*)
	23–32	i4,a1,i2,a1,i2	SOH data sampling period end date (*yyyy/mm/dd*)
	34–43	i2,a1,i2,a1,f4.1	SOH data sampling period end time (*hh:mm:ss.s*)
	45–54	i4,a1,i2,a1,i2	transmit date (*yyyy/mm/dd*)
	56–65	i2,a1,i2,a1,f4.1	transmit time (*hh:mm:ss.s*)

An SOH data sampling period is defined as the total time duration in which the SOH data in the entire RMSSOH message are acquired. SOH is characterized by a start date and time as well as an end date and time. The SOH data sampling period consists of consecutive data sampling intervals. The interval start date and time indicates when the sampling interval begins. The interval duration describes how long the sampling interval lasts until the next one starts. An IMS station writes records at regular intervals (e.g., every 10 min) and upon a change of a status (e.g., power supplies, shielding, etc.).

Table 127. #AirSamplerFlow block format

Record	Position	Format	Description
1	1–15	a15	`#AirSamplerFlow`
2–n	1–10	f10.4	average flow rate (m^3/h at STP)
	12–22	f11.6	flow rate standard deviation (m^3/h at STP)
	24–33	i4,a1,i2,a1,i2	SOH data sampling interval start date (*yyyy/mm/dd*)
	35–44	i2,a1,i2,a1,f4.1	SOH data sampling interval start time (*hh:mm:ss.s*)

Continues on next page

Table 127. #AirSamplerFlow block format (cont.)

Record	Position	Format	Description
	46–51	i6	SOH data sampling interval duration (s)

Table 128. #AirSamplerEnv block format

Record	Position	Format	Description
1	1–14	a14	`#AirSamplerEnv`
2–n	1–5	f5.1	average air temperature after filter (°C)
	7–13	f7.2	average static air pressure after filter (kPa)
	15–24	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	26–35	i2,a1,i2,a1,f4.1	time (*hh:mm:ss.s*)
	37–42	i6	SOH data sampling interval duration (s)

Table 129. #DetEnv block format

Record	Position	Format	Description
1	1–7	a7	`#DetEnv`
2–n	1–5	f5.1	average room temperature (°C)
	7–12	a6	detector shield status (`OPEN` or `CLOSED`)
	14–16	i3	average room humidity (in % relative humidity)
	18–22	i5	detector high voltage (V)[†]
	24–27	i4	average crystal temperature (°C)
	29–31	a3	electric cooler status (`ON` or `OFF`)
	33–36	f4.2	liquid nitrogen fill-fraction or cooling power (W)[‡]
	38–43	f6.3	detector leakage current (nanoamperes [nA])[*]
	45–54	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	56–65	i2,a1,i2,a1,f4.1	time (*hh:mm:ss.s*)
	67–72	i6	SOH data sampling interval duration (s)

[†] This field contains the voltage that is applied across the detector crystal by the high voltage power supply and sometimes called the bias voltage.

[‡] This field contains the volume fraction of liquid nitrogen remaining (usually in a dewar) for cooling the detector crystal or power consumption (W) for electrical cooling equipment. For example, a full dewar would have a liquid nitrogen fill-fraction of 1.00. A half-full dewar would have a liquid nitrogen fill-fraction of 0.50. For electrical cooling equipment, the field displays power consumption as a rounded value with 4 digits from 00.0 up to 9999 W.

[*] This field contains the steady-state leakage current of the detector crystal during normal operations.

Example

An IMS station writes a record in the #DetEnv block (Table 129) every 10 min or upon a change in the shield status and electric cooler status. The events in Table 130 occurred from 9:00:00 to 10:00:00 UTC on 13 December, 2000.

Table 130. Example detector environment events at an IMS station

Time	Event
9:10:45	the detector shield is opened
9:21:30	the detector shield is closed
9:34:30	the electro cooler fails

During this time, the average room temperature was 21.0 °C, the average room humidity was 54.0%, and the average crystal temperature was −196 °C. Accordingly, the following records are written in the #DetEnv block.

```
21.0  CLOSED 54  13   -196  ON  -999 5.9   2000/12/13 9:10:45   540
21.0  OPEN   54  13   -196  ON  -999 5.9   2000/12/13 9:19:45   105
21.0  CLOSED 54  13   -196  ON  -999 5.9   2000/12/13 9:21:30   600
21.0  CLOSED 54  13   -196  ON  -999 5.9   2000/12/13 9:31:30   180
21.0  CLOSED 54  13   -196  OFF -999 6.0   2000/12/13 9:34:30   600
21.0  CLOSED 54  13   -196  OFF -999 6.0   2000/12/13 9:34:30   600
```

The liquid nitrogen fill-fraction is not applicable to a detector system that is electrically cooled. Then the field displays power consumption as a rounded value with 4 digits from 00.0 up to 9999 W. The field, however, must be filled with data or else the parsing program will fail. In case neither nitrogen fill-fraction nor power consumption are available, it is considered to be a case of missing data. The field is replaced with −999 as described in subsection 3.5.7 "Missing data" on p. 41 of this document.

Table 131. #PowerSupply block format

Record	Position	Format	Description
1	1–12	a12	`#PowerSupply`
2–n	1–4	a4	`MAIN` (for MAIN power supply)
	6–8	a3	status of main power supply (`ONOFF`)
	10–12	a3	`AUX` (for AUXiliary power supply)
	14–16	a3	status of auxiliary power supply (`ON/OFF`)†
	18–20	a3	`UPS` (for Uninterruptible Power Supply)
	22–24	a3	status of uninterruptedly power supply (`ON/OFF`)‡
	26–35	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	37–46	i2,a1,i2,a1,f4.1	time (*hh:mm:ss.s*)
	48–53	i6	SOH data sampling interval duration (s)

† This parameter is required when an auxiliary generator is installed.

‡ A UPS status of `ON` indicates the internal UPS batteries are being used to power the station.

Table 132. #TamperEnv block format

Record	Position	Format	Description
1	1–10	a10	`#TamperEnv`
2–n	1–20	a20	tamper sensor name
	22–27	a6	tamper sensor status (`OPEN` or `CLOSED`)
	29–38	i4,a1,i2,a1,i2	date (*yyyy*/*mm*/*dd*)
	40–49	i2,a1,i2,a1,f4.1	time (*hh*:*mm*:*ss*.*s*)
	51–56	i6	SOH data sampling interval duration (s)

Valid names for tamper sensors are listed in Table 133. Stations should send data for the tamper sensors they have. Some stations may have more tamper sensors than those currently recognized by the IDC. If an invalid name or extra sensor is listed in the #TamperEnv block (Table 132), the record will saved at the IDC but not parsed into the database tables. In the future, more sensor names may be added.

Table 133. Tamper sensor names recognized by IDC parsing software

Name	Tamper sensor location
door1	main entrance
door2	second door
door3	third door
fence	fence entrance
aslid	air sampler lid
aspanel	air sampler panel
fscab	filter storage cabinet
decaycab	decay cabinet
equipcab	equipment cabinet —primarily for automated stations

Table 134 is required for noble gas RMSSOH messages. It facilitates the reporting of SOH data from various sensors throughout the units during different processes. Each noble gas unit may report any number of sensor readings using this data block, for example, temperatures, pressures, flows, voltages and count rates. Stations report data only for those sensors they have. Unique sensor names are required to distinguish between sensors of the same type. Each station type can create its own sensor names up to 20 alphanumeric characters long. Sensor readings must be reported in the units listed.

Table 134. #ProcessSensors block format

Record	Position	Format	Description
1	1–13	a13	`#ProcessSensors`
2–n	1–15	a15	sensor type (`TEMP`, `PRESSURE`, `PROCESSFLOW`, `VOLTAGE`, `COUNTRATES`, `DEWPOINT`, `CO2VOLUME`)

Continues on next page

Table 134. #ProcessSensors block format (cont.)

Record	Position	Format	Description
	17–36	a20	sensor name
	38–57	f10.4	sensor reading (TEMP in °C, PRESSURE in Pa, PROCESSFLOW in m^3/h, VOLTAGE in V, COUNTRATE in counts/s, DEWPOINT in °C, CO2VOLUME in cm^3)
	59–68	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	70–79	i2, a1,i2, a1, f4.1	time (*hh:mm:ss.s*)
	81–86	i6	SOH duration (s)

The #Chromatogram block is used only for RMSSOH messages from noble gas stations with chromatograms.

Table 135. #Chromatogram block format

Record	Position	Format	Description
1	1–11	a11	`#Chromatogram`
2	1–80	a80	the SRID of the sample being counted
3	1–5	i5	total number of chromatogram readings (equal to the total number of channels)
4–n	1–5	i5	interval† number (starts at 1)
	6–15	i10	interval start channel
	16–29	f14	duration between chromatogram readings (in seconds [s])
n+1–m	1–5	i5	channel‡
	7–16	i10	detector response at channel + 0
	18–27	i10	detector response at channel + 1
	29–38	i10	detector response at channel + 2
	40–49	i10	detector response at channel + 3
	51–60	i10	detector response at channel + 4

† A group of chromatogram readings with the same time duration between each.

‡ Each detector reading is assigned a sequential number that is the channel number.

7.6 Meteorological data

Data messages of DATA_TYPE MET contain the meteorological data recorded at an IMS radionuclide station. The format for the MET data type is given in Table 136 "MET data format" on p. 209 and an example is provided in section I.22 "MET" on p. 303. There must be at least one record in a MET message.

Table 136. MET data format

Record	Position	Format	Description
1	1–5	a5	station code
2–n	1–10	i4,a1,i2,a1,i2	met start date (*yyyy/mm/dd*)
	12–21	i2,a1,i2,a1,f4.1	met start time (*hh:mm:ss.s*)
	23–32	i4,a1,i2,a1,i2	met end date (*yyyy/mm/dd*)
	34–43	i2,a1,i2,a1,f4.1	met end time (*hh:mm:ss.s*)
	45–49	f5.1	average outside temperature (°C)
	51–53	i3	average wind-direction (° from North)
	55–59	f5.1	average wind-speed (m/s)
	61–67	f7.2	average barometric reading (hPa)
	69–71	i3	average relative humidity (% relative humidity)
	73–77	f5.1	rainfall (mm)

7.7 Alerts

Currently five types of ALERT messages are implemented.

- ALERT_FLOW: This type of data message indicates that the sampler flow rate is above or below a specified threshold.
- ALERT_SYSTEM: This type of data message indicates a problem with major equipment.
- ALERT_TEMP: This type of data message indicates that a temperature sensor is above or below a specified threshold.
- ALERT_POWER: This type of data message indicates a problem with the power supply (e.g., loss of main power).
- ALERT_PRESSURE: This type of data message indicates that a pressure sensor reading is above or below a specified threshold.

Table 137 describes the general format of an ALERT message. Examples of ALERT messages can be found in Appendix I "Data message examples" on p. 263.

Table 137. General ALERT message format

Record	Position	Format	Description
1	1–5	a5	station code
	7–18	a12	alert type (`ALERT_FLOW`, `ALERT_SYSTEM`, `ALERT_TEMP`, `ALERT_POWER` or `ALERT_PRESSURE`)
	20–29	i4,a1,i2,a1,i2	date (*yyyy/mm/dd*)
	31–40	i2,a1,i2,a1,f4.1	time (*hh:mm:ss.s*)
2–n†	1–80	a80	free text describing alert

† There must be at least one line of free text describing the problem.

7.8 IDC products

The following data products are generated by the IDC and are made available to subscribers:

- ARR (Automated Radionuclide Report): The ARR contains results from the automated analysis of a particulate or noble gas sample.
- RRR (Reviewed Radionuclide Report): The RRR is a revised version of the ARR and is generated after the manual analysis of a particulate or noble gas sample is complete.
- SSREB (Standard Screened Radionuclide Event Bulletin): The SSREB is produced for particulate samples categorized as level 4 and level 5 and noble gas samples categorized as level C. This report contains the RRRs from stations contributing to the event, information on fission or activation products identified and an enhanced field of regard. The SSREBs may be updated as the laboratory analysis results arrive.
- RNPS (Radionuclide Network Product Summary): The RNPS contains a compilation of the status of collection, processing and analysis of all the data received from the IMS stations during a period.
- SAMPML/REVSAMP (sample PHD data plus analysis results in XML format): The SAMPML/REVSAMP contains noble gas spectra PHDs and analysis results in XML format, including the SAMPML and REVSAMP for Automated Radionuclide Report and Reviewed Radionuclide Report, respectively. For β-γ coincidence samples, it includes all four kind spectra of the sample, detector background, gas background and QCPHDs. It is not a standard IDC product but can be requested from the *VDMS*. And it is only available for noble gas monitoring systems.

The DATA_TYPE of these reports is ARR, RRR, SSREB, RNPS, SAMPML or REVSAMP, respectively.

7.8.1 ARR

7.8.1.1 ARR—Particulate version

An ARR for particulate systems contains the following sections:

- Sample Information
- Measurement Categorization
- Activity Summary
- Minimum Detectable Concentration for Key Nuclides
- Peak Search Results
- Processing parameters
- Calibration Parameters
- Data Timeliness and Availability Flags
- Data Quality Flags
- Calibration Equations.
- Field of Regard

The Sample Information section includes information on the sample collection and data acquisition (Table 138).

Table 138. ARR Sample Information section format for particulate systems

Record	Position	Format	Description
1(title)	1–73	a73	`SAMPLE INFORMATION =====================`
3	1–12	a11	`Station ID:`
	21–26	a6	system code
	41–52	a12	`Detector ID:`
	61–70	a10	detector code
4	1–14	a14	`Authenticated:`
	21–23	a3	`YES` or `NO`
6	1–17	a17	`Station Location:`
	19–48	a30	place and county location of the station
7	1–21	a21	`Detector Description:`
	23–73	a49	detector number and location
9	1–10	a10	`Sample ID:`
	23–30	i8	unique number assigned to a PHD message by the IDC. This number is referenced in all data products resulting from the PHD set with that SID
	41–56	a16	`Sample Geometry:`
	61–70	a10	station type and sample dimensions
10	1–16	a16	`Sample Quantity:`
	23–30	f8.2	total atmospheric air volume sampled (m^3 at STP)
	32–33	a2	`m3`
	41–52	a12	`Sample Type:`
	61–71	a11	`particulate` or `gas`
13	1–17	a17	`Collection Start:`
	21–30	i4,a1,i2,a1,i2	collection start date (*yyyy/mm/dd*)
	32–36	i2, a1, i2	collection start time (*hh*:*mm*)
	41–54	a14	`Sampling Time:`
	63–67	f5.2	sample collection duration and is equal to the difference in the Collection Stop and Collection Start times
	69–73	a5	`hours`
14	1–16	a16	`Collection Stop:`
	21–30	i4,a1,i2,a1,i2	collection stop date (*yyyy/mm/dd*)
	32–36	i2, a1, i2	collection start time (*hh*:*mm*)
	41–51	a11	`Decay Time:`
	63–67	f5.2	decay time in h
	69–73	a5	`hours`
15	1–18	a18	`Acquisition Start:`
	21–30	i4,a1,i2,a1,i2	sample start date (*yyyy/mm/dd*)
	32–36	i2, a1, i2	sample start time (*hh*:*mm*)
	41–57	a17	`Acquisition Time:`

Continues on next page

Table 138. ARR Sample Information section format (particulates) (cont.)

Record	Position	Format	Description
	63–67	f5.2	detector count duration in h
	69–73	a5	`hours`
16	1–17	a17	`Acquisition Stop:`
	21–30	i4,a1,i2,a1,i2	acquisition stop date (*yyyy*/*mm*/*dd*)
	32–26	i2, a1, i2	acquisition stop time (*hh*:*mm*)
	41–54	a14	`Avg Flow Rate:`
	62–67	f6.2	average blower flow rate in m^3/h for IMS particulate stations. For particulate IMS stations, the average flow rate is equivalent to the Sample Quantity divided by the Sampling Time
	69–73	a5	`m3/hr`
18	1–28	a28	`Collection Station Comments:`
19-k	1–73	a73	free text comments
20	1–30	a30	`IDC Analysis General Comments:`
20-k	1–73	a73	free text comments

The Measurement Categorization section contains a legend of categorizations levels as well as the sample category (Table 139).

Table 139. ARR Measurement Categorization section format for particulate systems

Record	Position	Format	Description
1 (title)	1–73	a73	`MEASUREMENT CATEGORIZATION` `======================`
3 (header)	1–22	a22	`Categorization Legend`
	1–21	a21	`-----------`
	1–41	a41	`Level 1 = Typical Background Rad. Meas.`
	1–43	a43	`Level 2 = Anomalous Background Rad. Meas.`
	1–44	a44	`Level 3 = Typical Anthropogenic Rad. Meas.`
	1–46	a46	`Level 4 = Anomalous Anthropogenic Rad. Meas.`
	1–52	a52	`Level 5 = Mult. Anomalous Anthropogenic Rad. Meas.`
11 (data)	1–19	a19	`Spectrum Category (`
	20	i1	spectrum category of the sample
	21–25	a5	`) -`
	26–56	a40	short description of the spectrum category
13	1–23	a23	`Categorization Summary:`
15(header)	1–4	a4	`Name`
	12–19	a8	`Category`
	23–44	a22	`Categorization Comment`
	1–4	a4	`--`

Continues on next page

Table 139. ARR Measurement Categorization section format (particulates) (cont.)

Record	Position	Format	Description
17 (data)	1–6	a6	isotope name
	15	i1	isotope category
	24–45	a22	comments to the isotope category

The Activity Summary section displays the concentrations and relative uncertainties of the radionuclides detected in the sample (Table 140). The following blocks are included: Natural Radioactivity, Activation-Products Radioactivity and Fission-Product Radioactivity. Quantified relevant and non-relevant CTBT radionuclides are listed in the Activation-Products Radioactivity and Fission-Product Radioactivity blocks.

Table 140. ARR Activity Summary section format for particulate systems

Record	Position	Format	Description
1 (title)	1–16	a16	`ACTIVITY SUMMARY`
3	1–22	a22	`NATURAL RADIOACTIVITY:`
5	1–45	a45	`Nuclides Identified and not Quantified:`
7		free text	list of nuclide present in the sample for which the concentration has not been determined
11	1–20	a20	`Nuclides Quantified:`
13 (header)	1–7	a7	`Nuclide`
	20–28	a9	`Half-Life`
	41–52	a12	`Conc(uBq/m3)`
	61–68	a8	`RelErr(%)`
	77–88	a12	`Activ(uBq)`
	97–104	a8	`RelErr(%)`
15–n (data)†	1–7	a7	nuclide name
	20–22	a13	half-life in seconds, hours, days or years
	41–51	e11.2	activity concentration (μBq/m^3)
	61–65	f5.2	uncertainty of the activity concentration in percentage
	77–87	e11.2	activity (μBq) at the acquisition start
	97–101	f5.2	uncertainty of the activity in percentage
n+1	1–33	a33	`ACTIVATION-PRODUCT RADIOACTIVITY:`
n+3 (header)	1–7	a7	`Nuclide`
	20–28	a9	`Half-Life`
	41–52	a12	`Conc(uBq/m3)`
	61–68	a8	`RelErr(%)`
	77–88	a12	`Activ(uBq)`
	97–104	a8	`RelErr(%)`
	113–123	a11	`Coincidence`
n+5-m (data)†	1–7	a7	nuclide name

Continues on next page

Table 140. ARR Activity Summary section format (particulates) (cont.)

Record	Position	Format	Description
	20–22	a13	half-life in seconds, hours, days, or years
	41–51	e11.2	activity concentration (μBq/m^3)
	61–65	f5.2	uncertainty of the activity concentration in percentage
	77–87	e11.2	activity (μBq)
	97–101	f5.2	uncertainty of the activity in percentage
	113–115	a3	`YES` or `NO`
m+1	1–33	a33	`FISSION-PRODUCT RADIOACTIVITY:`
m+3 (header)	1–7	a7	`Nuclide`
	20–28	a9	`Half-Life`
	41–52	a12	`Conc(uBq/m3)`
	61–68	a8	`RelErr(%)`
	77–88	a12	`Activ(uBq)`
	97–104	a8	`RelErr(%)`
	113–123	a11	`Coincidence`
m+5-p (data)†	1–7	a7	nuclide name
	20–22	a13	half-life in seconds, hours, days, or years
	41–51	e11.2	activity concentration (μBq/m^3)
	61–65	f5.2	uncertainty of the activity concentration in percentage
	77–87	e11.2	activity (μBq)
	97–101	f5.2	uncertainty of the activity in percentage
	113–115	a3	`YES` or `NO`

† The records in the data block are the number of the detected isotopes.

The Minimum Detectable Concentration for Key Nuclides section (Table 141) lists the half-lives and MDCs of CTBT relevant radionuclides.

Table 141. ARR Minimum Detectable Concentration for key Nuclides section format for particulate systems

Record	Position	Format	Description
1 (title)	1–45	a45	`MINIMUM DETECTABLE CONCENTRATION FOR KEY NUCLIDES`
2 (header)	1–7	a7	`Nuclide`
	20–28	a9	`Half-Life`
	44–54	a11	`MDC(uBq/m3)`
	64–74	a11	`MDA(uBq)`
3 (data)	1–7	a7	nuclide name
	20–32	a13	half-life in seconds, hours, days, or years
	44–54	e11.2	MDC (μBq/m^3)
	64–74	e11.2	MDA (μBq)

The Peak Search Results section (Table 142) lists information on the peaks identified during automated analysis of high-resolution γ-spectrometry data.

Table 142. ARR Peak Search Results section format for particulate systems

Record	Position	Format	Description
1 (title)	1–30	a30	`PEAK SEARCH RESULTS`
3	6–8	i3	number of peaks found in the spectrum by automated peak search
	10–68	a59	`peaks found in spectrum by automated peak search.`
4	6–8	i3	number of peaks associated with nuclide by automated processing
	10–68	a59	`peaks associated with nuclide by automated processing.`
5	6–8	i3	number of peaks not associated with nuclide by automated processing
	10–68	a59	`peaks not associated with nuclide by automated processing.`
6	7–8	i2	% of peaks were associated with nuclide
	10–68	a59	`% of peaks were associated with nuclide.`
8	2–64	a63	`Note: "*" indicates that a peak was a component of a multiplet.`
10 (headers)	2–7	a6	`Energy`
	11–18	a8	`Centroid`
	22–26	a5	`Width`
	29–32	a4	`FWHM`
	36–40	a5	`%Eff`
	46–53	a8	`Net Area`
	56–63	a8	`%RelErr`
	69–75	a8	`%Bkgnd`
	78–84	a7	`Nuclide`
	87–89	a3	`Nts`
12–n (data)	1–7	i4.2	energy at peak centroid in KeV
	10–16	i4.2	peak centroid channel
	24–25	i2	peak width (FWHM) in channel
	29–32	i3.2	FWHM in KeV
	37–40	i3.2	detection efficiency in percentage
	45–53	i7.2	peak net area in counts corrected for background
	59–63	i4.2	uncertainty of the peak net area in percentage
	69–75	i4.2	ratio of the peak area to the normalized background peak area in percentage
	78–84	a7	nuclide id

Continues on next page

Table 142. ARR Peak Search Results section format (particulates) (cont.)

Record	Position	Format	Description
	87-	free text	free text notes

The Processing Parameters section (Table 143) includes the settings used by the software to identify peaks and quantify peak characteristics.

Table 143. ARR Processing Parameters section format for particulate systems

Record	Position	Format	Description
1 (title)	1–21	a21	`PROCESSING PARAMETERS`
3	1–32	a13	`Risk level K:`
	34–50	f5.2	risk of making an incorrect judgment that a channel represents part of a real peak when it does not
4	1–32	a19	`Baseline algorithm:`
	34–50	a17	algorithm used for estimating the shape of the background under a peak
5	1–32	a32	`Nucl Id Detectability Threshold:`
	34–50	f4.2	quality threshold for declaring a peak
6	1–32	a20	`Energy Id Tolerance:`
	34–50	a10	maximum allowed difference in KeV for automatic association of a peak to a nuclide
7	1–32	a22	`Background subtraction:`
	34–50	a3	`YES` or `NO`
8	1–32	a22	`Background spectrum ID:`
	34–51	a8	sample ID of the background spectrum used
9	1–32	a22	`Background data type:`
	34–50	a8	data type of the background spectrum, e.g., blank or detector background
10	1–32	a30	`Background acquisition start:`
	34–50	a3	date and time of the acquisition start
11	1–32	a22	`Background acquisition time:`
	34–38	f5.2	acquisition time (h) of the background spectrum
	40–44	a5	`hours`
12	1–32	a16	`IRF for Pb-212F:`
	34–50	a3	`YES` or `NO`

The Calibration Parameters section (Table 144) includes the types of energy, resolution and efficiency calibration parameters used during automated analysis.

Table 144. ARR Calibration Parameters section format for particulate systems

Record	Position	Format	Description
1 (title)	1–23	A23	CALIBRATION PARAMETERS
3	1–15	a15	Area Threshold:
	29–31	i3	area threshold
4	1–16	a16	Confidence Level:
	29–31	i3	confidence level used
5	1–11	a11	ECR updated:
	29–31	a3	Energy vs Channel Regression updated
6	1–11	a11	RER updated:
	29–31	a3	Resolution vs Energy Regression updated
7	1–8	a8	Used ECR:
	29–38	a10	ECR type
8	1–9	a9	Used RER:
	29–38	a10	RER type

The Data Timeliness and Availability Flags section (Table 145) contains information about the presence or absence of the previous sample; the acceptability of the duration of sample collection, sample decay and sample acquisition; and the time difference between receipt of raw data and report creation.

Table 145. ARR Data Timeliness and Availability Flags section format for particulate systems

Record	Position	Format	Description
1 (header)	1–38	a38	DATA TIMELINESS AND AVAILABILITY FLAGS
3	1–24	a24	Previous Sample Present?
	56–58	a3	YES or NO
4	1–38	a38	Collection time within 24 hours +/- 10%?
	56–58	a3	YES or NO
5	1–29	a29	Acquisition time >= 20 hours?
	56–58	a3	YES or NO
6	1–23	a23	Decay time <= 24 hours?
	56–58	a3	YES or NO
7	1–50	a50	Sample received within 72 hours of collect start?
	56–58	a3	YES or NO

The Data Quality Flags section lists values for SOH and data quality parameters, acceptable values for these parameters, and test results (PASS/FAIL)(Table 146).

Table 146. ARR Data Quality Flags section format for particulate systems

Record	Position	Format	Description
1 (title)	1–18	a18	`DATA QUALITY FLAGS`
3 (header)	1–4	a4	`Name`†
	32–40	a9	`Pass/Fail`
	43–47	a5	`Value`
	59–61	a4	`Test`
5	1–30	a30	`Ba140_MDC`
	32–35	a4	`PASS` or `FAIL`
	43–53	e11.5	value of the ^{140}Ba MDC (µBq/m^3)
	59–74	a16	`<30`
6	1–30	a30	`K40_LocationDifference`
	32–35	a4	`PASS` or `FAIL`
	43–53	e11.5	value of the difference between the centroid location for the 40 K peak in the current spectrum and the location of the 40 K peak in the MRP spectrum
	59–74	a16	`<3*standard deviation`
7	1–30	a30	`NormalizedGainDifference`
	32–35	a4	`PASS` or `FAIL`
	43–53	e11.5	value of the difference between the normalized gain for the current spectrum and that of the MRP spectrum
	59–74	a16	`<0.0001`
8	1–30	a30	`Be7_FWHM`
	32–35	a4	`PASS` or `FAIL`
	43–53	e11.5	value of the ^{7}Be FWHM (KeV)
	59–74	a16	`<1.7`
9	1–30	a30	`FlowRate`
	32–35	a4	`PASS` or `FAIL`
	43–53	e11.5	value of the sampling flow rate (m^3/h)
	59–74	a16	`>500`

† The five flags are listed in the table but only flags which are available will be given in A/RRRs.

The Calibration Equations section includes the energy, resolution, and efficiency calibration equations generated during automated analysis (Table 147).

Table 147. ARR Calibration Equations section format for particulate systems

Record	Position	Format	Description
1 (title)	1–21	a21	`CALIBRATION EQUATIONS`
3	1–18	a18	`Energy vs. Channel`
5	1–42	a42	energy calibration equation

Continues on next page

Table 147. ARR Calibration Equations section format (particulates) (cont.)

Record	Position	Format	Description
7	3–19	a16	`E = energy (keV)`
8	3–20	a18	`c = channel number`
11	1–18	a18	`Resolution vs. Energy`
13	1–42	a42	resolution calibration equation
15	3–35	a32	`FWHM = Full Width Half Max (keV)`
16	3–18	a16	`E = energy (keV)`
19	1–21	a21	`Efficiency vs. Energy`
21	2–11	a10	type of efficiency calibration
22 (header)	11–46	a36	`Energy Efficiency Uncertainty`
23	13–16	i4	energy
	22–31	f10	efficiency value
	37–46	f10	uncertainty

The Field of Regard section contains the URL link to the field of regard associated with the sample.

An example of an Automated Radionuclide Report is provided in section section I.3 "ARR—Particulate version" on p. 281.

7.8.1.2 ARR—Noble gas systems

An ARR noble gas report contains following sections:

- Report title
- Sample Information
- Measurement Categorization
- Activity Summary and Minimum Detectable Concentration for Xenon Isotopes
- Processing Specific Parameters and Results
- Processing Parameters
- Calibration Parameters
- Data Timeliness and Availability Flags
- Data Quality Flags
- Event Screening Flags
- Calibration Equations.

ARR noble gas reports are given in both plain text and HTML formats. Since the structure and content of both plain text and HTML formats are the same, only the latter will be described. The only difference between the two is that the HTML format contains also time development and frequency distribution plots. The HTML format consists of HTML tags, that specify the appearance of the content. The title and section names are defined as bold letters with different font-sizes. The report contents are displayed either in a line style with two parts of a header and specific data or in a table style with headers and data rows in a few columns. The detailed description of the HTML tags is beyond the scope of this document. Two complete typical examples from an HPGe system and a β-γ coincidence system with detailed HTML tags are provided in subsection I.2.2 "β-γ coincidence systems (HTML format)" and subsection I.2.4 "HPGe systems (HTML format)" on pp. 268 and 276, respectively. Formats of report contents are described below.

The Title section includes the ARR title along with the date and time information about the sample spectrum and report. A screenshot of the Title section of the ARR example from the station AUX33 is shown in Figure 3. The title block displays a bold free text of "IDC Generated Report", "Automatic Radionuclide Report" and "Noble Gas Version" in three lines, respectively. The second block displays the "Creation Date", "Sample Arrival Time" and "Time difference from receipt of the sample spectra to the report creation" in three distinct lines. Each message line contains two parts, i.e., the header and the specific data. For example, the header of the first message line is the Creation Date: which will be the same for all spectra analysis and the report specific data is 2021-12-08 17:54:49, which is the specific date and time when this report was created. All message lines in the title section are centre aligned.

IDC Generated Report
Automatic Radionuclide Report
Noble Gas Version

Creation Date: 2022-06-01 03:53:55
Sample Arrival Time: 2022-06-01 03:53:40
Time difference from receipt of raw data to report creation: 15.0 s

Figure 3. ARR title section for noble gas (common in both β-γ coincidence and HPGe) systems.

The contents of the Sample Information section are more or less the same as those in subsubsection 7.8.1.1 "ARR—Particulate version" (Table 138 on p. 211), except for the stable xenon volume instead of the total sampling volume for the particulate systems. It contains four blocks as shown in Figure 4:

- The first block lists the Station ID, Detector Code and Authenticated flag in four columns by two rows.
- The second block lists the Station Location, Detector Description and System Technology in two columns by three rows.
- The third block displays the Sample Reference ID, Sample ID, Stable Xenon Volume and Sample Type in four columns by three rows.
- The last block contains the time information like the Collection Start date and time, Sampling Time, Processing Time, Acquisition Start and Acquisition Stop date and time, and Acquisition Time in four columns by four rows.

All messages are left-aligned unless otherwise noted.

The Measurement Categorization section contains three blocks as shown in Figure 5:

- The first block is the Categorization Legend for noble gas samples and is presented in two columns, e.g., Level A, B and C and their short descriptions, respectively.
- The second block is the Isotope Category for each xenon isotope in a table style. Headers of the table are shown in Table 148.

Sample Information

Station ID:	USX75	Detector Code:	USX75_007
Authenticated:	YES		
Station Location:	NG Charlottesville, VA, USA		
Detector Description:	Detector #7 in Charlottesville, VA, USA		
System Technology:	SAUNA		
Sample Reference ID:	75202205302111X		
Sample ID:	6738612		
Stable Xe Volume:	3.20 ml	Sample Type:	Gas
Collection Start:	2022-05-30 21:42:10	Sampling Time:	12 h
Collection Stop:	2022-05-31 09:42:10	Processing Time:	6 h 59 m 2 s
Acquisition Start:	2022-05-31 16:41:12	Acquisition Time:	11 h 10 m
Acquisition Stop:	2022-06-01 03:51:12		

Figure 4. ARR Sample Information section for noble gas (common in both β-γ coincidence and HPGe) systems.

- The last block is an one line message about the Spectrum Category, which is dependent on the highest level of the isotope category, including the category level and its short description.

Measurement Categorization

Categorization Legend

Level A = Clean spectrum - No Xenon is present in the sample.
Level B = Xenon detection within the typical range for the station.
Level C = Anomalous Xenon detection.

Isotope category

Isotope	Nuclide detected	Abnormal_limit (mBq/m3)	Category
Xe-131m	YES	1.67E-01	B
Xe-133m	NO	1.14E-01	A
Xe-133	NO	5.24E-01	A
Xe-135	NO	7.94E-01	A

Spectrum Category: B - Xenon detection within the typical range for the station

Figure 5. ARR Measurement Categorization section for noble gas (common in both β-γ coincidence and HPGe) systems.

Table 148. ARR Isotope category block columns

Column	Content	Description
1	`Isotope`	xenon isotope name
2	`Nuclide Detected`	flags of the detected xenon isotopes, `YES` or `NO`
3	`Abnormal_Limit`	abnormal limit (mBq/m^3)
4	`Category`	category for the xenon isotope

The Activity Summary and MDC for Xenon Isotopes section displays the radon counts, concentrations and relative uncertainties of four radio-xenon isotopes detected in the sample, which has different formats for β-γ coincidence and HPGe based systems, respectively.

- For HPGe stations, it contains two blocks as shown in Figure 6a.

- The first block is the Radon Level in Xenon Sample listing the nuclide (e.g., `Rn-222`), the half-life (e.g., `3.82 D`), the area (peak net area of 352 KeV (counts) and the relative uncertainty of the net area as a percentage (RelErr (%)).
- The second block is the Xenon Isotopes displaying the analysis results in two sub-blocks, which responding the two different analysis methods, e.g., the Peak Fit Method and Decay Analysis Method as shown in Figure 6a and Table 149.

• For β-γ coincidence stations, this section contains two blocks. The Activity Summary section of an ARR example is shown in Figure 6b. The first block lists the radon counts in the xenon sample, which is the net counts in ROI 1. The second one displays analysis results for xenon isotopes with a subtitle "Xenon Isotopes -Net Count Calculation (NCC) analysis method" as shown in Table 150.

Table 149. ARR Activity Summary section columns for HPGe spectra analysis

Column	Content	Description
1	`Nuclide`	xenon name
2	`Half-life`	half-life of xenon isotopes
3	`Activity (mBq)`	activity (mBq)
4	`StatErr (%)`	relative statistical uncertainty of the activity (%)
5	`SysErr (%)`	relative systematic uncertainty of the activity (%)
6	`RelErr (%)`	relative total uncertainty of the activity (%)
7	`Conc (mBq/m3)`	activity concentration (mBq/m^3)
8	`StatErr (%)`	relative statistical uncertainty of the activity concentration (%)
9	`SysErr (%)`	relative systematic uncertainty of the activity concentration (%)
10	`RelErr (%)`	relative total uncertainty of the activity concentration (%)
11	`MDI/MDC`	MDC (mBq/m^3) for ^{133}Xe and ^{135}Xe; MDI (milli-photon/s/m^3) for ^{131m}Xe and ^{133m}Xe

Table 150. ARR Activity Summary section columns for β-γ coincidence spectra analysis

Column	Content	Description
1	`Nuclide`	xenon name
2	`Half-life`	half-life of xenon isotopes
3	`Activity (mBq)`	activity at acquisition start (mBq/m^3)
4	`StatErr (%)`	relative statistical uncertainty of the activity (%)
5	`SysErr (%)`	relative systematic uncertainty of the activity (%)
6	`RelErr (%)`	relative total uncertainty of the activity (%)
7	`Conc (mBq/m`^{3}`)`	activity concentration (mBq/m^3)
8	`StatErr (%)`	relative statistical uncertainty of the activity concentration (%)
9	`SysErr (%)`	relative systematic uncertainty of the activity concentration (%)
10	`RelErr (%)`	relative total uncertainty of the activity concentration (%)
11	`LC`	critical level of the activity concentration (mBq/m^3)
12	`MDC`	MDC of the xenon isotope (mBq/m^3)

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes

Radon level in Xenon sample

Nuclide	Half-Life	Area	RelErr (%)
Rn-222	3.82 D	315.68	7.39

Xenon isotopes

Peak Fit Method

Nuclide	Half-Life	Activity (mBq)	StatErr (%)	SysErr (%)	TotalErr (%)	Conc (mBq/m3)	StatErr (%)	SysErr (%)	TotalErr (%)	MDI/MDC
XE-131M	11.962 D	2.12E+00	925.66	2.68	925.66	4.26E-02	925.66	4.02	925.66	2.62E-01
XE-133M	2.198 D	2.26E+01	90.14	2.72	90.18	5.23E-01	90.14	4.05	90.23	2.62E-01
XE-133	5.2441 D	9.26E+00	28.91	2.50	29.02	1.94E-01	28.91	3.91	29.18	2.88E-01
XE-135	9.143 H	2.53E+00	187.34	2.72	187.36	1.19E-01	187.34	4.05	187.38	1.14E+00

Decay Analysis Method

Nuclide	Half-Life	Activity (mBq)	StatErr (%)	SysErr (%)	TotalErr (%)	Conc (mBq/m3)	StatErr (%)	SysErr (%)	TotalErr (%)	MDI/MDC
XE-131M	11.962 D	-1.35E+01	149.16	2.68	149.18	-2.72E-01	149.16	4.02	149.21	2.62E-01
XE-133M	2.198 D	2.96E+01	70.93	2.72	70.98	6.84E-01	70.93	4.05	71.05	2.62E-01
XE-133	5.2441 D	1.21E+01	22.06	2.50	22.20	2.53E-01	22.06	3.91	22.40	2.88E-01
XE-135	9.143 H	6.42E+00	69.80	2.72	69.85	3.01E-01	69.80	4.05	69.92	1.14E+00

(a) Activity Summary and Minimum Detectable Concentration for Xenon Isotopes for a HPGe noble gas station.

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes

Radon counts in Xenon sample: 113

Xenon isotopes - Beta gamma matrix (BGM) analysis method

Nuclide	Half-Life	Activity (mBq)	StatErr (%)	SysErr (%)	TotalErr (%)	Conc (mBq/m3)	StatErr (%)	SysErr (%)	TotalErr (%)	LC (mBq/m3)	MDC (mBq/m3)
XE-131M	11.962 D	9.80E-01	45.80	4.71	46.04	2.75E-02	45.80	11.05	47.11	1.69E-02	3.91E-02
XE-133M	2.198 D	2.88E-01	98.04	5.70	98.21	9.30E-03	98.04	11.51	98.72	1.29E-02	3.21E-02
XE-133	5.2441 D	7.42E-01	119.12	10.88	119.61	2.17E-02	119.12	14.78	120.03	4.04E-02	8.86E-02
XE-135	9.143 H	-7.51E-01	120.20	10.50	120.65	-5.29E-02	120.20	14.50	121.07	1.08E-01	2.28E-01

(b) Activity Summary and Minimum Detectable Concentration for Xenon Isotopes section for a β-γ coincidence noble gas station.

Figure 6. ARR Activity Summary and Minimum Detectable Concentration for Xenon Isotopes sections of noble gas systems.

The Processing Specific Parameters and Results section includes information on the peaks identified during spectra analysis and is different between β-γ coincidence and HPGe systems.

- For HPGe spectra, the section contains only one block, the Xenon Peak Data, as shown in Figure 7a and Table 151. It is noted that this section is populated only if the sample has xenon peaks.
- For β-γ coincidence spectra, the section includes three blocks as shown Figure 7b:
  - The first one is a line message about the analysis method displayed as Method 1 (Net Count Calculation).
  - The second block is the ROI Net Count Results described in Table 152.
  - The third block is the ROI Limits described in Table 153.

Processing Specific Parameters and Results

Xenon Peak Data

Energy (keV)	Centroid	Width	FWHM (keV)	Eff (%)	Net Area	RelErr (%)
29.74	135.38	3.00	0.60	12.79	99.90	27.85
80.92	368.42	3.00	0.66	26.07	74.66	28.03

(a) Processing Specific Parameters and Results section of an HPGe noble gas station.

Processing Specific Parameters and Results

Beta gamma matrix (BGM) analysis method

ROI Net Count Results

ROI	Nuclide	Net Counts	Abs Net Error	LC	Efficiency	Abs Eff Error
1	PB-214	53.10	3.33	13.68	N/A	N/A
2	XE-135	-11.02	3.64	22.46	0.60	0.01
3	XE-133	7.54	3.00	14.06	0.70	0.01
4	XE-133	10.17	2.49	8.78	0.71	0.01
5	XE-131M	14.16	2.55	8.70	0.67	0.01
6	XE-133M	4.00	1.98	5.56	0.67	0.01

ROI Limits (channels)

ROI	BetaLow *(channels)*	BetaHigh *(channels)*	GammaLow *(channels)*	GammaHigh *(channels)*
1	1	195	115	136
2	1	251	79	101
3	1	122	26	36
4	1	136	8	16
5	28	54	8	16
6	63	92	8	16
7	1	25	8	16
8	95	136	8	16
9	63	136	8	16
10	1	54	8	16

(b) Processing Specific Parameters and Results section of a β-γ coincidence noble gas station.

Figure 7. ARR Processing Specific Parameters and Results sections of noble gas systems.

Table 151. ARR Processing Specific Parameters section: Xenon Peak Data block columns for HPGe spectra analysis

Column	Content	Description
1	`Energy (KeV)`	peak energy (KeV)
2	`Centroid`	peak centroid (channels)
3	`Width`	peak width (actually the FWHM) (channels)
4	`FWHM (KeV)`	full width at half maximum (KeV)
5	`Eff (%)`	peak detection efficiency (%)
6	`Net Area`	peak net area (counts)
7	`RelErr (%)`	relative uncertainty of the peak net area (%)

Table 152. ARR Processing Specific Parameters section: ROI Net Count Results block columns for β-γ coincidence spectra analysis

Column	Content	Description
1	`ROI`	ROI number
2	`Nuclide`	xenon isotopes like `XE-131M, XE-133M, XE-133 and XE-135`
3	`Net Counts`	net counts in the ROI
4	`Abs Net Error`	absolute uncertainty of the net counts
5	`LC`	critical level of the net counts
6	`Efficiency`	detection efficiency of the β-γ coincidence
7	`Abs Eff Error`	absolute uncertainty of the coincidence efficiency

Table 153. ARR Processing Specific Parameters section: ROI Limits block columns for β-γ coincidence spectra analysis

Column	Content	Description
1	`ROI`	ROI number
2	`BetaLow (channels)`	low β energy limit in channels
3	`BetaHigh (channels)`	high β energy limit in channels
4	`GammaLow (channels)`	low γ energy limit in channels
5	`GammaHigh (channels)`	high γ energy limit in channels

The Processing Parameters section includes settings used to identify peaks and quantify peak characteristics.

- For HPGe spectra, the section lists only two parameters, e.g., risk level K and baseline algorithm in two rows by two columns, as shown in Figure 8a.
- For β-γ coincidence spectra, the section lists five parameters, e.g., risk level K, gas background used (`YES` or `NO`), detector background used (`YES` or `NO`), interference corrections (`YES` or `NO`) and analysis method (NCC or others) in five rows by two columns, as shown in Figure 8b.

The Calibration Parameters section displays the information about calibration parameters used during the spectra analysis.

- For the HPGe analysis, the Calibration Parameters section is the same as that of the ARR—Particulate version (Table 144 on p. 217), including the area threshold, confidence level, ECR updated, RER updated, used ECR and used RER in six rows by two columns as shown in Figure 9a.
- For the β-γ coincidence spectra analysis, the section is about updating flags if calibration parameters are updated, including the γ energy calibration updated (`YES/NO`) and β energy calibration updated (`YES/NO`) in two rows by two columns as shown in Figure 9b.

The Data Timeliness and Availability Flags section is the same as that of the ARR—Particulate

```
Processing Parameters
Risk level K:        4.26489
Baseline algorithm: Smoothing / Lawn Mowers
```

(a) Processing Parameters section of an HPGe noble gas station.

```
Processing Parameters
Risk level k:                1.6449
Gas background used:         YES
Detector background used:    YES
Interference corrections:    YES
Analysis method:             BGM
```

(b) Processing Parameters section of a β-γ coincidence noble gas station.

Figure 8. ARR Processing Parameters section of noble gas systems.

```
Calibration Parameters
SAreaThreshold: 100
ConfidenceLevel: 95
ECR updated:    Yes
RER updated:    Yes
Used ECR:       INITIAL
Used RER:       MRPM
```

(a) Calibration Parameters section of an HPGe noble gas station.

```
Calibration Parameters
Gamma energy calibration updated: YES
Beta energy calibration updated:  YES
```

(b) Calibration Parameters section of a β-γ coincidence noble gas station.

Figure 9. ARR Calibration Parameters sections of noble gas systems.

version (Table 145 on p. 217). It gives the information about the four flags and testing results as shown in Figure 10, Table 154 and Table 155.

```
Data Timeliness and Availability Flags
Name                     Pass/Fail  Value  Test
Previous Sample Present  Fail       N/A    -1/2 day sample available
Collection Time          Pass       12.00  12h +- 10%
Acquisition Time         Pass       11.17  12h +- 10%
Response Time            Pass       30.19  sample received within 96h of collect start
```

Figure 10. ARR Data Timeliness and Availability Flags section of noble gas stations.

Table 154. ARR Data Timeliness and Availability Flags section columns

Column	Content	Description
1	`Name`	flag name
2	`Pass/Fail`	test result, `Pass` or `Fail`
3	`Value`	value of the monitoring metrics

Continues on next page

Table 154. ARR Data Timeliness and Availability Flags section columns (cont.)

Column	Content	Description
4	`Test`	criterion of the test

Table 155. ARR Data Timeliness and Availability Flags section flag names

Column	Content	Description
1	`Previous Sample Present`	flag of previous sample present, the value is the sample ID of the previous sample
2	`Collection Time`	flag if the collection time is within the requirement
3	`Acquisition Time`	flag if the acquisition time is within the requirement
4	`Response Time`	flag if the sample reporting time is within the requirement

The Data Quality Flags section lists quality testing values for different monitoring metrics as shown in Figure 11, Table 156 and Table 157. The testing criteria might be different for the HPGe and β-γ coincidence spectra, respectively.

Data Quality Flags

Name	Pass/Fail	Value	Test
Stable Xenon Volume	Pass	3.20	greater than 0.44 ml
SOH	N/A	N/A	N/A
Xe-133 MDC	PASS	0.09	less than 1 mBq/m3

Figure 11. ARR Data Quality Flags section of noble gas stations.

Table 156. ARR Data Quality Flags block columns

Column	Content	Description
1	`Name`	flag name
2	`Pass/Fail`	test result, `Pass` or `Fail`
3	`Value`	value of the monitoring metrics
4	`Test`	criterion of the test

Table 157. ARR Data Quality Flags block format flag names

Column	Content	Description
1	`Stable Xenon Volume`	value of the sample xenon volume (ml)
2	`SOH`	N/A
3	`Xe-133 MDC`	^{133}Xe MDC (mBq/m^3)

The Event Screening Flags section contains the information of radio-xenon isotopes present in the spectrum and ratios between xenon isotopes as shown in Figure 12 and Table 158.

Table 158. ARR **Event Screening Flags section columns**

Column	Content	Description
1	`Xenon Isotopes present in this spectrum`	`YES` or `NO`
2	`Only one Xenon Isotope in spectrum`	`YES` or `NO`
3	`Number of days since last Xenon detection`	value of the days
4	`2 or more Xenon Isotopes present in this spectrum`	`YES` or `NO`
5	`Xe-133 present in spectrum`	`YES` or `NO`
6	`Number of times Xe-133 seen in last 365 days`	number of samples
7	`Short term flag`	sample category based on short term (30 days) history
8	`Isotopic ratios:`	
	`- Xe-133m/131m > 2`	`YES` or `NO`
	`- Xe-135/133 > 5`	`YES` or `NO`
	`- Xe-133m/133 > 0.3`	`YES` or `NO`

Event Screening Flags

Name	YES/NO/Value
Xenon Isotopes present in this spectrum	YES
Only one Xenon Isotope in spectrum	NO
Number of days since last Xenon detection	0
2 or more Xenon Isotopes present in this spectrum	YES
Xe-133 present in spectrum	NO
Number of times Xe-133 seen in last 365 days	156
Short term flag	b - Xenon detection within the typical range for the station
Isotopic ratios:	
- Xe-133m/131m > 2	NO
- Xe-135/133 > 5	NO
- Xe-133m/133 > 0.3	NO

Figure 12. ARR Event Screening Flags section of noble gas stations.

The Calibration Equations section includes: (a) energy and resolution calibration coefficients for HPGe noble gas and (b) γ and β energy calibration coefficients for β-γ noble gas. The latter is shown in Figure 13.

The efficiency information is given in the Processing Specific Parameters and Results section.

Calibration Equations

Beta Energy To Channel : C(E)= t0 + t1 E + t2 E²
t0 : -7.72307
t1 : 0.414462
t2 : -0.0001607

Gamma Energy To Channel : C(E)= t0 + t1 E + t2 E²
t0 : 0.0703898
t1 : 0.382508
t2 : -0.0000566

Figure 13. ARR Calibration Equations section β-γ noble gas.

Examples of ARR reports for noble gas systems are provided in section I.2 “ARR—Noble gas version” on p. 265.

7.8.2 RRR

The RRR is the product of the manual review of the automated results by an IDC analyst.

For noble gas systems, the items and formats are the same between ARR and RRR but the values, like concentrations and categorizations, might be different due to the re-processing of the spectra during the interactive review. A block of the IDC Analysis General Comments is included in the RRR Sample Information section, which contains the date and time and a free text of comments entered by analysts. Like the ARR noble gas reports, the RRR noble gas reports are also given in both plain text and HTML formats.

For the particulate systems, all sections in the ARR are also found in the RRR, including the three additional sections listed below:

- The Spectral-Region-of-Interest Editing section summarizes the number of peaks added, deleted, and modified by the analyst through the interactive analysis tool (Table 159).
- The Peak Search Notes section contains the comments associated with the sample peaks (Table 160). These are added via the interactive analysis tool by analysts and other reviewers.
- The Event Screening Flags section contains the flags about the specified fission and activation products (Table 161).

Examples of RRR are provided in section I.33 “RRR—Noble gas version” on p. 328 and section I.34 “RRR—Particulate version” on p. 345.

Table 159. RRR Spectral Region of Interest (SROI) Editing section format

Record	Position	Format	Description
1 (title)	1–50	a50	`SPECTRAL-REGION-OF-INTEREST (SROI) EDITING`
3	1–19	a19	`Nuclide ID Changes:`
4	4–38	a34	`Average Concentration Differences:`
	39–42	a4	`YES` or `none`
5	3–21	a18	`Nuclides Entering:`
6 (header)	9–12	a4	`Name`
	19–30	a12	`Average Conc`
	35–42	a8	`%RelErr`
7 (data)	9–14	a7	nuclide name
	19–30	f11.2	average concentration (µBq/m^3)
	35–40	f5.2	uncertainty of the concentration in percentage (%)
	4–20	a17	`Nuclides Leaving:`
	22–25	a4	`YES` or `none`

Table 160. RRR Peak Search Notes section format

Record	Position	Format	Description
1 (title)	1–17	a17	`PEAK SEARCH NOTES`
3	1–4	a4	`NOTE`
	6–7	i2	number of the note
4	1–13	a13	`Date entered:`
	15–24	i4,a1,i2,a1,i2	entered date (*yyyy/mm/dd*)
	26–33	i2, a1, i2	entered time (*hh:mm*)
5	1–8	a8	`Analyst:`
	10-	a8	analyst information
	1–80	a80	free text of the comment entered by analyst

Table 161. RRR Event Screening Flags section format

Record	Position	Format	Description
1 (header)	1–21	a21	`EVENT SCREENING FLAGS`
3	6–49	a44	`Activation Products present in this spectrum`
	67–69	a3	`YES` or `NO`
5	6–41	a36	`Only one fission product in spectrum`
	67–69	a3	`YES` or `NO`
7	6–43	a38	`2 or more fission products in spectrum`
	67–69	a3	`YES` or `NO`
9	6–31	a26	^{137}Cs `present in spectrum`
	67–69	a3	`YES` or `NO`

7.8.3 SSREB

7.8.3.1 SSREB—Particulate version

The Standard Screened Radionuclide Event Bulletin (SSREB) is designated as DATA_TYPE SSREB. The SSREB comprises the following sections:

- The Event Detection Summary section lists the station where the sample originated, the collection stop date and time, the IDC-generated sample ID, the level 4 CTBT-relevant radionuclides or radio-xenon isotopes that resulted in the event, and several event screening flags (Table 162).
- The Enhanced Field of Regard section contains the URL link to an enhanced field of regard for the sample, for example

```
ENHANCED FIELD OF REGARD
    =========================================================
https://swp.ctbto.org/FOR/ARP01/2016/11/13
```

- The Certified Laboratory Results section includes sample analysis results performed at a certified radionuclide laboratory. Contents include the #Header and #Conclusion block of the associated RLR.

- The Additional Information section contains information added through the use of the SS-REB editor. Appended data may contain additional information on the event as it is detected at other stations over time.

An example of the particulate systems of the SSREB is provided in section I.38 "SSREB—Particulate version" on p. 356.

Table 162. SSREB Event Detection Summary block format—Particulate version

Record	Position	Format	Description
1 (title)	1–23	a23	`Event Detection Summary`
3 (header)	6–12	a7	`Station`
	17–28	a12	`Collect Stop`
	38–46	a9	`Sample ID`
	49–52	a4	`Name`
	60–81	a22	`Categorization Comment`
5 (data)	6–10	a5	station code
	17–26	i4,a1,i2,a1,i2	collection stop date (*yyyy*/*mm*/*dd*)
	28–35	i2,a1,i2,a1,a2	collection stop time (*hh*:*mm*:*ss*.*s*)
	38–44	i7	sample ID
	49–52	a6	isotope name
	60–79	a20	free text about the categorization comment
6	6–49	a44	`Activation Products present in this spectrum`
	67–69	a3	`Yes` or `No`
7	11–54	a44	`Number of days since last activation product`
	67–68	i2	number of days
8	6–41	a36	`Only one fission product in spectrum`
	67–69	a3	`Yes` or `No`
9	11–51	a41	`Number of days since last fission-product`
	67–68	i2	number of days
10	6–43	a38	`2 or more fission-products in spectrum`
	67–69	a3	`Yes` or `No`
11	6–31	a26	^{137}Cs `present in spectrum`
	67–69	a3	`Yes` or `No`
12	11–46	a36	`Number of times seen in last 30 days`
	67–68	a2	number of times

7.8.3.2 SSREB—Noble gas systems

The SSREB noble gas report is the same for both β-γ coincidence and HPGe systems and is given in both HTML and plain text formats like the ARR and RRR for noble gas samples. Since the structure and content of both plain text and HTML formats is the same (the only difference being that the HTML format contains also time development and frequency distribution plots), only the latter will be described.

The Event Detection Summary section contains three blocks, e.g., Sample Information, Sample Categorization and Event Screening Flags, which are more or less the same as the sections in RRR, respectively.

- The block of Sample Information lists the station ID, detector code, Sample Reference Identification and collection stop date and time, which is a short version of the Sample Information section in the RRR.
- The block of Measurement Categorization is the same as the Measurement Categorization section in the RRR.
- The block of Event Screening Flags contains all contents of the Event Screening Flags section in the RRR in addition to the values of the isotope ratios in Table 163.

Table 163. SSREB Isotopic Ratio block format

Isotopic ratio	Value	YES/NO	Test
^{133m}Xe/^{131m}Xe		`YES/NO`	^{133m}Xe/^{131m}Xe > 2
^{135}Xe/^{133}Xe		`YES/NO`	^{135}Xe/^{133}Xe > 5
^{133m}Xe/^{133}Xe		`YES/NO`	^{133m}Xe/^{133}Xe > 0.3
^{133}Xe/^{131m}Xe		`YES/NO`	^{133}Xe/^{131m}Xe > 1000

The other sections like the Enhanced Field of Regard, Certified Laboratory Results and Additional Information are all the same as the SSREB—Particulate version.

Examples of the SSREB—Noble gas systems are provided in section I.37 “SSREB—Noble gas systems” on p. 353.

7.8.4 RNPS

The Radionuclide Network Product Summary provides a summary of all the radionuclide network activity over a period. This report is produced daily and includes a listing of all of the radionuclide products received at the IDC —ARRs, RRRs, SSREBs, SAMPMLs and REVSAMPs Table 164. An example of a RNPS is provided on p. 327.

Table 164. Station block format

Record	Position	Format	Description
1 (header)	1–7	a7	`Station`
	9–16	a8	`SID`
	18	a4	`Type`
	24–37	a12	`Cstart(GMT)`
	40–53	a11	`Cstop(GMT)`
	56–62	a8	`Category`
	65	a1	`Status`
	73–83	a8	`Products`
	84-end of line	free text	`CTBT Relevant`
2–n (data)	1–7	a7	station code
	9–16	i8	sample ID
	18	a1	type of station. `P`: particulate station, `G`: noble gas station based on γ spectroscopy, `B`: noble gas station based on β-γ coincidence, `X`: noble gas station based on β-γ coincidence with high resolution
	24–35	i2,a1,i2,a1, i2,i2,a1,i2	collection start date and time ($yy/mm/dd\ \ hh:mm$)
	40–53	i2,a1,i2,a1, i2,i2,a1,i2	collection stop date and time ($yy/mm/dd\ \ hh:mm$)
	56–62	a7	categorization level of the sample (for particulates, Level 1 to Level 5; for noble gas, from Level A to Level C
	65	a1	sample status; it can be `A`: Automatic or `R`: Reviewed
	73–83	a11	type of radionuclide reports available for the sample. This is a comma-delimited list, with the following possible codes: `A`: ARR, `R`: RRR, `S`: SSREB, `XA`: SAMPML, `XR`: REVSAMP
	84-end of line		list of relevant radionuclides found in the sample

8

Command request and response messages

This chapter describes the command request and response message formats and includes the following sections:

8.1 Introduction

All command messages require the basic message structure described in section 3.2 "Message preface" on p. 34. If a message is a command request or command response message, the MSG_TYPE is set to `command_request` or `command_response`, respectively.

```
begin IMS2.0
msg_type command_request | command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
e-mail name@my.computer
time_stamp yyyy/mm/dd hh:mm:ss
cmnd_req | cmnd_resp
command parameter lines
stop
```

The body of a command request message contains a series of free-format command lines that provide information about the return message (E-MAIL), specify the type of command that is requested, and set the environment for the requested command.

The reply to a command request is contained in a command response message. In the COMMAND_RESPONSE message the identification (ID) fields from the MSG_ID line of the request message are placed in the REF_ID line.

8.2 E-MAIL

The E-MAIL line contains the address where responses to the command request should be sent.

Syntax

```
email address
```

address e-mail address to send response

8.3 TIME_STAMP

The TIME_STAMP line specifies the time when the command request or response is issued. This line is mandatory for command requests and responses. Stations will use this time to determine if the command request is recent and that it is reasonable to process the request. This time is in UTC and in the *yyyy/mm/dd hh:mm:ss* format specified in ISO 8601 (1988).

Syntax

```
time_stamp yyyy/mm/dd hh:mm:ss
```

8.4 Command request and response lines

Command request lines specify the type of command to be performed at the station. Some command requests have arguments that are specified in the same line or as specific environment lines.

Command response lines provide an acknowledgement of the execution of a command and may include the information resulting from command execution.

Table 165 lists the command request lines and the corresponding command response lines.

Table 165. Command types and corresponding responses

Command request	Command response	Command type
CALIBRATE_START	CALIBRATE_CONFIRM, CALIBRATE_RESULT	operation change S/H/I stations
DETBKPHD_START	DETBKPHD_CONFIRM	operation change radionuclide stations
BLANKPHD_START	BLANKPHD_CONFIRM	operation change radionuclide stations
CALIBPHD_START	CALIBPHD_CONFIRM	operation change radionuclide stations
CHANGE_DECAY	DECAY_CHANGED	operation change radionuclide stations
SEND_SAMPLE	SAMPLE_SENT, SAMPLE_NOTSENT, SAMPLE_RECEIVED	Operation change radionuclide stations
UPDATE_CALIBPAIRS	CALIBPAIRS_UPDATED	operation change radionuclide stations
GENERATE_KEYPAIR	KEYPAIR_GENERATED	key management
START_KEYPAIR	KEYPAIR_STARTED	key management
UPDATE_CRL	CRL_UPDATED	key management

8.5 Operation change S/H/I stations

8.5.1 Station calibration

To calibrate an IMS seismic, hydroacoustic or infrasound station the command request, CALIBRATE_START, is issued, which indicates the time of the calibration and details as to how the calibration should be conducted.

The command response is first to confirm the calibration, CALIBRATE_CONFIRM and then later the calibration results are sent, CALIBRATE_RESULT.

8.5.2 CALIBRATE_START

Syntax

```
begin IMS2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
start_time yyyy/mm/dd hh:mm:ss
stn_list station_code
chan_list channels
sensor yes | no
type random | sine
calib_param seconds[ volts]| hertz seconds [volts]}
calibrate_start
...stop
```

The *station_code* is the station name of the station receiving the command request. If the station has more than one site and channel, the desired channel to be calibrated can be specified in CHAN_LIST.

The requested start time for the calibration is given on a single line starting with START_TIME, for example

```
START_TIME yyyy/mm/dd hh:mm:ss
```

Time is specified following ISO 8601 (1988) in UTC.

Whether the sensor should be included in the calibration is given on a single line starting with SENSOR, for example

```
SENSOR YES
```

or

```
SENSOR NO.
```

The type of calibration is either sine or random. This is given on a single line starting with TYPE, for example

```
TYPE RANDOM
```

or

```
TYPE SINE
```

8.5.2.1 Random calibration signals

For a calibration of the TYPE RANDOM, a duration shall be specified. This is given on a single line starting with CALIB_PARAM, for example

```
CALIB_PARAM xx
```

specifies the duration of the random binary signal in seconds.

Optionally, the amplitude of the calibration signal can be specified for a random calibration. The amplitude is given as a second argument to the line CALIB_PARAM, for example

```
CALIB_PARAM xx yy
```

specifies the amplitude (yy) in Volts.

8.5.2.2 Sine calibration signals

For sine calibration signals, TYPE SINE, the command parameters field is a sequence of one or more CALIB_PARAM lines. The first of these specifies frequency in Hz, duration in seconds and (optionally) the amplitude in Volts of the calibrating signal. Any further lines specify the frequency in Hz, duration in seconds, time in seconds after the end of the previous sine wave and (optionally) the amplitude in Volts of the calibrating signal. For example,

```
CALIB_PARAM  1.0 30.0       10.0
CALIB_PARAM  5.0 30.0 120.0 10.0
CALIB_PARAM 10.0 30.0  60.0 10.0
CALIB_PARAM 25.0 30.0  20.0 10.0
```

8.5.2.3 Pulse calibration signals

For pulse calibration signals, TYPE PULSE, the command parameters field is a sequence of one or more CALIB_PARAM lines. The first of these specifies the duration of the pulse in seconds and (optionally) the amplitude in Volts of the calibrating signal. Any further lines specify the duration of each subsequent pulse in seconds, time in seconds after the end of the previous pulse and (optionally) the amplitude in Volts of the calibrating signal. For example,

```
CALIB_PARAM  2.0        10.0
CALIB_PARAM  2.0 20.0 - 10.0
CALIB_PARAM  2.0 20.0   10.0
CALIB_PARAM  2.0 20.0 - 10.0
```

8.5.2.4 Sweep calibration signals

For sweep calibration signals, TYPE SWEEP, the signal should be a sinusoidal sweep whose phase increases with the logarithm of time (so that the frequency decreases by a constant factor within each period). The CALIB_PARAM line specifies the initial frequency in Hz, the duration of the sweep in seconds and (optionally) the amplitude in Volts of the calibrating signal. For example,

```
CALIB_PARAM      0.5 0.02 320.0 10.0
```

IMS stations may not support all four types of calibration. If a requested calibration cannot be performed because of this, this will be indicated in the START_TIME line as a START_TIME_-NOT_CONFIRMED.

8.5.3 CALIBRATE_CONFIRM

Syntax

Listing 8.1. Syntax of the CALIBRATE_CONFIRM command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
[chan_list chan]
start_time yyyy/mm/dd hh:mm:ss | not_confirmed
calibrate_confirm
stop
```

The *station_code* is the station name of the station receiving the command request. If the station has more than one site and channel, the channel to be calibrated can be specified in CHAN_-LIST.

The calibration is confirmed by providing a time that the calibrations will start. This may be the requested start time, given in the CALIBRATE_START message or a different time. This is given on a single line starting with START_TIME, for example

```
START_TIME yyyy/mm/dd hh:mm:ss
```

Time is specified following ISO 8601 (1988) in UTC.

If the calibration cannot be performed at the requested time and if a new time for the calibration cannot be provided, this will be indicated in the START_TIME line as START_TIME NOT_-CONFIRMED.

8.5.4 CALIBRATE_RESULT

Syntax

Listing 8.2. Syntax of the CALIBRATE_RESULT command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
```

```
sta_list station_code
[chan_list channel]
calibrate_result
in_spec yes | no
[calib value]
[calper value]
[system response in ims2.0]
stop
```

The *station_code* is the station name of the station receiving the command request. If the station has more than one site and channel, the code for the site/channel results being provided can be specified in CHAN_LIST.

This message reports whether the calibration was within specifications or not. This is accomplished on a single line starting with IN_SPEC, for example

```
IN_SPEC YES
```

or

```
IN_SPEC NO
```

If the calibration was not within specifications then a new response shall be calculated. In some cases a new response may be calculated even if the calibration was within specification.

In the case of a single-frequency calibration, this consists of a pair of values for CALIB, the calibration constant, and CALPER, the period (s) at which the calibration constant was calculated. These are given on single lines starting with CALIB and CALPER, for example

```
CALIB 105.0
```

or

```
CALPER 1.0
```

The units of CALIB for seismic stations are given in ISO 8601 (1988); the units for hydroacoustic and infrasound stations are µPa/count and Pa/count respectively.

For a full-frequency calibration, it consists of a full system response in IMS2.0 RESPONSE format (ISO 8601, 1988).

8.6 Operation change radionuclide stations

8.6.1 Special measurements

The request for special measurements includes the three command requests, DETBKPHD_-START, BLANKPHD_START, and CALIBPHD_START. The response to these commands is DETBKPHD_CONFIRM, BLANKPHD_CONFIRM, or CALIBPHD_CONFIRM respectively.

8.6.2 DETBKPHD_START / BLANKPHD_START / CALIBPHD_START

Syntax

Listing 8.3. Syntax of the special measurement command requests

```
begin ims2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
detbkphd_start | blankphd_start | calibphd_start
start_time yyyy/mm/dd hh:mm:ss
duration hours
stop
```

The station_code is the station name of the station receiving the command request. The start time in UTC of the measurement as *yyyy/mm/dd hh:mm:ss* is provided in the START_TIME line.

The DURATION parameter line contains length of the measurement in h.

8.6.3 DETBKPHD_CONFIRM / BLANKPHD_CONFIRM / CALIBPHD_-CONFIRM

Syntax

Listing 8.4. Command response to special measurement command requests

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
detbkphd_confirm | blankphd_confirm | calibphd_confirm
start_time yyyy/mm/dd hh:mm:ss | not_confirmed
stop
```

The station_code is the station name of the station that received the command request.

The START_TIME parameter line indicates the start time of the measurement in UTC as *yyyy/mm/dd hh:mm:ss*.

If the command cannot be performed at the requested time and if a new time for the measurement cannot be provided, the response will indicate this in the START_TIME line as START_-TIME NOT_CONFIRMED.

8.7 Operational mode change

To request an operational mode change at an IMS radionuclide station the command request is CHANGE_DECAY, which indicates the time of the requested change. The command response to confirm the change is DECAY_CHANGED and some additional information.

8.7.1 CHANGE_DECAY

Syntax

Listing 8.5. Syntax of the CHANGE_DECAY command request

```
begin ims2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
change_decay
[start_time yyyy/mm/dd hh:mm:ss]
decay_time hours
stop
```

The *station_code* is the station name of the station receiving the command request. The start time in UTC of the decay time change can be specified in the START_TIME line as *yyyy/mm/dd hh:mm:ss*.

The DECAY_TIME parameter line contains the new decay time in h.

8.7.2 DECAY_CHANGED

Syntax

Listing 8.6. Syntax of the DECAY_CHANGED command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
decay_changed
new_decay_time hours srid
stop
```

The station_code is the station name of the station that received the command request.

The NEW_DECAY_TIME line indicates the new decay time in h and the Sample Reference Identification (SRID) separated by a space, for example *xx ccyyyymmddhhPp*.

8.8 Send sample to a laboratory

To request the dispatch of a sample for further analysis, or for quality control, the command request is SEND_SAMPLE, which identifies the sample and where it should be sent. The command response to confirm the dispatch is SAMPLE_SENT and some additional information. After arrival at the laboratory the response is SAMPLE_RECEIVED, which indicates that the Station Operator is no longer responsible for the sample. If the requested sample cannot be sent, the command response SAMPLE_NOTSENT is sent.

8.8.1 SEND_SAMPLE

Syntax

Listing 8.7. Syntax of the SEND_SAMPLE command request

```
begin ims2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
send_sample
priority urgent|routine
srid ccyyyymmddhhpp
poc somebody
organization somewhere
address address1
address address2
address address3
stop
```

The *station_code* is the station name of the station receiving the command request. The priority of the shipment is either urgent or routine. This is given on a single line starting with PRIORITY, for example

```
PRIORITY URGENT
```

or

```
PRIORITY ROUTINE
```

Which sample, or which part of the split sample, has to be shipped is indicated with the sample reference ID.

The Point-of-Contact, the Organization and the Address where to ship the sample is indicated by the lines: POC, ORGANIZATION and (if necessary multiple) ADDRESS.

8.8.2 SAMPLE_SENT

Syntax

Listing 8.8. Syntax of the SAMPLE_SENT command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
sample_sent
srid ccyyyymmddhhpp
mass ms_full|ms_split
poc somebody
organization somewhere
address address1
address address2
address address3
courier courier company
handover yyyy/mm/dd hh:mm:ss
arrival yyyy/mm/dd hh:mm:ss
awb airwaybillnumber
seal cccccnnnnnnnn
stop
```

The station_code is the station name of the station that received the command request.

The sample, or the split sample, that was shipped is indicated with the sample reference ID. The mass of the unsplit sample and the split mass is indicated by a line MASS followed by the numbers of the two masses (in grams).

Additional information on the courier company, handover date/time, estimated arrival date/time, airway bill number and the stations seal number are given.

8.8.3 SAMPLE_NOTSENT

Syntax

Listing 8.9. Syntax of the SAMPLE_NOTSENT command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
sample_notsent
srid ccyyyymmddhhpp
```

```
free text describing why the sample could not be sent
stop
```

8.8.4 SAMPLE_RECEIVED

Syntax

Listing 8.10. Syntax of the SAMPLE_RECEIVED command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
sample_received
srid ccyyyymmddhhpp
arrival yyyy/mm/dd hh:mm:ss
stop
```

The station_code is the station name of the station that received the command request. The sample, or the split sample, that was shipped is indicated with the sample reference ID. Additional information on the arrival date/time is given.

8.9 Update of HPGe detector calibration information

To request an update of the HPGe detector calibration information sent with the PHD messages, the command request UPDATE_CALIBPAIRS is sent, which includes the updated data pairs. The command response to confirm the implementation of the new data pairs is CALIBPAIRS_-UPDATED.

8.9.1 UPDATE_CALIBPAIRS

Syntax

Listing 8.11. Syntax of the UPDATE_CALIBPAIRS command request

```
begin ims2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code[ detector_code]}
update_calibpairs
#g_Energy
...
```

```
#g_Resolution
...
#g_Efficiency
...
#g_TotalEfficiency
...
stop
```

The station_code is the station name of the station receiving the command request. The detector code may be specified if a station operates more detectors.

8.9.2 CALIBPAIRS_UPDATED

Syntax

Listing 8.12. Syntax of the CALIBPAIRS_UPDATED command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code[ detector_code]
calibpairs_updated
stop
```

8.10 Generate new keypair

To generate new keypairs at the station authenticators the command request GENERATE_KEYPAIR is sent. The response KEYPAIR_GENERATED acknowledged the successful execution of the command request along with a certificate request for the new keys.

8.10.1 GENERATE_KEYPAIR

Syntax

Listing 8.13. Syntax of the GENERATE_KEYPAIR command request

```
begin ims2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
[chan_list chan]
[auth_id id]
```

```
generate_keypair
[pem dsa parameters]
stop
```

The *station_code* is the station name of the station receiving the command request. If the station has more than one site and channel, the code for the site/channel results being provided can be specified in CHAN_LIST.

If the site or channel has more than one authentication unit, the desired authenticator can be specified using the AUTH_ID line.

Optionally, the values for the DSA parameters (P, Q and G) to be used for the new keys can be specified in PEM format.

8.10.2 KEYPAIR_GENERATED

Syntax

Listing 8.14. Syntax of the KEYPAIR_GENERATED command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
[chan_list chan]
[auth_id id]
keypair_generated
[signature signature]
{certificate request}
stop
```

The *station_code* is the station name of the station receiving the command request. If the station has more than one authentication unit, the channel code for the authenticator affected by the keypair change shall be specified. If the channel has more than one authentication unit, the desired authenticator can be specified using the AUTH_ID line. In this case multiple KEYPAIR_GENERATED messages must be sent from the station, each including the information of one authenticator.

The signature of the new key signed with the old key, in hex representation is included in the SIGNATURE line. This line can be omitted if the corresponding old key or the key of the authorized device manager is used to sign the e-mail message.

The response message includes the certificate request for the new key, in PEM format.

8.11 Start a new keypair

To start using a new keypair at the station authenticators the command request START_KEYPAIR is sent along with the newly created certificate. The KEYPAIR_STARTED response acknowledges the successful execution of the command request.

8.11.1 START_KEYPAIR

Syntax

Listing 8.15. Syntax of the START_KEYPAIR command request

```
begin ims2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
[chan_list chan]
[auth_id id]
[start_time yyyy/mm/dd hh:mm:ss]
start_keypair
x509 certificate
stop
```

The *station_code* is the station name of the station receiving the command request. If the station has more than one site, the site/channel code for the desired authenticator can be specified. If the channel has more than one authentication unit, the desired authenticator can be specified using the AUTH_ID line.

The time to start using the new keypair can be specified in the START_TIME line. If not specified the station should start using the new keypair immediately upon reception of the command request.

The X.509 certificate (PEM) is included in the message, for reference and future use at the station.

8.11.2 KEYPAIR_STARTED

Syntax

Listing 8.16. Syntax of the KEYPAIR_STARTED command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
```

```
sta_list station_code
[chan_list chan]
[auth_id id]
keypair_started
stop
```

Station_code is the station name of the station where the command request was implemented.

If the station has more than one site, the site/channel code for the authenticator affected by the keypair start shall be specified. If the site has more than one authentication unit, the desired authenticator can be specified using the AUTH_ID line.

8.12 Update the CRL

To send a new Certificate Revocation List (CRL) to the station and request them to update the station copy, the command request UPDATE_CRL is sent along with the information to update the CRL. The response CRL_UPDATED acknowledges the successful execution of the command request.

8.12.1 UPDATE_CRL

Syntax

Listing 8.17. Syntax of the UPDATE_CRL command request

```
begin ims2.0
msg_type command_request
msg_id id_string[ source]
e-mail address
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
update_crl
x509 crl
stop
```

Station_code of the station receiving the command request can be specified in the command line. The station must use the latest CRL for all sites and authenticators.

The certificate revocation list in X.509 (PEM) format is included.

8.12.2 CRL_UPDATED

Syntax

Listing 8.18. UPDATE_CRL command request

```
begin ims2.0
msg_type command_response
msg_id id_string[ source]
ref_id ref_str[ ref_src]
time_stamp yyyy/mm/dd hh:mm:ss
sta_list station_code
[chan_list chan]
[auth_id id]
[start_time yyyy/mm/dd hh:mm:ss]
crl_updated
stop
```

Station_code is the station name of the station receiving the command request.

If the station has more than one site and/or authenticator, the site/channel and auth_id code for the authenticator affected by the command request shall be specified.

9

Summary messages

This chapter describes the request message formats and includes the following sections:

9.1 Introduction

IMS2.0 data formats provide a common format for data and data product exchange. The data messages described in this chapter are for summary data products such as the Executive Summary.

Each data message contains the required information for all IMS2.0 messages. All data messages must contain the BEGIN line and be followed by a MSG_TYPE line and a MSG_ID line using the proper formats for the arguments. The MSG_TYPE for data messages is data. Because a data message may be a response to a request, a REF_ID line may also appear. If the data message is a response to a subscription, then a PROD_ID line will be included. Sections of data-specific information follow the identification line(s).

The data format for summary messages is IMS2.0. The type of data that is included in a data section and the format of the data are designated with a DATA_TYPE line.

9.1.1 DATA_TYPE

Data sections must begin with a DATA_TYPE line. The arguments to DATA_TYPE are the type of data that follows (for example, EXECSUM) and the format (IMS2.0).

Syntax

`data_type` *data_type format*

data_type type of data that follows; typical examples are EXECSUM, BULLETIN, and RESPONSE

format general format of the data (IMS2.0)

Example

```
data_type execsum ims2.0
```

The end of a data section is implied by another DATA_TYPE line or a STOP line.

The following sections give the formats for data messages. Examples of these data formats are provided in Appendix I "Data message examples" on p. 263.

9.2 Executive Summary

The Executive Summary contains summary statistics of the number of events in the SEB and those in the various event-screening categories, the number of radionuclide detections and those categorized as Level 4 or Level 5, and the number of events with cross-referenced radionuclide and seismic-acoustic data. It also contains status metrics regarding the IMS network, GCI communications, IDC processing, and Radionuclide Laboratories. It includes the time interval for which the results were requested, the time at which it was generated, and the times at which the latest seismic-acoustic and radionuclide processing were performed. The format is defined in Table 166, and an example is provided in subsection 4.7.16 "EXECSUM" on p. 86.

Table 166. Executive summary format

Record	Position	Format	Description
1 (title)	2–22	a21	`Executive Summary for`
	24–33	i4,a1,i2,a1,i2	start date of requested interval (*yyyy/mm/dd*)
	35–42	i2,a1,i2,a1,i2	start time of requested interval (*hh:mm:ss.s*)
	44–45	a2	`to`
	47–56	i4,a1,i2,a1,i2	end date of requested interval (*yyyy/mm/dd*)
	58–65	i2,a1,i2,a1,i2	end time of requested interval (*hh:mm:ss.s*)
2 (time stamp)	2–13	a12	generated at
	15–24	i4,a1,i2,a1,i2	date generated (*yyyy/mm/dd*)
	26–33	i2,a1,i2,a1,i2	time generated (*hh:mm:ss.s*)
3			(blank line)
4 (header)	1–48	a48	`LATEST PROCESSING TIME (for requested interval)`
5 (header)	4–19	a16	`Seismic-Acoustic`
	31–42	a12	`Radionuclide`
6 (time stamps)	1–10	i4,a1,i2,a1,i2	date of latest S/H/I processing (*yyyy/mm/dd*)

Continues on next page

Table 166. Executive summary format (cont.)

Record	Position	Format	Description
	12–19	i2,a1,i2,a1,i2	time of latest S/H/I processing (*hh*:*mm*:*ss*.*s*)
	24–33	i4,a1,i2,a1,i2	date of latest RN processing (*yyyy*/*mm*/*dd*)
	35–42	i2,a1,i2,a1,i2	time of latest RN processing (*hh*:*mm*:*ss*.*s*)
7			(blank line)
8 (header)	1–24	a24	`SEISMIC-ACOUSTIC SUMMARY`
9 (header)	1–11	a11	`TotalEvents`
	13–22	a10	`Considered`
	24–34	a11	`InsufftData`
	36–46	a11	`NotScreened`
	48–58	a11	`ScreenedOut`
10 (data)	8–11	i4	total number of events in the SEB
	19–22	i4	number of events that were considered for screening
	31–34	i4	number of events that had insufficient data for screening
	43–46	i4	number of events that were not screened out
	55–58	i4	number of events in time block that were screened out
11			(blank line)
12 (header)	1–20	a20	`RADIONUCLIDE SUMMARY`
13 (header)	1–10	a10	`Detections`
	13–18	a6	`Level4`
	21–26	a6	`Level5`
14 (data)	7–10	i4	total number of radionuclide detections
	15–18	i4	number of Level 4 radionuclide detections
	23–26	i4	number of Level 5 radionuclide detections
15			(blank line)
16 (header)	1–14	a14	`FUSION SUMMARY`
17 (header)	1–11	a11	`FusedEvents`
18 (data)	8–11	i4	number of fused seismic, hydroacoustic, infrasound, radionuclide events
19			(blank line)
20 (header)	1–22	a22	`SYSTEMS STATUS SUMMARY`
21 (header)	2–4	a3	`IMS`
	7–9	a3	`GCI`
	12–14	a3	`IDC`
	16–20	a5	`RNLab`
22 (data)	2–4	i3	IMS network status summary
	7–9	i3	GCI communications status summary
	12–14	i3	IDC processing status summary

Continues on next page

Table 166. Executive summary format (cont.)

Record	Position	Format	Description
	18–20	i3	radionuclide laboratory status summary
23			(blank line)
24 (header)	1–24	a24	`IMS STATUS BY TECHNOLOGY`
25 (header)	4–5	a2	`PS`
	9–10	a2	`AS`
	15	a1	`H`
	20	a1	`I`
	24–25	a2	`RN`
26 (data)	3–5	i3	primary seismic (PS) network status
	8–10	i3	auxiliary seismic (AS) network status
	13–15	i3	hydroacoustic (H) network status
	18–20	i3	infrasound (I) network status
	23–25	i3	radionuclide (RN) network status

10

Station VDMS basics

This chapter describes the basic *VDMS* capabilities that are needed for auxiliary seismic stations and includes the following sections:

10.1 Introduction

Stations and NDCs providing station data must have a minimum capability to provide data to the IDC through the message system. Clearly, all of the functionality of the request and data messages cannot be supported by these stations to the full extent, and a minimal *VDMS* capability is all that is necessary. This chapter describes the minimal *VDMS* configuration necessary to fulfil the duties of an auxiliary station supplying data in IMS2.0 format.

10.2 Basic message support

A station/NDC providing segmented data must adhere to all of the basic message conventions on size, line length, date-time formats, station and channel naming, and use of units. The following sections describe the basic message formats that must be supported.

10.2.1 BEGIN line

All messages must contain the BEGIN line and must support IMS2.0 format.

10.2.2 MSG_TYPE

The `request` message type must be supported for receiving requests; the `data` message type must be supported for sending data messages.

10.2.3 MSG_ID

The message identification string and optional source in the MSG_ID line must be recognized in request messages, and a unique message identification string must be generated for data messages.

10.2.4 ACK

The ACK environment is used to enable or disable the *VDMS* to send an acknowledgement message to the requestor. The default value is true

10.2.5 REF_ID

The message identification of the request message must be used as the reference identifier of the returned data message.

10.2.6 E-MAIL line

E-mail must be supported as a data return mechanism.

10.3 Environment lines

Many of the environment lines described in the chapter on Request messages are not applicable to a limited station capability for *VDMS*s. The only variable that must be explicitly specified is TIME. If STA_LIST and CHAN_LIST are not explicitly specified, the default values of all stations and all channels are assumed. The AUX_LIST environment is required only if necessary to distinguish between two different data streams. Using these environments, simple requests can be made that obtain data from a particular station and channel within a specified time interval.

10.4 Request lines

The request lines specify the data that can be obtained from the *VDMS*. A simple station *VDMS* should be able to provide WAVEFORM, STATION, CHANNEL, RESPONSE, and OUTAGE data.

Request lines may have one or more arguments that specify subtype, formats, and subformats. A simple *VDMS* must support the IMS2.0 format as the main format for all requests as well as one of the ASCII subformats (INT, CM6, or CSF) for waveforms.

10.5 Data types

Data messages are sent in response to requests sent to the *VDMS*. Thus, WAVEFORM, STATION, CHANNEL, RESPONSE, and radionuclide data types must be supported by a simple *VDMS* in the IMS2.0 format.

10.6 VDMS implementation safeguards

Responding to requests in an automatic system requires safeguards against repeated requests, excessive numbers of requests, excessively large requests, and failures of the e-mail system (for example, returned mail). Although each installation of the *VDMS* will be different, some general guidelines are suggested to avoid major problems.

10.6.1 Message size

Messages returned by e-mail will have a maximum size of 1 MB.

10.6.2 Request echo

The original request message should be echoed in the returned data message as a LOG data type.

10.6.3 Request echo

An error in the address for a data message sent out by an *VDMS* will result in an e-mail returned to the *VDMS* by the e-mail system. The sender's name (before the @ character in the mail address) for such an e-mail will be either mailer-daemon or postmaster (with any combination of upper- and lowercase letters). The *VDMS* will forward these messages to the local *VDMS*-operator; no other action is taken and no response is sent. The *VDMS* may also recognize returned messages by the MSG_TYPE, which will be `data`, or by the presence of a REF_ID line, which is not used in request messages.

10.6.4 Syntax errors

If any syntax error is detected while processing a request message, a ERROR_LOG data message is returned. Also, if a request is made with a keyword that has not been implemented, a ERROR_LOG data message is sent.

A serious syntax error anywhere in a message should abort the entire message, but local policy can override this suggestion.

10.6.5 VDMS internal problem logging

Any problem other than a syntax error revealed during processing of a request message is appropriately logged and the Processing Engineers should take appropriate action. All request messages must be answered; an ERROR_LOG data message is sent as response for these types of errors.

10.6.6 VDMS operation logs

All local *VDMS* installations should keep logs of incoming and outgoing messages, parameters of MSG_ID lines, volume of data transferred, and Universal Coordinated Time (UTC) of message receipt and dispatch

10.7 Help Recommendations

The HELP mechanism can be used to convey a variety of information. The following topics can be included in an *VDMS* HELP message. At a minimum, every HELP message contains the items shown in **bold**.

10.7.1 Introduction

- information about the local data centre
- **e-mail address of local contact** (in case of problems)
- recently added features
- date that the HELP message was last updated

10.7.2 Description of message formats and protocols

- basic message format
- sending and receiving e-mail through *VDMS*

10.7.3 Description of commands understood by this *VDMS*

- **supported environments**
- **supported data types**
  - **supported subtypes, default subtype**
  - **supported subformats, default subformats**
- local extensions

10.7.4 Local limits

- maximum size of e-mail message
- maximum size of HTTP message
- maximum size of data requests per day per user
- types of requests that will be rejected (for example, sent by root or mailer-daemon)
- repeated identical requests from the same user over a short interval

10.7.5 Local data

- description of what data types are available from what stations/channels
- description of local data archives
  - segmented versus continuous
  - delay in data collection (how soon after real time is data available)
  - time period during which data are available

Appendix I

Data message examples

This appendix contains examples of formatted data messages. Some of the examples wrap onto the next line and appear as they would on a computer screen.

I.1 Alerts

I.1.1 ALERT_FLOW

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68552137 CTBT_IDC
REF_ID 222222
DATA_TYPE ALERT_FLOW
TIME_STAMP 2021/12/10 08:47:04
AUP06 ALERT_FLOW   2021/12/01 23:08:53
Low Flow - Alerting Operator.
AUP10 ALERT_FLOW   2021/12/02 02:15:58
Low Flow - Alerting Operator.
NOP49 ALERT_FLOW   2021/12/03 14:44:02.7
Air flow alarm!
Air Sampler average flow rate: 335.2 scm/h
LowLow Limit: 500.0 Low Limit: 530.0 HighHigh Limit: 800.0
AUP10 ALERT_FLOW   2021/12/05 01:41:51
Low Flow - Alerting Operator.
AUP05 ALERT_FLOW   2021/12/05 03:57:46
Low Flow - Alerting Operator.
AUP10 ALERT_FLOW   2021/12/08 01:48:58
Low Flow - Alerting Operator.
TIME_STAMP 2021/12/10 08:47:04
STOP
```

I.1.2 ALERT_SYSTEM

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68552022 CTBT_IDC
```

```
REF_ID 24680
DATA_TYPE ALERT_SYSTEM
TIME_STAMP 2021/12/10 08:39:48
RUP58 ALERT_SYSTEM 2021/12/01 00:00:13.6
 Full shutdown of IMS station software at UTC 2021/12/01
    00:00:13.110.
RUP58 ALERT_SYSTEM 2021/12/01 14:13:05.5
 Warning: Mains power lost.
RUP58 ALERT_SYSTEM 2021/12/01 14:13:13.8
 Notifcation: Mains power restored.
TIME_STAMP 2021/12/10 08:39:48
STOP
```

I.1.3 ALERT_TEMP

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68552220 CTBT_IDC
REF_ID 235791113
DATA_TYPE ALERT_TEMP
TIME_STAMP 2021/12/10 08:53:16
GBX66 ALERT_TEMP   2021/11/12 02:51:11
Warning level: Warning
SoH sensor: 1_T03_SOV_A is out of bounds.
Value of sensor: 303.758755 Lower limit: 304.4933 Upper Limit:
   394.9568
Process time: 1208 min
Recommended action: Consult Manual
TIME_STAMP 2021/12/10 08:53:16
STOP
```

I.1.4 ALERT_UPS

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68552263 CTBT_IDC
REF_ID 510152025
DATA_TYPE ALERT_UPS
TIME_STAMP 2021/12/10 08:55:51
USP77 ALERT_UPS    2021/12/01 02:53:35
WARNING
UPS Load Power out of range.
Param #21: 14 is not within the range 15 - 75
AUP09 ALERT_UPS    2021/12/01 05:58:14
Switched to battery
USP77 ALERT_UPS    2021/12/01 22:49:28
ERROR
UPS Time Remaining out of range.
Param #16: 234 is not within the range 30 - 150
TIME_STAMP 2021/12/10 08:55:51
STOP
```

I.2 ARR—Noble gas version

I.2.1 β-γ coincidence systems (plain text format)

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 72999919 CTBT_IDC
REF_ID 24163264
DATA_TYPE ARR
TIME_STAMP 2022/06/02 09:33:28
IDC Generated Report
Automatic Radionuclide Report
Noble Gas Version

Creation Date: 2022-06-02 03:54:30
Sample Arrival Time: 2022-06-02 03:54:13
Time difference from receipt of raw data to report creation:    17.0 s

Sample Information
--------------------------------------------------------------------------------

Station ID:     USX75   Detector Code: USX75_007
Authenticated:  YES

Station Location:       NG Charlottesville, VA, USA
Detector Description:   Detector #7 in Charlottesville, VA, USA
System Technology:      SAUNA

Sample Reference ID:    75202205312111X
Sample ID:              6740102
Stable Xe Volume:       2.75 ml         Sample Type:    Gas

Collection Start:       2022-05-31 21:42:11     Sampling Time:           12 h  1 s
Collection Stop:        2022-06-01 09:42:12     Processing Time:         6 h 58 m 59 s
Acquisition Start:      2022-06-01 16:41:11     Acquisition Time:        11 h 10 m
Acquisition Stop:       2022-06-02 03:51:11


Measurement Categorization
--------------------------------------------------------------------------------

Categorization Legend

Level A         Clean spectrum - No Xenon is present in the sample.
Level B         Xenon detection within the typical range for the station.
Level C         Anomalous Xenon detection.

Isotope category
Isotope  Nuclide detected  Abnormal_limit (mBq/m3)  Category
Xe-131m  NO                1.67E-01                 A
Xe-133m  NO                1.14E-01                 A
Xe-133   NO                5.23E-01                 A
Xe-135   NO                7.89E-01                 A

Spectrum Category: A - Clean spectrum - No Xenon is present in the sample

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes
--------------------------------------------------------------------------------

Radon counts in Xenon sample: 115

Xenon isotopes - Beta gamma matrix (BGM) analysis method

Nuclide  Half-Life  Activity (mBq)  StatErr (%)  SysErr (%)  TotalErr (%)  Conc (mBq/m3)  StatErr (%)  SysErr (%)  TotalErr (%)  LC (mBq/m3)  MDC (mBq/m3)
XE-131M  11.962 D   -1.35E-01       317.81       22.65       318.62        -4.43E-03      317.81       24.76       318.77         2.38E-02     5.38E-02
XE-133M  2.198 D    1.09E-01        268.09       15.49       268.54        4.10E-03       268.09       18.44       268.73         1.74E-02     4.20E-02
```

```
XE-133   5.2441 D   7.11E-01        146.98        11.74       147.44         2.42E-02
          146.98        15.42        147.78        5.66E-02     1.22E-01
XE-135   9.143 H    -7.86E-01       125.50        9.43        125.85         -6.45E-02
         125.50        13.74        126.25        1.37E-01     2.88E-01

Processing Specific Parameters and Results
--------------------------------------------------------------------------------

Beta gamma matrix (BGM) analysis method

ROI Net Count Results
ROI  Nuclide  Net Counts  Abs Net Error  LC     Efficiency  Abs Eff Error
1    PB-214   47.70       3.71           19.53  N/A         N/A
2    XE-135   -11.54      3.81           24.47  0.60        0.01
3    XE-133   7.23        3.26           16.91  0.70        0.01
4    XE-133   15.17       3.19           18.15  0.71        0.01
5    XE-131M  -1.96       2.49           10.54  0.67        0.01
6    XE-133M  1.51        2.01           6.41   0.67        0.01

ROI Limits (channels)
ROI  BetaLow (channels)  BetaHigh (channels)  GammaLow (channels)  GammaHigh
    (channels)
1    1                   198                  114                  135
2    1                   255                  79                   101
3    1                   124                  26                   36
4    1                   138                  8                    16
5    28                  55                   8                    16
6    64                  93                   8                    16
7    1                   25                   8                    16
8    96                  138                  8                    16
9    64                  138                  8                    16
10   1                   55                   8                    16

Processing Parameters
--------------------------------------------------------------------------------

Risk level k:                   1.6449
Gas background used:            YES
Detector background used:       YES
Interference corrections:       YES
Analysis method:                BGM

Calibration Parameters
--------------------------------------------------------------------------------

Gamma energy calibration updated:        YES
Beta energy calibration updated:         YES

Data Timeliness and Availability Flags
--------------------------------------------------------------------------------

Name                       Pass/Fail  Value     Test
Previous Sample Present    Pass       6739323   -1/2 day sample available
Collection Time            Pass       12.00     12h +- 10%
Acquisition Time           Pass       11.17     12h +- 10%
Response Time              Pass       30.20     sample received within 96h of collect
    start

Data Quality Flags
--------------------------------------------------------------------------------

Name                   Pass/Fail  Value  Test
Stable Xenon Volume    Pass       2.75   greater than 0.44 ml
SOH                    N/A        N/A    N/A
Xe-133 MDC             PASS       0.12   less than 1 mBq/m3

Event Screening Flags
--------------------------------------------------------------------------------

Name                                                        YES/NO/Value

Xenon Isotopes present in this spectrum                     YES
```

```

Only one Xenon Isotope in spectrum                            NO

Number of days since last Xenon detection                     0

2 or more Xenon Isotopes present in this spectrum             YES

Xe-133 present in spectrum                                    NO

Number of times Xe-133 seen in last 365 days                  156

Short term flag                                               a - Clean spectrum - No
    Xenon is present in the sample
Isotopic ratios:
- Xe-133m/131m > 2                                            NO
- Xe-135/133 > 5                                              NO
- Xe-133m/133 > 0.3                                           NO

Calibration Equations
--------------------------------------------------------------------------------

Beta Energy To Channel : C(E)= t0 + t1 E + t2 EB2
t0 : -7.83515
t1 : 0.420477
t2 : -0.000163

Gamma Energy To Channel : C(E)= t0 + t1 E + t2 EB2
t0 : 0.0655633
t1 : 0.382069
t2 : -0.0000565
TIME_STAMP 2022/06/02 09:33:28
STOP
```

I.2.2 β-γ coincidence systems (HTML format)

IDC Generated Report
Automatic Radionuclide Report
Noble Gas Version

Creation Date: 2022-06-01 03:53:55
Sample Arrival Time: 2022-06-01 03:53:40
Time difference from receipt of raw data to report creation: 15.0 s

Sample Information

Station ID:	USX75	Detector Code:	USX75_007
Authenticated:	YES		
Station Location:	NG Charlottesville, VA, USA		
Detector Description:	Detector #7 in Charlottesville, VA, USA		
System Technology:	SAUNA		
Sample Reference ID:	75202205302111X		
Sample ID:	6738612		
Stable Xe Volume:	3.20 ml	Sample Type:	Gas
Collection Start:	2022-05-30 21:42:10	Sampling Time:	12 h
Collection Stop:	2022-05-31 09:42:10	Processing Time:	6 h 59 m 2 s
Acquisition Start:	2022-05-31 16:41:12	Acquisition Time:	11 h 10 m
Acquisition Stop:	2022-06-01 03:51:12		

Measurement Categorization

Categorization Legend

Level A	=	Clean spectrum - No Xenon is present in the sample.
Level B	=	Xenon detection within the typical range for the station.
Level C	=	Anomalous Xenon detection.

Isotope category

Isotope	Nuclide detected	Abnormal_limit (mBq/m3)	Category
Xe-131m	YES	1.67E-01	B
Xe-133m	NO	1.14E-01	A
Xe-133	NO	5.24E-01	A
Xe-135	NO	7.94E-01	A

Spectrum Category: B - Xenon detection within the typical range for the station

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes

Radon counts in Xenon sample: 113

Xenon isotopes - Beta gamma matrix (BGM) analysis method

Nuclide	Half-Life	Activity (mBq)	StatErr (%)	SysErr (%)	TotalErr (%)	Conc (mBq/m3)	StatErr (%)	SysErr (%)	TotalErr (%)	LC (mBq/m3)	MDC (mBq/m3)
XE-131M	11.962 D	9.80E-01	45.80	4.71	46.04	2.75E-02	45.80	11.05	47.11	1.69E-02	3.91E-02
XE-133M	2.198 D	2.88E-01	98.04	5.70	98.21	9.30E-03	98.04	11.51	98.72	1.29E-02	3.21E-02
XE-133	5.2441 D	7.42E-01	119.12	10.88	119.61	2.17E-02	119.12	14.78	120.03	4.04E-02	8.86E-02
XE-135	9.143 H	-7.51E-01	120.20	10.50	120.65	-5.29E-02	120.20	14.50	121.07	1.08E-01	2.28E-01

Processing Specific Parameters and Results

Beta gamma matrix (BGM) analysis method

ROI Net Count Results

ROI	Nuclide	Net Counts	Abs Net Error	LC	Efficiency	Abs Eff Error
1	PB-214	53.10	3.33	13.68	N/A	N/A
2	XE-135	-11.02	3.64	22.46	0.60	0.01
3	XE-133	7.54	3.00	14.06	0.70	0.01
4	XE-133	10.17	2.49	8.78	0.71	0.01
5	XE-131M	14.16	2.55	8.70	0.67	0.01
6	XE-133M	4.00	1.98	5.56	0.67	0.01

ROI Limits (channels)

ROI	BetaLow *(channels)*	BetaHigh *(channels)*	GammaLow *(channels)*	GammaHigh *(channels)*
1	1	195	115	136
2	1	251	79	101
3	1	122	26	36
4	1	136	8	16
5	28	54	8	16
6	63	92	8	16
7	1	25	8	16
8	95	136	8	16
9	63	136	8	16
10	1	54	8	16

Processing Parameters

Risk level k:	1.6449
Gas background used:	YES
Detector background used:	YES
Interference corrections:	YES
Analysis method:	BGM

Calibration Parameters

Gamma energy calibration updated:	YES
Beta energy calibration updated:	YES

Data Timeliness and Availability Flags

Name	Pass/Fail	Value	Test
Previous Sample Present	Fail	N/A	-1/2 day sample available
Collection Time	Pass	12.00	12h +- 10%
Acquisition Time	Pass	11.17	12h +- 10%
Response Time	Pass	30.19	sample received within 96h of collect start

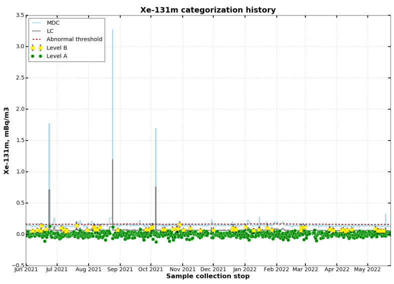
Data Quality Flags

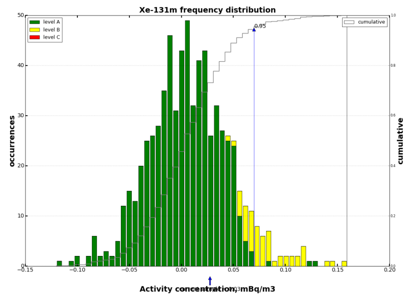
Name	Pass/Fail	Value	Test
Stable Xenon Volume	Pass	3.20	greater than 0.44 ml
SOH	N/A	N/A	N/A
Xe-133 MDC	PASS	0.09	less than 1 mBq/m3

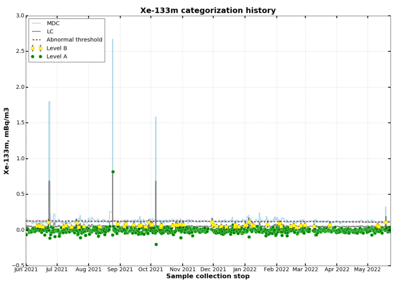
Event Screening Flags

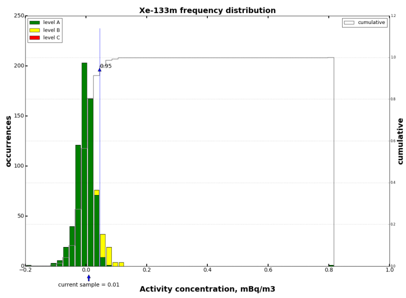
Name	YES/NO/Value
Xenon Isotopes present in this spectrum	YES
Only one Xenon Isotope in spectrum	NO
Number of days since last Xenon detection	0

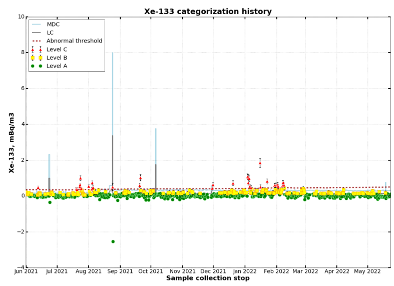
2 or more Xenon Isotopes present in this spectrum	YES
Xe-133 present in spectrum	NO
Number of times Xe-133 seen in last 365 days	156
Short term flag	b - Xenon detection within the typical range for the station
Isotopic ratios:	
- Xe-133m/131m > 2	NO
- Xe-135/133 > 5	NO
- Xe-133m/133 > 0.3	NO

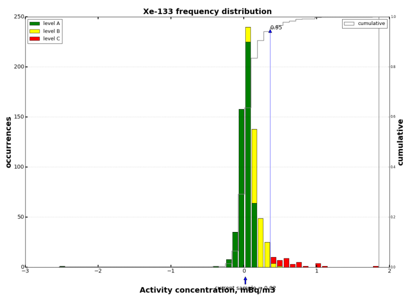


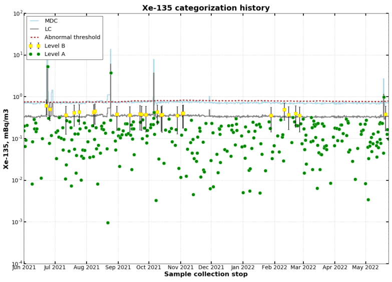


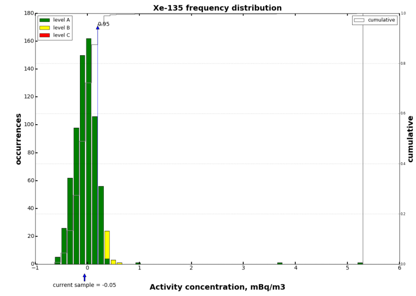


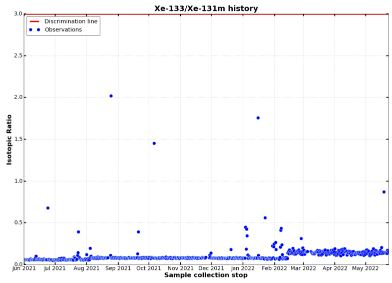


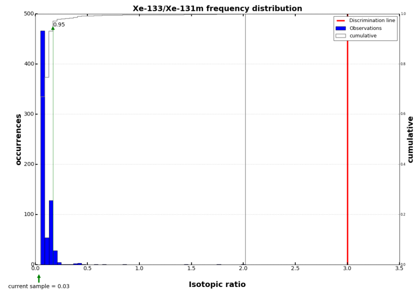


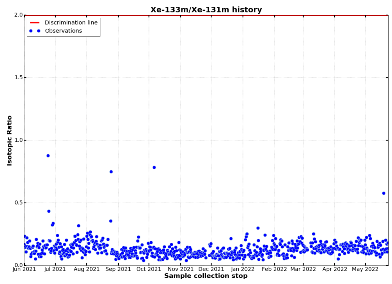


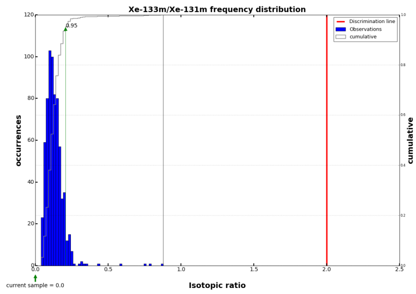

Xe-135 categorization history
MDC
LC
Abnormal threshold
Level B
Level A
Xe-135, mBq/m3
Jun 2021 Jul 2021 Aug 2021 Sep 2021 Oct 2021 Nov 2021 Dec 2021 Jan 2022 Feb 2022 Mar 2022 Apr 2022 May 2022
Sample collection stop

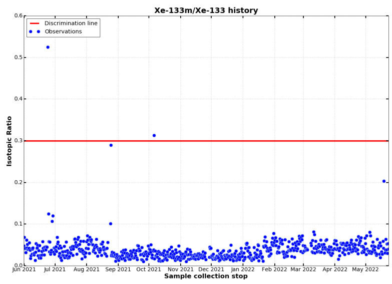

Xe-135 frequency distribution
level A
level B
level C
cumulative
0.95
occurrences
current sample = -0.05
Activity concentration, mBq/m3

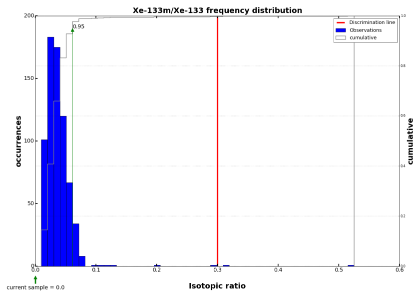

Xe-133/Xe-131m history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop

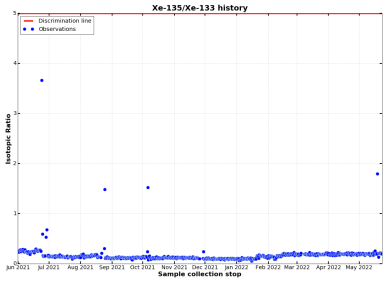

Xe-133/Xe-131m frequency distribution
Discrimination line
Observations
cumulative
0.95
occurrences
current sample = 0.03
Isotopic ratio

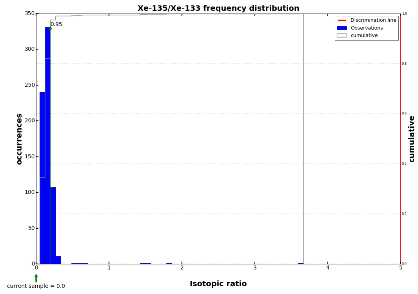

Xe-133m/Xe-131m history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop


Xe-133m/Xe-131m frequency distribution
Discrimination line
Observations
cumulative
0.95
occurrences
current sample = 0.0
Isotopic ratio


Xe-133m/Xe-133 history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop


Xe-133m/Xe-133 frequency distribution
Discrimination line
Observations
cumulative
0.95
occurrences
current sample = 0.0
Isotopic ratio





Calibration Equations

Beta Energy To Channel : C(E)= t0 + t1 E + t2 E^2

t0 : -7.72307
t1 : 0.414462
t2 : -0.0001607

Gamma Energy To Channel : C(E)= t0 + t1 E + t2 E^2

t0 : 0.0703898
t1 : 0.382508
t2 : -0.0000566

I.2.3 HPGe systems (plain text format)

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 73000117 CTBT_IDC
REF_ID 24163264
DATA_TYPE ARR
TIME_STAMP 2022/06/02 09:40:46
IDC Generated Report
Automatic Radionuclide Report
Noble Gas Version

Creation Date: 2022-05-30 21:53:38
Sample Arrival Time: 2022-05-30 21:53:26
Time difference from receipt of raw data to report creation:    12.0 s

Sample Information
------------------------------------------------------------------------------

Station ID:     MNX45   Detector Code: MNX45_005
Authenticated:  YES

Station Location:       MNX45, Mongolia
Detector Description:   BE3825 detector #5 in Mongolia
System Technology:      SPALAX

Sample Reference ID:    45202205282211G
Sample ID:              6736824
Stable Xe Volume:       4.35 ml Sample Type: Gas

Collection Start:       2022-05-28 22:00:00     Sampling Time:          1 d
Collection Stop:        2022-05-29 22:00:00     Processing Time:         1 h 24 m 6 s
Acquisition Start:      2022-05-29 23:24:06     Acquisition Time:        22 h 21 m 5
    s
Acquisition Stop:       2022-05-30 21:45:11

Measurement Categorization
------------------------------------------------------------------------------

Categorization Legend

Level A =       Clean spectrum - No Xenon is present in the sample.
Level B =       Xenon detection within the typical range for the station.
Level C =       Anomalous Xenon detection.

Isotope category
Isotope Nuclide detected        Abnormal_limit (mBq/m3) Category
Xe-131m NO      1.20E+00        A
Xe-133m NO      1.58E+00        A
Xe-133  NO      4.94E-01        A
Xe-135  NO      7.50E-01        A

Spectrum Category: A - Clean spectrum - No Xenon is present in the sample

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes
------------------------------------------------------------------------------

Radon level in Xenon sample
Nuclide Half-Life       Area    RelErr (%)
Rn-222  3.82 D          277.46  8.02

Xenon isotopes

Peak Fit Method

Nuclide  Half-Life  Activity (mBq)  StatErr (%)  SysErr (%)  TotalErr (%)  Conc
    (mBq/m3)  StatErr (%)  SysErr (%)  TotalErr (%)  MDI/MDC
XE-131M  11.962 D   2.70E+01        75.05        2.68        75.10         5.58E-01
         75.05        4.02        75.16          2.75E-01
XE-133M  2.198 D    -5.02E+00       420.72       2.72        420.73        -1.19E-01
         420.72       4.05        420.74        2.75E-01
```

```
XE-133   5.2441 D   -2.51E-01       979.93       2.50        979.93         -5.39E-03
         979.93       3.91        979.93        2.92E-01
XE-135   9.143 H    4.67E+00        102.21       2.72        102.25         2.25E-01
          102.21       4.05        102.29        1.16E+00

Decay Analysis Method

Nuclide  Half-Life  Activity (mBq)  StatErr (%)  SysErr (%)  TotalErr (%)  Conc
    (mBq/m3)  StatErr (%)  SysErr (%)  TotalErr (%)  MDI/MDC
XE-131M  11.962 D   -1.77E+01       117.69       2.68        117.73         -3.66E-01
         117.69       4.02        117.76        2.75E-01
XE-133M  2.198 D    3.40E+01        63.65        2.72        63.71          8.07E-01
          63.65        4.05        63.78         2.75E-01
XE-133   5.2441 D   5.44E+00        45.30        2.50        45.37          1.17E-01
          45.30        3.91        45.47         2.92E-01
XE-135   9.143 H    5.08E+00        86.81        2.72        86.85          2.45E-01
          86.81        4.05        86.90         1.16E+00

Processing Specific Parameters and Results
--------------------------------------------------------------------------------

Xenon Peak Data

Energy (keV)  Centroid  Width  FWHM (keV)  Eff (%)  Net Area  RelErr (%)
29.66       134.87    3.00   0.60        12.72    101.60    27.88

Processing Parameters
--------------------------------------------------------------------------------

Risk level K:            4.26489
Baseline algorithm:      Smoothing / Lawn Mowers

Calibration Parameters
--------------------------------------------------------------------------------

SAreaThreshold:          100
ConfidenceLevel:         95
ECR updated:             Yes
RER updated:             Yes
Used ECR:                INITIAL
Used RER:                MRPM

Data Timeliness and Availability Flags
--------------------------------------------------------------------------------

Name                      Pass/Fail  Value     Test
Previous Sample Present   Pass       6735347   -1 day sample available
Collection Time           Pass       24.00     24h +- 10%
Acquisition Time          Pass       22.35     24h +- 10%
Response Time             Pass       47.89     sample received within 96h of collect
    start

Data Quality Flags
--------------------------------------------------------------------------------

Name                 Pass/Fail  Value  Test
Stable Xenon Volume  Pass       4.35   greater than 0.87 ml
SOH                  N/A        N/A    N/A
Xe-133 MDC           PASS       0.29   less than 1 mBq/m3

Event Screening Flags
--------------------------------------------------------------------------------

Name                                                   YES/NO/Value
Xenon Isotopes present in this spectrum                YES
Only one Xenon Isotope in spectrum                     NO
Number of days since last Xenon detection              0
2 or more Xenon Isotopes present in this spectrum      YES
Xe-133 present in spectrum                             NO
Number of times Xe-133 seen in last 365 days           124
Short term flag                                        a - Clean spectrum - No
    Xenon is present in the sample
```

```
Isotopic ratios:
- Xe-133m/131m > 2                                                    NO
- Xe-135/133 > 5                                                      NO
- Xe-133m/133 > 0.3                                                   NO

Calibration Equations
--------------------------------------------------------------------------------

Energy : E(C)= t0 + t1 C + t2 CB2 + t3 CB3
t0 : 0.07120749 t1 : 0.2193672  t2 : 2.677922E-7        t3 : 0
Resolution : R(E)= b  (t0 + t1 E + t2 EB2)
t0 : 0.3162     t1 : 0.001381   t2 : 4.614E-7
TIME_STAMP 2022/06/02 09:40:46
STOP
```

I.2.4 HPGe systems (HTML format)

IDC Generated Report
Automatic Radionuclide Report
Noble Gas Version

Creation Date: 2022-05-29 21:52:36
Sample Arrival Time: 2022-05-29 21:52:22
Time difference from receipt of raw data to report creation: 14.0 s

Sample Information

Station ID:	MNX45	Detector Code:	MNX45_005
Authenticated:	YES		
Station Location:	MNX45, Mongolia		
Detector Description:	BE3825 detector #5 in Mongolia		
System Technology:	SPALAX		
Sample Reference ID:	45202205272211G		
Sample ID:	6735347		
Stable Xe Volume:	4.47 ml	Sample Type:	Gas
Collection Start:	2022-05-27 22:00:00	Sampling Time:	1 d
Collection Stop:	2022-05-28 22:00:00	Processing Time:	1 h 24 m 6 s
Acquisition Start:	2022-05-28 23:24:06	Acquisition Time:	22 h 21 m 1 s
Acquisition Stop:	2022-05-29 21:45:07		

Measurement Categorization

Categorization Legend

Level A = Clean spectrum - No Xenon is present in the sample.
Level B = Xenon detection within the typical range for the station.
Level C = Anomalous Xenon detection.

Isotope category

Isotope	Nuclide detected	Abnormal_limit (mBq/m3)	Category
Xe-131m	NO	1.21E+00	A
Xe-133m	NO	1.58E+00	A
Xe-133	YES	4.91E-01	B
Xe-135	NO	7.51E-01	A

Spectrum Category: B - Xenon detection within the typical range for the station

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes

Radon level in Xenon sample

Nuclide	Half-Life	Area	RelErr (%)
Rn-222	3.82 D	315.68	7.39

Xenon isotopes

Peak Fit Method

Nuclide	Half-Life	Activity (mBq)	StatErr (%)	SysErr (%)	TotalErr (%)	Conc (mBq/m3)	StatErr (%)	SysErr (%)	TotalErr (%)	MDI/MDC

XE-131M	11.962 D	2.12E+00	925.66	2.68	925.66	4.26E-02	925.66	4.02	925.66	2.62E-01
XE-133M	2.198 D	2.26E+01	90.14	2.72	90.18	5.23E-01	90.14	4.05	90.23	2.62E-01
XE-133	5.2441 D	9.26E+00	28.91	2.50	29.02	1.94E-01	28.91	3.91	29.18	2.88E-01
XE-135	9.143 H	2.53E+00	187.34	2.72	187.36	1.19E-01	187.34	4.05	187.38	1.14E+00

Decay Analysis Method

Nuclide	**Half-Life**	**Activity (mBq)**	**StatErr (%)**	**SysErr (%)**	**TotalErr (%)**	**Conc (mBq/m3)**	**StatErr (%)**	**SysErr (%)**	**TotalErr (%)**	**MDI/MDC**
XE-131M	11.962 D	-1.35E+01	149.16	2.68	149.18	-2.72E-01	149.16	4.02	149.21	2.62E-01
XE-133M	2.198 D	2.96E+01	70.93	2.72	70.98	6.84E-01	70.93	4.05	71.05	2.62E-01
XE-133	5.2441 D	1.21E+01	22.06	2.50	22.20	2.53E-01	22.06	3.91	22.40	2.88E-01
XE-135	9.143 H	6.42E+00	69.80	2.72	69.85	3.01E-01	69.80	4.05	69.92	1.14E+00

Processing Specific Parameters and Results

Xenon Peak Data

Energy (keV)	**Centroid**	**Width**	**FWHM (keV)**	**Eff (%)**	**Net Area**	**RelErr (%)**
29.74	135.38	3.00	0.60	12.79	99.90	27.85
80.92	368.42	3.00	0.66	26.07	74.66	28.03

Processing Parameters

Risk level K:	4.26489
Baseline algorithm:	Smoothing / Lawn Mowers

Calibration Parameters

SAreaThreshold:	100
ConfidenceLevel:	95
ECR updated:	Yes
RER updated:	Yes
Used ECR:	INITIAL
Used RER:	MRPM

Data Timeliness and Availability Flags

Name	**Pass/Fail**	**Value**	**Test**
Previous Sample Present	Pass	6733920	-1 day sample available
Collection Time	Pass	24.00	24h +- 10%
Acquisition Time	Pass	22.35	24h +- 10%
Response Time	Pass	47.87	sample received within 96h of collect start

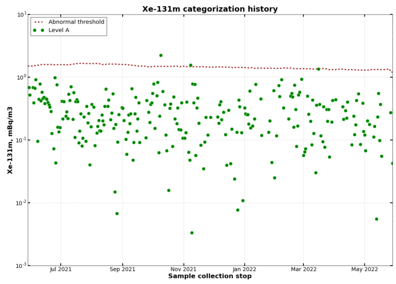
Data Quality Flags

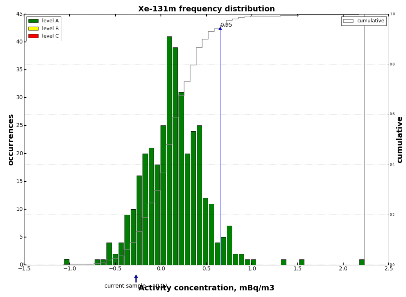
Name	**Pass/Fail**	**Value**	**Test**
Stable Xenon Volume	Pass	4.47	greater than 0.87 ml
SOH	N/A	N/A	N/A
Xe-133 MDC	PASS	0.29	less than 1 mBq/m3

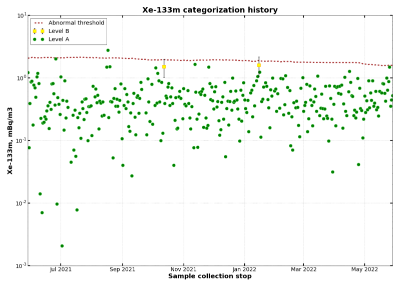
Event Screening Flags

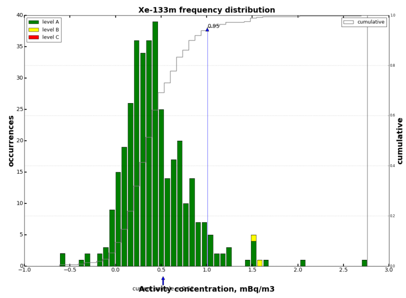
Name	**YES/NO/Value**
Xenon Isotopes present in this spectrum	YES
Only one Xenon Isotope in spectrum	NO
Number of days since last Xenon detection	0
2 or more Xenon Isotopes present in this spectrum	YES
Xe-133 present in spectrum	YES
Number of times Xe-133 seen in last 365 days	122
Short term flag	b - Xenon detection within the typical range for the

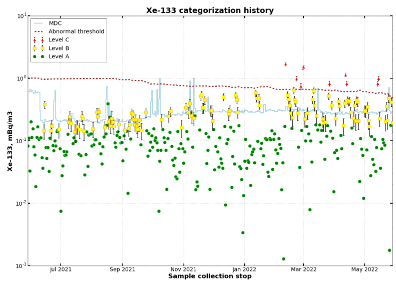
```
                                             station
Isotopic ratios:
- Xe-133m/131m > 2                           NO
- Xe-135/133 > 5                             NO
- Xe-133m/133 > 0.3                          NO
```

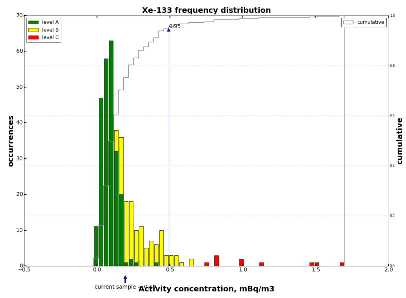


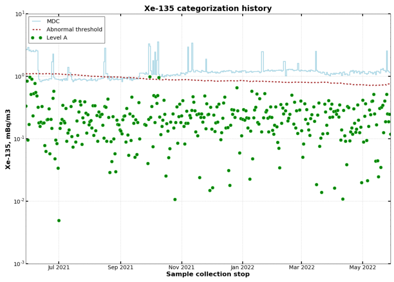


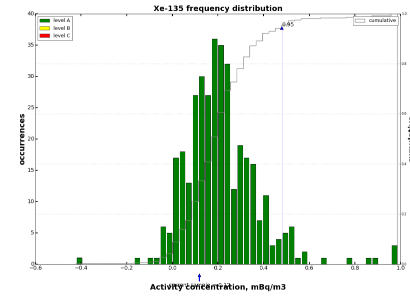


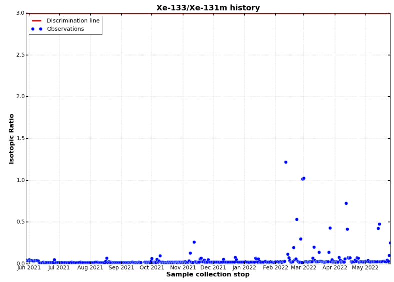


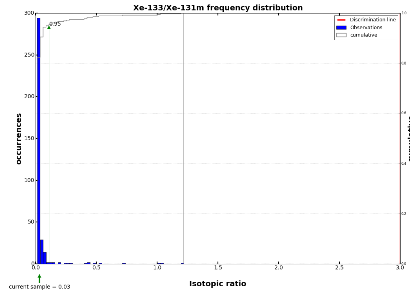


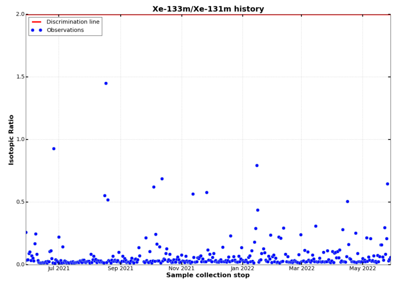


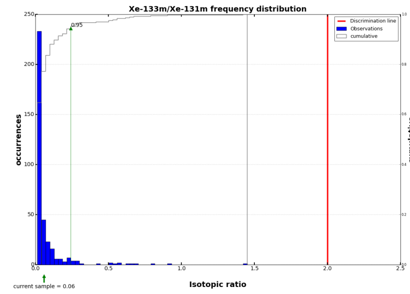

Xe-135 categorization history
MDC
Abnormal threshold
Level A
Xe-135, mBq/m3
Sample collection stop

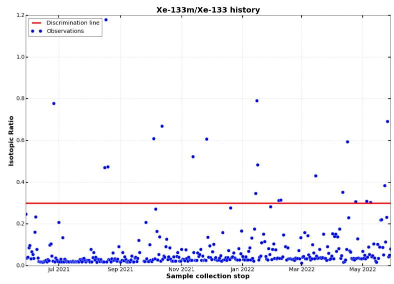

Xe-135 frequency distribution
level A
level B
level C
cumulative
occurrences
Activity concentration, mBq/m3

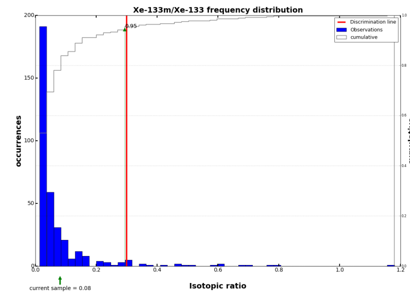

Xe-133/Xe-131m history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop

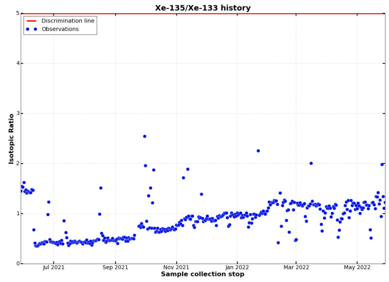

Xe-133/Xe-131m frequency distribution
Discrimination line
Observations
cumulative
occurrences
Isotopic ratio
current sample = 0.03

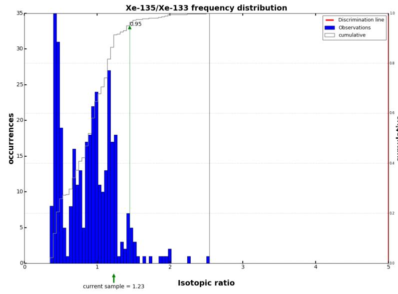

Xe-133m/Xe-131m history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop


Xe-133m/Xe-131m frequency distribution
Discrimination line
Observations
cumulative
occurrences
Isotopic ratio
current sample = 0.06


Xe-133m/Xe-133 history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop


Xe-133m/Xe-133 frequency distribution
Discrimination line
Observations
cumulative
occurrences
Isotopic ratio
current sample = 0.08





Calibration Equations

Energy : E(C)= t0 + t1 C + t2 C ^{2} ***+ t3 C*** ^{3}

t0 : 0.03144813
t1 : 0.2194418
t2 : 2.846689E-7
t3 : 0

Resolution : R(E)= $\sqrt{(t0 + t1\ E + t2\ E^2)}$

t0 : 0.3162
t1 : 0.001381
t2 : 4.614E-7

I.3 ARR—Particulate version

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 72650191 CTBT_IDC
REF_ID 235791113
DATA_TYPE ARR
TIME_STAMP 2022/05/19 09:51:20
                              IDC GENERATED REPORT
                          AUTOMATED RADIONUCLIDE REPORT
                               Particulate Version

                         Creation Date: 2022/05/11 22:27:29
                   Sample Arrival Time: 2022/05/11 22:27:22
    Time difference from receipt of raw data to report creation: 0 hours

SAMPLE INFORMATION ======================================================

Station ID:          AUP04               Detector ID:        AUP04_005
Authenticated:       YES

Station Location: Melbourne, VIC, Australia
Detector Description: Detector 05 at AUP04

Sample ID:              6709060          Sample Geometry:    50mmX4.5mm
Sample Quantity:       21750.00 m3       Sample Type:        Particulate


Collection Start:    2022/05/08 23:22    Sampling Time:        23.69 hours
Collection Stop:     2022/05/09 23:04    Decay Time:           24.45 hours
Acquisition Start:   2022/05/10 23:31    Acquisition Time:     22.89 hours
Acquisition Stop:    2022/05/11 22:25    Avg Flow Rate:       918.11 m3/hr

Collection Station Comments:
------ UTC: 2022/05/11 22:06:13 ------
Sys Log: Archiving SOH email
------ UTC: 2022/05/11 22:25:00 ------
Sys Log: Spectrum Acquisition Complete
------ UTC: 2022/05/11 22:25:00 ------
Sys Log: Archiving spectrum.spm


IDC Analysis General Comments:



MEASUREMENT CATEGORIZATION ==============================================

Categorization Legend
---------------------
Level 1  =  Typical Background Rad. Meas.
Level 2  =  Anomalous Background Rad. Meas.
Level 3  =  Typical Anthropogenic Rad. Meas.
Level 4  =  Anomalous Anthropogenic Rad. Meas.
Level 5  =  Mult. Anomalous Anthropogenic Rad. Meas.

Spectrum Category (2) -- Anomalous Background Rad. Meas.

Categorization Summary:

Name        Category   Categorization Comment
----        --------   ----------------------
AM-241         2        Not Regularly Measured



ACTIVITY SUMMARY ========================================================

NATURAL RADIOACTIVITY:

Nuclides Identified and not Quantified:

```

```
BI-214, PB-210, PB-214


Nuclides Quantified:

Nuclide            Half-Life            Conc(uBq/m3)        RelErr(%)        Activ(uBq)          RelErr(%)

BE-7               53.290 D               2.13E+03          2.32             4.54E+07            2.32
PB-212F            10.64 H                2.52E+05          2.01             5.69E+08            2.01

ACTIVATION-PRODUCT RADIOACTIVITY:

Nuclide            Half-Life            Conc(uBq/m3)        RelErr(%)        Activ(uBq)          RelErr(%)       Coincidence

None Found

FISSION-PRODUCT RADIOACTIVITY:

Nuclide            Half-Life            Conc(uBq/m3)        RelErr(%)        Activ(uBq)          RelErr(%)       Coincidence

AM-241             432.2 Y                7.78E+00          21.72            1.69E+05           21.72            NO

MINIMUM DETECTABLE CONCENTRATION FOR KEY NUCLIDES =======================

Nuclide            Half-Life               MDC(uBq/m3)         MDA(uBq)

BA-140             12.752 D                  2.13E+01            4.27E+05
CE-143             1.377 D                   2.11E+01            2.17E+05
CS-134             2.062 Y                   5.80E+00            1.26E+05
```

⋮

```
TE-132             3.204 D                   5.62E+00            8.83E+04
ZR-95              64.020 D                  8.50E+00            1.82E+05
ZR-97              16.900 H                  3.12E+01            1.59E+05


PEAK SEARCH RESULTS =====================================================

      91 peaks found in spectrum by automated peak search.
      73 peaks associated with nuclides by automated processing.
      18 peaks not associated with nuclides by automated processing.
      80 percent of peaks were associated with nuclides.

 Note: "*" indicates that a peak was a component of a multiplet.

 Energy (keV)  Centroid  Width  FWHM (keV)  Eff (%)      Area     Bkgnd (%)  RelErr (%)    Nuclide    Nts

      27.79     80.73      3        0.86    23.16     11315.41       0.00        1.35
      28.83     83.76      3        0.86    23.23      9367.54       0.00        1.73
      29.86     86.78      3        0.87    23.29      8552.00       0.00        1.98     PB-212F
```

⋮

```
    2614.30   7660.33      9        3.16     1.98    131219.69       0.14        0.28     PB-212F
    2687.38   7874.64      9        3.21     1.93      3023.30       0.00        2.31     PB-212F
    2699.31   7909.63      9        3.22     1.92       405.72       0.00       12.83     PB-212F

PROCESSING PARAMETERS ==================================================

Risk level K:                    4.26489
Baseline algorithm:              Smoothing / Lawn Mowers
```

```
Nucl Id Detectability Threshold: 0.2
Energy Id Tolerance:             0.8 + 0 * FWHM
Background subtraction:          YES
Background spectrum ID:          6577190
Background data type:            blank
Background acquisition start:    2022/02/07 22:38
Background acquisition time:     72 hours
IRF for Pb-212F:                 YES

CALIBRATION PARAMETERS =======================================================

SAreaThreshold:             100
Confidence level:           95
ECR updated:                NO
RER updated:                YES
Used ECR:                   MRP A
Used RER:                   MRP M

DATA TIMELINESS AND AVAILABILITY FLAGS ==================================

Previous Sample Present?                             YES
Collection time within 24 hours +/- 10%?             YES
Acquisition time >= 20 hours?                        YES
Decay time <= 24 hours?                              YES
Sample received within 72 hours of collect start?    YES

DATA QUALITY FLAGS =====================================================

Name                           Pass/Fail  Value           Test

Ba140_MDC                      PASS       21.3136         <30
K40_LocationDifference         PASS       0.19873         <3*std deviation
Be7_FWHM                       PASS       1.39926         <1.7
FlowRate                       PASS       918.109         >500


CALIBRATION EQUATIONS ==================================================

Energy vs. Channel

        E(c) = 0.2271 + 0.3415*c - 3.222E-08*c^2

                E = energy (keV)
                c = channel number


Resolution vs. Energy

        FWHM(E) = SQRT(0.67+0.002494*E+4.089e-07*E^2)

                FWHM = Full Width Half Max (keV)
                E = energy (keV)


Efficiency vs. Energy

        VGSL pairs
                 Energy     Efficiency    Uncertainty
                     40          0.238        0.00297
                     50          0.242         0.0043
                     60          0.243        0.00528
```

⋮

```
                   2300         0.0221       0.000384
                   2380         0.0217       0.000379
                   2450         0.0211       0.000373

 FIELD OF REGARD ======================================================

https://swp.ctbto.org/FOR/AUP04/2022/05/10
TIME_STAMP 2022/05/19 09:51:20
STOP
```

I.4 Arrival data messages

I.4.1 ARRIVAL:ASSOCIATED

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68527602 CTBT_IDC
REF_ID 1234
DATA_TYPE ARRIVAL:associated IMS2.0
Net       Sta     Dist  EvAz     Phase  Date        Time       TRes  Azim AzRes  Slow  SRes Def   SNR       Amp   Per Qual
    Magnitude   OrigID Author       ArrID
          MJAR    6.62 327.2 Pn       2021/12/01 02:09:46.763   0.2 155.9  11.2  10.7 -3.10 TAS  5.70       0.1  0.33 a__  ML
              2.7 21425704 IDC_SEL3  165853767
          WRA    51.30 190.1 P        2021/12/01 02:17:12.900  -0.3   8.0  -0.2   7.7  0.10 TAS  8.60       1.1  0.59 a__  mb
              4.0 21425704 IDC_SEL3  165853968
          WRA    51.30 190.1 tx       2021/12/01 02:17:23.650         8.6   0.3   8.0  -999 ___  5.70       1.0  0.50 a__
                         21425704 IDC_SEL3  165853969
          ILAR   54.08  29.9 P        2021/12/01 02:17:32.850  -0.5 257.3  -9.0   5.6 -0.90 TAS  6.30       0.5  0.69 a__  mb
              3.6 21425704 IDC_SEL3  165853924
          ILAR   54.08  29.9 tx       2021/12/01 02:17:37.050       284.9  14.4   7.7  -999 ___  4.10       0.4  0.87 a__
                         21425704 IDC_SEL3  165853925
          ASAR   55.03 189.9 P        2021/12/01 02:17:41.200   0.5   5.5  -2.1   5.5 -1.20 TAS  4.80       0.2  0.40 a__  mb
              3.5 21425704 IDC_SEL3  165853864
          NVAR   77.76  52.5 P        2021/12/01 02:20:07.025   0.3 298.9  11.4   7.1  2.00 TAS  4.40       0.4  0.55 a__  mb
              3.7 21425704 IDC_SEL3  165853930
```

⋮

```
          NRIK   84.31 342.2 tx       2021/12/01 02:47:57.650         2.4         2.6  -999 ___  4.10       2.0  0.54 a__
                         21426384 IDC_SEL3  165854505
          QSPA   84.77 180.0 P        2021/12/01 02:47:19.719   0.4 339.7 -21.7   2.2 -2.80 TAS 14.20       3.4  0.65 a__  mb
              4.2 21426384 IDC_SEL3  165857907
          ILAR   84.99  23.3 P        2021/12/01 02:47:19.400  -0.8 255.7   9.8   5.0  0.90 TAS 36.30       5.5  0.84 a__  mb
              4.3 21426384 IDC_SEL3  165854507
          ILAR   84.99  23.3 tx       2021/12/01 02:48:00.800       244.4   2.3   5.4  -999 ___  5.60       2.7  0.99 a__
                         21426384 IDC_SEL3  165854509
          BVAR   85.74 324.0 P        2021/12/01 02:47:23.475  -0.7 114.9  10.5   6.7  1.80 TAS  7.10       2.0  0.86 a__  mb
              3.8 21426384 IDC_SEL3  165855284
          I01AR  19.91 283.2 I        2021/12/01 02:30:00.000  76.3 118.6  -3.2 310.2 24.70 TA_  1.50       0.0  1.92 a__
                         21426476 IDC_SEL3  165854414
          I19DJ  25.51 157.3 I        2021/12/01 02:15:00.000  45.4 333.7  -7.6 324.0 -42.9 TA_  0.70       0.0  0.39 a__
                         21426741 IDC_SEL3  165854416
STOP
```

I.4.2 ARRIVAL:AUTOMATIC

This subtype is not supported by the IDC. See Appendix IV “Unsupported commands at the IDC” for a list of unsupported commands.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 14548
DATA TYPE ARRIVAL:AUTOMATIC IMS2.0
Net       Sta   BeamID           Date       Time       Phase     Azim  Slow   SNR       Amp   Per   STA   Dur  Author       DetID
          I32KE              2016/06/01  00:00:00.000 N         285.6 322.7   1.0       0.0 -1.00  -1.0       DFX       114378843
          CPUP               2016/06/01  00:00:02.475 tx        316.8   1.4   3.8       2.4  0.44   3.2       DFX       114378315
          JKA                2016/06/01  00:00:07.575 Sx        271.0  29.5   4.1      25.2  0.67  21.8       DFX       114379062
          I10CA              2016/06/01  00:00:10.000 N         176.3 332.4   0.8       0.0 -1.00  -1.0       DFX       114378769
          CMAR               2016/06/01  00:00:17.850 P         301.2   6.4   5.3       2.1  0.44   2.7       DFX       114378326
STOP
```

I.4.3 ARRIVAL:GROUPED

This subtype is not supported by the IDC. See Appendix IV “Unsupported commands at the IDC” for a list of unsupported commands.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 14548
DATA_TYPE ARRIVAL:GROUPED IMS2.0
Net       Sta   Chan Aux      Date       Time         Phase      Azim Slow    SNR       Amp   Per  Qual    Group C Author        ArrID
          CPUP  Z15       2016/06/01 00:00:02.475 tx        316.8  1.4    3.8       2.4  0.44 a__  7801174 0 STAPRO    114378315
          MKAR  MK_       2016/06/01 00:04:03.500 P         83.5  11.8   21.9       0.6  0.33 a__  7801177 0 STAPRO    114378545
          MKAR  MK_       2016/06/01 00:04:14.175 tx         88.4  6.1    4.8       0.3  0.33 a__  7801177 0 STAPRO    114378546
          FINES FI_       2016/06/01 00:07:10.300 P          67.5  5.8   40.5       1.5  0.33 a__  7801178 0 STAPRO    114378532
          FINES FI_       2016/06/01 00:07:20.550 tx         64.6  5.0    6.4       0.7  0.33 a__  7801178 0 STAPRO    114378533
          FINES FI_       2016/06/01 00:07:35.675 tx         66.9  4.2    5.6       0.6  0.33 a__  7801178 0 STAPRO    114378534
          ZALV  ZA_       2016/06/01 00:12:00.825 P         265.8  7.8    4.2       0.6  0.33 a__  7801186 0 STAPRO    114378743
          ZALV  ZA_       2016/06/01 00:12:22.875 tx        296.4  6.3    6.2       1.0  0.33 a__  7801186 0 STAPRO    114378744
          ASAR  AS_       2016/06/01 00:28:21.300 P         106.4  7.2   45.9       2.0  0.44 a__  7801187 0 STAPRO    114378774
          ASAR  AS_       2016/06/01 00:28:34.800 tx        113.3  7.5    7.2       4.2  0.89 a__  7801187 0 STAPRO    114378775
          ASAR  AS_       2016/06/01 00:28:43.050 tx        112.7  7.9    4.3       2.5  0.89 a__  7801187 0 STAPRO    114378776
          KMBO  H40       2016/06/01 00:28:30.925 Pn         59.8 20.9    6.3       2.7  0.17 a__  7801188 0 STAPRO    114378801
          KMBO  H15       2016/06/01 00:29:06.275 Lg         51.1 22.5    5.7       5.8  0.44 a__  7801188 0 STAPRO    114378803
STOP
```

I.4.4 ARRIVAL:REVIEWED

This subtype is not supported by the IDC. See Appendix IV "Unsupported commands at the IDC" for a list of unsupported commands.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 14548
DATA_TYPE ARRIVAL:REVIEWED IMS2.0
Net        Sta  Chan  Aux      Date        Time        Phase       Azim  Slow   SNR        Amp    Per  Qual  Author      ArrID
IDC_SEIS   BBB  bhz   _     1996/08/16  03:41:40.523 P          256.3  16.2  13.4      228.6   0.33 a__  IDC_REB    116183910
IDC_SEIS   BBB  bhz         1996/08/16  03:42:04.531 S          334.7  18.6   8.2      338.6   0.33 a__  IDC_REB    116183930
IDC_SEIS   DLBC bhz         1996/08/16  03:42:58.584 P          166.7  16.5  16.5      1.5     0.33 a__  IDC_REB    116183960
IDC_SEIS   DLBC bhz         1996/08/16  03:44:59.808 S                                                 m__  IDC_REB    116210220
IDC_SEIS   NEW  bhz         1996/08/16  03:43:23.394 P          308.2   6.6   4.2      0.3     0.33 a__  IDC_REB    116147830
IDC_SEIS   NEW  bhz         1996/08/16  03:46:03.321 S          337.6  12.2   4.1      0.2     0.33 a__  IDC_REB    116147870
STOP
```

I.4.5 ARRIVAL:UNASSOCIATED

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68527766 CTBT_IDC
REF_ID 1234
DATA_TYPE ARRIVAL:unassociated IMS2.0
Net        Sta    BeamID          Date        Time        Phase       Azim  Slow   SNR        Amp    Per    STA    Dur  Author       DetID
           CMIG                2021/12/01  02:05:35.294 N          191.0   2.6   8.7        1.6   0.17    2.0       IDC_SEL3   165854646
           CMIG                2021/12/01  02:05:47.569 N            3.2  23.1  18.4        2.0   0.17    5.6       IDC_SEL3   165854647
           CMAR                2021/12/01  02:06:15.450 N           48.8  29.3   4.6        2.6   0.33    4.6       IDC_SEL3   165853716
           I32KE               2021/12/01  02:07:40.000 N            7.6 116.6   3.5        0.0  -1.00   -1.0       IDC_SEL3   165854021
           CMAR                2021/12/01  02:12:15.700 N          295.6  16.2   4.3        2.6   0.33    4.4       IDC_SEL3   165853885
           CMAR                2021/12/01  02:13:51.450 N          331.6  32.5   4.2        3.0   0.33    5.7       IDC_SEL3   165853886
           I32KE               2021/12/01  02:20:25.000 N          103.3 314.1   3.0        0.0  -1.00   -1.0       IDC_SEL3   165854605
```

⋮

```
           CTA                 2021/12/01  02:46:41.200 N          339.4   5.2   3.3        8.6   1.00    5.7       IDC_SEL3   165855297
           CMAR                2021/12/01  02:47:57.850 N           32.6  29.7   4.6        1.4   0.44    2.9       IDC_SEL3   165854475
           I32KE               2021/12/01  02:50:00.000 N          119.6 325.0   2.5        0.0  -1.00   -1.0       IDC_SEL3   165855135
           I32KE               2021/12/01  02:50:25.000 N           99.8 311.2   4.5        0.0  -1.00   -1.0       IDC_SEL3   165855138
           I32KE               2021/12/01  02:52:50.000 N          248.8 266.1   0.7        0.0  -1.00   -1.0       IDC_SEL3   165855134
           I32KE               2021/12/01  02:54:50.000 N          119.8 335.3   0.8        0.0  -1.00   -1.0       IDC_SEL3   165855136
           CMAR                2021/12/01  02:59:23.450 Pn         185.5  14.4   4.4        1.6   0.44    2.1       IDC_SEL3   165854704
STOP
```

I.5 AUTH_STATUS

AUTH_STATUS is not supported by the IDC. See Appendix IV "Unsupported commands at the IDC" for a list of unsupported commands.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 10000998
DATA_TYPE AUTH_STATUS IMS2.0
Report period from 1994/12/03 00:00:00.0 to 1994/12/04 00:00:00.0

Net        Sta  Chan Aux   Packets_Tested Packets_Failed
IDC_SEIS   ABC   shz                 8640              3
IDC_SEIS   DEF   bhz                 8640              0

Failed Packet Intervals
Net        Sta  Chan Aux       Start_Time              End_Time          Comment
IDC_SEIS   ABC  shz       1994/12/03 14:28:40    1994/12/03 14:29:10    Unknown cause
STOP
```

I.6 BLANKPHD

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68533772 CTBT_IDC
REF_ID 444444
DATA_TYPE LOG
 Info - 68533772 - IMSLANGUAGE request successfully parsed
 Info - 68533772 - Job 89156110: job status has changed to: QUEUED
 Info - 68533772 - Request submitted successfully, request id 68533772
 Info - 68533772 - Job 89156110: job status has changed to: RUNNING
 Info - 68533772 - The product BLANKPHD has been generated in 0 minutes, 0 seconds
     and 187 milliseconds
 Info - 68533772 - You have 4174157.81KB left out of your daily 4194304.00KB quota
DATA_TYPE BLANKPHD
TIME_STAMP 2021/12/09 15:40:11
#Header 3
BRP11 BRP11_002 P RASA              FULL
11000000000131
BRP11_002-2021/11/25-19:53:40   0                               0
2021/11/29 14:30:02
#Comment
Barcode ID: 0000054508
This data generated by RASA Linux Control Software Version 5.50
RASA LINUX CONTROL SOFTWARE VERSION 5.5 - Nov 2017
Ortec 50-TP42122A 3800V
#Acquisition
2021/11/25 19:53:40   300619.52      300197.32
#Calibration
2021/11/24 21:04:04
#g_Energy
59.54            173.37           0.0000
88.03            256.60           0.0000
122.06           355.96           0.0000
136.47           398.05           0.0000
165.86           484.02           0.0000
255.13           745.61           0.0000
391.70           1144.97          0.0000
661.66           1934.99          0.0000
834.84           2441.76          0.0000
898.04           2626.77          0.0000
1115.54          3263.12          0.0000
1173.23          3431.95          0.0000
1332.49          3898.00          0.0000
1836.05          5371.66          0.0000
#g_Resolution
59.54            1.0350           0.000000
88.03            1.0350           0.000000
122.06           1.0630           0.000000
```

```
136.47          1.0840          0.000000
165.86          1.0960          0.000000
255.13          1.0750          0.000000
391.70          1.2420          0.000000
661.66          1.4850          0.000000
834.84          1.5500          0.000000
898.04          1.6400          0.000000
1115.54         1.7540          0.000000
1173.23         1.7470          0.000000
1332.49         1.8600          0.000000
1836.05         2.1040          0.000000
#g_Efficiency
59.54           0.0057000000    0.000150000000
88.03           0.0310000000    0.000660000000
122.06          0.0479000000    0.000950000000
165.86          0.0559000000    0.001110000000
391.70          0.0406000000    0.000770000000
661.66          0.0299000000    0.000580000000
834.84          0.0267000000    0.000510000000
898.04          0.0224000000    0.000400000000
1115.54         0.0215000000    0.000440000000
1173.23         0.0187000000    0.000340000000
1332.49         0.0170000000    0.000310000000
1836.05         0.0144000000    0.000260000000
#g_Spectrum
8192  2900
1     0         0          0          0          0
6     0         0          0          0          0
11    0         0          0          0          0
16    0         0          0          0          0
21    0         0          0          0          0
```

⋮

```
8181  10        18         13         9          9
8186  8         5          13         7          6
8191  16        0
TIME_STAMP 2021/12/09 15:40:11
STOP
```

I.7 BULLETIN (IMS2.0:short format)

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68533072 CTBT_IDC
REF_ID 12345
DATA_TYPE BULLETIN IMS2.0:SHORT
TIME_STAMP 2021/12/09 15:11:20
Reviewed Event Bulletin of the CTBT_IDC from 2021/12/01 12:00:00 to 2021/12/01 13:00:00,  generated 2021/12/09 15:11:20
EVENT  21429064 SOUTH OF HONSHU, JAPAN
   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author      OrigID
2021/12/01 12:07:08.52   0.76  1.06  31.1076  142.4125  23.5  16.2  64   0.0f        14   14 136   2.98  93.04 m i uk IDC_REB    21436469

Magnitude  Err Nsta Author      OrigID
ML      3.2 0.2    2 IDC_REB   21436469
mb      3.9 0.1   12 IDC_REB   21436469
mbtmp   3.8 0.1   14 IDC_REB   21436469

Sta     Dist  EvAz Phase        Time      TRes  Azim AzRes   Slow   SRes Def   SNR       Amp   Per Qual Magnitude    ArrID
JHJ     2.98 312.9 Pn       12:07:55.681   1.9 197.5  66.0   20.1    6.4 T__   1.8      11.8  0.33 ___ ML     3.4 165912469
                                                                                        82.8  0.42     mbtmp  4.2
JHJ     2.98 312.9 Sn       12:08:31.358   6.3  90.0 -41.5   20.2   -4.5 ___   5.2      38.6  0.33 a__            165867479
JCJ     4.00 183.0 Pn       12:07:59.550  -7.6   3.5   0.6   18.8    5.0 ___                       ___            165912306
                                                          ⋮
NOA    79.97 338.2 P        12:19:19.470   0.1  56.2  14.1    6.3    1.0 T__   3.3       0.7  0.71 a__ mbtmp  3.8 165866316
                                                                                         0.7  0.71     mb     3.8
PDAR   81.24  45.1 P        12:19:27.965   1.2 346.0   2.0    0.4   -2.2 T__   4.6       0.3  0.64 a__ mbtmp  3.6 165866216
                                                                                         0.3  0.64     mb     3.6
TXAR   93.04  53.1 P        12:20:25.721   1.3 316.5  17.8    2.5   -0.4 T__   3.6       0.6  0.94 a__ mbtmp  3.9 165866238
                                                                                         0.6  0.94     mb     4.0



EVENT  21428539 FIJI ISLANDS REGION
   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author      OrigID
2021/12/01 12:11:02.02  12.04  0.05 -18.7411  -177.863 272.0  41.2 142 502.8  95.6    4    4 242  15.08  86.58 m i uk IDC_REB    21451355

Magnitude  Err Nsta Author      OrigID
mb      3.1 0.1    3 IDC_REB   21451355
mbtmp   4.1 0.1    4 IDC_REB   21451355

Sta     Dist  EvAz Phase        Time      TRes  Azim AzRes   Slow   SRes Def   SNR       Amp   Per Qual Magnitude    ArrID
DZM    15.08 254.7 P        12:14:13.107  -0.0  74.7  -5.5   17.1    6.7 TA_   2.2       6.0  0.89 ___ mbtmp  4.3 165917346
```

```
WRA     45.00  260.3  P         12:18:32.247    0.1   95.1   -0.2     8.5     0.5  TAS   29.2         0.6   0.27  a__  mbtmp   4.0  165866253
                                                                                                      0.6   0.27       mb      3.1
ASAR    45.07  255.0  P         12:18:32.691   -0.0   89.9    1.5     8.8     0.5  TAS   44.6         2.8   0.64  a__  mbtmp   4.3  165866197
                                                                                                      2.8   0.64       mb      3.4
ILAR    86.58   12.8  P         12:22:50.905   -0.0  215.1   -5.8     5.0    -0.2  TAS   10.1         0.3   0.41  a__  mbtmp   3.8  165866438
                                                                                                      0.3   0.41       mb      3.0



EVENT  21429217  SOUTH  OF  HONSHU,  JAPAN
   Date         Time         Err    RMS Latitude Longitude  Smaj   Smin   Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author
       OrigID
2021/12/01 12:45:04.62   5.61   0.88   31.0229   142.0538 225.4   21.7   72   0.0f         6    6 218   6.34  54.94 m i uk IDC_REB
    21436786

Magnitude  Err Nsta Author      OrigID
mb      3.4  0.1    5  IDC_REB   21436786
mbtmp   3.3  0.1    6  IDC_REB   21436786

Sta     Dist  EvAz  Phase        Time      TRes   Azim  AzRes    Slow    SRes  Def   SNR         Amp    Per  Qual  Magnitude     ArrID
MJAR    6.34  331.0  Pn         12:46:39.462   -0.9  154.3    5.4    11.1    -2.6  TA_    1.3         1.6   0.95  ___  mbtmp   3.0  165913223
ZALV   46.51  316.8  P          12:53:35.157    1.8  101.6    5.9     6.5    -1.4  TAS    1.4         0.2   0.31  ___  mbtmp   3.5  165913581
                                                                                                      0.2   0.31       mb      3.5
MKAR   47.96  306.9  P          12:53:44.151   -0.7   89.8    2.7     7.8     0.1  TAS    1.5         0.2   0.52  ___  mbtmp   3.3  165913220
                                                                                                      0.2   0.52       mb      3.3
KURK   50.27  312.2  P          12:54:02.466   -0.0   90.9    3.2     9.3     1.8  TAS    1.2         0.1   0.40  ___  mbtmp   3.1  165913219
                                                                                                      0.1   0.40       mb      3.1
WRA    51.21  189.3  P          12:54:09.747   -0.1    8.8    1.3     7.6    -0.0  TAS    4.9         0.5   0.77  a__  mbtmp   3.5  165867167
                                                                                                      0.5   0.77       mb      3.5
ASAR   54.94  189.1  P          12:54:37.164   -0.2   16.3    6.0     6.9    -0.2  TAS    1.6         0.2   0.38  ___  mbtmp   3.4  165913183
                                                                                                      0.2   0.38       mb      3.4



TIME_STAMP  2021/12/09  15:11:20
STOP
```

I.8 BULLETIN (IMS2.0:long Format)

BULLETIN IMS2.0:LONG is not supported by the IDC. See Appendix IV “Unsupported commands at the IDC” for a list of unsupported commands.

I.9 CALIBPHD

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68552597 CTBT_IDC
REF_ID 3912151821
DATA_TYPE CALIBPHD
TIME_STAMP 2021/12/10 09:14:00
#Header 3
BRP11 BRP11_002 P RASA              FULL
11999999990002
BRP11_002-2021/11/24-17:24:27   0                                0
2021/11/24 23:45:27
#Comment
This data generated by RASA Linux Control Software Version 5.50
RASA LINUX CONTROL SOFTWARE VERSION 5.5 - Nov 2017
Ortec 50-TP42122A 3800V
#Acquisition
2021/11/24 17:24:27.0 15848.0        15749.1
#g_Energy
59.541           173.37           0
88.034           256.60           0
122.061          355.96           0
                              ⋮
1173.228         3431.95          0
1332.492         3898.00          0
1836.052         5371.66          0
#g_Resolution
59.541           1.035            0
88.034           1.035            0
122.061          1.063            0
                              ⋮
1173.228         1.747            0
1332.492         1.860            0
1836.052         2.104            0
#g_Efficiency
59.541           0.0057           0.00015
88.034           0.0310           0.00066
122.061          0.0479           0.00095
                              ⋮
1173.228         0.0187           0.00034
1332.492         0.0170           0.00031
1836.052         0.0144           0.00026
#Calibration
2021/11/24 17:24:27.0
#Certificate
10558      2020/10/01 17:00:00.0 B
Am-241   432.904     Y 308.00   1.850   59.540    35.920  0 0        0
Cd-109   1.264       Y 3070.00  1.950   88.030    3.626   0 0        0
Co-57    271.800     D 154.60   1.850   122.060   85.510  0 0        0
Ce-139   137.640     D 1032.00  1.950   165.860   79.900  0 0        0
Sn-113   115.090     D 2077.00  1.850   391.700   64.970  0 0        0
Cs-137   30.071      Y 102.20   1.850   661.660   84.990  0 0        0
Mn-54    312.130     D 154.70   1.750   834.840   99.795  0 0        0
Y-88     106.630     D 3075.00  1.750   898.040   93.900  0 0        0
Zn-65    244.010     D 370.00   1.850   1115.540  50.220  0 0        0
Co-60    5.275       Y 214.90   1.750   1173.230  99.850  0 0        0
Co-60    5.275       Y 214.90   1.750   1332.490  99.983  0 0        0
Y-88     106.630     D 3076.00  1.750   1836.050  99.320  0 0        0
#g_Spectrum
8192  2800
1     0          0          0          0          0
6     0          0          0          0          0
11    0          0          0          0          0
                              ⋮
8181  1          0          0          0          1
8186  0          2          0          0          1
8191  0          0
#Header 3
GBL15 GBL15_143 P RASA_7028mm_D_Top FULL
```

```
15999999990147
GBL15_143-2021/11/03-16:21:38.0 0                                   0
2021/11/04 13:11:16.9
#Acquisition
2021/11/03 16:21:38.0 20060.68       20000.00
#g_Energy
46.539           134.328          0.02102
59.541           171.537          0.00685
88.034           252.968          0.00753
                                         ⋮
1332.490         3805.658         0.02477
1836.060         5243.537         0.17242
2505.700         7154.078         0.08329
#g_Resolution
46.539           0.941            0.01600
59.541           0.975            0.00478
88.034           1.003            0.00550
                                         ⋮
1332.490         2.263            0.01578
1836.060         2.781            0.12990
2505.700         3.039            0.05098
#g_Efficiency
46.493           0.160500         0.0083860
59.538           0.163200         0.0062880
88.058           0.160600         0.0056470
                                         ⋮
1173.236         0.021920         0.0006716
1332.559         0.019680         0.0005727
1836.162         0.014940         0.0004016
2505.446         0.011220         0.0003088
#g_Spectrum
8192  2800
1     0          0          0          0          0
6     0          0          0          0          0
11    0          0          0          0          0
                                         ⋮
8181  1          0          0          0          0
8186  0          0          0          0          0
8191  0          0          0          0          0
#Calibration
2021/08/12 10:39:13
#Certificate
5358        2019/09/01 12:00:00   B
PB-210    8108.55    D  1375.    2.76    46.54    4.25    0 0        0
AM-241    158007.15  D  241.3    2.58    59.54    35.9    0 0        0
CD-109    461.4      D  1169.    2.63    88.03    3.7     0 0        0
CO-57     271.74     D  40.15    2.64    122.06   85.6    0 0        0
CE-139    137.64     D  37.44    2.69    165.86   80.     0 0        0
CR-51     27.7       D  710.     2.64    320.08   9.91    0 0        0
SN-113    115.09     D  158.6    2.63    391.7    64.97   0 0        0
SR-85     64.85      D  156.5    2.64    514.     96.     0 0        0
CS-137    10986.72   D  228.4    2.7     661.66   85.1    0 0        0
MN-54     312.2      D  197.1    2.58    834.85   99.98   0 0        0
Y-88      106.63     D  370.9    2.58    898.04   93.7    0 0        0
ZN-65     243.93     D  435.8    2.64    1115.54  50.04   0 0        0
CO-60     1925.28    D  237.7    2.57    1173.23  99.85   0 0        0
CO-60     1925.28    D  237.7    2.57    1332.49  99.98   0 0        0
Y-88      106.63     D  370.9    2.58    1836.06  99.2    0 0        0
TIME_STAMP 2021/12/10 09:14:00
STOP
```

I.10 CALIBPHD_Calibration blocks by VGSL simulations

```
#g_Energy
40                 122.111          0
50                 152.44           0
60                 182.769          0
```

⋮

```
2220               6733.833         0
2320               7037.123         0
2420               7340.413         0
#g_Resolution
40                 0.936008547      0
50                 0.945079362      0
60                 0.954071276      0
```

⋮

```
2220               2.219681959      0
2320               2.264678344      0
2420               2.309101124      0
#g_Efficiency
40.000000          0.000223         0.000406
50.000000          0.002218         0.002929
60.000000          0.008153         0.010446
```

⋮

```
2220.000000        0.013835         0.070331
2320.000000        0.013453         0.070332
2420.000000        0.013143         0.070186
```

I.11 CHANNEL

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68531923 CTBT_IDC
REF_ID 999999
DATA_TYPE CHANNEL IMS2.0
Net       Sta  Chan Aux  Latitude  Longitude Coord Sys     Elev Depth  Hang  Vang Sample_Rate Inst     On Date    Off Date
          BDFB  sz       -15.64400 -48.01410               1.095 0.032         0.0   20.000000 GS-21 1993/07/08 2003/05/17
          CPUP SHZ       -26.33070 -57.33100               0.135 0.032         0.0   40.000000 GS-21 2002/08/28
          CPUP  sz       -26.33060 -57.32920               0.005 0.032         0.0   20.000000 GS-21 1994/01/01 2002/04/23
          LPAZ SHZ       -16.28790 -68.13070               4.774 0.100         0.0   40.000000 GS-21 2003/05/07 2003/05/08
          LPAZ SHZ       -16.28793 -68.13071               4.792 0.100         0.0   40.000000 GS-21 2003/05/08 2018/08/08
          LPAZ SHZ       -16.28793 -68.13071               4.792 0.030         0.0   40.000000 GS-21 2018/08/09
          LPAZ  sz       -16.28790 -68.13070               4.774 0.032         0.0   20.000000 GS-21 1993/08/20 2003/05/07
          PLCA SHZ       -40.73273 -70.55083               1.073 0.031         0.0   40.000000 GS-21 2002/09/04
          PLCA  sz       -40.73060 -70.55000               0.950 0.033         0.0   20.000000 GS-21 1992/10/26 1994/11/04
          PLCA  sz       -40.73273 -70.55083               1.073 0.033         0.0   20.000000 GS-21 1994/11/04 2002/05/21
          SIV  SH1       -15.99100 -61.07200               0.450 0.000   4.0  90.0   50.000000 HM500 2008/10/09
          SIV  SH2       -15.99100 -61.07200               0.450 0.000  94.0  90.0   50.000000 HM500 2008/10/09
          SIV  SHE       -15.99100 -61.07200               0.450 0.000  90.0  90.0   50.000000 HM500 2000/05/18 2008/10/08
          SIV  SHN       -15.99100 -61.07200               0.450 0.000   0.0  90.0   50.000000 HM500 2000/05/18 2008/10/08
          SIV  SHZ       -15.99100 -61.07200               0.450 0.000         0.0   50.000000 ZM500 2000/05/18
STOP
```

I.12 CHAN_STATUS

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68530395 CTBT_IDC
REF_ID 9876543210
DATA_TYPE CHAN_STATUS IMS2.0
Report period from 2021/12/01 00:00:00.0 to 2021/12/02 00:00:00.0
Channel Status
Net       Sta  Chan %_Recvd %_AvaUA %_Avail  Gaps  Samples  Constant       Mean        RMS
ASAR      AS01 SHZ  100.000 100.000 100.000     0  1728000         0      201.5      198.7
ASAR      AS02 SHZ  100.000 100.000  99.572     0  1728000         0      236.0      197.7
ASAR      AS03 SHZ  100.000 100.000 100.000     0  1728000         0      537.8      219.2
```

⋮

```
ASAR      AS19 SHZ  100.000 100.000 100.000     0  1728000         0      112.5      202.9
ASAR      AS31 BHZ  100.000 100.000 100.000     0  3456000         0      149.6      842.6
          CPUP SHZ    0.000   0.000   0.000     1        0         0        0.0        0.0
          CPUP BHZ    0.000   0.000   0.000     1        0         0        0.0        0.0


STOP
```

I.13 COMMENT

COMMENT is not supported by the IDC. See Appendix IV "Unsupported commands at the IDC" for a list of unsupported commands.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 10000998
DATA_TYPE COMMENT IMS2.0

  Almost anything may be typed into the space between the
  DATA_TYPE line and the STOP line. No association was
  desired for this comment, so the association line was
  left blank. Note that this comment is indented so that
  the DATA_TYPE in the second line of this paragraph is
  not interpreted as a command line.
DATA_TYPE COMMENT IMS2.0
Event      7687234
  The referenced event was felt over a wide area (300 square
  kilometers) near the epicenter.
STOP
```

I.14 COMM_STATUS

COMM_STATUS is not supported by the IDC. See Appendix IV "Unsupported commands at the IDC" for a list of unsupported commands.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 10000998
DATA_TYPE COMM_STATUS IMS2.0
Report period from 1994/12/03 00:00:00.0 to 1994/12/04 00:00:00.0
Link                 Nom_kbps  Mode  %_Up   From     Util  From     Util
AUS_NDC  - CTBO_IDC     56.0  full  88.4  AUS_NDC  0.50  CTBO_IDC  0.08
NOR_NDC  - CTBO_IDC    128.0  full  99.2  NOR_NDC  0.77  CTBO_IDC  0.10
USA_NDC  - CTBO_IDC   1000.0  full 100.0  USA_NDC  0.25  CTBO_IDC  0.25

AUS_NDC  - CTBO_IDC link outages
         From                Through             Duration
1994/12/02 20:23:14.0 1994/12/03 00:48:28.0 000 00:25:14.0
1994/12/03 02:34:31.0 1994/12/03 02:49:39.0 000 00:15:08.0
1994/12/03 19:02:27.0 1994/12/03 19:12:29.0 000 00:10:02.0

NOR_NDC  - CTBO_IDC link outages
         From                Through             Duration
1994/12/03 04:34:31.0 1994/12/03 06:35:39.0 000 00:45:13.0
STOP
```

I.15 DETBKPHD

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68557217 CTBT_IDC
REF_ID 123454321
DATA_TYPE DETBKPHD
#Header 3
USL16 USL16_001 P RL16_01_EmptyCave FULL
16111111110040
USL16_001-2021/01/15-13:50:47   0                              0
2021/02/01 23:09:46.0
#Comment
Empty cave background for 7 day count on detector USL16_001.
The report was resent to change to efficiency file to a 3M 50x4.5mm
geometry.  Submitted by L. Greenwood
#Acquisition
2021/01/15 13:50:47.0 605323.83      604800.00
#g_Energy
46.500           122.496          0.01691
59.600           156.558          0.01337
                                        ⋮
1332.460         3491.567         0.01510
1836.010         4811.205         0.01325
#g_Resolution
46.500           1.039            0.00602
59.600           1.062            0.00449
                                        ⋮
1332.460         1.951            0.00430
1836.010         2.237            0.00381
#g_Efficiency
46.500           0.009518         0.0002600
59.540           0.044000         0.0006600
                                        ⋮
1332.460         0.065110         0.0016280
1836.010         0.051510         0.0012880
#g_Spectrum
8192  2800
1     0          0          0          0          0
6     0          0          0          0          0
                                        ⋮
8181  12         9          11         9          6
8186  5          9          12         10         7
8191  9          0          0          0          0
STOP
```

I.16 ERROR_LOG

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID err_888888 CTBT_IDC
REF_ID 888888
DATA_TYPE LOG
 Submitted request :
 begin ims2.0
 msg_type request
 msg_id 888888
 time 2021/12/001 12:00 to 2021/12/001 16:00  bull_type REB  group_bull_list SEL2
     sta_list WRA,MJAR  mag_type mb  mag 3.7 to  depth 0 to 10  event_sta_dist 0.0
     to 20.0  event ims2.0  stop DATA_TYPE ERROR_LOG
 Error[line=4,pos=5]: 2021/12/001 is not a valid DATETIME.
STOP
```

I.17 EVENT

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68531540 CTBT_IDC
REF_ID 888888
DATA_TYPE EVENT IMS2.0
Reviewed Event Bulletin of the CTBT_IDC from 2021/12/01 12:00:00 to 2021/12/01 16:00:00,  generated 2021/12/09 13:57:37
EVENT  21429064 SOUTH OF HONSHU, JAPAN
   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author       OrigID
2021/12/01 12:07:08.52   0.76  1.06  31.1076  142.4125  23.5  16.2  64   0.0f        14   14 136   2.98  93.04 m i uk IDC_REB   21436469

Magnitude  Err Nsta Author      OrigID
ML     3.2 0.2    2 IDC_REB   21436469
mb     3.9 0.1   12 IDC_REB   21436469
mbtmp  3.8 0.1   14 IDC_REB   21436469


EVENT  21428380 NEAR EAST COAST OF HONSHU, JAPAN
   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author       OrigID
2021/12/01 14:31:34.03   0.71  0.81  40.0857   141.084  17.8  10.6 120   0.0f        19   15 134   4.18  75.72 m i uk IDC_REB   21452111

Magnitude  Err Nsta Author      OrigID
ML     3.7 0.1    3 IDC_REB   21452111
mb     3.8 0.1   11 IDC_REB   21452111
mbtmp  3.9 0.1   15 IDC_REB   21452111
Ms     3.2 0.1    6 IDC_REB   21452111


EVENT  21428379 NEAR EAST COAST OF HONSHU, JAPAN
   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author       OrigID
2021/12/01 14:38:25.65   1.01  0.72  36.3695  141.2515  20.2  15.6  92   0.0f        11    9 156   2.43  64.57 m i uk IDC_REB   21448744

Magnitude  Err Nsta Author      OrigID
ML     3.0 0.5    2 IDC_REB   21448744
mb     3.7 0.2    7 IDC_REB   21448744
mbtmp  3.7 0.2    9 IDC_REB   21448744


STOP
```

I.18 EXECSUM

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 10000998
DATA_TYPE EXECSUM IMS2.0
 Executive Summary for 2001-03-01 00:00:00 to 2001-03-06 00:00:00
 generated at 2001-06-13 18:31:01

LATEST PROCESSING TIME (for requested interval)
Seismic-Acoustic              Radionuclide
2001/03/13 18:39:05    2001/03/02 13:56:15

SEISMIC-ACOUSTIC SUMMARY
TotalEvents Considered InsufftData NotScreened ScreenedOut
         59         49          15          6           28

RADIONUCLIDE SUMMARY
Detections  Level4  Level5
        18       1       0

FUSION SUMMARY
FusedEvents


SYSTEM STATUS SUMMARY
 IMS  GCI  IDC RNLab
  47

IMS STATUS BY TECHNOLOGY
   PS   AS    H    I   RN
   66   39   36
STOP
```

I.19 GASBKPHD

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68553509 CTBT_IDC
REF_ID 714212835
DATA_TYPE GASBKPHD
TIME_STAMP 2021/12/10 09:55:32
#Header 3
USX74 USX74_006 B GEOMETRY          FULL
74202111301900X
USX74_006-2021/11/30-19:02      USX74_006-2015/08/22-16:12      0
2021/12/01 06:12:43.2
#Comment
Using Pixie electronics v. 2.43.
Produced by SAUNA_PHDAQ with program version 1.0.12.3.
GC:LL333:2958
Coincidence spectrum set to zero counts where gamma or beta channel is zero.

 IMS data from the upgraded SAUNA II station in Ashland, KS, USA
 Dead volume factor 0.893.

#Acquisition
2021/11/30 19:02:46.2 40195.653000   40179.839000
#Calibration
2014/06/03 16:46:00.0
#g_Energy
32.000000        12.520000        0.006000
59.540000        22.680000        0.006000
121.780000       45.480000        0.005000
244.700000       87.490000        0.041000
344.280000       121.890000       0.013000
661.660000       229.400000       0.013000
#b_Energy
73.340000        C 22.740000        0.500000
88.260000        C 27.820000        0.500000
103.160000       C 32.600000        0.500000
```

⋮

```
410.680000       C 134.970000       0.500000
425.080000       C 138.940000       0.500000
439.450000       C 142.800000       0.500000
#g_Resolution
32.000000        8.490000         0.039300
59.540000        11.870000        0.033800
121.780000       12.720000        0.034100
244.700000       21.650000        0.362700
344.280000       30.990000        0.084400
```

```
661.660000        64.710000         0.075200
#b_Resolution
73.340000         25.570000         0.500000
88.260000         27.140000         0.500000
103.160000        34.650000         0.500000
```

⋮

```
410.680000        70.160000         0.500000
425.080000        72.280000         0.500000
439.450000        71.540000         0.500000
#g_Efficiency
31.630000         0.672000          0.006500
80.980000         0.897000          0.005000
123.000000        0.772000          0.002000
165.000000        0.732000          0.000700
208.000000        0.692000          0.000900
249.800000        0.598000          0.000700
#ROI_Limits
1  18.66820   622.63200  323.65200  393.57200
2  18.66820   976.44500  219.74700  285.99700
3  18.66820   360.30300  63.18320   102.79200
```

⋮

```
8  274.27200  407.62500  18.11650   43.44040
9  173.97100  407.62500  18.11650   43.44040
10 18.66820   145.90400  18.11650   43.44040
#b-gEfficiency
XE-135     2         0.538600   0.076300
XE-133     3         0.684200   0.009300
XE-133     4         0.683800   0.012900
```

⋮

```
XE-133     8         0.033500   0.000900
XE-133     9         0.181500   0.003800
XE-133     10        0.438100   0.008800
#Ratios
PB214_352:242   1  2  0.676000   0.0065
PB214_352:80    1  3  0.461000   0.0050
PB214_352:30_4  1  4  0.095000   0.0020
```

⋮

```
XE133-8_81:30   3  8  0.000780   0.0005
XE133-9_81:30   3  9  0.009900   0.0016
XE133-10_81:30  3  10 0.032100   0.0029
#g_Spectrum
256   742
0     2          3544       8864       5263       3881
5     3612       3279       2519       2294       2161
10    2202       2314       2562       2322       2033
```

⋮

```
245   555         552         574         554         586
250   550         589         586         559         568
255   570
#b_Spectrum
256   984
0     3           4           31          83          77
5     83          62          57          65          65
10    56          58          50          54          55
```

⋮

```
245   31          22          24          20          24
250   13          17          20          24          13
255   16
#Histogram
256   256   742  984
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0
0 0 0 0 1 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0
```

⋮

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0
TIME_STAMP 2021/12/10 09:55:32
STOP
```

I.20 HELP

Any email with

- any subject and the word help as the body of the message or
- subject help and empty message body

will return the latest Tutorial for Requests and Subscriptions

I.21 LOG

The following example is a section of a message that is sent to a data requestor or subscriber after a subscription or request message has been processed. The log section precedes the message data section and is used to state that the request command was processed.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68531540 CTBT_IDC
REF_ID 888888
DATA_TYPE LOG
 Info - 68531540 - IMSLANGUAGE request successfully parsed
 Info - 68531540 - Job 89153483: job status has changed to: QUEUED
 Info - 68531540 - Request submitted successfully, request id 68531540
 Info - 68531540 - Job 89153483: job status has changed to: RUNNING
 Info - 68531540 - The product EVENT has been generated in 0 minutes, 0 seconds and 48 milliseconds
 Info - 68531540 - You have 4188554.24KB left out of your daily 4194304.00KB quota
DATA_TYPE EVENT IMS2.0
```

⋮

```
STOP
```

I.22 MET

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68553922 CTBT_IDC
REF_ID 714212835
DATA_TYPE MET
CAP14
2021/12/01 11:10:00.0 2021/12/01 11:20:00.0 11.0  112 3.4   1017.80 85  0
2021/12/01 11:20:00.0 2021/12/01 11:30:00.0 11.0  124 3.5   1018.00 84  0
2021/12/01 11:30:00.0 2021/12/01 11:40:00.0 11.1  134 2.1   1018.10 85  0
2021/12/01 11:40:00.0 2021/12/01 11:50:00.0 11.9  122 1.9   1018.30 80  0
2021/12/01 11:50:00.0 2021/12/01 12:00:00.0 12.8  145 1.9   1018.20 77  0.1
2021/12/01 12:00:00.0 2021/12/01 12:10:00.0 12.2  114 1.7   1018.30 78  0
2021/12/01 12:10:00.0 2021/12/01 12:20:00.0 12.0  130 1.7   1018.30 79  0
2021/12/01 12:20:00.0 2021/12/01 12:30:00.0 12.4  137 1.9   1018.30 77  0
2021/12/01 12:30:00.0 2021/12/01 12:40:00.0 12.7  147 1.7   1018.50 75  0
2021/12/01 12:40:00.0 2021/12/01 12:50:00.0 12.0  114 2.1   1018.30 79  0
2021/12/01 12:50:00.0 2021/12/01 13:00:00.0 12.1  121 1.6   1018.20 78  0
2021/12/01 13:00:00.0 2021/12/01 13:10:00.0 12.1  125 1.7   1018.10 79  0
CAP14
2021/12/01 13:10:00.0 2021/12/01 13:20:00.0 11.9  134 2.4   1017.40 80  0
2021/12/01 13:20:00.0 2021/12/01 13:30:00.0 12.9  213 1.9   1018.30 75  0
2021/12/01 13:30:00.0 2021/12/01 13:40:00.0 13.2  217 2.4   1018.30 73  0
2021/12/01 13:40:00.0 2021/12/01 13:50:00.0 13.2  160 1.7   1018.10 73  0
2021/12/01 13:50:00.0 2021/12/01 14:00:00.0 12.5  121 3.1   1017.50 77  0
2021/12/01 14:00:00.0 2021/12/01 14:10:00.0 11.4  96  2.7   1018.20 82  0
2021/12/01 14:10:00.0 2021/12/01 14:20:00.0 11.4  115 2.6   1018.00 82  0
2021/12/01 14:20:00.0 2021/12/01 14:30:00.0 11.8  104 1.7   1018.10 82  0
2021/12/01 14:30:00.0 2021/12/01 14:40:00.0 11.8  106 3.1   1017.90 81  0
2021/12/01 14:40:00.0 2021/12/01 14:50:00.0 11.6  102 2.9   1017.80 82  0
2021/12/01 14:50:00.0 2021/12/01 15:00:00.0 11.6  98  3.6   1017.50 83  0
2021/12/01 15:00:00.0 2021/12/01 15:10:00.0 11.8  107 2.3   1017.80 81  0
STOP
```

I.23 NETWORK

NETWORK is not supported by the IDC. See Appendix IV "Unsupported commands at the IDC" for a list of unsupported commands.

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 10000998
DATA_TYPE network IMS2.0
Net        Description
IDC_SEIS   International Data Center Seismic Network
IDC_HYDR   International Data Center Hydroacoustic Network
STOP
```

I.24 ORIGIN

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68530852 CTBT_IDC
REF_ID 666666
DATA_TYPE ORIGIN IMS2.0
Reviewed Event Bulletin of the CTBT_IDC from 2021/12/01 00:00:00 to 2021/12/02 00:00:00,  generated 2021/12/09 13:14:31
   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author      OrigID
2021/12/01 04:39:22.34   0.33  0.90  -37.954  -73.4738  12.6   8.5  79   0.0f        66   48  47   3.58 176.98 m i uk IDC_REB    21451982

Magnitude  Err Nsta Author      OrigID
ML      4.7 0.1    3 IDC_REB   21451982
mb      5.2 0.1   16 IDC_REB   21451982
mbtmp   5.1 0.1   19 IDC_REB   21451982
Ms      4.8 0.1   30 IDC_REB   21451982




   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author      OrigID
2021/12/01 06:04:52.33   0.47  0.83   35.248  141.3103  11.0   9.9 101   0.0f        41   38 118   0.82 147.64 m i uk IDC_REB    21451882

Magnitude  Err Nsta Author      OrigID
ML      4.1 0.2    7 IDC_REB   21451882
mb      4.6 0.1   28 IDC_REB   21451882
```

```
mbtmp  4.6 0.1   35 IDC_REB   21451882
Ms     4.3 0.0   71 IDC_REB   21451882




   Date       Time        Err   RMS Latitude Longitude  Smaj  Smin  Az Depth   Err Ndef Nsta Gap  mdist  Mdist Qual   Author       OrigID
2021/12/01 08:40:45.80   0.51  0.74  31.0532  142.5334  15.1  10.7  51   0.0f        35   33  73   3.09 151.65 m i uk IDC_REB    21451545

Magnitude  Err Nsta Author      OrigID
ML     3.8 0.1    7 IDC_REB   21451545
mb     4.6 0.1   23 IDC_REB   21451545
mbtmp  4.5 0.0   30 IDC_REB   21451545
Ms     3.7 0.0   48 IDC_REB   21451545




STOP
```

I.25 OUTAGE

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68555677 CTBT_IDC
REF_ID 714212835
DATA_TYPE OUTAGE IMS2.0
Report period from 2021/11/30 00:00:00.0 to 2021/12/01 00:00:00.0
Outage
Net       Sta   Chan     Start Date Time          End Date Time        Duration Comment
MJAR      MJB7  HHZ  2021/11/30 22:50:10.000 2021/12/01 00:00:00.000   4190.000
MJAR      MJB8  HHZ  2021/11/30 00:00:00.000 2021/12/01 00:00:00.000  86400.000
          APG   BHZ  2021/11/30 02:21:15.000 2021/11/30 02:39:05.000   1070.000
          APG   BHZ  2021/11/30 11:12:54.000 2021/11/30 11:29:24.000    990.000
          APG   BHZ  2021/11/30 11:29:24.000 2021/11/30 11:31:41.000    137.000
          APG   BHZ  2021/11/30 13:10:57.000 2021/11/30 13:22:06.000    669.000
          APG   BHZ  2021/11/30 14:12:20.000 2021/11/30 14:29:51.000   1051.000
          SDV   BHZ  2021/11/30 10:56:10.000 2021/11/30 11:14:19.000   1089.000
          SDV   BHZ  2021/11/30 11:14:19.000 2021/11/30 11:23:22.000    543.000
          SDV   BHZ  2021/11/30 11:23:22.000 2021/11/30 11:41:49.000   1107.000
          SDV   BHZ  2021/11/30 14:09:25.000 2021/11/30 14:21:37.000    732.000
          SIJI  BHZ  2021/11/30 00:53:08.000 2021/11/30 01:08:21.000    913.000
          SIJI  BHZ  2021/11/30 01:28:01.000 2021/11/30 01:46:46.000   1125.000

STOP
```

I.26 QCPHD

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68555690 CTBT_IDC
REF_ID 714212835
DATA_TYPE QCPHD
#Header 3
KWP40 KWP40_004 P RASA-QC           FULL
40888888880109
KWP40_004-2021/11/26-06:30:33   0                               0
2021/11/26 07:15:01
#Comment
Barcode ID: QC202111260630
This data generated by RASA Linux Control Software Version 5.50
RASA LINUX CONTROL SOFTWARE VERSION 5.0
#Acquisition
2021/11/26 06:30:33   1200.44        1189.98
#Calibration
2018/09/11 10:24:54
#g_Energy
59.54            173.43           0.0000
88.03            256.68           0.0000
122.06           356.21           0.0000
```

⋮

```
1173.23          3433.05          0.0000
1332.49          3899.35          0.0000
1836.05          5373.58          0.0000
#g_Resolution
59.54            0.8580           0.000000
88.03            0.8440           0.000000
122.06           0.8600           0.000000
```

⋮

```
1173.23          1.7430           0.000000
1332.49          1.8440           0.000000
1836.05          2.0570           0.000000
#g_Efficiency
88.00            0.0161690000     0.000100000000
122.00           0.0242920000     0.000200000000
392.00           0.0163160000     0.000100000000
662.00           0.0119040000     0.000100000000
898.00           0.0099618000     0.000100000000
1173.00          0.0081298000     0.000070000000
1333.00          0.0074916000     0.000070000000
#g_Spectrum
8192  2900
1     0          0          0          0          0
6     0          0          0          0          0
11    0          0          0          0          0
```

⋮

```
8181  0          0          0          0          0
8186  0          0          0          0          1
8191  0          0
#Certificate
5300        2008/01/01 12:00:00
EU-152   13.52       Y 2000.000 5.000   121.800  28.580  0 0        0
EU-152   13.52       Y 2000.000 5.000   244.700  7.580   0 0        0
EU-152   13.52       Y 2000.000 5.000   344.300  26.500  0 0        0
CS-137   30.05       Y 1600.000 5.000   661.700  85.100  0 0        0
EU-152   13.52       Y 2000.000 5.000   778.900  12.940  0 0        0
EU-152   13.52       Y 2000.000 5.000   964.100  14.610  0 0        0
EU-152   13.52       Y 2000.000 5.000   1085.900 10.210  0 0        0
CO-60    5.271       Y 1700.000 5.000   1173.200 99.970  0 0        0
EU-152   13.52       Y 2000.000 5.000   1112.100 13.640  0 0        0
CO-60    5.271       Y 1700.000 5.000   1332.500 99.990  0 0        0
EU-152   13.52       Y 2000.000 5.000   1408.000 21.010  0 0        0
STOP
```

I.27 RESPONSE

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68555644 CTBT_IDC
REF_ID 714212835
DATA_TYPE RESPONSE:OPERATIONAL IMS2.0
CAL2 STKA  BHZ      CMG3TB  6.28000000E-03   1.000    40.00000 2020/05/15 00:00
 (Note: the group delay is unknown and set to zero)
PAZ2  1 C  1.44854388E+10    0    0.000   5   3 instrument:theoretical
 -5.02654800E+02  0.00000000E+00
 -1.00530960E+03  0.00000000E+00
 -1.13097340E+03  0.00000000E+00
 -3.70080000E-02 -3.70080000E-02
 -3.70080000E-02  3.70080000E-02
  0.00000000E+00  0.00000000E+00
  0.00000000E+00  0.00000000E+00
  0.00000000E+00  0.00000000E+00
 (The scale factor is computed such that resp(NCALPER) = 1/NCALIB)
 (Note: the group delay is unknown and set to zero)
PAZ2  2 C  1.33388815E+04    0    0.000   1   0 instrument:theoretical
 -1.33388800E+04  0.00000000E+00
 (The scale factor is computed such that resp(NCALPER) = 1/NCALIB)
DIG2  3  1.00000000E+00 30000.00000 digitizer:theoretical
 (Note: the group delay is unknown and set to zero)
FIR2  4   1.00E+00   15    0.000 A  177 digitizer:theoretical
 -1.50596300E-10 -1.49886400E-10 -1.00311400E-10  1.25946400E-10  7.96045200E-10
  2.42982600E-09  5.98254500E-09  1.31275800E-08  2.66780500E-08  5.11949000E-08
  9.38367800E-08  1.65513100E-07  2.82403400E-07  4.67903700E-07  7.55046400E-07
                                      ⋮
  1.65513100E-07  9.38367800E-08  5.11949000E-08  2.66780500E-08  1.31275800E-08
  5.98254500E-09  2.42982600E-09  7.96045200E-10  1.25946400E-10 -1.00311400E-10
 -1.49886400E-10 -1.50596300E-10
 (The scale factor is set to 1.0)
 (Note: the group delay is unknown and set to zero)
FIR2  5   1.00E+00    5    0.000 A   71 digitizer:theoretical
 -1.40022900E-08 -1.25505900E-07 -6.07492100E-07 -2.04686600E-06 -5.23635200E-06
 -1.04276600E-05 -1.56651400E-05 -1.46713800E-05  3.86690300E-06  5.25491700E-05
  1.34544700E-04  2.27328500E-04  2.69408800E-04  1.65388700E-04 -1.75420500E-04
                                      ⋮
  1.34544700E-04  5.25491700E-05  3.86690300E-06 -1.46713800E-05 -1.56651400E-05
 -1.04276600E-05 -5.23635200E-06 -2.04686600E-06 -6.07492100E-07 -1.25505900E-07
 -1.40022900E-08
 (The scale factor is set to 1.0)
 (Note: the group delay is unknown and set to zero)
FIR2  6   1.00E+00    5    0.000 A  113 digitizer:theoretical
  3.62415300E-09  1.47021700E-08  2.92464800E-08  1.67581600E-08 -9.45969300E-08
 -4.00529200E-07 -9.37365200E-07 -1.53043500E-06 -1.64599100E-06 -4.07870400E-07
  3.03009400E-06  8.68599200E-06  1.47660300E-05  1.71367500E-05  1.01281400E-05
                                      ⋮
  1.47660300E-05  8.68599200E-06  3.03009400E-06 -4.07870400E-07 -1.64599100E-06
 -1.53043500E-06 -9.37365200E-07 -4.00529200E-07 -9.45969300E-08  1.67581600E-08
  2.92464800E-08  1.47021700E-08  3.62415300E-09
 (The scale factor is set to 1.0)
 (Note: the group delay is unknown and set to zero)
FIR2  7   1.00E+00    2    0.000 A  223 digitizer:theoretical
 -2.48770400E-10  4.73744000E-09  1.24031900E-08  2.18423000E-09 -2.97350400E-08
 -2.77409800E-08  4.82350100E-08  9.04852000E-08 -4.37720200E-08 -2.02925100E-07
 -2.93251000E-08  3.57677100E-07  2.38075600E-07 -5.05054100E-07 -6.56660600E-07
                                      ⋮
  2.38075600E-07  3.57677100E-07 -2.93251000E-08 -2.02925100E-07 -4.37720200E-08
  9.04852000E-08  4.82350100E-08 -2.77409800E-08 -2.97350400E-08  2.18423000E-09
  1.24031900E-08  4.73744000E-09 -2.48770400E-10
 (The scale factor is set to 1.0)
 (Note: the group delay is unknown and set to zero)
PAZ2  8 C  1.00005000E+00    0    0.000   1   1 digitizer:theoretical
 -6.28318500E-02  0.00000000E+00
  0.00000000E+00  0.00000000E+00
 (The scale factor is computed such that resp(NCALPER) = 1/NCALIB)
STOP
```

I.28 REVSAMP/SAMPML—Noble gas systems

I.28.1 β-γ coincidence systems

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<SampML xmlns="http://www.ctbto.org/SAMPML/0.7">
  <SampleInformation REFID="44202112071111X" SID="6482923"
      MID="MXX44_004-2021/12/08-06:39">
    <StationInformation>
      <StationLocation>Guerrero Negro, Baja California, Mexico.</StationLocation>
      <StationCode>MXX44</StationCode>
      <CountryCode>MX</CountryCode>
      <Coordinates>28 -114 9.4</Coordinates>
    </StationInformation>
    <DetectorInformation>
      <DetectorCode>MXX44_004</DetectorCode>
      <DetectorDescription>Detector #4 in Guerrero Negro,
          Mexico.</DetectorDescription>
    </DetectorInformation>
    <SampleType>SAUNA</SampleType>
    <SystemTechnology>SAUNA</SystemTechnology>
    <MeasuredInformation>
      <SpectrumGroup id="MXX44-6482923-SPHD" calibrationIDs="EN-B-1195981
          EN-G-1169389">
        <Geometry>GEOMETRY</Geometry>
        <ProcessedAirVolume unit="m3">14.7095146179199</ProcessedAirVolume>
        <FlowRate unit="m3/h">1.225792884826658333333333333333333333333</FlowRate>
        <SampleQuantity unit="ml">12.7280457266</SampleQuantity>
        <XeVolume unit="ml">1.10733997821808</XeVolume>
        <SohFlag>${SOH_FLAG}</SohFlag>
        <Authenticated>1</Authenticated>
        <CollectionStart>2021-12-07T11:36:35</CollectionStart>
        <CollectionStop>2021-12-07T23:36:35</CollectionStop>
        <AcquisitionStart>2021-12-08T06:39:36</AcquisitionStart>
        <AcquisitionStop>2021-12-08T17:49:34</AcquisitionStop>
        <ArrivalDate>2021-12-08T17:50:04</ArrivalDate>
        <RealAcquisitionTime>PT40198S</RealAcquisitionTime>
        <LiveAcquisitionTime>PT40184S</LiveAcquisitionTime>
        <SamplingTime>PT43200S</SamplingTime>
        <DecayTime>PT25381S</DecayTime>
        <Comments>
                Using Pixie electronics v. 2.43.
                Produced by SAUNA_PHDAQ with program version 1.0.12.3.
                GC:LL333:3424
                Coincidence spectrum set to zero counts where gamma or beta channel
                    is zero.
                MXX44 SAUNA II station (upgraded) in Guerrero Negro, Mexico
                Deadvolume factor 0.905
</Comments>
        <GeneralComments>
None
None

</GeneralComments>
        <IsotopeComments>
N/A
</IsotopeComments>
        <MeasurementType>S</MeasurementType>
        <SampleID>6482923</SampleID>
        <SpectrumType>FULL</SpectrumType>
        <Data>
          <Spectrum id="MXX44-6482923-SPHD-G" channelSpan="256" energySpan="748"
              type="SPHD-G" format="IMS2.0">
                1          1854       7170       5169       3615
                3088       2657       2332       1746       1652
                                 ⋮
                430        417        409        408        402
                395

</Spectrum>
```

```
          <Histogram id="MXX44-6482923-SPHD-H" gammaChannelSpan="256"
              gammaEnergySpan="748" betaChannelSpan="256" betaEnergySpan="868"
              type="SPHD-H" format="IMS2.0">
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
⋮
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

</Histogram>
        </Data>
      </SpectrumGroup>
      <SpectrumGroup id="MXX44-4569366-DETBK" calibrationIDs="EN-B-18889123
          EN-G-9682116">
⋮
      </SpectrumGroup>
    </MeasuredInformation>
    <Analyses>
      <Analysis id="AN-MXX44-6482923-SPHD" spectrumIDs="MXX44-6482923-SPHD"
          calibrationIDs="EN-B-1195981 EN-G-1169389">
        <Software>
          <Name>BG_ANALYSE</Name>
          <Version>1.0</Version>
        </Software>
        <Categorization>
1
</Categorization>
        <IdedNuclides>
          <Corrected>
            <Nuclide quantifiable="true">
              <Name>XE-131M</Name>
              <Type>FISSION (G)</Type>
              <HalfLife>11.962 D</HalfLife>
              <Concentration unit="mBq/m3">-0.0344312348882</Concentration>
              <Activity unit="mBq">-0.438242332082</Activity>
              <ActivityAtAcquisition
                  unit="mBq">-0.424628223813</ActivityAtAcquisition>
              <UndecayCorrectedActivity
                  unit="mBq">-0.418892838039</UndecayCorrectedActivity>
              <AbsoluteConcentrationError
                  unit="mBq/m3">0.0278760820791</AbsoluteConcentrationError>
              <RelativeConcentrationError
                  unit="percentage">80.9616099151</RelativeConcentrationError>
              <RelativeActivityAtAcquisitionError
                  unit="percentage">-80.16807230220061061492784596434321923496
                  </RelativeActivityAtAcquisitionError>
              <AbsoluteActivityError
                  unit="mBq">0.354808047383</AbsoluteActivityError>
              <RelativeActivityError
                  unit="percentage">80.9616099151</RelativeActivityError>
              <MDC unit="mBq/m3">0.116764127988</MDC>
              <LC unit="mBq/m3">0.0508909505258</LC>
              <LD unit="mBq/m3">0.0</LD>
              <LCActivity unit="mBq">0.647742345365</LCActivity>
              <LDActivity unit="mBq">0.0</LDActivity>
              <NuclideIdentificationIndicator numericVal="0">nuclide not identified
                  by automated analysis</NuclideIdentificationIndicator>
            </Nuclide>
            <Nuclide quantifiable="true">
```

⋮


```
        </Nuclide>
      </Corrected>
      <Uncorrected>
        <Nuclide quantifiable="true">
          <Name>XE-131M</Name>
          <Type>FISSION (G)</Type>
          <HalfLife>11.962 D</HalfLife>
          <Concentration unit="mBq/m3">-0.0344312348882</Concentration>
          <Activity unit="mBq">-0.438242332082</Activity>
          <ActivityAtAcquisition unit="mBq">${ACTIVITY_AT_ACQUISITION}</ActivityAtAcquisition>
          <UndecayCorrectedActivity unit="mBq">-0.418892838039</UndecayCorrectedActivity>
          <AbsoluteConcentrationError unit="mBq/m3">0.0278760820791</AbsoluteConcentrationError>
          <RelativeConcentrationError unit="percentage">80.9616099151</RelativeConcentrationError>
          <RelativeActivityAtAcquisitionError unit="percentage">${ACTIVITY_AT_ACQUISITION_ERROR_PERC}</RelativeActivityAtAcquisitionError>
          <AbsoluteActivityError unit="mBq">0.354808047383</AbsoluteActivityError>
          <RelativeActivityError unit="percentage">80.9616099151</RelativeActivityError>
          <MDC unit="mBq/m3">0.116764127988</MDC>
          <LC unit="mBq/m3">0.0508909505258</LC>
          <LD unit="mBq/m3">0.0</LD>
          <LCActivity unit="mBq">0.647742345365</LCActivity>
          <LDActivity unit="mBq">0.0</LDActivity>
          <NuclideIdentificationIndicator numericVal="0">nuclide not identified by automated analysis</NuclideIdentificationIndicator>
        </Nuclide>
        <Nuclide quantifiable="true">
```

⋮

```
        </Nuclide>
      </Uncorrected>
    </IdedNuclides>
    <ABGAM2DFIdedNuclides>
      <Corrected/>
      <Uncorrected/>
    </ABGAM2DFIdedNuclides>
    <RoiInfo>
      <RoiNetCount>
        <RoiNumber>1</RoiNumber>
        <Name>PB-214</Name>
        <NetCounts>-7.14836044950061 10.0763030443496</NetCounts>
        <GrossCounts>44</GrossCounts>
        <GrossCountsError>0</GrossCountsError>
        <LC unit="counts">17.14805240197</LC>
        <LD unit="counts">0.0</LD>
        <DetBackgroundCounts>340 340</DetBackgroundCounts>
        <GasBackgroundCounts>-1.69800003857206 7.69206604390014</GasBackgroundCounts>
        <Efficiency>N/A</Efficiency>
        <AbsoluteEfficiencyError>N/A</AbsoluteEfficiencyError>
        <RelativeEfficiencyError unit="percentage">N/A</RelativeEfficiencyError>
      </RoiNetCount>
      <RoiNetCount>
```

⋮

```
      </RoiNetCount>
      <RoiBoundaries>
        <RoiNumber>1</RoiNumber>
        <GammaLow unit="keV">116</GammaLow>
        <GammaHigh unit="keV">139</GammaHigh>
        <BetaLow unit="keV">1</BetaLow>
        <BetaHigh unit="keV">193</BetaHigh>
      </RoiBoundaries>
      <RoiBoundaries>
```


⋮

```
          </RoiBoundaries>
        </RoiInfo>
        <ABGAM2DRoiInfo/>
        <ABGAM2DPeakInfo>
${ABGAM2D_PEAKINFO}
</ABGAM2DPeakInfo>
        <CatDataLong>
          <PrevValidSamples>604</PrevValidSamples>
          <AbnXe131M>0.1449058958934322</AbnXe131M>
          <AbnXe133M>0.11975423953871216</AbnXe133M>
```

⋮

```
          <Conc135133>2.1412978324260714</Conc135133>
          <Conc133131M>2.2676833289680367</Conc133131M>
          <Conc133131MMdc>2.2676833289680367</Conc133131MMdc>
        </CatDataLong>
        <CatDataShort>
          <PrevValidSamples>58</PrevValidSamples>
          <AbnXe131M>0.1418519492169052</AbnXe131M>
          <AbnXe133M>0.09944645851075329</AbnXe133M>
```

⋮

```
          <Conc135133>2.1412978324260714</Conc135133>
          <Conc133131M>${Conc133131M}</Conc133131M>
          <Conc133131MMdc>2.2676833289680367</Conc133131MMdc>
        </CatDataShort>
        <CatParams>
          <MovingAvgDays>365</MovingAvgDays>
          <AbnormalConcFactor>3</AbnormalConcFactor>
          <Xe133MXe131MLimit>2</Xe133MXe131MLimit>
          <Xe133MXe133Limit>0.3</Xe133MXe133Limit>
          <Xe135Xe133Limit>5</Xe135Xe133Limit>
          <BayesPlus>0.025</BayesPlus>
          <BayesMinus>0.975</BayesMinus>
        </CatParams>
        <Parameters>
          <ProcessingParameters>
            <BetaEcrOrder>2</BetaEcrOrder>
            <BinBetaStart>1</BinBetaStart>
            <BinGammaStart>1</BinGammaStart>
            <BinMaxVectorSize>100000</BinMaxVectorSize>
            <BinMinCount>10</BinMinCount>
            <BinRows>3</BinRows>
            <DetBkgndId>4569366</DetBkgndId>
            <DetBkgndUsed>1</DetBkgndUsed>
            <GammaEcrOrder>2</GammaEcrOrder>
            <GasBkgndId>6482210</GasBkgndId>
            <GasBkgndUsed>1</GasBkgndUsed>
            <InterferenceUsed>1</InterferenceUsed>
            <LcAbscissa>1.6449</LcAbscissa>
            <MaxQcDev>1</MaxQcDev>
            <Method>21</Method>
            <QcBThreshold>40</QcBThreshold>
            <QcId>6482254</QcId>
            <XeInAir>0.087</XeInAir>
          </ProcessingParameters>
        </Parameters>
        <ABGAM2D_Parameters>
${ABGAM2D_PARAMETERS}
</ABGAM2D_Parameters>
        <Flags>
          <DataQualityFlags>
            <XeVolume>
              <Value unit="ml">1.10733997821808</Value>
              <Pass>Pass</Pass>
              <Test>greater than 0.44 ml</Test>
            </XeVolume>
            <SOH>
              <Value>N/A</Value>
              <Pass>N/A</Pass>
              <Test>N/A</Test>
            </SOH>
          </DataQualityFlags>
```

```xml
          <TimelinessAndAvailabilityFlags>
            <PreviousSamplePresent>
              <Value unit="sample ID">6482207</Value>
              <Pass>Pass</Pass>
              <Test>-1/2 day sample available</Test>
            </PreviousSamplePresent>
            <CollectionTime>
              <Value unit="h">12.0</Value>
              <Pass>Pass</Pass>
              <Test>12h +- 10%</Test>
            </CollectionTime>
            <AcquisitionTime>
              <Value unit="h">11.1661111111</Value>
              <Pass>Pass</Pass>
              <Test>12h +- 10%</Test>
            </AcquisitionTime>
            <ResponseTime>
              <Value unit="h">30.2247222222</Value>
              <Pass>Pass</Pass>
              <Test>sample received within 96h of collect start</Test>
            </ResponseTime>
          </TimelinessAndAvailabilityFlags>
          <EventScreeningFlags>
            <LastDetectionDays>0</LastDetectionDays>
            <XeIsotopesSeenTimes>99</XeIsotopesSeenTimes>
            <Abgam2DLastDetectionDays>N/A</Abgam2DLastDetectionDays>
            <Abgam2DXeIsotopesSeenTimes>N/A</Abgam2DXeIsotopesSeenTimes>
          </EventScreeningFlags>
          <EventScreeningImages>
⋮
          </EventScreeningImages>
        </Flags>
      </Analysis>
    </Analyses>
    <CalibrationInformation>
      <Calibration Type="Beta Energy To Channel" EnergyUnits="keV" ID="EN-B-599037">
        <Remark>Beta Energy to Channel Calibration equation</Remark>
        <CalibrationUpdated>YES</CalibrationUpdated>
        <CalibrationCreationDate>2007-11-24T12:09:53.89</CalibrationCreationDate>
        <Equation Model="Polynomial" Form="C(E)= t0 + t1 E + t2 E^2">
          <Coefficients>-3.39709 0.386269 -0.000094</Coefficients>
        </Equation>
      </Calibration>
      <Calibration Type="Gamma Energy To Channel" EnergyUnits="keV"
          ID="EN-G-1182157">
        <Remark>Gamma Energy to Channel Calibration equation</Remark>
        <CalibrationUpdated>YES</CalibrationUpdated>
        <CalibrationCreationDate>2007-11-24T12:09:53.89</CalibrationCreationDate>
        <Equation Model="Polynomial" Form="C(E)= t0 + t1 E + t2 E^2">
          <Coefficients>-0.437781 0.379658 -0.0000521</Coefficients>
        </Equation>
      </Calibration>
      <Calibration Type="Beta Energy To Channel" EnergyUnits="keV"
          ID="EN-B-18889123">
⋮
      </Calibration>
    </CalibrationInformation>
  </SampleInformation>
</SampML>
```

I.28.2 HPGe systems


```
<?xml version="1.0" encoding="ISO-8859-1"?>
<SampML xmlns="http://www.ctbto.org/SAMPML/0.7">
  <SampleInformation REFID="29202112062311X" SID="6483215"
      MID="FRX29_004-2021/12/08">
    <StationInformation>
      <StationLocation>Noble Gas Experim. Stn. Reunion, France.</StationLocation>
      <StationCode>FRX29</StationCode>
      <CountryCode>FR</CountryCode>
      <Coordinates>-20.909 55.586917 89.8</Coordinates>
    </StationInformation>
    <DetectorInformation>
      <DetectorCode>FRX29_004</DetectorCode>
      <DetectorDescription>Detector #4 in FRX29, France</DetectorDescription>
    </DetectorInformation>
    <SampleType>SPALAX</SampleType>
    <MeasuredInformation>
      <SpectrumGroup id="FRX29-6483215-SPHD" calibrationIDs="EN-18817220 RE-4839200
          EF-76260964">
        <Geometry>CELLULE_GAZ</Geometry>
        <AirVolume unit="m3">42.1189994812012</AirVolume>
        <FlowRate unit="m3/h">1.75495831171671666666666666666666666667</FlowRate>
        <XeVolume unit="ml">3.6643500328064</XeVolume>
        <SohFlag>N/A</SohFlag>
        <Authenticated>1</Authenticated>
        <CollectionStart>2021-12-06T23:00:00</CollectionStart>
        <CollectionStop>2021-12-07T23:00:00</CollectionStop>
        <AcquisitionStart>2021-12-08T00:24:15</AcquisitionStart>
        <AcquisitionStop>2021-12-08T22:45:10</AcquisitionStop>
        <ArrivalDate>2021-12-08T22:53:07</ArrivalDate>
        <RealAcquisitionTime>PT80455S</RealAcquisitionTime>
        <LiveAcquisitionTime>PT80294S</LiveAcquisitionTime>
        <SamplingTime>PT86400S</SamplingTime>
        <DecayTime>PT5055S</DecayTime>
        <Comments>
                Phase 3 - Station Gaz
                Spalax2M - EnvSA
                be2825 8467 source X13
                Calibration 2015/06/16
</Comments>
        <GeneralComments>
None
None

</GeneralComments>
        <MeasurementType>S</MeasurementType>
        <SampleID>6483215</SampleID>
        <SpectrumType>FULL</SpectrumType>
        <Data>
          <Spectrum id="FRX29-6483215-SPHD" channelSpan="4096" energySpan="6162"
              type="SPHD-G" format="IMS2.0">
                0          0          0          0          0
                0          0          0          0          0
                0          0          0          0          0
                0          0          0          0          0
                0          0          0          0          0
                0          0          0          0          0
                0          0          0          0          0
                0          0          0          0          0
                148        137        148        137        148
                150        187        263        182        109
                131        117        111        90         103
```

⋮

```
        </Data>
      </SpectrumGroup>
      <SpectrumGroup id="FRX29-3263599-DETBK" calibrationIDs="EN-37997392
          RE-19378556 EF-267289886">
```

⋮

```
      </SpectrumGroup>
```

```
    &lt;/MeasuredInformation&gt;
    &lt;Analyses&gt;
      <Analysis id="AN-FRX29-6483215-SPHD" spectrumIDs="FRX29-6483215-SPHD"
          calibrationIDs="EN-18817220 RE-4839200 EF-76260964">
        &lt;Software&gt;
          &lt;Name&gt;AutoSaint&lt;/Name&gt;
          &lt;Version&gt;1.0&lt;/Version&gt;
        &lt;/Software&gt;
        &lt;Categorization&gt;
1
&lt;/Categorization&gt;
        &lt;IdedNuclides&gt;
          &lt;Corrected&gt;
            &lt;Nuclide quantifiable="true" method="Peak Fit Method"&gt;
              &lt;Name&gt;XE-131M&lt;/Name&gt;
              &lt;Halflife&gt;11.962 D&lt;/Halflife&gt;
              &lt;Concentration unit="mBq/m3"&gt;-0.1986376&lt;/Concentration&gt;
              &lt;Activity unit="mBq"&gt;-8.36641029973&lt;/Activity&gt;
              &lt;ActivityAtAcquisition unit="mBq"&gt;-8.101116&lt;/ActivityAtAcquisition&gt;
              <UndecayCorrectedActivity
                  unit="mBq">-7.88401466946&lt;/UndecayCorrectedActivity&gt;
              &lt;AbsoluteActivityError unit="mBq"&gt;17.3780705213&lt;/AbsoluteActivityError&gt;
              <RelativeActivityError
                  unit="percentage">-207.712386779&lt;/RelativeActivityError&gt;
              <AbsoluteConcentrationError
                  unit="mBq/m3">0.4125949&lt;/AbsoluteConcentrationError&gt;
              <RelativeConcentrationError
                  unit="percentage">-207.712386779&lt;/RelativeConcentrationError&gt;
              <RelativeActivityAtAcquisitionError
                  unit="percentage">-207.690644103849395564759225765931508696
                  &lt;/RelativeActivityAtAcquisitionError&gt;
              &lt;MDC unit="mBq/m3"&gt;0.2414189&lt;/MDC&gt;
              &lt;MDI unit="mBq"&gt;${MDI}&lt;/MDI&gt;
              &lt;LC unit="mBq/m3"&gt;23.26725&lt;/LC&gt;
              &lt;LD unit="mBq/m3"&gt;46.53449&lt;/LD&gt;
              &lt;LCActivity unit="mBq"&gt;979.992509205&lt;/LCActivity&gt;
              &lt;LDActivity unit="mBq"&gt;1959.98459722&lt;/LDActivity&gt;
              &lt;NuclideIdentificationIndicator numericVal="0"&gt;nuclide not identified
                  by automated analysis&lt;/NuclideIdentificationIndicator&gt;
            &lt;/Nuclide&gt;
            &lt;Nuclide quantifiable="true" method="Peak Fit Method"&gt;
⋮
            &lt;/Nuclide&gt;
            &lt;Nuclide quantifiable="true" method="Decay Analysis Method"&gt;
              &lt;Name&gt;XE-131M&lt;/Name&gt;
              &lt;Halflife&gt;11.962 D&lt;/Halflife&gt;
              &lt;Concentration unit="mBq/m3"&gt;-0.08665206&lt;/Concentration&gt;
              &lt;Activity unit="mBq"&gt;-3.64969515981&lt;/Activity&gt;
              &lt;ActivityAtAcquisition unit="mBq"&gt;-3.533965&lt;/ActivityAtAcquisition&gt;
              <UndecayCorrectedActivity
                  unit="mBq">-3.43925879178&lt;/UndecayCorrectedActivity&gt;
              &lt;AbsoluteActivityError unit="mBq"&gt;18.5438771664&lt;/AbsoluteActivityError&gt;
              <RelativeActivityError
                  unit="percentage">-508.093864127&lt;/RelativeActivityError&gt;
              <AbsoluteConcentrationError
                  unit="mBq/m3">0.4402738&lt;/AbsoluteConcentrationError&gt;
              <RelativeConcentrationError
                  unit="percentage">-508.093864127&lt;/RelativeConcentrationError&gt;
              <RelativeActivityAtAcquisitionError
                  unit="percentage">-508.084828231179425942249003597941688726
                  &lt;/RelativeActivityAtAcquisitionError&gt;
              &lt;MDC unit="mBq/m3"&gt;0.2414189&lt;/MDC&gt;
              &lt;MDI unit="mBq"&gt;${MDI}&lt;/MDI&gt;
              &lt;LC unit="mBq/m3"&gt;23.26725&lt;/LC&gt;
              &lt;LD unit="mBq/m3"&gt;46.53449&lt;/LD&gt;
              &lt;LCActivity unit="mBq"&gt;979.992509205&lt;/LCActivity&gt;
              &lt;LDActivity unit="mBq"&gt;1959.98459722&lt;/LDActivity&gt;
              &lt;NuclideIdentificationIndicator numericVal="0"&gt;nuclide not identified
                  by automated analysis&lt;/NuclideIdentificationIndicator&gt;
            &lt;/Nuclide&gt;
            &lt;Nuclide quantifiable="true" method="Decay Analysis Method"&gt;
```

⋮

```
        &lt;/Nuclide&gt;
      &lt;/Corrected&gt;
      &lt;Uncorrected&gt;
        &lt;Nuclide quantifiable="true" method="Peak Fit Method"&gt;
          &lt;Name&gt;XE-131M&lt;/Name&gt;
          &lt;Halflife&gt;11.962 D&lt;/Halflife&gt;
          &lt;Concentration unit="mBq/m3"&gt;-0.1872418&lt;/Concentration&gt;
          &lt;Activity unit="mBq"&gt;N/A&lt;/Activity&gt;
          <ActivityAtAcquisition
              unit="mBq">${ACTIVITY_AT_ACQUISITION}&lt;/ActivityAtAcquisition&gt;
          &lt;UndecayCorrectedActivity unit="mBq"&gt;N/A&lt;/UndecayCorrectedActivity&gt;
          &lt;AbsoluteActivityError unit="mBq"&gt;N/A&lt;/AbsoluteActivityError&gt;
          &lt;RelativeActivityError unit="percentage"&gt;N/A&lt;/RelativeActivityError&gt;
          <AbsoluteConcentrationError
              unit="mBq/m3">0.3889244&lt;/AbsoluteConcentrationError&gt;
          <RelativeConcentrationError
              unit="percentage">-207.712380462&lt;/RelativeConcentrationError&gt;
          <RelativeActivityAtAcquisitionError
              unit="percentage">${ACTIVITY_AT_ACQUISITION_ERROR_PERC}
              &lt;/RelativeActivityAtAcquisitionError&gt;
          &lt;MDC unit="mBq/m3"&gt;0.2414189&lt;/MDC&gt;
          &lt;MDI unit="mBq"&gt;${MDI}&lt;/MDI&gt;
          &lt;LC unit="mBq/m3"&gt;267.4396&lt;/LC&gt;
          &lt;LD unit="mBq/m3"&gt;None&lt;/LD&gt;
          &lt;LCActivity unit="mBq"&gt;N/A&lt;/LCActivity&gt;
          &lt;LDActivity unit="mBq"&gt;N/A&lt;/LDActivity&gt;
          &lt;NuclideIdentificationIndicator numericVal="0"&gt;nuclide not identified
              by automated analysis&lt;/NuclideIdentificationIndicator&gt;
        &lt;/Nuclide&gt;
```

⋮

```
        &lt;/Nuclide&gt;
        &lt;Nuclide quantifiable="true" method="Decay Analysis Method"&gt;
          &lt;Name&gt;XE-131M&lt;/Name&gt;
          &lt;Halflife&gt;11.962 D&lt;/Halflife&gt;
          &lt;Concentration unit="mBq/m3"&gt;-0.08168085&lt;/Concentration&gt;
          &lt;Activity unit="mBq"&gt;N/A&lt;/Activity&gt;
          <ActivityAtAcquisition
              unit="mBq">${ACTIVITY_AT_ACQUISITION}&lt;/ActivityAtAcquisition&gt;
          &lt;UndecayCorrectedActivity unit="mBq"&gt;N/A&lt;/UndecayCorrectedActivity&gt;
          &lt;AbsoluteActivityError unit="mBq"&gt;N/A&lt;/AbsoluteActivityError&gt;
          &lt;RelativeActivityError unit="percentage"&gt;N/A&lt;/RelativeActivityError&gt;
          <AbsoluteConcentrationError
              unit="mBq/m3">0.4150153&lt;/AbsoluteConcentrationError&gt;
          <RelativeConcentrationError
              unit="percentage">-508.093757594&lt;/RelativeConcentrationError&gt;
          <RelativeActivityAtAcquisitionError
              unit="percentage">${ACTIVITY_AT_ACQUISITION_ERROR_PERC}
              &lt;/RelativeActivityAtAcquisitionError&gt;
          &lt;MDC unit="mBq/m3"&gt;0.2414189&lt;/MDC&gt;
          &lt;MDI unit="mBq"&gt;${MDI}&lt;/MDI&gt;
          &lt;LC unit="mBq/m3"&gt;267.4396&lt;/LC&gt;
          &lt;LD unit="mBq/m3"&gt;None&lt;/LD&gt;
          &lt;LCActivity unit="mBq"&gt;N/A&lt;/LCActivity&gt;
          &lt;LDActivity unit="mBq"&gt;N/A&lt;/LDActivity&gt;
          &lt;NuclideIdentificationIndicator numericVal="0"&gt;nuclide not identified
              by automated analysis&lt;/NuclideIdentificationIndicator&gt;
        &lt;/Nuclide&gt;
```

⋮

```
      &lt;/Uncorrected&gt;
    &lt;/IdedNuclides&gt;
    &lt;XeCovarianceMatrixes&gt;
      &lt;XeCovarianceMatrix method="Peak Fit Method"&gt;
        &lt;Cell row="XE-131M" col="XE-131M" unit="(mBq)^2"&gt;268.1678&lt;/Cell&gt;
        &lt;Cell row="XE-131M" col="XE-133M" unit="(mBq)^2"&gt;-831.6442&lt;/Cell&gt;
        &lt;Cell row="XE-131M" col="XE-133" unit="(mBq)^2"&gt;-3.56204&lt;/Cell&gt;
```

⋮

```
        &lt;Cell row="XE-135" col="XE-133M" unit="(mBq)^2"&gt;-8.716597e-05&lt;/Cell&gt;
        &lt;Cell row="XE-135" col="XE-133" unit="(mBq)^2"&gt;-0.04836546&lt;/Cell&gt;
        &lt;Cell row="XE-135" col="XE-135" unit="(mBq)^2"&gt;3.471289&lt;/Cell&gt;
```

```
          &lt;/XeCovarianceMatrix&gt;
          &lt;XeCovarianceMatrix method="Decay Analysis Method"&gt;
            &lt;Cell row="XE-131M" col="XE-131M" unit="(mBq)^2"&gt;305.5182&lt;/Cell&gt;
            &lt;Cell row="XE-131M" col="XE-133M" unit="(mBq)^2"&gt;-967.2635&lt;/Cell&gt;
            &lt;Cell row="XE-131M" col="XE-133" unit="(mBq)^2"&gt;-3.850661&lt;/Cell&gt;
⋮
            &lt;Cell row="XE-135" col="XE-133M" unit="(mBq)^2"&gt;-0.0005981146&lt;/Cell&gt;
            &lt;Cell row="XE-135" col="XE-133" unit="(mBq)^2"&gt;-0.06291585&lt;/Cell&gt;
            &lt;Cell row="XE-135" col="XE-135" unit="(mBq)^2"&gt;3.690312&lt;/Cell&gt;
          &lt;/XeCovarianceMatrix&gt;
        &lt;/XeCovarianceMatrixes&gt;
        &lt;PeakResults&gt;
          &lt;PeakResult peakID="1"&gt;
            &lt;Energy&gt;20.875074&lt;/Energy&gt;
            &lt;Centroid&gt;95.650819&lt;/Centroid&gt;
            &lt;Area&gt;81.319453&lt;/Area&gt;
            &lt;AreaErr&gt;18.810603&lt;/AreaErr&gt;
            &lt;Width&gt;2&lt;/Width&gt;
            &lt;FWHM&gt;0.450049&lt;/FWHM&gt;
            &lt;Efficiency&gt;0.037033&lt;/Efficiency&gt;
          &lt;/PeakResult&gt;
⋮
          &lt;PeakResult peakID="20"&gt;
            &lt;Energy&gt;803.182751&lt;/Energy&gt;
            &lt;Centroid&gt;3656.556646&lt;/Centroid&gt;
            &lt;Area&gt;26.515659&lt;/Area&gt;
            &lt;AreaErr&gt;9.097795&lt;/AreaErr&gt;
            &lt;Width&gt;7&lt;/Width&gt;
            &lt;FWHM&gt;1.504568&lt;/FWHM&gt;
            &lt;Efficiency&gt;0.023728&lt;/Efficiency&gt;
          &lt;/PeakResult&gt;
        &lt;/PeakResults&gt;
        &lt;CatDataLong&gt;
          &lt;PrevValidSamples&gt;346&lt;/PrevValidSamples&gt;
          &lt;AbnXe131M&gt;1.145135628&lt;/AbnXe131M&gt;
          &lt;AbnXe133M&gt;1.3801566250000001&lt;/AbnXe133M&gt;
⋮
          &lt;Conc133131M&gt;1.2095540158620557&lt;/Conc133131M&gt;
          &lt;Conc133131MMdc&gt;1.2095540158620557&lt;/Conc133131MMdc&gt;
        &lt;/CatDataLong&gt;
        &lt;CatDataShort&gt;
          &lt;PrevValidSamples&gt;28&lt;/PrevValidSamples&gt;
          &lt;AbnXe131M&gt;1.1221391600000001&lt;/AbnXe131M&gt;
          &lt;AbnXe133M&gt;1.3599651500000003&lt;/AbnXe133M&gt;
⋮
          &lt;Conc135133&gt;3.505793653076684&lt;/Conc135133&gt;
          &lt;Conc133131M&gt;${Conc133131M}&lt;/Conc133131M&gt;
          &lt;Conc133131MMdc&gt;1.2095540158620557&lt;/Conc133131MMdc&gt;
        &lt;/CatDataShort&gt;
        &lt;CatParams&gt;
          &lt;MovingAvgDays&gt;365&lt;/MovingAvgDays&gt;
          &lt;AbnormalConcFactor&gt;3&lt;/AbnormalConcFactor&gt;
          &lt;Xe133MXe131MLimit&gt;2&lt;/Xe133MXe131MLimit&gt;
          &lt;Xe133MXe133Limit&gt;0.3&lt;/Xe133MXe133Limit&gt;
          &lt;Xe135Xe133Limit&gt;5&lt;/Xe135Xe133Limit&gt;
          &lt;BayesPlus&gt;0.025&lt;/BayesPlus&gt;
          &lt;BayesMinus&gt;0.975&lt;/BayesMinus&gt;
        &lt;/CatParams&gt;
        &lt;Parameters&gt;
          &lt;ProcessingParameters&gt;
            &lt;AverageEnergyCalibration&gt;NO&lt;/AverageEnergyCalibration&gt;
            &lt;BackDataType&gt;BorD&lt;/BackDataType&gt;
            &lt;BackSampleId&gt;0&lt;/BackSampleId&gt;
⋮
            &lt;XeGammaFactor&gt;15.5188682&lt;/XeGammaFactor&gt;
            &lt;XeSigmaFactor&gt;3.0&lt;/XeSigmaFactor&gt;
            &lt;bkgndAcqLimit&gt;23.5&lt;/bkgndAcqLimit&gt;
          &lt;/ProcessingParameters&gt;
        &lt;/Parameters&gt;
```

```
        <Flags>
          <DataQualityFlags>
            <XeVolume>
              <Value unit="ml">3.6643500328064</Value>
              <Pass>Pass</Pass>
              <Test>greater than 0.87 ml</Test>
            </XeVolume>
            <SOH>
              <Value>N/A</Value>
              <Pass>N/A</Pass>
              <Test>N/A</Test>
            </SOH>
          </DataQualityFlags>
          <TimelinessAndAvailabilityFlags>
            <PreviousSamplePresent>
              <Value unit="sample ID">6481775</Value>
              <Pass>Pass</Pass>
              <Test>-1 day sample available</Test>
            </PreviousSamplePresent>
            <CollectionTime>
              <Value unit="h">24.0</Value>
              <Pass>Pass</Pass>
              <Test>24h +- 10%</Test>
            </CollectionTime>
            <AcquisitionTime>
              <Value unit="h">22.3486111111</Value>
              <Pass>Pass</Pass>
              <Test>24h +- 10%</Test>
            </AcquisitionTime>
            <ResponseTime>
              <Value unit="h">47.8852777778</Value>
              <Pass>Pass</Pass>
              <Test>sample received within 96h of collect start</Test>
            </ResponseTime>
          </TimelinessAndAvailabilityFlags>
          <EventScreeningFlags>
            <LastDetectionDays>0</LastDetectionDays>
            <XeIsotopesSeenTimes>35</XeIsotopesSeenTimes>
          </EventScreeningFlags>
          <EventScreeningImages>
⋮
          </EventScreeningImages>
        </Flags>
      </Analysis>
    </Analyses>
    <CalibrationInformation>
      <Calibration Type="Energy" EnergyUnits="keV" ID="EN-18817220">
        <Remark>Energy to Channel Calibration equation</Remark>
        <Winner>INITIAL </Winner>
        <CalibrationCreationDate>2008-02-02T08:05:53.89</CalibrationCreationDate>
        <Equation Model="Polynomial" Form="E(C)= t0 + t1 C + t2 C^2 + t3 C^3">
          <Coefficients>-0.1354979 0.2196582 9.396198E-9 0</Coefficients>
        </Equation>
      </Calibration>
      <Calibration Type="Resolution" EnergyUnits="keV" FWHMUnits="Energy"
          ID="RE-4839200">
        <Remark>Resolution to Energy Calibration equation</Remark>
        <Winner>MRPM    </Winner>
        <CalibrationCreationDate>2007-11-24T12:09:53.89</CalibrationCreationDate>
        <Equation Model="Polynomial" Form="R(E)=SQRT( t0 + t1 E + t2 E^2 )">
          <Coefficients>0.17813 0.00114 0.000001813</Coefficients>
        </Equation>
      </Calibration>
⋮
    </CalibrationInformation>
  </SampleInformation>
</SampML>
```

I.29 RLR—Noble gas systems

I.29.1 β-γ coincidence systems

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 00002990 GBL15
REF_ID 00012620 IMSRM
DATA_TYPE RLR
#Header
Routine
AUX09 09201912030811X
GBL15 GBL15_00X
FIN 1
Category XA
2020/01/15 14:17:42.5
#LabDataVersion
IMS2.0_IDCR8
IMS Laboratory Communication Software Version 1.3.1
#Objective
~AnalysisPurpose
verifying AUX09 results as part of the revalidation process
~TestsAuthorized
-
~SpecialInstructions
-
#Collection
2019/12/03 07:55:39.9 2019/12/03 19:55:38.6 14.251403
#X_Processing
2.0      5.0
2
1.8      5.0      80.0     5.0
2.2      5.0      80.0     5.0
#X_StationSample
spikesample
-9999 -9999
SAUNA bottle    stainless steel
#SampleReceipt
09201912030811X
99999
2019/12/16 13:30:00.0
~PackageCondition
OK
~SealCondition
N/A
~SampleCondition
OK
#X_LabSample
-9999999999
-9999
example comment
#Test
Beta-gamma coincidence spectroscopy
2020/01/15
Spike measurement
#AnalysisMethods
Xecon OSI
~NuclidesMethod
0
~BaselineMethod
0
~LCMethod
0
~CalibrationMethod
0
#References
~SAMPLEPHD
0
~CALIBPHD
0
```

```
~PhysicalConstants
0
#InteractiveAnalysisLog
beta-gamma coincidence spectroscopy, using NaI gamma detector with BC404 Al2O3 c
d plastic scintillator
#X_Results
2019/12/16 16:46:00.0 2019/12/03 19:55:39.0
XE-131M  5.8980E-01  2.54  1.00  68.00 1.3528E-01  7.60  1.00  68.00
XE-133   2.6434E+01  1.32  1.00  68.00 1.3085E+01  6.53  1.00  68.00
XE-133M  2.1601E-01  9.82  1.00  68.00 1.2448E+00  11.75 1.00  68.00
#NuclideRatios
XE-133   XE-131M  0.022    2.86  2019/12/16 16:46:00.0 1970/01/01 00:00:00.0 0.00
XE-133   XE-133M  0.008    9.91  2019/12/16 16:46:00.0 1970/01/01 00:00:00.0 0.00
XE-131M  XE-133M  0.366    10.15 2019/12/16 16:46:00.0 1970/01/01 00:00:00.0 0.00
#CoincidenceCorrection
0        0.00     0.00     0.00
#UncertaintyBudget
~Uncertainties
0        0.00  0
~UncertaintyCalculationMethods
0
#X_MDA/MDC
XE-131M  8.3810E-03  8.2458E-06
XE-133M  7.4826E-03  3.9500E-04
XE-133   5.3822E-03  1.4789E-04
XE-135   2.6334E-03  5.4098E+03
#Conclusions
~IDCSummary
IDC FINDINGS
~LabSummary
GBL15 FINDINGS
~ResultComparison
IDC-GBL15 COMPARISON
#Comment
Re-measured January 2020.
--- Archive Bottle Information ---
Archive Bottle Volume:             0.89  cm3
Archive Bottle Volume uncertainty: 2.58  %
Sample splitting and data aggregation has taken place.
Below are the individual results of each analysis and the metric used to weight
results
Nuclide  Conc (mBq/m3)      MDC     METRIC
XE-131M  109.047(8.20  %)   17.421  8.498
XE-131M  142.152(7.79  %)   15.425  20.398
XE-131M  136.440(7.49  %)   8.246   71.104
Nuclide  Conc (mBq/m3)      MDC     METRIC
XE-133M  1244.778(11.75 %)   395.002 100.000
XE-133M  0.000  (0.00  %)   174875.8540.000
XE-133M  0.000  (0.00  %)   127898.3030.000
Nuclide  Conc (mBq/m3)      MDC     METRIC
XE-133   13085.472(6.53  %)   147.888 100.000
XE-133   0.000  (0.00  %)   68386.1000.000
XE-133   0.000  (0.00  %)   50490.7230.000

STOP
```

I.29.2 HPGe systems

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 00002125 ATL03
DATA_TYPE RLR
#Header
Routine
AUX09 0920191205201 1X
ATL03 ATL03_004
FIN 1
Category XE
2019/12/20 08:11:58.7
#LabDataVersion
IMS2.0_IDCR8
IMS Laboratory Communication Software Version 1.3.1
#Objective
~AnalysisPurpose
network QC
~TestsAuthorized
high resolution gamma spectrometry is authorized for this sample
~SpecialInstructions
-
#Collection
2019/12/05 19:55:45.0 2019/12/06 07:55:43.0 8.30
#X_Processing
2.0      5.0
2
1.8      5.0      80.0     5.0
2.2      5.0      80.0     5.0
#X_StationSample
Environmental Sample
-9999 -999
SAUNA           Archive bottle 1
#SampleReceipt
0920191205201 1X
-
2019/12/16 07:30:00.0
~PackageCondition
package ok
~SealCondition
no seal
~SampleCondition
sample ok
#X_LabSample
-9999999999
-9999
xenon measurement cell XMC
#Test
high resolution gamma spectrometry
2019/12/20
Spike measurement
#EnergyCalibrationEquation
1
2  3  22.0    2700.0
0.0000E+00  1.7001E-01  -8.0000E-10  -9999999999
#ShapeCalibrationEquation
1
4  2  22.0    2700.0
2.2980E-03  3.6000E-01  -9999999999  -9999999999
#EfficiencyCalibrationEquation
1
6  7  25.0    2700.0
-1.3063E+02 1.7133E+02  -9.0658E+01  2.5273E+01
-3.8958E+00 3.1373E-01  -1.0306E-02  -9999999999
#TotalEfficiencyCalibrationEquation
0
0  0  0.0     0.0
-9999999999 -9999999999 -9999999999 -9999999999
#PeaksMethod
Interwinner
```

```
Method used: INTERPOLATION
Around every channel the algorithms uses a zone of four FWHMs width. The first
and the last quarter of this is used, to calculate a linear regression. The
```

⋮

```
more channels are found. Finally all zones smaller than one FHWM or smaller
than four channels are erased.
#PeakSearch
1      175.15    -9999 29.778    -9999       2.000    M
2      182.13    -9999 30.964    -9999       2.000    M
3      198.40    -9999 33.730    -9999       2.000    M
4      205.75    -9999 34.980    -9999       2.000    M
5      211.10    -9999 35.889    -9999       2.000    M
6      419.26    -9999 71.279    -9999       2.000    0
7      454.38    -9999 77.249    -9999       2.000    0
8      476.97    -9999 81.090    -9999       2.000    0
9      946.36    -9999 160.890   -9999       2.000    0
10     964.87    -9999 164.038   -9999       2.000    0
#PeakFitPart1
1      0.90  161.00   190.00   1.2379E+02  1.64  BLANK        -9999999999  -9999
2      -9999 161.00   190.00   1.2379E+02  1.64  BLANK        -9999999999  -9999
3      0.81  193.00   215.00   7.4892E+01  2.41  BLANK        -9999999999  -9999
4      1.02  193.00   215.00   7.4892E+01  2.41  BLANK        -9999999999  -9999
5      -9999 193.00   215.00   7.4892E+01  2.41  BLANK        -9999999999  -9999
6      0.73  414.00   424.00   5.2509E+01  4.16  BLANK        -9999999999  -9999
7      0.43  452.00   457.00   5.2952E+01  5.61  BLANK        2.2711E-04   25.73
8      0.78  466.00   484.00   4.1759E+01  3.55  BLANK        -9999999999  -9999
9      0.49  942.00   950.00   1.9053E+01  7.64  BLANK        -9999999999  -9999
10     0.92  956.00   974.00   1.7842E+01  5.43  BLANK        -9999999999  -9999
#PeakFitPart2
1      6.4940E+04  0.42  2.1506E-01  0.38  1.6389E+02  501.35 2.4376E+01  8.51
2      5.1194E+04  0.47  1.8073E-01  0.41  1.6024E+02  430.92 2.4712E+01  8.28
3      1.3085E+04  0.96  4.3308E-02  0.88  1.4760E+02  112.10 2.5362E+01  7.81
4      1.1499E+04  1.07  4.2816E-02  0.88  1.1658E+02  140.32 2.5607E+01  7.63
5      2.7854E+03  2.51  2.3300E-02  0.92  9.5766E+01  92.95  2.5769E+01  7.51
6      2.3940E+02  15.60 7.3769E-04  15.43 1.1080E+02  2.54   2.7743E+01  5.41
7      6.0287E+01  54.09 1.5980E-05  100.0 1.3274E+02  0.05   2.7634E+01  5.27
8      5.4560E+04  0.43  1.6471E-01  0.44  9.3378E+01  673.93 2.7522E+01  5.20
9      6.2520E+01  32.21 1.7978E-04  34.13 7.2459E+01  0.95   2.1767E+01  4.64
10     2.3710E+03  2.33  7.1090E-03  2.37  7.0397E+01  38.58  2.1508E+01  4.64
#AnalysisMethods
Interwinner
~NuclidesMethod
First step:
For each peak in the spectrum it is determined which lines in the nuclide
library are in the range of the peak identification window around the measured
```

⋮

```
sample after transfer into the cell. The xenon transfer efficiency is the
calculated ratio from these two measurements.
#PeakAssociation
1      100.000 XE-131M
2      100.000 XE-133
3      100.000 XE-131M
4      100.000 XE-133
5      100.000 XE-133
6      100.000 XE-133
7      -999999 below LC
8      100.000 XE-133
9      -999999 below LC
10     100.000 XE-131M
#References
~SAMPLEPHD
ATL03_004-2019/12/16-10:22:55.0
~CALIBPHD
ATL03_004-2014/10/20-14:26:35.0
~PhysicalConstants
The decay data is taken from two sources, depending on the availability.
- Decay Data Evaluation Project (http://www.nucleide.org/DDEP_WG/DDEPdata.htm)
- NNDC Brookhaven (https://www.nndc.bnl.gov)
Above sequence reflects the priority.
DDEP is preferred, if the required data is not available NNDC Brookhaven is used
#InteractiveAnalysisLog
```

```
- peak search performed with sensitivity factors 2.00 and 2.00
- LC criterion according to Currie applied -
(only peaks above LC are categorized as detected)
- manual inspection of the quality of the fit of all peaks
- lines for activity calculation checked and selected
#X_Results
2019/12/16 10:22:55.0 2019/12/05 19:55:45.0
XE-131M  1.9265E+03  5.40  1.0   68.27 4.2292E+02  6.72  -9999 -9999
XE-133   2.0609E+03  5.29  1.0   68.27 9.7471E+02  6.64  -9999 -9999
#NuclideRatios
XE-131M  XE-133   1.0697   7.57  2019/12/16 10:22:55.0 1970/01/01 00:00:00.0 0.00
0        0        -9999999 -9999 1970/01/01 00:00:00.0 1970/01/01 00:00:00.0 0.00
#CoincidenceCorrection
00000000 99999999 99999999 99999
#UncertaintyBudget
~Uncertainties
VOL      4.00  % unc. of sample volume
XE-131M  0.42  % unc. of net count rate at 29.8 keV
XE-131M  8.51  % unc. of efficiency at 29.8 keV
XE-131M  2.50  % unc. of e.prob. and c.cor. at 29.8 keV
```

⋮

```
XE-133   32.21 % unc. of net count rate at 160.9 keV
XE-133   4.64  % unc. of efficiency at 160.9 keV
XE-133   12.00 % unc. of e.prob. and c.cor. at 160.9 ke
~UncertaintyCalculationMethods
By assuming Poisson statistics the absolute uncertainty of the peak area is
calculated by taking the square root of the peak area.
```

⋮

```
uncertainty from the volume of the transfer syringe and the uncertainty of
the temperature measurement.
#X_MDA/MDC
XE-131M  1.2446E+02  2.7321E+01
XE-133   7.7256E+00  3.6539E+00
XE-133M  4.1715E+01  1.3141E+02
XE-135   1.9349E+01  3.4329E+08
#Conclusions
~IDCSummary
0
~LabSummary
archive bottle properties:
pressure at STP corrected = (76900 +:- 400) Pa
stable xenon in bottle = (0.960 +:- 0.04) cm3
transfer to measurement cell:
stable xenon in measurement cell = (0.722 +:- 0.029) cm3
~ResultComparison
0
#Comment
Archive bottle pressure was close to ambient pressure.
Also unusual amount of air was found in the bottle.

sample category XE
RLR produced: 2019/12/20 06:19:29.0
Spe-file: C:/InterWinner/GE/*NG-SAMPLE/2019/E09201912052011X/D4_09201912052011X.

EFF-file: C:/InterWinner/GE/(DET4)/D4_XMC.eff
NUL-file: C:/InterWinner/GE/(DET4)/D4_XMC_36.nul
ISO-file: C:/InterWinner/GE/(DET4)/ISO/E09201912052011X.iso

for particulate samples, activities and MDAs are reported in Bq
for noble gas samples, activities and MDAs are reported in mBq
for particulate samples, activity concentrations and MDCs are reported in Bq/m3
for noble gas samples, activity concentrations and MDCs are reported in mBq/m3

reference date for activity calculation:16.12.2019, 10:22:55

STOP
```

I.30 RLR—Particulate version

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68556088 CTBT_IDC
REF_ID 111211221
DATA_TYPE RLR
#Header
Routine
AUP09 09202111060511
NZL12 NZL12_004
FIN 1
Category A
2021/12/02 20:58:53.2
#LabDataVersion
IMS2.0_IDCR8
IMS Laboratory Communication Software Version 1.4.4
#Objective
~AnalysisPurpose
The purpose of this test is network QC
~TestsAuthorized
High resolution Gamma Ray Spectroscopy is authorized for this sample
~SpecialInstructions
0
#P_IDCActivitySummary
~NuclidesNotQuantified
GE-71M, GE-75M, K-40, PB-206
~NaturalNuclides
BE-7      53.290 D      3.3858e-3   2.23
PB-212F   10.64 H       3.3192e-2   2.05
~ActivationProducts
NA-24     14.959 H      1.1826e-5   26.17
~FissionProducts
0         0             -9999999999 -9999
#P_IDCEventScreeningFlags
Y 168
N 0
N 0
N 0
#Collection
2021/11/06 06:00:57.0 2021/11/07 06:04:18.0 20872.0
#P_StationSample
Environmental sample
5.0   0.45  -9999
8.8
-9999999 -9999 PVC
Compressed cylinder
#SampleReceipt
09202111060511
IMS-2017-2029
2021/11/22 03:30:00.0
~PackageCondition
Good
~SealCondition
Good
~SampleCondition
Good
#g_LabSample
-9999999999
5.00  0.65  -9999
8.81
-9999999 -9999 0
3M filter
#Test
High resolution gamma spectrometry
2021/11/30
Example text
#EnergyCalibrationEquation
1
2  2  16.41   2714.86
-2.4421E-01 1.6657E-01  -9999999999 -9999999999
#ShapeCalibrationEquation
```

```
1
3  2  16.41   2714.86
9.4214E-01  2.8986E-02  -9999999999 -9999999999
#EfficiencyCalibrationEquation
2
2  6  16.41   122.1
-2.1581E+03 2.2943E+03  -9.8503E+02 2.1298E+02
-2.3151E+00 1.0105E+00  -9999999999 -9999999999
2  6  122.1   2714.86
-2.2985E+02 1.7358E+02  -5.1988E+01 7.6917E+00
-5.6446E-01 1.6434E-02  -9999999999 -9999999999
#TotalEfficiencyCalibrationEquation
0
0  0  0.0     0.0
-9999999999 -9999999999 -9999999999 -9999999999
#PeaksMethod
Genie2000 V3.4
Peak Locate Unidentified Second Difference
Peak search sensitivity 2.2
Sum/Non linear least squares fit Peak area
Continuum Step 2 channels
Residual Search Threshold 4.0
----------------------
PEAK ASSOCIATION CODES
----------------------
S = Sum     X = X-ray
SE = Single escape     DE = Double escape
UNKNOWN = not yet identified
#PeakSearch
1      281.484  0.04  46.643   0.49        2.200   IF
2      322.382  0.22  53.455   0.24        2.200   IF
3      841.349  0.02  139.900  0.15        2.200   IF
```

⋮

```
16     8772.010 0.01  1460.920 0.01        2.200   IF
17     0596.200 0.01  1764.770 0.00        2.200   IF
18     5703.900 0.01  2615.570 0.00        2.200   IF
#PeakFitPart1
1      1.13  258.000  298.000  1.8625E+02  1.73  BLANK        -9999999999  -9999
2      1.02  312.000  333.000  1.7858E+02  1.77  BLANK        -9999999999  -9999
3      1.01  832.000  853.000  1.6097E+02  1.77  BLANK        -9999999999  -9999
```

⋮

```
16     2.46  8759.000 8788.000 6.7254E+00  7.08  BLANK        -9999999999  -9999
17     1.19  0586.000 0607.000 4.1135E+00  8.75  BLANK        -9999999999  -9999
18     2.60  5692.000 5715.000 3.1961E+00  9.34  BLANK        -9999999999  -9999
#PeakFitPart2
1      2.1962E+03  3.23  8.0315E-03  3.23  2.6039E+02  8.43   3.1890E-02  5.20
2      2.3193E+02  22.71 8.4817E-04  22.71 1.5391E+02  1.51   6.1950E-02  4.96
3      5.6874E+02  9.41  2.0799E-03  9.41  1.4199E+02  4.01   2.0317E-01  4.00
```

⋮

```
16     1.6042E+02  10.96 5.8666E-04  10.96 3.3132E+01  4.84   4.0314E-02  3.40
17     2.7266E+01  36.52 9.9714E-05  36.52 2.0357E+01  1.34   3.4803E-02  3.50
18     8.3540E+01  15.45 3.0551E-04  15.45 1.8613E+01  4.49   2.5086E-02  3.67
#AnalysisMethods
Genie2000 V3.4
~NuclidesMethod
NID plus Interference Correction Tolerence=1.00 keV NID Threshold = 0.1
~BaselineMethod
Sum Non-linear LSQ Fit Step 2 channels
~LCMethod
L.A. Currie Method Canberra Genie Algorithms 5% risk at type 1 errors
~CalibrationMethod
LabSOCS
#PeakAssociation
1      100.00  Pb-210
2      100.00  Ge-73
3      100.00  Ge-75m
```

⋮

```
16     100.00  K-40
17     100.00  Bi-214
18     100.00  Tl-208
```

```
#References
~SAMPLEPHD
NZL12_004-2021/11/22-21:21:31.0
~CALIBPHD
NZL12_004-2018/06/12-16:03:57.0
~PhysicalConstants
DDEP and Brookhaven Nuclear Data, last reviewed April 2018
#InteractiveAnalysisLog
Genie 2K Peak Search Alterations
Energy (keV) Alteration Type  Remark(s)
596.114        2              G
2577.484       2              D, E
2582.010       2              D, E
Notes
1 = Peak Added
2 = Peak Deleted
3 = Peak ROI adjusted
```

⋮

```
L = ROI Channels Reduced Due To Overlapping Adjacent Peak
M = ROI Channels Reduced To Better Represent the Background
N = Use Fixed FWHM
#P_Results
2021/11/22 21:21:31.0 2021/11/06 06:00:57.0
Be-7     5.9822e+01  5.58  1.00  68.00 3.5379e-03  5.58  1.00  68.00
#NuclideRatios
0        0        0.00     0.00  1970/01/01 00:00:00.0 1970/01/01 00:00:00.0 0.00
#CoincidenceCorrection
-9999    -9999999 -9999999 -9999
#UncertaintyBudget
~Uncertainties
Be-7     5.58  concentration combined
Be-7     0.25  Peak rate
Be-7     0.57  Gamma ray emission probability
```

⋮

```
Be-7     0.00  Sample volume
Be-7     5.58  Activity combined
Be-7     2.00  Systematic Uncertainty
~UncertaintyCalculationMethods
The peak area uncertainty is calculated using Genie-2000 equations.
The detector efficiency is derived using LabSOCS and its uncertainty
has been quantified experimentally.
The gamma ray emission probability has been taken from DDEP and Brookhaven Nucle
ata, reviewed April 2018.
Bias errors on Genie coincidence summing factors have been applied on a
linear scale ranging from 0% error for 0% coincidence factor, through
5% error for a 20% coincidence factor.Combined uncertainties have
been obtained by quadratically summing the statistical components and adding
linearly 2% systematic uncertainty.
 
#P_MDA/MDC
Ag-106m  2.3642E-02  4.3723E-06
Ag-108m  1.1004E-02  5.2723E-07
Ag-110m  1.0293E-02  5.1572E-07
```

⋮

```
Zr-95    1.0483E-02  5.9813E-07
Zr-97    2.0277E-02  7.3269E+00
#Conclusions
~IDCSummary
Be-7     IDC Result:   3.3858E-03 Bq/m3
Pb-212F  IDC Result:   3.3192E-02 Bq/m3
Na-24    IDC Result:   1.1826E-05 Bq/m3
~LabSummary
Be-7     NZL12 Result: 3.5379E-03 Bq/m3
~ResultComparison
Be-7     Difference:   4.5 %
#Comment
Pb-212F and Na-24 were not detected.
---
---
STOP
```

I.31 RMSSOH

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68555686 CTBT_IDC
REF_ID 714212835
DATA_TYPE RMSSOH
#Header 3
GBP68 GBP68_002
2021/12/01 17:58:51.7 2021/12/01 20:00:00.0 2021/12/01 20:04:46.3
#AirSamplerEnv
17.00 1010.00 2021/12/01 18:00:00.0 600
17.00 1010.00 2021/12/01 18:10:00.0 600
16.00 1010.00 2021/12/01 18:20:00.0 600
⋮
16.00 1010.00 2021/12/01 19:30:00.0 600
16.00 1010.00 2021/12/01 19:40:00.0 600
16.00 1010.00 2021/12/01 19:50:00.0 600
#AirSamplerFlow
908.0000   -9999999999 2021/12/01 18:00:00.0 600
897.0000   -9999999999 2021/12/01 18:10:00.0 600
898.0000   -9999999999 2021/12/01 18:20:00.0 600
⋮
904.0000   -9999999999 2021/12/01 19:30:00.0 600
900.0000   -9999999999 2021/12/01 19:40:00.0 600
900.0000   -9999999999 2021/12/01 19:50:00.0 600
#Comment
 HealthMonitor.exe Version 4.2.9.0 at 2021/12/01 20:04:45.535
#DetEnv
22.5  CLOSED 29  2500  -173 0   -999 -99999 2021/12/01 17:58:51.7 600
22.4  CLOSED 29  2500  -173 0   -999 -99999 2021/12/01 18:08:51.7 600
22.4  CLOSED 29  2500  -173 0   -999 -99999 2021/12/01 18:18:51.7 600
⋮
22.4  CLOSED 26  2500  -173 0   -999 -99999 2021/12/01 19:28:51.7 600
22.3  CLOSED 26  2500  -173 0   -999 -99999 2021/12/01 19:38:51.7 600
22.1  CLOSED 26  2500  -173 0   -999 -99999 2021/12/01 19:48:51.7 600
#EquipStatus
C: 68202112011711   P: 68202111301711   A: 68202111291711   2021/12/01 17:58:51.7 600
C: 68202112011711   P: 68202111301711   A: 68202111291711   2021/12/01 18:08:51.7 600
C: 68202112011711   P: 68202111301711   A: 68202111291711   2021/12/01 18:18:51.7 600
⋮
C: 68202112011711   P: 68202111301711   A: 68202111291711   2021/12/01 19:28:51.7 600
C: 68202112011711   P: 68202111301711   A: 68202111291711   2021/12/01 19:38:51.7 600
C: 68202112011711   P: 68202111301711   A: 68202111291711   2021/12/01 19:48:51.7 600
#PowerSupply
MAIN ON  AUX OFF UPS OFF 2021/12/01 17:58:51.7 600
MAIN ON  AUX OFF UPS OFF 2021/12/01 18:08:51.7 600
MAIN ON  AUX OFF UPS OFF 2021/12/01 18:18:51.7 600
⋮
MAIN ON  AUX OFF UPS OFF 2021/12/01 19:28:51.7 600
MAIN ON  AUX OFF UPS OFF 2021/12/01 19:38:51.7 600
MAIN ON  AUX OFF UPS OFF 2021/12/01 19:48:51.7 600
#TamperEnv
aslid                 CLOSED 2021/12/01 17:58:51.7 600
aspanel               OPEN   2021/12/01 17:58:51.7 600
decaycab              CLOSED 2021/12/01 17:58:51.7 600
door1                 OPEN   2021/12/01 17:58:51.7 600
aslid                 CLOSED 2021/12/01 18:08:51.7 600
aspanel               OPEN   2021/12/01 18:08:51.7 600
decaycab              CLOSED 2021/12/01 18:08:51.7 600
door1                 OPEN   2021/12/01 18:08:51.7 600
⋮
aslid                 CLOSED 2021/12/01 19:48:51.7 600
aspanel               OPEN   2021/12/01 19:48:51.7 600
decaycab              CLOSED 2021/12/01 19:48:51.7 600
door1                 OPEN   2021/12/01 19:48:51.7 600
STOP
```

I.32 RNPS

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68556594 CTBT_IDC
REF_ID 714212835
DATA_TYPE RNPS
                      Radionuclide Network Product Summary
                  Product created on 2021/12/10 12:44:11

   This product shows the radionuclide products received at the IDC between
                    2021/11/25 00:00:00 and 2021/11/30 00:00:00


Station Detector  SID      P/G/B Cstart(GMT)      Cstop(GMT)       Category Status  Products    CTBT Relevant
-------------------------------------------------------------------------------------------------------------
SEX63   SEX63_008 6470591  B     2021/11/29 12:01 2021/11/29 18:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_007 6470224  B     2021/11/29 06:01 2021/11/29 12:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_008 6469853  B     2021/11/29 00:01 2021/11/29 06:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_007 6469497  B     2021/11/28 18:01 2021/11/29 00:01 Level 2  R       A,R,XA,XR   XE-131M XE-133M
SEX63   SEX63_008 6469132  B     2021/11/28 12:01 2021/11/28 18:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_007 6468767  B     2021/11/28 06:01 2021/11/28 12:01 Level 2  R       A,R,XA,XR   XE-131M
SEX63   SEX63_008 6468398  B     2021/11/28 00:01 2021/11/28 06:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_007 6468039  B     2021/11/27 18:01 2021/11/28 00:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_008 6467684  B     2021/11/27 12:01 2021/11/27 18:01 Level 1  R       A,R,XA,XR
SEX63   SEX63_007 6467336  B     2021/11/27 06:01 2021/11/27 12:01 Level 2  R       A,R,XA,XR   XE-135
SEX63   SEX63_008 6466978  B     2021/11/27 00:01 2021/11/27 06:01 Level 1  R       A,R,XA,XR
SEX63   SEX63_007 6466627  B     2021/11/26 18:01 2021/11/27 00:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_008 6466273  B     2021/11/26 12:01 2021/11/26 18:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_007 6465922  B     2021/11/26 06:01 2021/11/26 12:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_008 6465566  B     2021/11/26 00:01 2021/11/26 06:01 Level 2  R       A,R,XA,XR   XE-133
SEX63   SEX63_007 6465221  B     2021/11/25 18:01 2021/11/26 00:01 Level 2  R       A,R,XA,XR   XE-133 XE-135
SEX63   SEX63_008 6464863  B     2021/11/25 12:01 2021/11/25 18:01 Level 1  R       A,R,XA,XR
SEX63   SEX63_007 6464510  B     2021/11/25 06:01 2021/11/25 12:01 Level 1  R       A,R,XA,XR
SEX63   SEX63_008 6464146  B     2021/11/25 00:01 2021/11/25 06:01 Level 1  R       A,R,XA,XR
SEX63   SEX63_007 6463796  B     2021/11/24 18:01 2021/11/25 00:01 Level 2  R       A,R,XA,XR   XE-131M

Products Legend:
     A: ARR
     R: RRR
     S: SSREB
     XA: SAMPML XML A
     XR: SAMPML XML R
STOP
```

I.33 RRR—Noble gas version

I.33.1 β-γ coincidence systems (plain text format)

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 73000890 CTBT_IDC
REF_ID 24163264
DATA_TYPE RRR
TIME_STAMP 2022/06/02 10:33:05
IDC Generated Report
Reviewed Radionuclide Report
Noble Gas Version

Creation Date: 2022-05-30 07:12:50
Sample Arrival Time: 2022-05-28 00:54:17
Time difference from receipt of raw data to report creation: 2 d 6 h 18 m 33.0 s

Sample Information
--------------------------------------------------------------------------------

Station ID:     AUX04   Detector Code: AUX04_005
Authenticated:  YES

Station Location:       Melbourne, VIC
Detector Description:   Detector #5 in Victoria, Australia.
System Technology:      SAUNA

Sample Reference ID:    04202205261811X
Sample ID:              6732658
Stable Xe Volume:       0.99 ml         Sample Type:    Gas

Collection Start:       2022-05-26 18:31:48     Sampling Time:          12 h  4 s
Collection Stop:        2022-05-27 06:31:52     Processing Time:        7 h 10 m 58 s
Acquisition Start:      2022-05-27 13:42:50     Acquisition Time:       11 h 9 m 58 s
Acquisition Stop:       2022-05-28 00:52:48

IDC Analysis General Comments:2022-05-30 07:12:33
The sample is categorized at Level B due to the detection of Xe133 with activity concentration(s) within the normal range for the
    station

Measurement Categorization
--------------------------------------------------------------------------------

Categorization Legend
```

```
Level A          Clean spectrum - No Xenon is present in the sample.
Level B          Xenon detection within the typical range for the station.
Level C          Anomalous Xenon detection.

Isotope category
Isotope  Nuclide detected  Abnormal_limit (mBq/m3)  Category
Xe-131m  NO                1.57E-01                 A
Xe-133m  NO                1.37E-01                 A
Xe-133   YES               5.17E-01                 B
Xe-135   NO                8.85E-01                 A

Spectrum Category: B - Xenon detection within the typical range for the station

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes
--------------------------------------------------------------------------------

Radon counts in Xenon sample: 102

Xenon isotopes - Beta gamma matrix (BGM) analysis method

Nuclide  Half-Life  Activity (mBq)  StatErr (%)  SysErr (%)  TotalErr (%)  Conc (mBq/m3)  StatErr (%)  SysErr (%)  TotalErr (%)
    LC (mBq/m3)  MDC (mBq/m3)
XE-131M  11.962 D   -8.25E-01       58.55        40.61       71.25         -7.52E-02      58.55        41.83       71.95
    8.17E-02     1.83E-01
XE-133M  2.198 D    -1.23E-01       289.67       167.59      334.66        -1.29E-02      289.67       167.89      334.81
    6.37E-02     1.50E-01
XE-133   5.2441 D   2.03E+00        51.18        33.37       61.10         1.93E-01       51.18        34.84       61.91
    1.48E-01     3.19E-01
XE-135   9.143 H    -1.76E+00       49.84        28.25       57.29         -4.07E-01      49.84        29.97       58.16
    3.58E-01     7.58E-01

Processing Specific Parameters and Results
--------------------------------------------------------------------------------

Beta gamma matrix (BGM) analysis method

ROI Net Count Results
ROI  Nuclide  Net Counts  Abs Net Error  LC     Efficiency  Abs Eff Error
1    PB-214   21.81       3.70           21.19  N/A         N/A
2    XE-135   -26.53      3.64           23.35  0.62        0.11
3    XE-133   22.14       3.37           16.95  0.75        0.15
4    XE-133   8.40        3.38           20.48  0.70        0.10
5    XE-131M  -10.59      2.49           11.52  0.60        0.07
6    XE-133M  -1.54       2.11           7.64   0.60        0.07

ROI Limits (channels)
```

```
ROI  BetaLow (channels)  BetaHigh (channels)  GammaLow (channels)  GammaHigh (channels)
1    1                   217                  117                  140
2    1                   277                  82                   104
3    1                   136                  25                   36
4    1                   152                  6                    15
5    29                  55                   6                    15
6    68                  102                  6                    15
7    1                   28                   6                    15
8    103                 152                  6                    15
9    68                  152                  6                    15
10   1                   55                   6                    15

Processing Parameters
--------------------------------------------------------------------------------

Risk level k:                   1.6449
Gas background used:            YES
Detector background used:       YES
Interference corrections:       YES
Analysis method:                BGM

Calibration Parameters
--------------------------------------------------------------------------------

Gamma energy calibration updated:       YES
Beta energy calibration updated:        YES

Data Timeliness and Availability Flags
--------------------------------------------------------------------------------

Name                       Pass/Fail  Value     Test
Previous Sample Present    Pass       6731925   -1/2 day sample available
Collection Time            Pass       12.00     12h +- 10%
Acquisition Time           Pass       11.17     12h +- 10%
Response Time              Pass       30.37     sample received within 96h of collect start

Data Quality Flags
--------------------------------------------------------------------------------

Name                   Pass/Fail  Value  Test
Stable Xenon Volume    Pass       0.99   greater than 0.44 ml
SOH                    Pass       Fair   SOH substantially meets operational requirements
Xe-133 MDC             PASS       0.32   less than 1 mBq/m3

Event Screening Flags
--------------------------------------------------------------------------------

```

```
Name                                                 YES/NO/Value

Xenon Isotopes present in this spectrum              YES

Only one Xenon Isotope in spectrum                   NO

Number of days since last Xenon detection            0

2 or more Xenon Isotopes present in this spectrum    YES

Xe-133 present in spectrum                           YES

Number of times Xe-133 seen in last 365 days         110

Short term flag                                      b - Xenon detection within the typical range for the station
Isotopic ratios:
- Xe-133m/131m > 2                                   NO
- Xe-135/133 > 5                                     NO
- Xe-133m/133 > 0.3                                  NO

Calibration Equations
--------------------------------------------------------------------------------

Beta Energy To Channel : C(E)= t0 + t1 E + t2 EB2
t0 : -3.62
t1 : 0.432138
t2 : -0.0001346

Gamma Energy To Channel : C(E)= t0 + t1 E + t2 EB2
t0 : -0.3268965
t1 : 0.3819843
t2 : -0.0000436
TIME_STAMP 2022/06/02 10:33:05
STOP
```

I.33.2 β-γ coincidence systems (HTML format)

IDC Generated Report
Reviewed Radionuclide Report
Noble Gas Version

Creation Date: 2022-05-30 07:12:50
Sample Arrival Time: 2022-05-28 00:54:17
Time difference from receipt of raw data to report creation: 2 d 6 h 18 m 33.0 s

Sample Information

Station ID:	AUX04	Detector Code:	AUX04_005
Authenticated:	YES		
Station Location:	Melbourne, VIC		
Detector Description:	Detector #5 in Victoria, Australia.		
System Technology:	SAUNA		
Sample Reference ID:	04202205261811X		
Sample ID:	6732658		
Stable Xe Volume:	0.99 ml	Sample Type:	Gas
Collection Start:	2022-05-26 18:31:48	Sampling Time:	12 h 4 s
Collection Stop:	2022-05-27 06:31:52	Processing Time:	7 h 10 m 58 s
Acquisition Start:	2022-05-27 13:42:50	Acquisition Time:	11 h 9 m 58 s
Acquisition Stop:	2022-05-28 00:52:48		

IDC Analysis General Comments:

```
2022-05-30 07:12:33
The sample is categorized at Level B due to the detection of Xe133 with activity concentration(s) within the normal
range for the station
```

Measurement Categorization

Categorization Legend

Level A	=	Clean spectrum - No Xenon is present in the sample.
Level B	=	Xenon detection within the typical range for the station.
Level C	=	Anomalous Xenon detection.

Isotope category

Isotope	Nuclide detected	Abnormal_limit *(mBq/m3)*	Category
Xe-131m	NO	1.57E-01	A
Xe-133m	NO	1.37E-01	A
Xe-133	YES	5.17E-01	B
Xe-135	NO	8.85E-01	A

Spectrum Category: B - Xenon detection within the typical range for the station

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes

Radon counts in Xenon sample: 102

Xenon isotopes - Beta gamma matrix (BGM) analysis method

Nuclide	Half-Life	Activity (mBq)	StatErr (%)	SysErr (%)	TotalErr (%)	Conc (mBq/m3)	StatErr (%)	SysErr (%)	TotalErr (%)	LC (mBq/m3)	MDC (mBq/m3)

XE-131M	11.962 D	-8.25E-01	58.55	40.61	71.25	-7.52E-02	58.55	41.83	71.95	8.17E-02	1.83E-01
XE-133M	2.198 D	-1.23E-01	289.67	167.59	334.66	-1.29E-02	289.67	167.89	334.81	6.37E-02	1.50E-01
XE-133	5.2441 D	2.03E+00	51.18	33.37	61.10	1.93E-01	51.18	34.84	61.91	1.48E-01	3.19E-01
XE-135	9.143 H	-1.76E+00	49.84	28.25	57.29	-4.07E-01	49.84	29.97	58.16	3.58E-01	7.58E-01

Processing Specific Parameters and Results

Beta gamma matrix (BGM) analysis method

ROI Net Count Results

ROI	Nuclide	Net Counts	Abs Net Error	LC	Efficiency	Abs Eff Error
1	PB-214	21.81	3.70	21.19	N/A	N/A
2	XE-135	-26.53	3.64	23.35	0.62	0.11
3	XE-133	22.14	3.37	16.95	0.75	0.15
4	XE-133	8.40	3.38	20.48	0.70	0.10
5	XE-131M	-10.59	2.49	11.52	0.60	0.07
6	XE-133M	-1.54	2.11	7.64	0.60	0.07

ROI Limits (channels)

ROI	BetaLow *(channels)*	BetaHigh *(channels)*	GammaLow *(channels)*	GammaHigh *(channels)*
1	1	217	117	140
2	1	277	82	104
3	1	136	25	36
4	1	152	6	15
5	29	55	6	15
6	68	102	6	15
7	1	28	6	15
8	103	152	6	15
9	68	152	6	15
10	1	55	6	15

Processing Parameters

Risk level k:	1.6449
Gas background used:	YES
Detector background used:	YES
Interference corrections:	YES
Analysis method:	BGM

Calibration Parameters

Gamma energy calibration updated:	YES
Beta energy calibration updated:	YES

Data Timeliness and Availability Flags

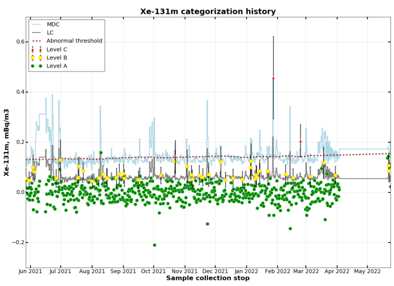
Name	Pass/Fail	Value	Test
Previous Sample Present	Pass	6731925	-1/2 day sample available
Collection Time	Pass	12.00	12h +- 10%
Acquisition Time	Pass	11.17	12h +- 10%
Response Time	Pass	30.37	sample received within 96h of collect start

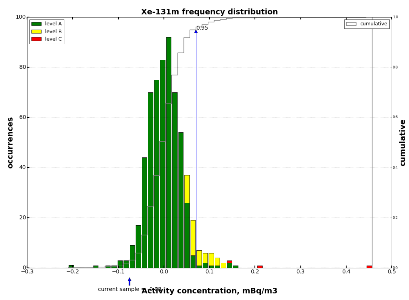
Data Quality Flags

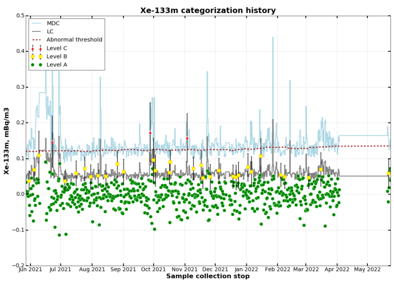
Name	Pass/Fail	Value	Test
Stable Xenon Volume	Pass	0.99	greater than 0.44 ml
SOH	Pass	Fair	SOH substantially meets operational requirements
Xe-133 MDC	PASS	0.32	less than 1 mBq/m3

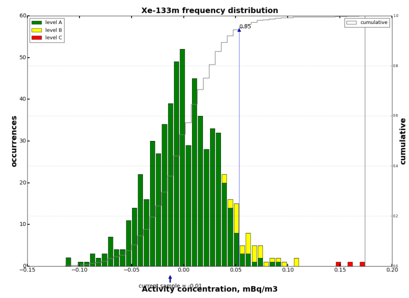
Event Screening Flags

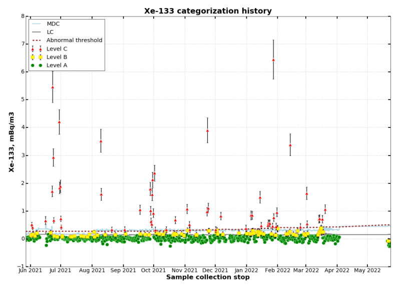
Name	**YES/NO/Value**
Xenon Isotopes present in this spectrum	YES
Only one Xenon Isotope in spectrum	NO
Number of days since last Xenon detection	0
2 or more Xenon Isotopes present in this spectrum	YES
Xe-133 present in spectrum	YES
Number of times Xe-133 seen in last 365 days	110
Short term flag	b - Xenon detection within the typical range for the station
Isotopic ratios:	
- Xe-133m/131m > 2	NO
- Xe-135/133 > 5	NO
- Xe-133m/133 > 0.3	NO

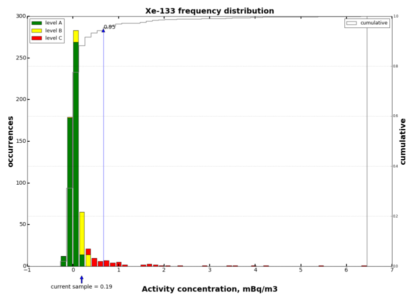


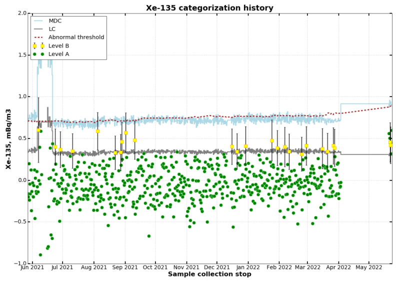


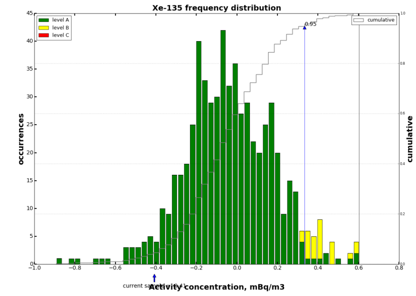


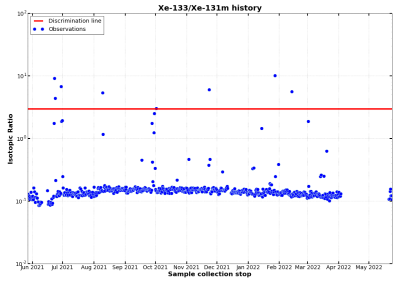


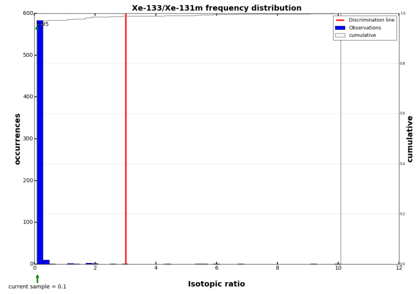


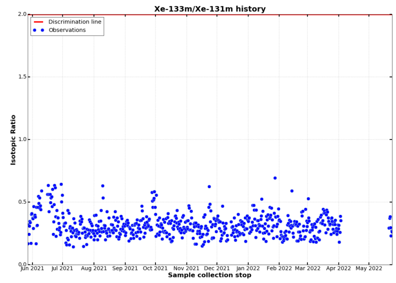


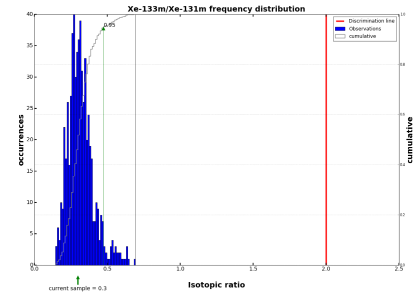

Xe-135 categorization history
MDC
LC
Abnormal threshold
Level B
Level A
Xe-135, mBq/m3
Sample collection stop

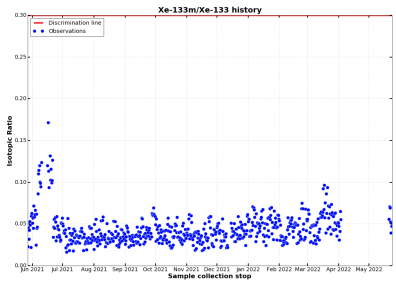

Xe-135 frequency distribution
level A
level B
level C
cumulative
occurrences
cumulative
Activity concentration, mBq/m3

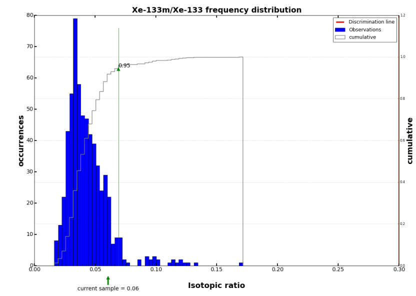

Xe-133/Xe-131m history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop

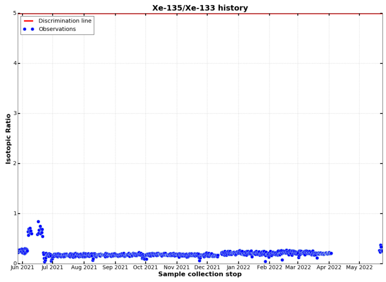

Xe-133/Xe-131m frequency distribution
Discrimination line
Observations
cumulative
occurrences
current sample = 0.1
Isotopic ratio

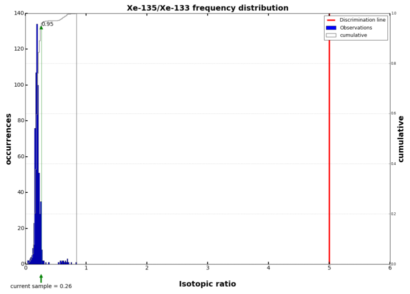

Xe-133m/Xe-131m history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop


Xe-133m/Xe-131m frequency distribution
Discrimination line
Observations
cumulative
occurrences
current sample = 0.3
Isotopic ratio


Xe-133m/Xe-133 history
Discrimination line
Observations
Isotopic Ratio
Sample collection stop


Xe-133m/Xe-133 frequency distribution
Discrimination line
Observations
cumulative
occurrences
current sample = 0.06
Isotopic ratio





Calibration Equations

Beta Energy To Channel : C(E)= t0 + t1 E + t2 E^2

t0 : -3.62
t1 : 0.432138
t2 : -0.0001346

Gamma Energy To Channel : C(E)= t0 + t1 E + t2 E^2

t0 : -0.3268965
t1 : 0.3819843
t2 : -0.0000436

I.33.3 HPGe systems reports (plain text format)

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 73001207 CTBT_IDC
REF_ID 24163264
DATA_TYPE RRR
TIME_STAMP 2022/06/02 10:51:54
IDC Generated Report
Reviewed Radionuclide Report
Noble Gas Version

Creation Date: 2022-05-31 08:10:32
Sample Arrival Time: 2022-05-30 21:53:26
Time difference from receipt of raw data to report creation:  10 h 17 m 6.0 s

Sample Information
--------------------------------------------------------------------------------

Station ID:      MNX45    Detector Code: MNX45_005
Authenticated:   YES

Station Location:        MNX45, Mongolia
Detector Description:    BE3825 detector #5 in Mongolia
System Technology:       SPALAX

Sample Reference ID:     45202205282211G
Sample ID:               6736824
Stable Xe Volume:        4.35 ml Sample Type: Gas

Collection Start:        2022-05-28 22:00:00     Sampling Time:          1 d
Collection Stop:         2022-05-29 22:00:00     Processing Time:         1 h 24 m 6 s
Acquisition Start:       2022-05-29 23:24:06     Acquisition Time:        22 h 21 m 5 s
Acquisition Stop:        2022-05-30 21:45:11

IDC Analysis General Comments:None
None

Measurement Categorization
--------------------------------------------------------------------------------

Categorization Legend

Level A =       Clean spectrum - No Xenon is present in the sample.
Level B =       Xenon detection within the typical range for the station.
Level C =       Anomalous Xenon detection.
```

```

Isotope category
Isotope Nuclide detected        Abnormal_limit (mBq/m3) Category
Xe-131m NO      1.34E+00        A
Xe-133m NO      1.58E+00        A
Xe-133  NO      5.67E-01        A
Xe-135  NO      7.17E-01        A

Spectrum Category: A - Clean spectrum - No Xenon is present in the sample

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes
--------------------------------------------------------------------------------

Radon level in Xenon sample
Nuclide Half-Life       Area    RelErr (%)
Rn-222  3.82 D          277.46  8.02

Xenon isotopes

Peak Fit Method

Nuclide  Half-Life  Activity (mBq)  StatErr (%)  SysErr (%)  TotalErr (%)  Conc (mBq/m3)  StatErr (%)  SysErr (%)  TotalErr (%)
    MDI/MDC
XE-131M  11.962 D   2.83E+01        71.57        2.68        71.62         5.85E-01       71.57        4.02        71.68
    2.74E-01
XE-133M  2.198 D    -4.92E+00       429.22       2.72        429.22        -1.17E-01      429.22       4.05        429.23
    2.74E-01
XE-133   5.2441 D   -3.08E-01       797.48       2.50        797.48        -6.62E-03      797.48       3.91        797.49
    2.92E-01
XE-135   9.143 H    4.66E+00        102.43       2.72        102.47        2.25E-01       102.43       4.05        102.51
    1.16E+00

Decay Analysis Method

Nuclide  Half-Life  Activity (mBq)  StatErr (%)  SysErr (%)  TotalErr (%)  Conc (mBq/m3)  StatErr (%)  SysErr (%)  TotalErr (%)
    MDI/MDC
XE-131M  11.962 D   -1.77E+01       117.69       2.68        117.73        -3.66E-01      117.69       4.02        117.76
    2.74E-01
XE-133M  2.198 D    3.40E+01        63.65        2.72        63.71         8.07E-01       63.65        4.05        63.78
    2.74E-01
XE-133   5.2441 D   5.44E+00        45.30        2.50        45.37         1.17E-01       45.30        3.91        45.47
    2.92E-01
XE-135   9.143 H    5.08E+00        86.81        2.72        86.85         2.45E-01       86.81        4.05        86.90
    1.16E+00

Processing Specific Parameters and Results
--------------------------------------------------------------------------------
```

```

Xenon Peak Data

Energy (keV)  Centroid  Width  FWHM (keV)  Eff (%)  Net Area  RelErr (%)
29.60       134.57    3.00   0.60        12.66    106.10    26.64

Processing Parameters
--------------------------------------------------------------------------------

Risk level K:            4.26489
Baseline algorithm:      Smoothing / Lawn Mowers

Calibration Parameters
--------------------------------------------------------------------------------

SAreaThreshold:          100
ConfidenceLevel:         95
ECR updated:             Yes
RER updated:             No
Used ECR:                INITIAL
Used RER:                MRPA

Data Timeliness and Availability Flags
--------------------------------------------------------------------------------

Name                      Pass/Fail  Value     Test
Previous Sample Present  Pass       6735347   -1 day sample available
Collection Time           Pass       24.00     24h +- 10%
Acquisition Time          Pass       22.35     24h +- 10%
Response Time             Pass       47.89     sample received within 96h of collect start

Data Quality Flags
--------------------------------------------------------------------------------

Name                  Pass/Fail  Value  Test
Stable Xenon Volume   Pass       4.35   greater than 0.87 ml
SOH                   Pass       Good   SOH meets operational requirements
Xe-133 MDC            PASS       0.29   less than 1 mBq/m3

Event Screening Flags
--------------------------------------------------------------------------------

Name                                                    YES/NO/Value
Xenon Isotopes present in this spectrum                 YES
Only one Xenon Isotope in spectrum                      NO
Number of days since last Xenon detection               1
2 or more Xenon Isotopes present in this spectrum       YES
```

```
Xe-133 present in spectrum                                  NO
Number of times Xe-133 seen in last 365 days                124
Short term flag                                             a - Clean spectrum - No Xenon is present in the sample
Isotopic ratios:
- Xe-133m/131m > 2                                          NO
- Xe-135/133 > 5                                            NO
- Xe-133m/133 > 0.3                                         NO

Calibration Equations
--------------------------------------------------------------------------------

Energy : E(C)= t0 + t1 C + t2 CB2 + t3 CB3
t0 : 0.07120926 t1 : 0.2193672  t2 : 2.677893E-7         t3 : 0
Resolution : R(E)= b  (t0 + t1 E + t2 EB2)
t0 : 0.3162     t1 : 0.001381   t2 : 4.614E-7
TIME_STAMP 2022/06/02 10:51:54
STOP
```

I.33.4 HPGe systems reports (HTML format)

IDC Generated Report
Reviewed Radionuclide Report
Noble Gas Version

Creation Date: 2022-05-31 08:10:31
Sample Arrival Time: 2022-05-30 21:53:26
Time difference from receipt of raw data to report creation: 10 h 17 m 5.0 s

Sample Information

Station ID:	MNX45	Detector Code:	MNX45_005
Authenticated:	YES		
Station Location:	MNX45, Mongolia		
Detector Description:	BE3825 detector #5 in Mongolia		
System Technology:	SPALAX		
Sample Reference ID:	45202205282211G		
Sample ID:	6736824		
Stable Xe Volume:	4.35 ml	Sample Type:	Gas
Collection Start:	2022-05-28 22:00:00	Sampling Time:	1 d
Collection Stop:	2022-05-29 22:00:00	Processing Time:	1 h 24 m 6 s
Acquisition Start:	2022-05-29 23:24:06	Acquisition Time:	22 h 21 m 5 s
Acquisition Stop:	2022-05-30 21:45:11		

IDC Analysis General Comments:

None
None

Measurement Categorization

Categorization Legend

Level A = Clean spectrum - No Xenon is present in the sample.
Level B = Xenon detection within the typical range for the station.
Level C = Anomalous Xenon detection.

Isotope category

Isotope	Nuclide detected	Abnormal_limit *(mBq/m3)*	Category
Xe-131m	NO	1.34E+00	A
Xe-133m	NO	1.58E+00	A
Xe-133	NO	5.67E-01	A
Xe-135	NO	7.17E-01	A

Spectrum Category: A - Clean spectrum - No Xenon is present in the sample

Activity Summary and Minimum Detectable Concentration for Xenon Isotopes

Radon level in Xenon sample

Nuclide	**Half-Life**	**Area**	**RelErr (%)**
Rn-222	3.82 D	277.46	8.02

Xenon isotopes

Peak Fit Method

Nuclide	**Half-Life**	**Activity (mBq)**	**StatErr (%)**	**SysErr (%)**	**TotalErr (%)**	**Conc (mBq/m3)**	**StatErr (%)**	**SysErr (%)**	**TotalErr (%)**	**MDI/MDC**
XE-131M	11.962 D	2.83E+01	71.57	2.68	71.62	5.85E-01	71.57	4.02	71.68	2.74E-01

XE-133M	2.198 D	-4.92E+00	429.22	2.72	429.22	-1.17E-01	429.22	4.05	429.23	2.74E-01
XE-133	5.2441 D	-3.08E-01	797.48	2.50	797.48	-6.62E-03	797.48	3.91	797.49	2.92E-01
XE-135	9.143 H	4.66E+00	102.43	2.72	102.47	2.25E-01	102.43	4.05	102.51	1.16E+00

Decay Analysis Method

Nuclide	Half-Life	Activity (mBq)	StatErr (%)	SysErr (%)	TotalErr (%)	Conc (mBq/m3)	StatErr (%)	SysErr (%)	TotalErr (%)	MDI/MDC
XE-131M	11.962 D	-1.77E+01	117.69	2.68	117.73	-3.66E-01	117.69	4.02	117.76	2.74E-01
XE-133M	2.198 D	3.40E+01	63.65	2.72	63.71	8.07E-01	63.65	4.05	63.78	2.74E-01
XE-133	5.2441 D	5.44E+00	45.30	2.50	45.37	1.17E-01	45.30	3.91	45.47	2.92E-01
XE-135	9.143 H	5.08E+00	86.81	2.72	86.85	2.45E-01	86.81	4.05	86.90	1.16E+00

Processing Specific Parameters and Results

Xenon Peak Data

Energy (keV)	Centroid	Width	FWHM (keV)	Eff (%)	Net Area	RelErr (%)
29.60	134.57	3.00	0.60	12.66	106.10	26.64

Processing Parameters

Risk level K: 4.26489
Baseline algorithm: Smoothing / Lawn Mowers

Calibration Parameters

SAreaThreshold: 100
ConfidenceLevel: 95
ECR updated: Yes
RER updated: No
Used ECR: INITIAL
Used RER: MRPA

Data Timeliness and Availability Flags

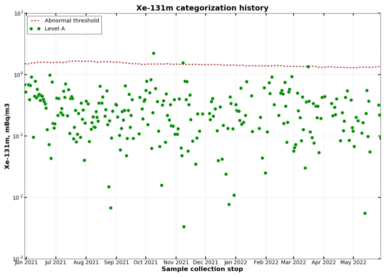
Name	Pass/Fail	Value	Test
Previous Sample Present	Pass	6735347	-1 day sample available
Collection Time	Pass	24.00	24h +- 10%
Acquisition Time	Pass	22.35	24h +- 10%
Response Time	Pass	47.89	sample received within 96h of collect start

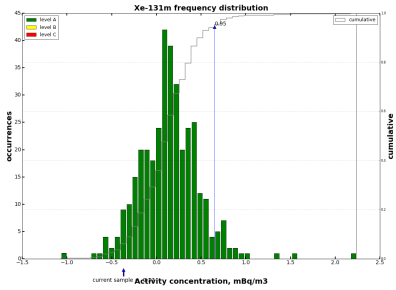
Data Quality Flags

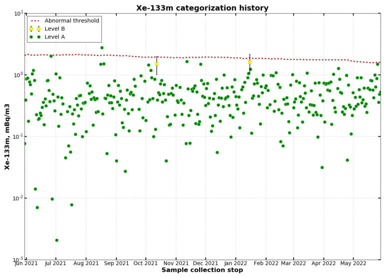
Name	Pass/Fail	Value	Test
Stable Xenon Volume	Pass	4.35	greater than 0.87 ml
SOH	Pass	Good	SOH meets operational requirements
Xe-133 MDC	PASS	0.29	less than 1 mBq/m3

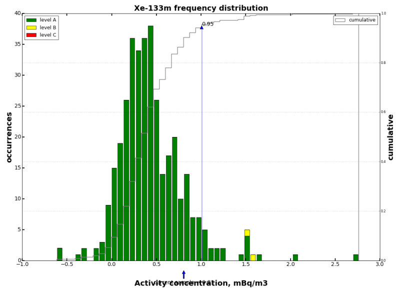
Event Screening Flags

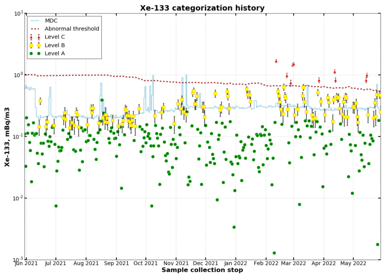
Name	YES/NO/Value
Xenon Isotopes present in this spectrum	YES
Only one Xenon Isotope in spectrum	NO
Number of days since last Xenon detection	1
2 or more Xenon Isotopes present in this spectrum	YES
Xe-133 present in spectrum	NO
Number of times Xe-133 seen in last 365 days	124
Short term flag	a - Clean spectrum - No Xenon is present in the sample
Isotopic ratios:	
- Xe-133m/131m > 2	NO
- Xe-135/133 > 5	NO
- Xe-133m/133 > 0.3	NO

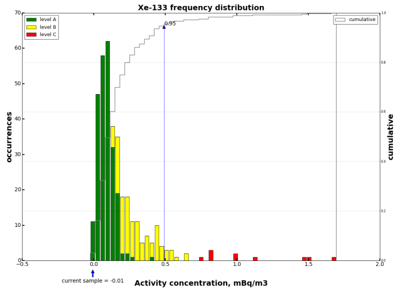

Xe-131m categorization history
Abnormal threshold
Level A
Xe-131m, mBq/m3
Sample collection stop

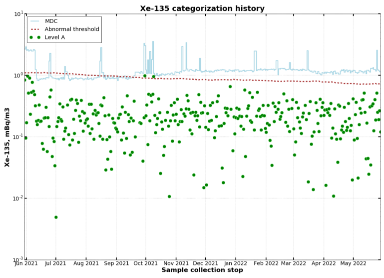

Xe-131m frequency distribution
level A
level B
level C
cumulative
occurrences
0.95
Activity concentration, mBq/m3

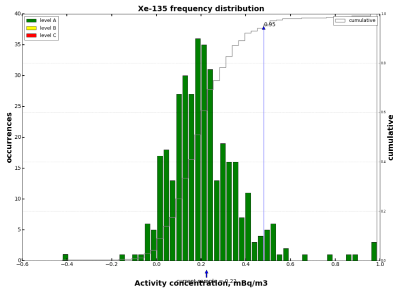

Xe-133m categorization history
Abnormal threshold
Level B
Level A
Xe-133m, mBq/m3
Sample collection stop

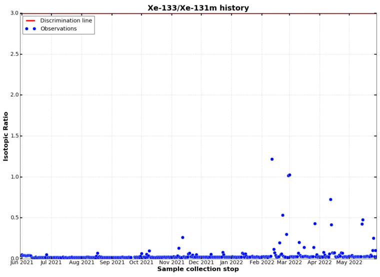

Xe-133m frequency distribution
level A
level B
level C
cumulative
occurrences
0.95
Activity concentration, mBq/m3

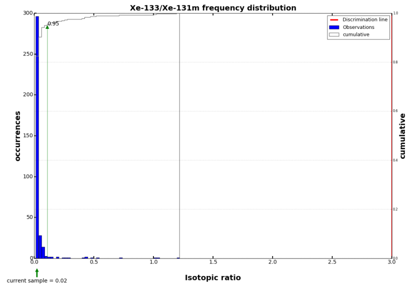

Xe-133 categorization history
MDC
Abnormal threshold
Level C
Level B
Level A
Xe-133, mBq/m3
Sample collection stop

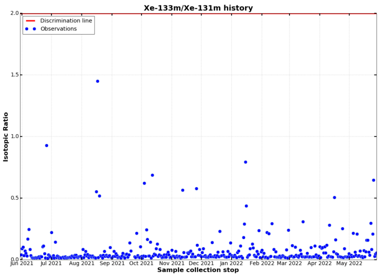

Xe-133 frequency distribution
level A
level B
level C
cumulative
occurrences
0.95
current sample = -0.01
Activity concentration, mBq/m3

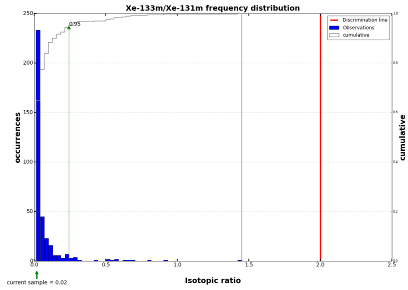

Xe-135 categorization history
MDC
Abnormal threshold
Level A
Xe-135, mBq/m3
Sample collection stop

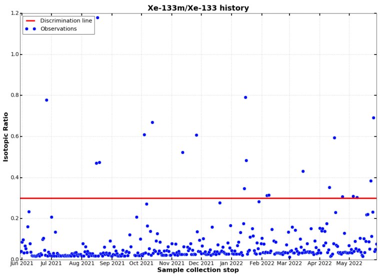

Xe-135 frequency distribution
level A
level B
level C
cumulative
occurrences
0.95
Activity concentration, mBq/m3

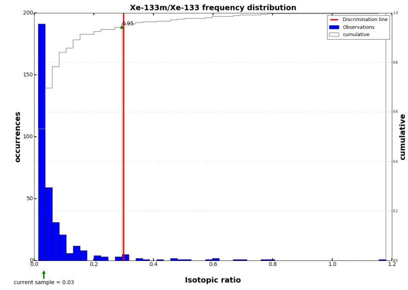


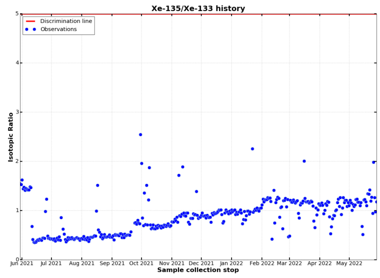


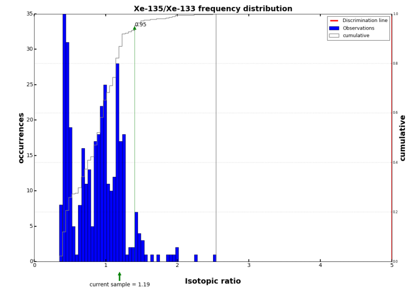












Calibration Equations

Energy : E(C)= t0 + t1 C + t2 C^2 + t3 C^3

t0 : 0.07120926
t1 : 0.2193672
t2 : 2.677893E-7
t3 : 0

Resolution : R(E)= $\sqrt{(t0 + t1\ E + t2\ E^2)}$

t0 : 0.3162
t1 : 0.001381
t2 : 4.614E-7

I.34 RRR—Particulate version

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 72650797 CTBT_IDC
REF_ID 714212835
DATA_TYPE RRR
                              IDC GENERATED REPORT
                           REVIEWED RADIONUCLIDE REPORT
                               Particulate Version

                        Creation Date: 2022/05/13 10:04:11
                  Sample Arrival Time: 2022/05/12 22:03:35
    Time difference from receipt of raw data to report creation: 12 hours

SAMPLE INFORMATION ======================================================

Station ID:          AUP04               Detector ID:        AUP04_005
Authenticated:       YES

Station Location: Melbourne, VIC, Australia
Detector Description: Detector 05 at AUP04

Sample ID:              6710514          Sample Geometry:    50mmX4.5mm
Sample Quantity:       22045.00 m3       Sample Type:        Particulate


Collection Start:    2022/05/09 23:04    Sampling Time:        24.29 hours
Collection Stop:     2022/05/10 23:22    Decay Time:           23.98 hours
Acquisition Start:   2022/05/11 23:21    Acquisition Time:     22.69 hours
Acquisition Stop:    2022/05/12 22:02    Avg Flow Rate:       907.58 m3/hr

Collection Station Comments:
------ UTC: 2022/05/12 21:21:02 ------
Sys Log: Archiving Spc email
------ UTC: 2022/05/12 22:03:00 ------
Sys Log: Spectrum Acquisition Complete
------ UTC: 2022/05/12 22:03:00 ------
Sys Log: Archiving spectrum.spm


IDC Analysis General Comments:
IDC 2022/05/13 10:04:11





MEASUREMENT CATEGORIZATION ==============================================

Categorization Legend
---------------------
Level 1  =  Typical Background Rad. Meas.
Level 2  =  Anomalous Background Rad. Meas.
Level 3  =  Typical Anthropogenic Rad. Meas.
Level 4  =  Anomalous Anthropogenic Rad. Meas.
Level 5  =  Mult. Anomalous Anthropogenic Rad. Meas.

Spectrum Category (1) -- Typical Background Rad. Meas.



ACTIVITY SUMMARY ========================================================

NATURAL RADIOACTIVITY:

Nuclides Identified and not Quantified:

K-40, PB-206, PB-210, TH-234


Nuclides Quantified:
```

```

Nuclide            Half-Life           Conc(uBq/m3)        RelErr(%)
    Activ(uBq)          RelErr(%)

BE-7               53.290 D              1.94E+03          2.34
    4.20E+07            2.34
PB-212F            10.64 H               3.12E+05          2.01
    7.24E+08            2.01

ACTIVATION-PRODUCT RADIOACTIVITY:

Nuclide            Half-Life           Conc(uBq/m3)        RelErr(%)
    Activ(uBq)          RelErr(%)      Coincidence

None Found

FISSION-PRODUCT RADIOACTIVITY:

Nuclide            Half-Life           Conc(uBq/m3)        RelErr(%)
    Activ(uBq)          RelErr(%)      Coincidence

None Found

MINIMUM DETECTABLE CONCENTRATION FOR KEY NUCLIDES =======================

Nuclide            Half-Life              MDC(uBq/m3)         MDA(uBq)

BA-140             12.752 D                 2.36E+01            4.79E+05
CE-143             1.377 D                  2.30E+01            2.40E+05
CS-134             2.062 Y                  6.32E+00            1.39E+05
CS-136             13.160 D                 8.49E+00            1.73E+05
CS-137             30.100 Y                 5.96E+00            1.31E+05
I-131              8.040 D                  6.67E+00            1.29E+05
I-133              20.87 H                  2.63E+01            1.79E+05
MO-99              2.748 D                  6.59E+01            9.96E+05
NB-95              34.970 D                 5.22E+00            1.12E+05
RU-103             39.260 D                 5.32E+00            1.14E+05
TE-132             3.204 D                  6.17E+00            9.84E+04
ZR-95              64.020 D                 9.31E+00            2.02E+05
ZR-97              16.900 H                 3.35E+01            1.75E+05


PEAK SEARCH RESULTS =====================================================

      80 peaks found in spectrum by automated peak search.
      72 peaks associated with nuclides by automated processing.
       8 peaks not associated with nuclides by automated processing.
      90 percent of peaks were associated with nuclides.

 Note: "*" indicates that a peak was a component of a multiplet.

 Energy (keV)  Centroid  Width  FWHM (keV)  Eff (%)      Area     Bkgnd (%)  RelErr
    (%)    Nuclide    Nts

       29.80     86.60      3        0.87    23.28      1103.95       0.00
           19.65     PB-212F
       35.00    101.84      3        0.87    23.56       664.11       0.00
           32.53                 1
       39.76    115.76      3        0.88    23.79     80145.27       0.00
           0.44     PB-212F
                                                  ⋮
     2687.38   7874.52      9        3.21     1.93      3779.35       0.00
         2.06     PB-212F
     2699.35   7909.64      9        3.22     1.92       427.95       0.00
         13.58     PB-212F
      670.00   1961.64      4        1.59     5.92       584.86       0.00
          4.13     PB-212F    10

SPECTRAL-REGION-OF-INTEREST (SROI) EDITING =============================

Nuclide ID Changes:
```

```
   Average Concentration Differences: none
   Nuclides Entering:
        Name      Average Conc (uBq/m3)  RelErr (%)
        BE-7      1944.93                2.34
        K-40      17.28                  69.90
        PB-206    6.00                   57.97
        PB-210    647.88                 2.65
        PB-212F   311905.10              2.01
        TH-234    7362.83                1.17

   Nuclides Leaving: none



PEAK SEARCH NOTES =====================================================

NOTE 1:
Date Entered: 2022/05/13 10:02:35
Analyst: IDC
False peak detection; Type I error in peak processing.

====================================================================

NOTE 2:
Date Entered: 2022/05/13 10:02:20
Analyst: IDC
False peak detection; Type I error in peak processing.

====================================================================

```

⋮

```

====================================================================

NOTE 9:
Date Entered: 2022/05/13 10:03:26
Analyst: IDC
PB-212F nuclide identity provided during review

====================================================================

NOTE 10:
Date Entered: 2022/05/13 10:03:31
Analyst: IDC
This peak was inserted to correct a perceived missed-peak error in automatic
processing (based on a nominal risk level of 0.001 per cent)

Date Entered: 2022/05/13 10:03:38
Analyst: IDC
PB-212F nuclide identity provided during review

====================================================================


PROCESSING PARAMETERS ==================================================

Risk level K:                     4.26489
Baseline algorithm:               Smoothing / Lawn Mowers
Nucl Id Detectability Threshold: 0.2
Energy Id Tolerance:              0.8 + 0 * FWHM
Background subtraction:           YES
Background spectrum ID:           6577190
Background data type:             blank
Background acquisition start:     2022/02/07 22:38
Background acquisition time:      72 hours
IRF for Pb-212F:                  YES

CALIBRATION PARAMETERS ======================================================

SAreaThreshold:              100
Confidence level:            95
```

```
ECR updated:                YES
RER updated:                YES
Used ECR:                   CMD
Used RER:                   CMD

DATA TIMELINESS AND AVAILABILITY FLAGS =================================

Previous Sample Present?                                YES
Collection time within 24 hours +/- 10%?                YES
Acquisition time >= 20 hours?                           YES
Decay time <= 24 hours?                                 YES
Sample received within 72 hours of collect start?       YES

DATA QUALITY FLAGS =====================================================

Name                           Pass/Fail  Value           Test

Ba140_MDC                      PASS       23.5646         <30
K40_LocationDifference         PASS       0.194824        <3*std deviation
Be7_FWHM                       PASS       1.39927         <1.7
FlowRate                       PASS       907.575         >500

EVENT SCREENING FLAGS ==================================================

     Activation Products present in this spectrum                 No

     Only one fission product in spectrum                         No

     2 or more fission products in spectrum                       No

     Cs-137 present in spectrum                                   No



CALIBRATION EQUATIONS ==================================================

Energy vs. Channel

        E(c) = 0.2271 + 0.3415*c - 3.222E-08*c^2

                E = energy (keV)
                c = channel number


Resolution vs. Energy

        FWHM(E) = SQRT(0.67+0.002494*E+4.089e-07*E^2)

                FWHM = Full Width Half Max (keV)
                E = energy (keV)


Efficiency vs. Energy

        VGSL pairs
                 Energy     Efficiency    Uncertainty
                     40          0.238        0.00297
                     50          0.242         0.0043
                     60          0.243        0.00528
```

⋮

```
                   2300         0.0221       0.000384
                   2380         0.0217       0.000379
                   2450         0.0211       0.000373

 FIELD OF REGARD =====================================================

https://swp.ctbto.org/FOR/AUP04/2022/05/11
STOP
```

I.35 SAMPLEPHD—Noble gas version

I.35.1 SAMPLEPHD—β-γ coincidence data version

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68558648 CTBT_IDC
REF_ID 714212835
DATA_TYPE SPHDF
#Header 3
AUX04 AUX04_003 B GEOMETRY          FULL
04202111302311X
AUX04_003-2021/12/01-18:43      AUX04_003-2015/09/17-01:24
    AUX04_003-2021/12/01-06:43
2021/12/02 05:53:20.1
#Comment
Using Pixie electronics v. 2.43.
Produced by SAUNA_PHDAQ with program version 1.0.12.3.
GC:LL333:2960
Coincidence spectrum set to zero counts where gamma or beta channel is zero.

 The upgraded SAUNA II System AUX04 in Melbourne, Australia


#Collection
2021/11/30 23:32:21.6 2021/12/01 11:32:18.2 14.920163
#Acquisition
2021/12/01 18:43:18.0 40201.886000   40190.260000
#Processing
0.99102  0.09910
0.85303  0.12064
01
#Calibration
2014/09/17 16:46:00.0
#g_Energy
32.860000        12.717500        0.050000
661.657000       228.899000       0.050000
121.782000       45.593100        0.050000
344.279000       124.528000       0.050000
59.541000        22.661500        0.050000
#b_Energy
81.606000        C 27.775600        0.050000
97.124000        C 33.752700        0.050000
```

⋮

```
379.449000       C 131.962000       0.050000
393.705000       C 136.392000       0.050000
#g_Resolution
32.860000        7.043420         0.314187
661.657000       53.292500        0.374654
121.782000       12.913400        0.321525
344.279000       28.483000        0.341482
59.541000        8.785120         0.316353
#b_Resolution
81.606000        27.905200        0.303536
97.124000        30.495000        0.306615
```

⋮

```
379.449000       60.111900        0.375997
393.705000       60.504800        0.380343
#g_Efficiency
31.630000        0.638800         0.004400
80.980000        0.743100         0.009100
123.000000       0.767000         0.050000
165.000000       0.723000         0.050000
208.000000       0.679000         0.050000
249.800000       0.649000         0.004400
#ROI_Limits
1  13.91920   581.53500  319.58000  386.58800
2  13.91920   869.35100  211.51700  279.39500
3  13.91920   357.36600  65.84220   98.33980
```

```
4  13.91920   395.67500  20.26630   41.64720
5  87.36280   150.90400  20.26630   41.64720
6  178.20200  266.30200  20.26630   41.64720
7  13.91920   79.60350   20.26630   41.64720
8  275.13200  395.67500  20.26630   41.64720
9  178.20200  395.67500  20.26630   41.64720
10 13.91920   150.90400  20.26630   41.64720
#b-gEfficiency
XE-135     2        0.609100   0.006600
XE-133     3        0.737800   0.012900
XE-133     4        0.706900   0.007800
XE-131m    5        0.638600   0.006700
XE-133m    6        0.645800   0.006800
XE-1337    7        0.211000   0.003300
XE-1338    8        0.037500   0.001000
XE-1339    9        0.191100   0.003000
XE-13310   10       0.451900   0.006300
#Ratios
PB214_352:242    1  2   0.568960    0.0051
PB214_352:80     1  3   0.392630    0.0039
PB214_352:30_4   1  4   0.072210    0.0015
PB214_352:30_5   1  5   0.009510    0.0005
PB214_352:30_6   1  6   0.017700    0.0007
PB214_352:30_7   1  7   0.009180    0.0005
PB214_352:30_8   1  8   0.027260    0.0009
PB214_352:30_9   1  9   0.047230    0.0012
PB214_352:30_10  1  10  0.020030    0.0008
XE133-1_81:30    3  4   0.045100    0.0451
XE133-2_81:30    3  5   0.379610    0.0001
XE133-3_81:30    3  6   0.269800    0.0001
XE133-7_81:30    3  7   0.033030    0.0330
XE133-8_81:30    3  8   0.000640    0.0006
XE133-9_81:30    3  9   0.004450    0.0045
XE133-10_81:30   3  10  0.039220    0.0392
#g_Spectrum
256   749
0     3          1024       7515       5938       4291
5     3694       3399       2547       2092       2037
                                   ⋮
250   523        522        498        525        510
255   468
#b_Spectrum
256   875
0     1          3          32         64         55
5     62         63         50         54         54
                                   ⋮
250   22         20         33         25         27
255   25
#Histogram
256   256   749  875
                                   ⋮
STOP
```

I.35.2 SAMPLEPHD—HPGe data version

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 73027467 CTBT_IDC
REF_ID 714212835
DATA_TYPE SPHDF
#Header 3
CAX16 CAX16_002 G CELLULE_GAZ       FULL
16202205231311G
CAX16_002-2022/05/24-15:05:18.0 0
2022/05/25 13:30:26.0
#Comment
Yellowknife
#Collection
2022/05/23 13:42:13.0 2022/05/24 13:42:13.0 65.541
#Acquisition
2022/05/24 15:05:18.0 80463.30       80387.67
#Processing
5.70207  0.17106
0        0
2
#g_Spectrum
16384 2000
0     0          0          0          0          0
5     0          0          0          0          0
10    0          0          0          0          0
                                                 ⋮
605   19         27         15         18         30
610   39         51         64         64         66
615   66         66         46         33         20
620   14         18         17         14         15
625   15         26         36         32         42
                                                 ⋮
16370 0          0          1          1          1
16375 1          0          1          0          1
16380 0          0          0          0          0
#g_Energy
22.076           182.880         0.00747
33.236           274.746         0.05289
46.539           382.780         0.01231
                                                 ⋮
391.688          3209.502        0.01722
513.990          4211.776        0.03680
661.657          5421.527        0.03184
#g_Resolution
22.076           0.627           0.00181
33.236           0.735           0.01348
46.539           0.631           0.00294
                                                 ⋮
391.688          1.046           0.00396
513.990          1.135           0.00860
661.657          1.317           0.00752
#g_Efficiency
22.076           0.18396         0.00868
33.236           0.19422         0.01040
46.539           0.23701         0.00973
                                                 ⋮
391.688          0.06302         0.00248
513.990          0.04451         0.00157
661.657          0.03553         0.00145
STOP
```

I.36 SAMPLEPHD—Particulate systems

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68558763 CTBT_IDC
REF_ID 714212835
DATA_TYPE SPHDF
#Header 3
AUP09 AUP09_007 P 50mmX4.5mmDisk    FULL
09202111300611
AUP09_007-2021/12/02-06:37:11.0 AUP09_007-2021/06/28-01:06:00.0 0
2021/12/03 05:07:00
#Comment
------ UTC: 2021/12/03 04:37:02 ------
Sys Log: Archiving Spc email
------ UTC: 2021/12/03 05:07:00 ------
Sys Log: Spectrum Acquisition Complete
------ UTC: 2021/12/03 05:07:00 ------
Sys Log: Archiving spectrum.spm
#Collection
2021/11/30 06:05:34   2021/12/01 06:13:26   20707
#Sample
5.00  0.50
#Acquisition
2021/12/02 06:37:11   80954          80676
#Calibration
2019/10/04 05:38:09
#g_Energy
59.541000        173.420000       0
88.034000        256.770000       0
122.061000       356.290000       0
⋮
1332.492000      3899.160000      0
1836.052000      5373.300000      0
2505.740000      7333.660000      0
#g_Resolution
59.541000        0.897000         0
88.034000        0.895000         0
122.061000       0.945000         0
⋮
1332.492000      2.186000         0
1836.052000      2.576000         0
2505.740000      3.000000         0
#g_Efficiency
59.541000        0.005500         0.000140
88.034000        0.059700         0.001220
122.061000       0.115200         0.002030
⋮
1173.228000      0.039900         0.000730
1332.492000      0.035500         0.000650
1836.052000      0.029400         0.000530
#g_Spectrum
8192  2800
1     0          0          0          0          0
6     0          0          0          0          0
11    0          0          0          0          0
⋮
8181  43         43         25         29         45
8186  29         32         39         38         37
8191  15         0
STOP
```

I.37 SSREB—Noble gas systems

The SSREB for noble gas have the same format for β-γ coincidence and HPGe systems

I.37.1 Plain text format

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 73003633 CTBT_IDC
REF_ID 24163264
TIME_STAMP 2022/06/02 13:14:52
IDC Generated Report
STANDARD SCREENED RADIONUCLIDE EVENT BULLETIN

Creation Date: 2022-05-27 09:08:24
Time Difference Between Receipt of Raw Data and Creation Date:  8 h 14 m 17.0 s

Fission Product ID: 12539       Authenticated: YES

EVENT DETECTION SUMMARY
--------------------------------------------------------------------------------

Sample Information
--------------------------------------------------------------------------------

Station ID:             AUX04
Detector Code:          AUX04_005
Sample ID:              6731183
Sample Reference ID:    04202205251811X
Collection Stop:        2022-05-26 06:31:48

Measurement Categorization
--------------------------------------------------------------------------------

Isotope category

Isotope Nuclide detected        Abnormal threshold (mBq/m3)     Categorization comment
Xe-131m NO      1.58E-01        Below detection threshold
Xe-133m NO      1.36E-01        Below detection threshold
Xe-133  YES     5.12E-01        Abnormal xenon concentration
Xe-135  NO      8.84E-01        Below detection threshold

Sample Category: C - Abnormal xenon concentration
```

```

Event Screening Flags
-------------------------------------------------------------------------------

Name                                            YES/NO/Value
Number of days since last xenon detection       0
2 or more xenon isotopes present in this sample NO
Xe-133 present in this sample                   YES
Number of times Xe-133 seen in last 365 days    108
Short term flag                                 c - Abnormal xenon concentration

Isotopic Ratio  Value   YES/NO  Test
Xe-133m/131m    0.84    NO      Xe-133m/131m > 2
Xe-135/133      1.16    NO      Xe-135/133 > 5
Xe-133m/133     0.31    NO      Xe-133m/133 > 0.3
Xe-133/131m     2.67    NO      Xe-133/131m > 1000

ENHANCED FIELD OF REGARD
-------------------------------------------------------------------------------

CERTIFIED LABORATORY RESULTS
-------------------------------------------------------------------------------

ADDITIONAL INFORMATION
-------------------------------------------------------------------------------
TIME_STAMP 2022/06/02 13:14:52
STOP
```

I.37.2 HTML format

IDC Generated Report
STANDARD SCREENED RADIONUCLIDE EVENT BULLETIN

Creation Date: 2022-05-27 09:08:23
Time Difference Between Receipt of Raw Data and Creation Date: 8 h 14 m 16.0 s

Fission Product ID: 12538 Authenticated: YES

EVENT DETECTION SUMMARY

Sample Information

Station ID:	AUX04
Detector Code:	AUX04_005
Sample ID:	6731183
Sample Reference ID:	04202205251811X
Collection Stop:	2022-05-26 06:31:48

Measurement Categorization

Isotope category

Isotope	**Nuclide detected**	**Abnormal threshold** *(mBq/m3)*	**Categorization comment**
Xe-131m	NO	1.58E-01	Below detection threshold
Xe-133m	NO	1.36E-01	Below detection threshold
Xe-133	YES	5.12E-01	Abnormal xenon concentration
Xe-135	NO	8.84E-01	Below detection threshold

Sample Category: C - Abnormal xenon concentration

Event Screening Flags

Name	**YES/NO/Value**
Number of days since last xenon detection	0
2 or more xenon isotopes present in this sample	NO
Xe-133 present in this sample	YES
Number of times Xe-133 seen in last 365 days	108
Short term flag	c - Abnormal xenon concentration

Isotopic Ratio	**Value**	**YES/NO**	**Test**
Xe-133m/131m	0.84	NO	Xe-133m/131m > 2
Xe-135/133	1.16	NO	Xe-135/133 > 5
Xe-133m/133	0.31	NO	Xe-133m/133 > 0.3
Xe-133/131m	2.67	NO	Xe-133/131m > 1000

ENHANCED FIELD OF REGARD

CERTIFIED LABORATORY RESULTS

ADDITIONAL INFORMATION

I.38 SSREB—Particulate version

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 72650394 CTBT_IDC
REF_ID 714212835
DATA_TYPE SSREB
                              IDC GENERATED REPORT
                 STANDARD SCREENED RADIONUCLIDE EVENT BULLETIN

                      Creation Date: 2022/03/01 14:19:36

     Time Difference Between Receipt of Raw Data and Creation Date: 9 hours


               Fission Product ID: 12340     Authenticated: YES



EVENT DETECTION SUMMARY ========================================================

     Station    Collect Stop         Sample ID  Name       Categorization Comment
     -------    ------------         ---------  ----       ----------------------
     AUP09      2022/02/27 06:11:23  6604185    CO-60      Not Regularly Measured


     Activation Products present in this spectrum                  Yes
          Number of days since last activation product             18

     Only one fission product in spectrum                          No

     2 or more fission products in spectrum                        No

     Cs-137 present in spectrum                                    No


ENHANCED FIELD OF REGARD =======================================================

    https://swp.ctbto.org/FOR/AUP09/2022/02/27

CERTIFIED LABORATORY RESULTS ===================================================

ADDITIONAL INFORMATION =========================================================

STOP
```

I.39 STATION

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68531352 CTBT_IDC
REF_ID 111111
DATA_TYPE STATION IMS2.0
Net        Sta    Type  Latitude  Longitude Coord Sys     Elev   On Date   Off Date
           AAK          42.63910   74.49420                1.645 2007/03/06
           ABKT         37.93040   58.11890                0.678 1993/04/25
           AFI         -13.90930 -171.77730                0.706 2004/11/29
           BR101        39.72540   33.63910                1.438 2000/01/07 2004/03/22
                                                                     ⋮
           BR131        39.72500   33.63900                1.440 2003/02/10 2017/02/13
           BR131        39.72500   33.63900                1.440 2017/02/14
           BRTR         39.72500   33.63900                1.440 2003/02/10
STOP
```

I.40 STA_STATUS

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68531118 CTBT_IDC
REF_ID 666666
DATA_TYPE STA_STATUS IMS2.0
Report period from 2021/12/01 00:00:00.0 to 2021/12/02 00:00:00.0
Station Status
Sta   Max_Exp_Time   ______________ Minimum Channels _______________ ____________ Geophysical Channels _____________
                          Data          Timely Data      Mission         Data           Data            Data
                      Availability    Availability   Capability (%)  Received (%)   Availability    Availability
                          (%)             (%)                                     Unauthenticated       (%)
                                                                                        (%)
MJAR  0001 00:00:00     95.988          95.899          38.576          84.707         84.707          84.695
MKAR  0001 00:00:00    100.000         100.000         100.000         100.000        100.000          91.667
ZALV  0001 00:00:00     99.273          99.273          92.211          99.995         99.995          91.000
MAW   0001 00:00:00      0.000           0.000           0.000         100.000         99.999           0.000
H01W  0001 00:00:00    100.000         100.000         100.000         100.000        100.000         100.000
                                                                     ⋮
MDT   0000 00:16:21      0.000           0.000           0.000         100.000        100.000           0.000
MLR   0000 01:18:49     99.741          99.741          99.233         100.000         99.741          99.741
MMAI  0000 20:43:02     99.998          99.998          99.972          99.996         99.996          99.991
MSKU  0000 00:00:00      0.000           0.000           0.000           0.000          0.000           0.000
MSVF  0000 08:58:20    100.000         100.000         100.000         100.000        100.000         100.000

STOP
```

I.41 WAVEFORM (IMS2.0:cm6 format)

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68607321 CTBT_IDC
REF_ID 123454321
DATA_TYPE WAVEFORM IMS2.0:CM6
WID2 2021/12/01 12:00:00.000 FIA0  SHZ      CM6    48000   40.000000   2.58e-03
    0.333 S-13    -1.0  0.0
STA2 FINES      61.44363   26.07713 WGS-84       0.150 0.000
DAT2
YYNob+m-Z2UE2WNlGWArBQXToLePl0uJkGYTXRu1n5aCbCpRpNZKrQaHY7r0UEW+V2VCaDw-0XDmJcBq
BYAYJlIkMqJZ3lKoScIoPlGYHo6aGt2XEf0uKWNu-W+UlSq2m0lQkTaRkEl2VMn0lHWHUFLaBpRp3V1o
AaLoMnIbTURuCVHg3p0qNlMb0l-VGV7o5V-l1a3pQV1lAWAb9xEWKW3SW5m1kFkFb9l0t-VNWNrJUMbP
o9l+IUGeHy8qSjRlEICn0X8W3pIW9Y4m0V7m4WGlNmSYBm8mNW1W0p74XCn1WNp+XFXQvPUl0V5y5dPq
Ia3YEw4c-q9lHZ0rReQWJy8bJWKs1bSo1ZMYBz2bLb7oBlDX9q40VCoId1lMr-kMWSMVIm3VEZQu-LlG
                                        ⋮
p6ULVQW1l5oEXAIV5VLlFX7n-m3VSo+kSZ9W6p+YKVGoAZ9oDoDkLnCY3YPnPV3bDlGs9AZSUEVCq8a+
lLq+i1u+VCZ6pQZMlFl0kSVSVGmFm7V9V1l+V0DmNm6WImDW8l8UPZRy+Sd0W+WHmIlQV4lQm+b4m+V0
lDr7Z0mJZ5mFl6XCrCaHr5kSUFo0dPnTXMkSpLY7UJV5o11X9XKG4l8kHW3rPX2Z0W6m0oBW8TV10Y-p
TKd3nPnIm4V6m-b0nHv+c5WMV1r5VMYD0V0pFb3rEVFe-tPX2lA1lFlNZ3qSbEkHkKX-oNbSr9nSX1d7
nQuKh1r8W7VCvTXQUNl4l-X3kJVRnElKbLq9lI3XJZLuClNg7n4oAW9FW1m9VSmE-MnLW9
CHK2 45455954
STOP
```

I.42 WAVEFORM (IMS2.0:int format)

```
BEGIN IMS2.0
MSG_TYPE DATA
MSG_ID 68607455 CTBT_IDC
REF_ID 123454321
DATA_TYPE WAVEFORM IMS2.0:INT
WID2 2021/12/01 12:00:00.000 FIA0  SHZ      INT    48000   40.000000   2.58e-03
    0.333 S-13    -1.0  0.0
STA2 FINES      61.44363   26.07713 WGS-84       0.150 0.000
DAT2
4249 4178 4042 4070 4114 4162 4299 4386 4549 4475 4389 4430 4320 4557 4760
4622 4466 4469 4597 4402 4104 4012 4158 4115 3887 3841 3543 3456 3506 3306
3122 3002 2918 2880 3049 2833 2607 2492 2292 2361 2225 2229 2382 2483 2560
2424 2453 2428 2245 2338 2276 2164 2199 2098 2207 2024 1953 2260 2225 2279
2012 1809 2180 2355 2440 2465 2459 2674 2873 3036 3255 3376 3446 3599 3769
                                        ⋮
-873 -871 -781 -656 -762 -812 -719 -636 -519 -579 -410 -481 -503 -204 -220
-136 -96 -53 -59 -122 -20 -140 -20 81 160 336 359 636 678 594 609 921 1109
955 1220 1251 1355 1505 1272 1163 1079 957 802 748 673 659 533 353 420 284
96 -87 -153 -36 -253 -527 -408 -391 -514 -562 -611 -593 -650 -645 -720 -794
-876 -1077 -1203
CHK2 45455954
STOP
```

Appendix II

Codes

This appendix contains codes used in *VDMS* messages and includes the following topics:

II.1 Country codes

Table 167. Country codes according to ISO 3166 (1997)

Country	2-letter code	3-letter code
Afghanistan	AF	AFG
Albania	AL	ALB
Algeria	DZ	DZA
Andorra	AD	AND
Angola	AO	AGO
Antigua and Barbuda	AG	ATG
Argentina	AR	ARG
Armenia	AM	ARM
Australia	AU	AUS
Austria	AT	AUT
Azerbaijan	AZ	AZE

Continues on next page

Table 167. Country codes according to ISO 3166 (cont.)

Country	2-letter code	3-letter code
Bahamas	BS	BHS
Bahrain	BH	BHR
Bangladesh	BD	BGD
Barbados	BB	BRB
Belarus	BY	BLR
Belgium	BE	BEL
Belize	BZ	BLZ
Benin	BJ	BEN
Bhutan	BT	BTN
Bolivia, Plurinational State of	BO	BOL
Bosnia and Herzegovina	BA	BIH
Botswana	BW	BWA
Brazil	BR	BRA
Brunei Darussalam	BN	BRN
Bulgaria	BG	BGR
Burkina Faso	BF	BFA
Burundi	BI	BDI
Cabo Verde	CV	CVP
Cambodia	KH	KHM
Cameroon	CM	CMR
Canada	CA	CAN
Central African Republic	CF	CAF
Chad	TD	TCD
Chile	CL	CHL
China	CN	CHN
Colombia	CO	COL
Comoros	KM	COM
Congo	CG	COG
Cook Islands	CK	COK
Costa Rica	CR	CRI
Côte d'Ivoire	CI	CIV
Croatia	HR	HRV
Cuba	CU	CUB
Cyprus	CY	CYP
Czechia	CZ	CZE
Democratic People's Republic of Korea	KP	PRK
Democratic Republic of the Congo	CD	COD
Denmark	DK	DNK

Continues on next page

Table 167. Country codes according to ISO 3166 (cont.)

Country	**2-letter code**	**3-letter code**
Djibouti	DJ	DJI
Dominica	DM	DMA
Dominican Republic	DO	DOM
Ecuador	EC	ECU
Egypt	EG	EGY
El Salvador	SV	SLV
Equatorial Guinea	GQ	GNQ
Eritrea	ER	ERI
Estonia	EE	EST
Eswatini	SZ	SWZ
Ethiopia	ET	ETH
Fiji	FJ	FJI
Finland	FI	FIN
France	FR	FRA
Gabon	GA	GAB
Gambia	GM	GMB
Georgia	GE	GEO
Germany	DE	DEU
Ghana	GH	GHA
Greece	GR	GRC
Grenada	GD	GRD
Guatemala	GT	GTM
Guinea	GN	GIN
Guinea-Bissau	GW	GNB
Guyana	GY	GUY
Haiti	HT	HTI
Holy See	VA	VAT
Honduras	HN	HND
Hungary	HU	HUN
Iceland	IS	ISL
India	IN	IND
Indonesia	ID	IDN
Iran, Islamic Republic of	IR	IRN
Iraq	IQ	IRQ
Ireland	IE	IRL
Israel	IL	ISR
Italy	IT	ITA
Jamaica	JM	JAM

Continues on next page

Table 167. Country codes according to ISO 3166 (cont.)

Country	2-letter code	3-letter code
Japan	JP	JPN
Jordan	JO	JOR
Kazakhstan	KZ	KAZ
Kenya	KE	KEN
Kiribati	KI	KIR
Kuwait	KW	KWT
Kyrgyzstan	KG	KGZ
Lao People's Democratic Republic	LA	LAO
Latvia	LV	LVA
Lebanon	LB	LBN
Lesotho	LS	LSO
Liberia	LR	LBR
Libya	LY	LBY
Liechtenstein	LI	LIE
Lithuania	LT	LTU
Luxembourg	LU	LUX
Madagascar	MG	MDG
Malawi	MW	MWI
Malaysia	MY	MYS
Maldives	MV	MDV
Mali	ML	MLI
Malta	MT	MLT
Marshall Islands	MH	MHL
Mauritania	MR	MRT
Mauritius	MU	MUS
Mexico	MX	MEX
Micronesia, Federated States of	FM	FSM
Monaco	MC	MCO
Mongolia	MN	MNG
Montenegro	ME	MNE
Morocco	MA	MAR
Mozambique	MZ	MOZ
Myanmar	MM	MMR
Namibia	NA	NAM
Nauru	NR	NRU
Nepal	NP	NPL
Netherlands	NL	NLD
New Zealand	NZ	NZL

Continues on next page

Table 167. Country codes according to ISO 3166 (cont.)

Country	2-letter code	3-letter code
Nicaragua	NI	NIC
Niger	NE	NER
Nigeria	NG	NGA
Niue	NU	NIU
North Macedonia	MK	MKD
Norway	NO	NOR
Oman	OM	OMN
Pakistan	PK	PAK
Palau	PW	PLW
Panama	PA	PAN
Papua New Guinea	PG	PNG
Paraguay	PY	PRY
Peru	PE	PER
Philippines	PH	PHL
Poland	PL	POL
Portugal	PT	PRT
Qatar	QA	QAT
Republic of Korea	KR	KOR
Republic of Moldova	MD	MDA
Romania	RO	ROU
Russian Federation	RU	RUS
Rwanda	RW	RWA
Saint Kitts and Nevis	KN	KNA
Saint Lucia	LC	LCA
Saint Vincent and the Grenadines	VC	VCT
Samoa	WS	WSM
San Marino	SM	SMR
Sao Tome and Principe	ST	STP
Saudi Arabia	SA	SAU
Senegal	SN	SEN
Serbia	RS	SRB
Seychelles	SC	SYC
Sierra Leone	SL	SLE
Singapore	SG	SGP
Slovakia	SK	SVK
Slovenia	SI	SVN
Solomon Islands	SB	SLB
Somalia	SO	SOM

Continues on next page

Table 167. Country codes according to ISO 3166 (cont.)

Country	2-letter code	3-letter code
South Africa	ZA	ZAF
Spain	ES	ESP
Sri Lanka	LK	LKA
Sudan	SD	SDN
Suriname	SR	SUR
Sweden	SE	SWE
Switzerland	CH	CHE
Syrian Arab Republic	SY	SYR
Tajikistan	TJ	TJK
Thailand	TH	THA
Timor-Leste	TL	TLS
Togo	TG	TGO
Tonga	TO	TON
Trinidad and Tobago	TT	TTO
Tunisia	TN	TUN
Turkey	TR	TUR
Turkmenistan	TM	TKM
Tuvalu	TV	TUV
Uganda	UG	UGA
Ukraine	UA	UKR
United Arab Emirates	AE	ARE
United Kingdom of Great Britain and Northern Ireland	GB	GBR
United Republic of Tanzania	TZ	TZA
United States of America	US	USA
Uruguay	UY	URY
Uzbekistan	UZ	UZB
Vanuatu	VU	VUT
Venezuela, Bolivarian Republic of	VE	VEN
Viet Nam	VN	VNM
Yemen	YE	YEM
Zambia	ZM	ZMB
Zimbabwe	ZW	ZWE

II.2 Radionuclide station codes

Table 168, Table 169 and Table 170 provide the station codes for all particulate stations, tentative noble gas stations, and certified labs, respectively.

Table 168. Radionuclide particulate station codes

Station code	Treaty number	Country	Location
ARP01	RN01	Argentina	Buenos Aires
ARP02	RN02	Argentina	Salta
ARP03	RN03	Argentina	Bariloche
AUP04	RN04	Australia	Melbourne, VIC
AUP05	RN05	Australia	Mawson, Antarctica
AUP06	RN06	Australia	Townsville, QLD
AUP07	RN07	Australia	Macquarie Island
AUP08	RN08	Australia	Cocos Islands
AUP09	RN09	Australia	Darwin, NT
AUP10	RN10	Australia	Perth, WA
BRP11	RN11	Brazil	Rio de Janeiro
BRP12	RN12	Brazil	Recife
CMP13	RN13	Cameroon	Douala
CAP14	RN14	Canada	Vancouver, BC
CAP15	RN15	Canada	Resolute, NWT
CAP16	RN16	Canada	Yellowknife, NT
CAP17	RN17	Canada	St. John’s, NL
CLP18	RN18	Chile	Punta Arenas
CLP19	RN19	Chile	Hanga Roa, Easter Island
CNP20	RN20	China	Beijing
CNP21	RN21	China	Lanzhou
CNP22	RN22	China	Guangzhou
CKP23	RN23	Cook Islands	Rarotonga
ECP24	RN24	Ecuador	Isla San Cristóbal, Galápagos Islands
ETP25	RN25	Ethiopia	Filtu
FJP26	RN26	Fiji	Nadi
FRP27	RN27	France	Papeete, Tahiti
FRP28	RN28	France	Pointe-á-Pitre, Guadeloupe
FRP29	RN29	France	Reunion
FRP30	RN30	France	Port-aux-Français, Kerguelen
FRP31	RN31	France	Cayanne, French Guiana
FRP32	RN32	France	Dumont d’Urville, Antarctica

Continues on next page

Table 168. Radionuclide particulate station codes (cont.)

Station code	Treaty number	Country	Location
DEP33	RN33	Germany	Schauinsland/Freiburg
ISP34	RN34	Iceland	Reykjavik
IRP36	RN36	Iran, Islamic Republic of	Tehran
JPP37	RN37	Japan	Okinawa
JPP38	RN38	Japan	Takasaki, Gunma
KIP39	RN39	Kiribati	Kiritimati
KWP40	RN40	Kuwait	Kuwait City
LYP41	RN41	Libya	Misratah
MYP42	RN42	Malaysia	Kuala Lumpur
MRP43	RN43	Mauritania	Nouakchott
MXP44	RN44	Mexico	Baja California
MNP45	RN45	Mongolia	Ulaanbaatar
NZP46	RN46	New Zealand	Chatham Island
NZP47	RN47	New Zealand	Kaitaia
NEP48	RN48	Niger	Bilma
NOP49	RN49	Norway	Spitsbergen
PAP50	RN40	Panama	Panama City
PGP51	RN51	Papua New Guinea	New Hanover
PHP52	RN52	Philippines	Quezon City
PTP53	RN53	Portugal	Ponta Delgada, São Miguel, Azores
RUP54	RN54	Russian Federation	Kirov
RUP55	RN55	Russian Federation	Norilsk
RUP56	RN56	Russian Federation	Peleduy
RUP57	RN57	Russian Federation	Bilibino
RUP58	RN58	Russian Federation	Ussuriysk
RUP59	RN59	Russian Federation	Zalesovo
RUP60	RN60	Russian Federation	Petropavlovsk-Kamchatskiy
RUP61	RN61	Russian Federation	Dubna
ZAP62	RN62	South Africa	Marion Island
SEP63	RN63	Sweden	Stockholm
TZP64	RN64	Tanzania, United Republic of	Dar es Salaam
THP65	RN65	Thailand	Bangkok
GBP66	RN66	United Kingdom of Great Britain and Northern Ireland	BIOT/Chagos Archipelago
GBP67	RN67	United Kingdom of Great Britain and Northern Ireland	St. Helena
GBP68	RN68	United Kingdom of Great Britain and Northern Ireland	Tristan de Cunha

Continues on next page

Table 168. Radionuclide particulate station codes (cont.)

Station code	**Treaty number**	**Country**	**Location**
GBP69	RN69	United Kingdom of Great Britain and Northern Ireland	Halley, Antarctica
USP70	RN70	United States of America	Sacramento, California
USP71	RN71	United States of America	Sand Point, Alaska
USP72	RN72	United States of America	Melbourne, Florida
USP73	RN73	United States of America	Palmer Station, Antarctica
USP74	RN74	United States of America	Ashland, Kansas
USP75	RN75	United States of America	Charlottesville, Virginia
USP76	RN76	United States of America	Salchacket, Alaska
USP77	RN77	United States of America	Wake Island
USP78	RN78	United States of America	Midway Islands
USP79	RN79	United States of America	Oahu, Hawaii
USP80	RN80	United States of America	Upi, Guam

Table 169. Radionuclide certified laboratory codes

Laboratory code	Country or state responsible for laboratory	Name and location of laboratory
ARL01	Argentina	National Board of Nuclear Regulation, Buenos Aires
AUL02	Australia	Australian Radiation Laboratory, Melbourne, VIC
ATL03	Austria	Austrian Research Centre, Seibersdorf
BRL04	Brazil	Institute of Radiation Protection and Dosimetry, Rio de Janeiro
CAL05	Canada	Health Canada, Ottawa, Ontario
CNL06	China	Beijing
FIL07	Finland	Centre for Radiation and Nuclear Safety, Helsinki
FRL08	France	Atomic Energy Commission, Montlhéry
ILL09	Israel	Soreq Nuclear Research Centre, Yavne
ITL10	Italy	Laboratory of the National Agency for the Protection of the Environment, Rome
JPP11	Japan	Japan Atomic Energy Research Institute, Tokai, Ibaraki
NZL12	New Zealand	National Radiation Laboratory, Christchurch
RUL13	Russian Federation	Central Radiation Control Laboratory, Ministry of Defence Special Verification Service, Moscow
ZAL14	South Africa	Atomic Energy Corporation, Pelindaba
GBL15	United Kingdom of Great Britain and Northern Ireland	AWE Blacknest, Chilton
USL16	United States of America	McClellan Central Laboratories, Sacramento, California

Table 170. Radionuclide noble gas station codes

Station code	Treaty number	Country	Location
ARG01	RN01	Argentina	Buenos Aires
AUG04	RN04	Australia	Melbourne, VIC
AUG09	RN09	Australia	Darwin, NT
BRG11	RN11	Brazil	Rio de Janeiro
BRG12	RN12	Brazil	Recife
CMG13	RN13	Cameroon	Douala
CAG16	RN16	Canada	Yellowknife, NT
CAG17	RN17	Canada	St. John’s, NL
CLG19	RN19	Chile	Hanga Roa, Easter Island
CNG20	RN20	China	Beijing
CNG21	RN21	China	Lanzhou
CNG22	RN22	China	Guangzhou
ETG25	RN25	Ethiopia	Filtu
FRG27	RN27	France	Papeete, Tahiti
FRG29	RN29	France	Réunion
FRG30	RN30	France	Port-aux-Français, Kerguelen
FRG31	RN31	France	Kourou, French Guiana
FRG32	RN32	France	Dumont d’Urville, Antarctica
DEG33	RN33	Germany	Freiburg
IRG36	RN36	Iran, Islamic Republic of	Tehran
JPG38	RN38	Japan	Takasaki, Gunma
KIG39	RN39	Kiribati	Kiritimati
KWG40	RN40	Kuwait	Kuwait City
MRG43	RN43	Mauritania	Nouakchott
MXG44	RN44	Mexico	Guerrero Negro, Baja California
MNG45	RN45	Mongolia	Ulaanbaatar
NZG46	RN46	New Zealand	Chatham Island
NEG48	RN48	Niger	Bilma
NOG49	RN49	Norway	Spitsbergen
PAG50	RN50	Panama	Panama City
RUG55	RN55	Russian Federation	Norilsk
RUG58	RN58	Russian Federation	Ussuriysk
RUG60	RN60	Russian Federation	Petropavlovsk-Kamchatskiy
RUG61	RN61	Russian Federation	Dubna
ZAG62	RN62	South Africa	Marion Island
SEG63	RN63	Sweden	Stockholm
THG65	RN65	Thailand	Bangkok

Continues on next page

Table 170. Radionuclide noble gas station codes (cont.)

Station code	**Treaty number**	**Country**	**Location**
GBG66	RN66	United Kingdom of Great Britain and Northern Ireland	BIOT/Chagos Archipelago
GBG68	RN68	United Kingdom of Great Britain and Northern Ireland	Tristan de Cuhna
GBG69	RN69	United Kingdom of Great Britain and Northern Ireland	Halley, Antarctica
USG72	RN72	United States of America	Melbourne, Florida
USG73	RN73	United States of America	Palmer Station, Antarctica
USG74	RN74	United States of America	Ashland, Kansas
USG75	RN75	United States of America	Charlottesville, Virginia
USG77	RN77	United States of America	Wake Island
USG79	RN79	United States of America	Oahu, Hawaii

II.3 S/H/I station codes

Table 171, Table 172, Table 173 and Table 174 provide the station codes for all primary seismic, auxiliary seismic, hydroacoustic and infrasonic stations, respectively.

Table 171. Primary seismic station codes

Station code	Treaty number	Country	Location
PLCA	PS01	Argentina	Paso Flores
WRA	PS02	Australia	Warramunga, NT
ASAR	PS03	Australia	Alice Springs, NT
STKA	PS04	Australia	Stephens Creek, NSW
MAW	PS05	Australia	Mawson, Antarctica
LPAZ	PS06	Bolivia, Plurinational State of	La Paz
BDFB	PS07	Brazil	Brasilia
ULM	PS08	Canada	Lac du Bonnet, MB
YKA	PS09	Canada	Yellowknife, NWT
SCHQ	PS10	Canada	Schefferville, Quebec
BGCA	PS11	Central African Republic	Bangui
HILR	PS12	China	Hailar
HIA	PS12	China	Hailar
LZDM	PS13	China	Lanzhou
ROSC	PS14	Colombia	El Rosal
DBIC	PS15	Côte d'Ivoire	Dimbokro
LUXOR	PS16	Egypt	Luxor
FINES	PS17	Finland	Lahti
PPT	PS18	France	Tahiti
GERES	PS19	Germany	Freyung
THR	PS21	Iran, Islamic Republic of	Tehran
MJAR	PS22	Japan	Matsushiro
MKAR	PS23	Kazakhstan	Makanchi
KMBO	PS24	Kenya	Kilimambogo
SONM	PS25	Mongolia	Songino
TORD	PS26	Niger	Torodi
NOA	PS27	Norway	Hamar
ARCES	PS28	Norway	Karasjok
PRPK	PS29	Pakistan	Pari
CPUP	PS30	Paraguay	Villa Florida
KSRS	PS31	Republic of Korea	Wonju
KBZ	PS32	Russian Federation	Khabaz

Continues on next page

Table 171. Primary seismic station codes (cont.)

Station code	**Treaty number**	**Country**	**Location**
ZALV	PS33	Russian Federation	Zalesovo
NRIK	PS34	Russian Federation	Norilsk
PDYAR	PS35	Russian Federation	Peleduy
PETK	PS36	Russian Federation	Petropavlovsk-Kamchatskiy
USRK	PS37	Russian Federation	Ussuriysk
HLBN	PS38	Saudi Arabia	Haleban
BOSA	PS39	South Africa	Boshof
ESDC	PS40	Spain	Sonseca
CMAR	PS41	Thailand	Chiang Mai
KEST	PS42	Tunisia	Kesra
BRMAR	PS43	Turkey	Keskin
BRTR	PS43	Turkey	Keskin
GEYT	PS44	Turkmenistan	Alibeck
AKASG	PS45	Ukraine	Malin
TXAR	PS46	United States of America	Lajitas, TX
NVAR	PS47	United States of America	Mina, NV
PDAR	PS48	United States of America	Pinedale, WY
ILAR	PS49	United States of America	Eielson, AK
VNDA	PS50	United States of America	Vanda, Antarctica

Table 172. Auxiliary seismic station codes

Station code	Treaty number	Country	Location
CFA	AS001	Argentina	Coronel Fontana
USHA	AS002	Argentina	Ushuaia
GNI	AS003	Armenia	Garni
CTA	AS004	Australia	Charters Towers, QLD
FITZ	AS005	Australia	Fitzroy Crossing, WA
NWAO	AS006	Australia	Narrogin, WA
BRDH	AS007	Bangladesh	Bariadhala, Chittagong
SIV	AS008	Bolivia, Plurinational State of	San Ignacio
LBTB	AS009	Botswana	Lobatse
PTGA	AS010	Brazil	Pitinga
RCBR	AS011	Brazil	Riachuelo
FRB	AS012	Canada	Iqaluit, NU
DLBC	AS013	Canada	Dease Lake, BC
SADO	AS014	Canada	Sadowa, ON
BBB	AS015	Canada	Bella Bella, BC
RES	AS016	Canada	Resolute, NU
INK	AS017	Canada	Inuvik, NT
RPN	AS018	Chile	Easter Island
LVC	AS019	Chile	Limon Verde
BJT	AS020	China	Baijiatuan
KMI	AS021	China	Kunming
SSE	AS022	China	Sheshan
XAN	AS023	China	Xian
RAR	AS024	Cook Islands	Rarotonga
JTS	AS025	Costa Rica	Las Juntas de Abangares
VRAC	AS026	Czech Republic	Vranov
SFJD	AS027	Denmark	Sondre Stromfjord, Greenland
ATD	AS028	Djibouti	Arta Tunnel
KEG	AS029	Egypt	Kottamya
FURI	AS030	Ethiopia	Furi
MSVF	AS031	Fiji	Monasavu, Viti Levu
DZM	AS032	Indonesia	Mont Dzumac
MDP	AS033	Indonesia	Montagne des Pères, French Guiana
MSKU	AS034	Gabon	Masuku
SNAA	AS035	Germany/South Africa	SANAE Station, Antarctica
IDI	AS036	Greece	Anogia, Crete
APG	AS037	Guatemala	El Apazote

Continues on next page

Table 172. Auxiliary seismic station codes (cont.)

Station code	Treaty number	Country	Location
BORG	AS038	Iceland	Borgarnes
LEM	AS040	Indonesia	Lembang, Jawa Barat
JAY	AS041	Indonesia	Jayapura, Irian Jaya
SIJI	AS042	Indonesia	Sorong, Irian Jaya
PSI	AS043	Indonesia	Parapat, Sumatera
KAPI	AS044	Indonesia	Kappang, Sulawesi Selatan
BATI	AS045	Indonesia	Baumata, Timur
KRBA	AS046	Iran, Islamic Republic of	Kerman
SHGO	AS047	Iran, Islamic Republic of	Shushtar
EIL	AS048	Israel	Eilath
MMAI	AS049	Israel	Mount Meron
VAE	AS050	Italy	Valguarnera, Sicily
JNU	AS051	Japan	Ohita, Kyushu
JOW	AS052	Japan	Kunigami, Okinawa
JHJ	AS053	Japan	Hachijojima, Izu Islands
JKA	AS054	Japan	Kamikawa-asahi, Hokkaido
JCJ	AS055	Japan	Chichijima, Ogasawara
ASF	AS056	Jordan	Tel-Alasfar
BVAR	AS057	Kazakhstan	Borovoye
KURK	AS058	Kazakhstan	Kurchatov
AKTO	AS059	Kazakhstan	Aktyubinsk
AAK	AS060	Kyrgyzstan	Ala-Archa
OPO	AS061	Madagascar	Ambohidratompo
KOWA	AS062	Mali	Kowa
TEIG	AS063	Mexico	Tepich, Quintana Roo
CMIG	AS064	Mexico	Colonia Cuauhtémoc Matias Romero, Oaxaca
LPIG	AS065	Mexico	La Paz, Baja California Sur
MDT	AS066	Morocco	Midelt
TSUM	AS067	Namibia	Tsumeb
EVN	AS068	Nepal	Everest
RPZ	AS069	New Zealand	Rata Peaks, South Island
RAO	AS070	New Zealand	Raoul Island
URZ	AS071	New Zealand	Urewera, North Island
SPITS	AS072	Norway	Spitsbergen
JMIC	AS073	Norway	Jan Mayen
WSAR	AS074	Oman	Wadi Sarin

Continues on next page

Table 172. Auxiliary seismic station codes (cont.)

Station code	Treaty number	Country	Location
PMG	AS075	Papua New Guinea	Port Moresby
KRVT	AS076	Papua New Guinea	Keravat
ATAH	AS077	Peru	Atahualpa
NNA	AS078	Peru	Nana
DAV	AS079	Philippines	Davao, Mindanao
TGY	AS080	Philippines	Tagaytay, Luzon
MLR	AS081	Romania	Muntele Rosu
KIRV	AS082	Russian Federation	Kirov
KVAR	AS083	Russian Federation	Kislovodsk
OBN	AS084	Russian Federation	Obninsk
ARTI	AS085	Russian Federation	Arti
SEY	AS086	Russian Federation	Seymchan
TLY	AS087	Russian Federation	Talaya
YAK	AS088	Russian Federation	Yakutsk
KLR	AS089	Russian Federation	Kuldur
BIL	AS090	Russian Federation	Bilibino
TIXI	AS091	Russian Federation	Tiksi
YSAH	AS092	Russian Federation	Yuzhno-Sakhalinsk
MA2	AS093	Russian Federation	Magadan
BELG	AS094	Russian Federation	Belogornoe
AFI	AS095	Samoa	Afiamalu
DJNS	AS096	Saudi Arabia	Dhaban Al-Janub
BBTS	AS097	Senegal	Babate
HNR	AS098	Solomon Islands	Honiara, Guadalcanal
SUR	AS099	South Africa	Sutherland
PALK	AS100	Sri Lanka	Pallekele
HFS	AS101	Sweden	Hagfors
DAVOX	AS102	Switzerland	Davos
MBAR	AS103	Uganda	Mbarara
EKA	AS104	United Kingdom of Great Britain and Northern Ireland	Eskdalemuir
GUMO	AS105	United States of America	Guam, Marianas Islands
PMSA	AS106	United States of America	Palmer Station, Antarctica
TKL	AS107	United States of America	Tuckaleechee Caverns TN
PFO	AS108	United States of America	Piñon Flat, CA
YBH	AS109	United States of America	Yreka, CA
KDAK	AS110	United States of America	Kodiak Island, AK

Continues on next page

Table 172. Auxiliary seismic station codes (cont.)

Station code	Treaty number	Country	Location
ANMO	AS111	United States of America	Albuquerque, NM
SHEM	AS112	United States of America	Shemya Island, AK
ELK	AS113	United States of America	Elko, NV
QSPA	AS114	United States of America	South Pole, Antarctica
NEW	AS115	United States of America	Newport, WA
SJG	AS116	United States of America	San Juan, PR
SDV	AS117	Venezuela, Bolivarian Republic of	Santo Domingo
PCRV	AS118	Venezuela, Bolivarian Republic of	Puerto la Cruz
LSZ	AS119	Zambia	Lusaka
MATP	AS120	Zimbabwe	Matopos

Table 173. Hydroacoustic station codes

Station code	Treaty number	Country	Location
H01W	HA01	Australia	Cape Leeuwin, WA
H02N	HA02	Canada	Haida Gwaii, BC
H02S	HA02	Canada	Haida Gwaii, BC
H03N	HA03	Chile	Juan Fernández Island
H03S	HA03	Chile	Juan Fernández Island
H04N	HA04	France	Crozet Islands
H04S	HA04	France	Crozet Islands
H05N	HA05	France	Guadeloupe
H05S	HA05	France	Guadeloupe
H06E	HA06	Mexico	Socorro Island
H06N	HA06	Mexico	Socorro Island
H06S	HA06	Mexico	Socorro Island
H07N	HA07	Portugal	Flores
H07S	HA07	Portugal	Flores
H08N	HA08	United Kingdom of Great Britain and Northern Ireland	BIOT/Chagos Archipelago
H08S	HA08	United Kingdom of Great Britain and Northern Ireland	BIOT/Chagos Archipelago
H09N	HA09	United Kingdom of Great Britain and Northern Ireland	Tristan da Cunha
H09W	HA09	United Kingdom of Great Britain and Northern Ireland	Tristan da Cunha
H10N	HA10	United Kingdom of Great Britain and Northern Ireland	Ascension
H10S	HA10	United Kingdom of Great Britain and Northern Ireland	Ascension
H11N	HA11	United States of America	Wake Island
H11S	HA11	United States of America	Wake Island

Table 174. Infrasonic station codes

Station code	Treaty number	Country	Location
I01AR	IS01	Argentina	Pilcaniyeu
I02AR	IS02	Argentina	Ushuaia
I03AU	IS03	Australia	Davis Base, Antarctica
I04AU	IS04	Australia	Shannon
I05AU	IS05	Australia	Hobart, TAS
I06AU	IS06	Australia	Cocos Islands
I07AU	IS07	Australia	Warramunga, NT
I08BO	IS08	Bolivia, Plurinational State of	La Paz
I09BR	IS09	Brazil	Brasilia
I11CV	IS11	Cabo Verde	Cape Verde Islands
I10CA	IS10	Canada	Lac du Bonnet, Man.
I12CF	IS12	Central African Republic	Bangui
I13CL	IS13	Chile	Easter Island
I14CL	IS14	Chile	Robinson Crusoe Island
I15CN	IS15	China	Beijing
I16CN	IS16	China	Kunming
I17CI	IS17	Côte d'Ivoire	Dimbokro
I18DK	IS18	Denmark	Qaanaaq, Greenland
I19DJ	IS19	Djibouti	Djibouti
I20EC	IS20	Ecuador	Isla Santa Cruz, Galápagos Islands
I21FR	IS21	France	Marquesas Islands
I22FR	IS22	France	Port Laguerre, New Caledonia
I23FR	IS23	France	Kerguelen
I24FR	IS24	France	Tahiti
I25FR	IS25	France	Guadeloupe
I26DE	IS26	Germany	Freyung
I27DE	IS27	Germany	Georg von Neumayer, Antarctica
I29IR	IS29	Iran (Islamic Republic of)	Tehran
I30JP	IS30	Japan	Isumi
I31KZ	IS31	Kazakhstan	Aktyubinsk
I32KE	IS32	Kenya	Nairobi
I33MG	IS33	Madagascar	Antananarivo
I34MN	IS34	Mongolia	Songino
I35NA	IS35	Namibia	Tsumeb
I36NZ	IS36	New Zealand	Chatham Island
I37NO	IS37	Norway	Bardufoss
I38PK	IS38	Pakistan	Rahimyar Khan

Continues on next page

Table 174. Infrasonic station codes (cont.)

Station code	**Treaty number**	**Country**	**Location**
I39PW	IS39	Palau	Palau
I40PG	IS40	Papua New Guinea	Keravat
I41PY	IS41	Paraguay	Villa Florida
I42PT	IS42	Portugal	Graciosa, Azores
I43RU	IS43	Russian Federation	Dubna
I44RU	IS44	Russian Federation	Petropavlovsk-Kamchatskiy
I45RU	IS45	Russian Federation	Ussuriysk
I46RU	IS46	Russian Federation	Zalesovo
I47ZA	IS47	South Africa	Boshof
I48TN	IS48	Tunisia	Kesra
I49GB	IS49	United Kingdom of Great Britain and Northern Ireland	Tristan da Cunha
I50GB	IS50	United Kingdom of Great Britain and Northern Ireland	Ascension
I51GB	IS51	United Kingdom of Great Britain and Northern Ireland	Bermuda
I52GB	IS52	United Kingdom of Great Britain and Northern Ireland	BIOT/Chagos Archipelago
I53US	IS53	United States of America	Fairbanks, AK
I54US	IS54	United States of America	Palmer Station, Antarctica
I55US	IS55	United States of America	Windless Bight, Antarctica
I56US	IS56	United States of America	Newport, WA
I57US	IS57	United States of America	Piñon Flat, CA
I58US	IS58	United States of America	Midway Islands
I59US	IS59	United States of America	Hawaii, HI
I60US	IS60	United States of America	Wake Island

II.4 Seismometer instrument codes

Table 175 lists the instrument codes used for seismometers.

Table 175. IMS S/H/I instrument codes

Instrument code	Description
20171A	Geotech 20171A
23900	Geotech 23900
7505A	Geotech 7505A
8700C	Geotech 8700C
Akashi	Akashi
BB-13V	Geotech BB-13V
CM3TB	Guralp CMG-3TB
CMG	Guralp CMG-3
CMG-3	Guralp CMG-3
CMG-3E	Guralp CMG3-ESP
CMG-3N	Guralp CMG-3NSN
CMG-3T	Guralp CMG-3T
CMG-3V	Guralp CMG-3V
CMG3T	Guralp CMG-3T
CMG3TB	Guralp CMG-3TB
CMG3VB	Guralp CMG-3VB
CMG40T	Guralp CMG-40T
FBA-23	Kinemetrics FBA-23
GS-13	Geotech GS-13
GS-13H	Geotech GS-13H
GS-13V	Geotech GS-13V
GS-21	Geotech GS-21
HM-500	HM-500
KS3600	Geotech KS-36000
KS360i	Geotech KS-36000-I
KS5400	Geotech KS-54000
LE-3D	LE-3D
LPHA	DASE LPHA-12
LPHA12	DASE LPHA-12
LPZA	DASE LPZA-12
LPZA12	DASE LPZA-12
Mk-3A	Willmore Mk 3A
Mk II	Willmore Mk II
MP-L4C	Mark Products L4C

Continues on next page

Table 175. IMS S/H/I instrument codes (cont.)

Instrument code	**Description**
Oki	Oki
Parus2	Parus-2
Podrst	Podrost
S-13	Geotech S-13
S-500	Geotech S-500
S-750	Geotech S-750
SDSE-1	SDSE-1
SOSUS	SOSUS
STS-1	Streckeisen STS-1
STS-1H	Streckeisen STS-1H
STS-1V	Streckeisen STS-1V
STS-2	Streckeisen STS-2
STS-2H	Streckeisen STS-2H
STS-2V	Streckeisen STS-2V
STS-5A	Streckeisen STS-5A
STS-6A	Streckeisen STS-6A
STS2.5	Streckeisen STS-2.5
TSJ-1e	TSJ-1e
T-120	Trillium 120
T-360	Trillium 360
T120QA	Trillium 120QA
T240	Trillium 240
ZM500	DASE ZM500

Appendix III

Computer code for CHK2 checksum

III.1 C code

Listing III.1. C code for the CHK2 checksum.

```c
#include <stdlib.h>
#include <math.h>

/* This function computes the ims2.0 checksum used in the CHK2 line
   */
void compute_checksum(signal_int, number_of_samples, _checksum)
    int  *signal_int;
    int  number_of_samples;
    int  *_checksum;
{
    int  i_sample;
    int  sample_value;
    int  modulo;
    int  checksum;

    int  MODULO_VALUE = 100000000;

    checksum = 0;

    modulo = MODULO_VALUE;

    for (i_sample=0; i_sample < number_of_samples; i_sample++)
    {
        /* check on sample value overflow */
        sample_value = signal_int[i_sample];

        if (abs(sample_value) >= modulo)
        {
                sample_value = sample_value -
                        (sample_value/modulo)*modulo;
        }
    }
}
```

III.2 FORTRAN code

Listing III.2. FORTRAN code for the CHK2 checksum.

```
subroutine compute_checksum(signal_int,number_of_samples,checksum)
c*************************************************************
c  This subroutine computes ims2.0 checksum used in the CHK2 line
c*************************************************************
c  declarations
c
      implicit none
c
      integer*4 signal_int(*)       ! (input)  seismic signal
                                    ! (counts, integer values)
      integer*4 number_of_samples   ! (input)  number of used samples
      integer*4 checksum            ! (output) computed checksum
      integer*4 i_sample            ! index
      integer*4 sample_value        ! value of one sample after
                                    ! sample overflow check
      integer*4 modulo              ! overflow protection value
      integer*4 MODULO_VALUE        ! overflow protection value
      parameter (MODULO_VALUE = 100 000 000)
c
c  initialize the checksum
      checksum = 0
c
c  use modulo variable besides MODULO_VALUE parameter to suppress
c  optimizing compilers to bypass local modulo division computation
      modulo = MODULO_VALUE
c
c  loop over all samples (counts, integer values)
c
      do i_sample = 1, number_of_samples
c
c  check on sample value overflow
c
          sample_value = signal_int(i_sample)
          if(abs(sample_value) .ge. modulo)then
              sample_value = sample_value-
     *        (sample_value/modulo)*modulo
          endif
```

Appendix IV

Unsupported commands at the IDC

This appendix contains a list of commands for the IMS2.0 format that are unsupported at the IDC.

Introduction

The IMS2.0 Formats and Protocols Specification was developed to provide an extensive set of formats for exchanging seismic data and derived parameters using e-mail messages.

However, IMS2.0 includes formats considered essential by some organizations outside the CTBT monitoring community, such as the European Mediterranean Seismological Centre (e.g., ARRIVAL:GROUPED). Thus, some of the request lines, environments, and subformats documented in subsequent chapters are not supported by the IDC's *VDMS*. Below are commands and environments documented in this manual but not supported at the IDC.

Request lines in request and subscription messages

- AUTH_STATUS
- ARRIVAL:GROUPED
- ARRIVAL:REVIEWED
- ARRIVAL:UNASSOCIATED
- BULLETIN IMS1.0:LONG
- COMMENT
- COMM_STATUS (with subscriptions)
- NETWORK
- WAVEFORM, subtype CM8

Environment lines in request and subscription messages

- AUX_LIST
- GROUP_BULL_LIST (with subscriptions)
- FREQ Custom (with subscriptions)

Request/environment combinations in request and subscription messages

- STATION/LAT; STATION/LON
- CHANNEL/LAT; CHANNEL/LON
- CHAN_STATUS: Minimum TIME precision of days
- STA_STATUS: Minimum TIME precision of days

Appendix V

History of "Formats and Protocols for Messages"

This appendix contains an outline of the history of the formats and protocols used to exchange messages to monitor data under the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

The first version of *Automatic Data Request Manager* (*AutoDRM*) was developed during July 1991. The set of commands that could be sent to an *AutoDRM* was small at that time, but sufficient for basic requests for waveforms and other seismological data. This set of commands did not have a special name and was at that time just known as "*AutoDRM* request commands". Later, when the GSE2.0 formats and protocols were defined, this first set of commands was referred to as the "GSE1-format" and was published in 1993 Kradolfer (1993). During 1994, the Group of Scientific Experts (GSE), a group of scientists established by the *Conference of Disarmament* in Geneva in 1976, decided to use this method of automated data exchange for its third technical test (GSETT-3). While the basic functions of *AutoDRM* were useful, it was also noted that some extensions were needed in order to use this method for international data centres. A dedicated working group created a new set of commands, allowing for data to be requested from individual channels and for requests and responses to be tracked by means of request-ID's for requests and reference-IDs for the corresponding responses. The new formats and protocols were written down in the document of the "Conference of Disarmament, Formats and Protocols for Data Exchange, Conference Room Paper 243, Volume 2 Operations, Annex 3" in 1995.

In 1996, when the Comprehensive Nuclear-Test-Ban Treaty (CTBT) was brought into and accepted by the UN General Assembly in New York and when the establishment of a CTBT-Organisation (CTBTO) in Vienna was foreseeable, the formats for *AutoDRM*s were extended once more and the new format was changed to GSE2.1. It was published in May 1997 as "Operations Annex 3" to the "Conference Room Paper 243" of the Conference of Disarmament.

During the establishment of the CTBTO (actually the Provisional Technical Secretariat (PTS)) in Vienna, the concept of *AutoDRM* was regarded as useful for other monitoring techniques as well. Therefore additional features were added to the formats and protocols, in order to include data from hydroacoustic and infrasound networks in addition to seismological data. The version of these new formats was IMS1.0, after the CTBTO division that deals with the stations of the global monitoring system: the International Monitoring System (IMS). In November 2001, after the addition of radionuclide messages, the version of the formats was changed to IMS2.0.

In 2009, the *AutoDRM* was redesigned to use current technologies and was renamed *Verification Data and products Messaging System* (*VDMS*). The current version of *VDMS* is 3.0.

References and supplements

Corporation, Pacific-Sierra Research (1998). *Radionuclide Detection Processing*. Tech. rep. PSR-98/TN1123.

Crocker, S. et al. (1995a). *MIME object security services*. Internet Requests for Comments. DOI: 10.17487/RFC1848.

– (1995b). *Security Multiparts for MIME: Multipart/Signed and Multipart/Encrypted*. Internet Requests for Comments. DOI: 10.17487/RFC1847.

Preparatory Commission for the CTBTO (2019). *Certification and Surveillance Assessment of Radionuclide Laboratories for Particulate and Noble Gas Sample Analysis*. Standard. Vienna, Austria: CTBTO.

Freed, N. and N. Borenstein (1996a). *Multipurpose Internet Mail Extensions (MIME) part one: Format of Internet Message Bodies*. Internet Requests for Comments. DOI: 10.17487/RFC2045.

– (1996b). *Multipurpose Internet Mail Extensions (MIME) part two: Media types*. Internet Requests for Comments. DOI: 10.17487/RFC2046.

Freed, N., J. Klensin and J. Postel (1996a). *Multipurpose Internet Mail Extensions (MIME) part five: Conformance criteria and examples*. Internet Requests for Comments. DOI: 10.17487/RFC2049.

– (1996b). *Multipurpose Internet Mail Extensions (MIME) part four: Registration procedures.* Internet Requests for Comments. DOI: 10.17487/RFC2048.

Gane, C. and T. Sarson (1979). *Structured systems analysis: Tools and techniques*. Englewood Cliffs, NJ: Prentice-Hall.

Housley, R. (1999). *Cryptographic Message Syntax*. Internet Requests for Comments. DOI: 10.17487/RFC2630.

– (2002a). *Cryptographic Message Syntax (CMS)*. Internet Requests for Comments. DOI: 10.17487/RFC3369.

– (2002b). *Cryptographic Message Syntax (CMS) algorithms*. Internet Requests for Comments. DOI: 10.17487/RFC3370.

IASPEI Seismic Format (ISF) (1999). Tech. rep. International Seismological Organization. DOI: 10.17487/RFC3370. URL: http://www.isc.ac.uk/standards/isf/.

Formats and Protocols for Continuous Data CD-1.0 (2002). IDC Documentation. CTBTO. Vienna, Austria.

Formats and Protocols for Continuous Data CD-1.1 (2002). IDC Documentation. CTBTO. Vienna, Austria.

Codes for the representation of names of countries and their subdivisions (1997). Standard. Geneva, CH.

Data elements and interchange formats — Information interchange — Representation of dates and times (1988). Standard. Geneva, CH.

Kaliski, B. (1998). *PKCS #7: Cryptographic Message Syntax — Version 1.5*. Internet Requests for Comments. DOI: 10.17487/RFC2315.

Kradolfer, Urs (1993). "Automating the exchange of earthquake information". In: *Eos, Transactions, American Geophysical Union* 74.39, pp. 442–445.

Moore, K. (1996). *MIME (Multipurpose Internet Mail Extensions) part three: Message header extensions for non-ASCII text*. Internet Requests for Comments. DOI: 10.17487/RFC2047.

Preparatory Commission for the CTBTO (2000). *Updated draft of the operational manual for the International Data Centre (February 2000 update)*. IDC/WGB-11/TL-2/45. CTBTO. Vienna, Austria.

– (2020). *Operational manual for the International Data Centre*. IDC/WGB/TL-11,17-19/Rev.7. CTBTO. Vienna, Austria.

Ramsdell, B. (1999a). *S/MIME Version 3 Certificate Handling*. Internet Requests for Comments. DOI: 10.17487/RFC2632.

– (1999b). *S/MIME Version 3 Message Specification*. Internet Requests for Comments. DOI: 10.17487/RFC2633.

Rescorla, E. (1999). *Diffie-Hellman Key Agreement Method*. Internet Requests for Comments. DOI: 10.17487/RFC2631.

Science Applications International Corporation (1999). *Formats and Protocols for Messages. IMS1.0*. IDC Documentation SAIC-99/3004.

– (2001). *Distributed Application Control System (DACS) software user's manual*. IDC Documentation IDC/OPS/MAN/401.

Veridian Systems (2002a). *IDC processing of radionuclide data*. IDC Documentation IDC/OPS/MAN/050/Rev.3.

– (2002b). *Radionuclide software design*. IDC Documentation IDC/OPS/MAN/250/Rev.3.

Information Technology — Open Systems Interconnection — The Directory: Authentication Framework (1997). Standard. URL: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-X.509-199708-S!!PDF-E&type=items.

Glossary

β Beta particle; an electron that is produced from a nuclear decay. May also refer to other electron radiations, for example, a conversion electron.

β-γ coincidence Nuclear decay that produces both a γ ray and a β particle within a very short time scale. May also refer to other photon-electron coincidence events such as an X-ray with a conversion electron.

γ Gamma particle.

γ ray Photon that is produced from a nuclear transition; may also imply other photon radiations, for example, an X-ray.

µBq Micro Becquerel.

µPa Micro Pascal.

acquisition live time Time Multi-Channel Analyser (MCA) electronics is available for processing pulse amplitude signals; equivalent to acquisition realtime less detector dead-time, reported in s.

acquisition real time Total elapsed clock time a sample is counted, reported in s.

acquisition start When the detection system at a station commences sample acquisition.

activation product A nuclide produced from the absorption of a neutron by a nucleus.

activity Decay rate of a radionuclide; usually expressed in Bq (disintegrations per second).

ALERT Alert message; data type that includes ALERT_FLOW, ALERT_SYS, ALERT_TEMP, and ALERT_UPS.

ALERT_FLOW Type of ALERT message used to notify the IDC/IMS that the sample flow rate is above or below a specified threshold.

ALERT_SYSTEM Type of ALERT message used to notify the IDC/IMS that the computer controlling the systems is being rebooted or that the system is shutting down.

ALERT_TEMP Type of ALERT message used to notify the IDC/IMS that a system temperature is above or below a specified threshold.

ALERT_UPS Type of ALERT message used to notify the IDC/IMS that there is a problem with the UPS.

ARR See Automatic Radionuclide Report.

array A collection of sensors distributed over a finite area (usually in a cross or concentric pattern) and referred to as a single station.

ASCII American Standard for Information Interchange. Standard, unformatted 256-character set of letters and numbers.

assay date Date of certificate source assay, format is *yyyy/mm/dd*.

assay time Time of certificate source assay, format is *hh:mm:ss.s*.

Automatic Radionuclide Report Product of the automatic data processing that includes sections describing the sample information, prioritization results (noble gas only), sample activity, MDCs for key nuclide, peak search results and notes, processing parameters, update parameters, data quality flags, event screening flags, calibration equations, and field of regard.

AUX (RN) Auxiliary power supply.
(S/H/I) Auxiliary station code.

background Contributions to the count from all sources other than the radionuclides of interest. Natural radioactivity in the sample contributes to the background, but sources outside the sample also can contribute. These outside sources include environmental radiation, cosmic rays, electromagnetic interference, other instrument noise and the interaction between radiation and the materials near the detector.

background measurement identification Unique alphanumeric string identifying the relevant background measurement for a specific sample; includes the detector code and the background acquisition initiation date and time.

baseline Contribution to a spectrum from the partial energy deposition of a γ ray in a detector.

beam Waveform created from array station elements that are sequentially summed in the direction of a specified azimuth and slowness.

Becquerel Unit of activity equal to one disintegration per second; denoted by Bq.

Blank Pulse Height Data ASCII data message containing the pulse-height data of an unexposed air filter, as well as other information, in an IDC-approved format.

BLANKPHD See Blank Pulse Height Data.

Bq Becquerel.

°C Degrees Celsius.

CALIBPHD See Calibration Pulse Height Data.

Calibration Pulse Height Data ASCII data message containing the pulse-height data of a certified standard source, as well as other information, in an IDC-approved format. The data in a CALIBPHD are used to determine the ECR, EER, and RER.

category Value (referred to as Level) assigned to a radionuclide sample, from 1 to 5 for particulates or from A to C for noble gas systems, indicating the presence of certain types of nuclide. For particulates, Level 1 indicates a spectrum with normal natural nuclides, while Level 5 indicates spectra with multiple anthropogenic nuclides, at least one of them being a fission product. For noble gases, Level A indicates no radio-xenon detected, while Level C indicates that a concentration of radio-xenon which is atypical for the station has been detected.

centroid Energy (in KeV) or channel number at the centre of a fitted peak.

centroid channel Spectrum channel at the centre of a photopeak.

certificate Certified standard source of known activity used in the acquisition of radionuclide energy, resolution, and efficiency calibration data.

certified laboratory A radionuclide laboratory listed in Annex 1 to the Protocol to the Treaty and certified by the Technical Secretariat. Additional laboratories may be certified with the approval of the Executive Council to perform the routine analysis of samples from manual monitoring stations, where necessary, in the future.

channel (RN) Energy window (in KeV) representing a differential increment of pulse height.
(S/H/I) Component of motion or distinct stream of data.

cm Centimetre(s).

CNF See Cooperating National Facility.

collection start When the air sample system at a station commences sample collection.

collection stop When the air sample system at a station completes sample collection.

comment Free text field containing comments made by a station operator or IDC analyst.

concentration Activity per unit volume of air.

Cooperating National Facility A monitoring facility, operated by a State Party, that has been designated, following a request by the hosting State Party and subject to the agreement of the Executive Council, and certified by the Technical Secretariat to provide authenticated data to the IDC when requested by a State Party, but that is not formally a part of the IMS.

count (RN) Number of pulses observed within a spectrum channel.
(S/H/I) Units of digital waveform data.

critical level Minimum net counts that must be contained in a ROI for nuclide identification.

data block (1) Units of information that, when combined with other data blocks, comprise a data message.
(2) Kind of data in a data message.
Radionuclide data types include: ALERT_FLOW, ALERT_SYS, ALERT_TEMP, ALERT_UPS, ARR, BLANKPHD, CALIBPHD, DETBKPHD, GASBKPHD, MET, QCPHD, RLR, RMSSOH, RNPS, RRR, SPHDF, SPHDP, and SSREB.
S/H/I data types include: ARRIVAL, BULLETIN, CHANNEL, CHAN_STATUS, COMMENT, COMM_STATUS, EVENT, EXECSUM, NETWORK ORIGIN, OUTAGE, RESPONSE STATION, STA_STATUS, and WAVEFORM.

date of last calibration Date of previous detector calibration, format is *yyyy/mm/dd*.

dB Decibel.

decade Factor of ten in frequency (Hz).

decay time Time duration an exposed filter is allowed to decay before data acquisition.

deg Degrees (as a distance).

DETBKPHD See Detector Background Pulse Height Data.

Detector Background Pulse Height Data ASCII data message containing the pulse-height data from a background count, as well as other information, in an IDC-approved format.

detector code Includes the radionuclide site code plus four unique characters identifying a specific detector unit.

detector ID See detector code.

ECR See Energy versus Channel Regression.

ECRU See Energy versus Channel Regression Update.

efficiency (1, processes) The capability of a process to provide appropriate performance, relative to the amount of used resources and time and under stated conditions. (2, RN) The probability of detection of an emitted quantum of radiation (either β or γ compared with the decay rate. For most spectra, this is equivalent to the ratio of counts detected under a detected peak to the amount of radiation quanta emitted by a sample, and depends on detector configuration and measuring geometry.

energy (RN) Usually refers to the measured kinetic energy of radiation quanta deposited in a detector. The unit most appropriate for such measurements is KeV.
(S/H/I) Occurrence that displays characteristics indicative of a possible nuclear weapons test.

Energy versus Channel Regression An equation providing the initial detector-specific relationship between channel number and energy. The equation contains calibration coefficients and is estimated from a transmitted calibration data set.

Energy versus Channel Regression Update An equation providing the final detector-specific relationship between channel number and energy.

event (1) A physical occurrence that generates seismoacoustic energy and/or emits radionuclides.
(2) A generation of seismoacoustic energy and/or radionuclides that has been detected and may have been located in space and/or time by a monitoring system.
(3) A detected generation of seismoacoustic energy and/or radionuclides qualifying to appear in the IDC products on the basis of any established event criteria.

Executive Council Executive body of the CTBTO responsible for supervising the activities of the Technical Secretariat.

File Transfer Protocol Protocol for transferring files between computers.

fission product Radionuclide produced from fission.

flow rate Air volume passing through an air filter per unit time; reported in m^3/h.

FTP See File Transfer Protocol.

Full Sample Pulse Height Data ASCII data message containing the pulse height data of a sample acquired for a complete collection interval, as well as other information, in an IDC-approved format.

FULL SPHD See Full Sample Pulse Height Data.

full width at half-maximum Metric of detector resolution and equivalent to the width of a photopeak (in KeV) taken at the peak height equal to half the maximum peak counts.

FWHM See full width at half-maximum.

gain (RN) Amplification of the measured energy deposition in a radiation detector. This is achieved through the use of electronic amplifiers.
(S/H/I) Amplification of waveform energy.

Gas Background Pulse Height Data Data type sent by noble gas monitoring systems that observe a memory effect during sample acquisition due to atoms from the previous sample adsorbed onto the walls of the gas cell. The counts from the memory effect must be subtracted from the sample counts for accurate activity quantification.

GASBKPHD See Gas Background Pulse Height Data.

h Hour(s).

Hz Hertz.

KB Kilobyte(s); 1 KB equals 1,024 bytes.

Kbps Kilobit per second; a measure of data transfer speed.

KeV Kilo electron Volts; a unit of kinetic energy.

Km Kilometre(s).

MB Megabyte; 1,024 kilobytes.

m_b Magnitude of an event based on seismic body waves.

mbmle Magnitude of an event based on maximum likelihood estimation using seismic body waves.

MDC See minimum detectable concentration.

measurement ID Unique alphanumeric string identifying a specific data acquisition; includes the detector code and the acquisition start date and time.

message identification Unique 20-character alphanumeric identification given to a message by the sender that facilitates message tracking for the sender.

message type Kind of message; possible message types include DATA, REQUEST, and SUBSCRIPTION.

met end When meteorological data collection at a station ends.

met start When meteorological data collection at a station commences.

MID See measurement ID.

minimum detectable concentration The smallest concentration of a radionuclide that can be reliably detected and quantified in a spectrum.

M_L Magnitude of an event based on waves measured near the source.

mm Millimetre(s).

M_S Magnitude of an event based on seismic surface waves.

msmle Magnitude of an event based on maximum likelihood estimation using surface waves.

multiplet Spectral region of interest comprised of more than one photopeak.

National Data Centre A data centre, operated and maintained by a State Party, whose functions may include sending IMS data to the IDC and/or receiving data and products from the IDC.

National Event Bulletin Bulletin of events that is a national product involving application of national event-screening criteria.

National Screened Event Bulletin Bulletin of events that is a national product, excluding events that were screened out by national event-screening criteria.

NDC See National Data Centre.

NEB See National Event Bulletin.

net area Equal to the integrated photopeak counts minus the baseline and background counts.

nm Nanometre(s).

noble gas system Radionuclide monitoring system that collects and measures relevant noble gas isotopes by compressing air from the station environment through adsorbent beds and purifying the relevant noble gas from other constituents of the air. A purified sample is then transferred to a nuclear counting system and analysed to determine its radioactive content.

NSEB See National Screened Event Bulletin.

nuclide One of many combinations of nucleons that may comprise an atomic nucleus. Because all nuclides of interest with respect to CTBT compliance verification are radioactive, this term is often used to refer specifically to radionuclides.

Pa Pascal; a unit of pressure.

particulate sample A sample collected for radionuclide monitoring at a particulate station.

particulate system Radionuclide monitoring system that collects air particles in a filter by pumping the air from the station environment through this filter. Following collection, the filter is then analysed for its radioactive content.

peak A statistically significant increase in counts above a spectrum baseline at an energy associated with a photon of a particular radionuclide or other phenomenon.

photon energy Component of the data pairs comprising a radionuclide detectorâĂŸs energy, resolution, and efficiency calibration data (in KeV).

photopeak A peak in the γ spectrum caused by the interaction of photoelectron effect.

PREL SPHD See Preliminary Sample Pulse Height Data.

Preliminary Sample Pulse Height Data ASCII data message containing the pulse height data of a sample acquired for less than a complete collection interval, as well as other information.

QCPHD See Quality Control Pulse Height Data.

Quality Control Pulse Height Data ASCII data message containing the pulse height data of a certified source as well as other information. Information in the QCPHD, along with other data, is used to check a detectorâĂŹs state of health.

quantity Collected air volume in m^3; same as sampled air volume.

quefrency Time-delay axis with units of seconds for a cepstrum.

radioactivity See activity.

radionuclide A nuclide that has an unstable nucleus, that is, a radioactive nuclide.

radionuclide laboratory See certified laboratory.

Radionuclide Monitoring System The part of the IMS that monitors the atmosphere for radionuclides.

Radionuclide Network Product Summary A daily report containing a summary of the radionuclide network for a three-day period, including the data received, their products, and any relevant nuclides.

REB See Reviewed Event Bulletin.

Region Of Interest Region of a radionuclide spectrum or histogram that corresponds to a particular radionuclide.

RER See Resolution vs Energy Regression.

resolution Metric of a detectorâĂŹs ability to detect photons at discrete energies and is equivalent to the FWHM.

Resolution vs Energy Regression an equation providing the initial detector-specific relationship between resolution and energy. This equation contains calibration coefficients and is interpolated from a transmitted calibration spectrum.

Reviewed Event Bulletin Bulletin formed of all S/H/I events that have passed analyst inspection and quality assurance review.

Reviewed Radionuclide Report Electronic file containing the final results of the interactive review of the automated radionuclide processing. It contains sections on sample information, measurement categorization, measured radionuclide quantities, MDCs, radionuclide identification, analyst editing, processing parameters, data quality flags, event screening flags, calibration equations, and field of regard.

RMS See Radionuclide Monitoring System.

RNPS See Radionuclide Network Product Summary.

ROI See Region Of Interest.

RRR See Reviewed Radionuclide Report.

s Second(s).

sample The solid or gaseous entity collected by the radionuclide equipment at a station that is analysed to determine its airborne activity concentration. This term can also refer to any physical entity counted on a detector.

sample geometry Sample configuration, shape, and physical state in a detector chamber.

Sample ID Unique identification number assigned to a given spectrum or record by the IDC.

Sample Pulse Height Data ASCII data message containing pulse height data acquired by counting a gas or particulate sample with a detector system.

sample reference identification Unique alphanumeric string identifying a sample; includes station code, data type, and sample collection commencement date and time.

SAMPLEPHD See Sample Pulse Height Data.

SEB SeeStandard Event Bulletin.

SEL1 See Standard Event List 1.

SEL2 See Standard Event List 2.

SEL3 See Standard Event List 3.

SID See Sample ID.

site code Five character alphanumeric field identifying a particular RMS site: the first two characters are the county code, the next character identifies the site type (P for particulate radionuclide station, G for noble gas radionuclide station, and L for certified lab), and the last two characters are the numbers assigned to the station or lab in the text of the CTBT.

SOH See State of Health.

spectral qualifier Code in a SAMPLEPHD that indicates whether the spectrum acquisition time is truncated (PREL) or full (FULL).

spectrum (RN) A plot of the number of pulses (counts) per pulse height (as counts versus energy)
(S/H/I) Plot of the energy contained in

waveforms as a function of frequency.

SPHD See Sample Pulse Height Data.

SPHDF See Full Sample Pulse Height Data.

SPHDP See Preliminary Sample Pulse Height Data.

SRID See sample reference identification.

SSEB SeeStandard Screened Event Bulletin.

SSREB SeeStandard Screened Radionuclide Event Bulletin.

Standard Event Bulletin List of analyst reviewed S/H/I events and event parameters (origin and associated arrival information). The SEB is similar to the REB, but also includes event characterization parameters and event screening results for each event.

Standard Event List 1 S/H/I bulletin created by total automatic analysis of continuous time series data. Typically, the list runs about 1 h behind real time.

Standard Event List 2 S/H/I bulletin created by totally automatic analysis of both continuous data and segments of data specifically down-loaded from stations of the auxiliary seismic network. Typically, the list runs about 4 h behind real time.

Standard Event List 3 S/H/I bulletin created by totally automatic analysis of both continuous data and segments of data specifically down-loaded from stations of the auxiliary seismic network. Typically, the list runs 6 h behind real time.

Standard Screened Event Bulletin Similar in content and format to the Standard Event Bulletin (SEB), but excludes events that were screened out by the standard event-screening criteria.

Standard Screened Radionuclide Event Bulletin Bulletin generated by the IDC when fission or activation products are detected at a radionuclide station above normal limits. A SSREB contains information on the possible event, source location, fission products, activation products detected, any isotopic ratios calculated, and any certified laboratory results. New event information can be added to the SSREB as it arrives, therefore, multiple revisions of an SSREB are possible.

State of Health Supplementary data provided by sensors connected to, or associated with, equipment and instrumentation at the station, to provide information on the operational status of the station and quality of the raw monitoring data being transmitted from the station.

State Party A Treaty signatory that has deposited its instrument of ratification.

station code (also *station ID*) (1) Code used to identify distinct stations. (2) Site code.

station ID See station code.

system type Phase of the RMS sample being collected; `P` indicates particulate and `G` gaseous.

Technical Secretariat The body established by the Executive Council to implement the technical provisions of the Treaty, including oversight of the IMS and the IDC.

time of last calibration Time of previous detector calibration, format is *hh:mm:ss.s*.

total efficiency Ratio of the total number of pulses in the entire energy spectrum due to a photon of a given energy, E, to the number of photons emitted by a source for a specified source-to-detector distance. “The total efficiency can be affected by the shield design due to photon scattering” (ANSI Standard 42.14). This parameter is required for cascade summing corrections.

transmit date Date a message was sent from a transmitter, format is *yyyy/mm/dd*.

transmit time Time a message is sent from a transmitter, format is *hh:mm:ss.s*.

uBq See µBq.