Role of the Radionuclide Laboratories in the IMS Network

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CTBTO PREPARATORY COMMISSION | PUTTING AN END TO NUCLEAR EXPLOSIONS

INTRODUCTION AND MAIN RESULTS

The International Monitoring System (IMS) network of radionuclide monitoring stations is supported by the PTS certified radionuclide laboratories (RLs) through the analysis of particulate and noble gas samples from these stations.
The performance assessment of certified radionuclide laboratories is done through their participation in the Network QC and Level 5 programme, Proficiency test exercises (PTEs) and Surveillance assessments.
This paper emphasizes the important role of radionuclide laboratories in the supporting IMS network and the PTS verification programme.
Fourteen radionuclide laboratories are currently certified and confirming their continuous compliance with the certification and operational requirements.

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Introduction

"The International Monitoring System (IMS) network of radionuclide monitoring stations are supported by the 16 laboratories through the analysis of samples from these stations."

Comprehensive Nuclear-Test-Ban Treaty (CTBT), Part I.C, paragraph 11 of the Protocol

Main roles of the radionuclide laboratories (RLs) are to:

- perform analysis of samples from IMS radionuclide stations (on a fee-for-service basis);
- provide an independent report on the analysis;
- provide an expert assessment of analytical results to meet the analysis objectives.

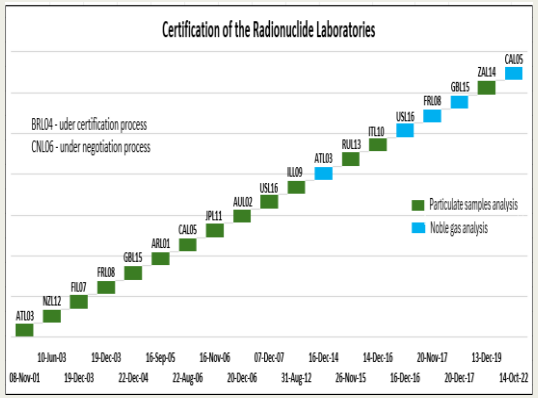
Radionuclide laboratory certification

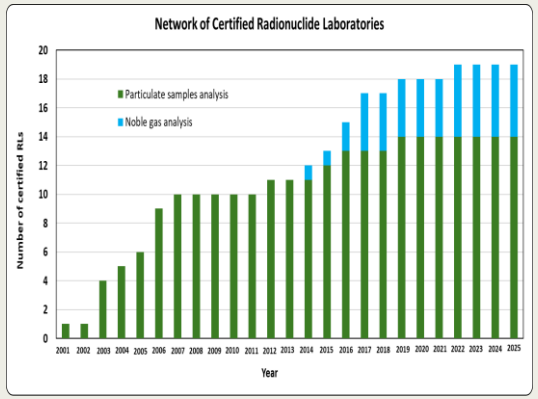
Purposes of the certification of the RL by the PTS is to provide States Signatories and the Preparatory Commission with the confidence that services provided by radionuclide laboratories meet the standards required for the CTBT verification regime.

The RLs are certified by the PTS for: particulate sample (P) and noble gas (NG) analysis:

- 14 RLs are certified for particulate samples analysis;
- 5 RLs are certified for noble gas analysis;
- 2 RLs have not yet been certified.

Treaty Number	RL code	Host Country	Laboratory Operator
RL01	ARL01	Argentina	ARN
RL02	AUL02	Australia	ARPANSA
RL03	ATL03	Austria	Seibesdorf Labor GmbH
RL04	BRL04	Brazil	Institute of Radiation Protection and Dosimetry
RL05	CAL05	Canada	Health Canada
RL06	CNL06	China	Beijing Radionuclide Laboratory
RL07	FIL07	Finland	STUK
RL08	FRL08	France	CEA
RL09	ILL09	Israel	SOREQ
RL10	ITL10	Italy	ISIN
RL11	JPL11	Japan	JAEA
RL12	NZL12	New Zealand	ESR
RL13	RUL13	Russian Federation	SMS MoD RF
RL14	ZAL14	South Africa	NECSA
RL15	GBL15	UK of GB and Northern Ireland	AWE
RL16	USL16	United States of America	PNNL





The certification process is based on the:
ISO/IEC 17025, CTBT/WGB/TL-11,17/18 and CTBT/PTS/INF.96.

Main steps of the certification process

1. Formal arrangement
2. Acceptance of documentation
3. Acceptance of the quality of analytical results
4. Data and report formats check
5. Communication test
6. Authentication test
7. IMS sample analysis test
8. Certification visit
9. Formal certification
10. Surveillance assessment of the certified radionuclide laboratory

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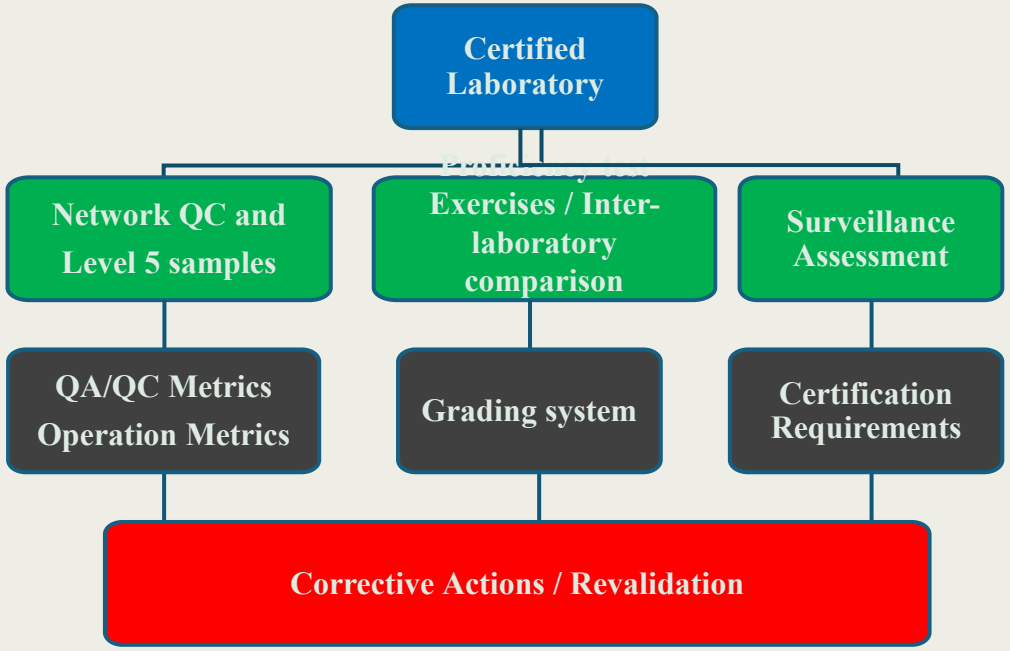
Radionuclide laboratory performance assessment

Performance assessment of the radionuclide laboratory is done through the:

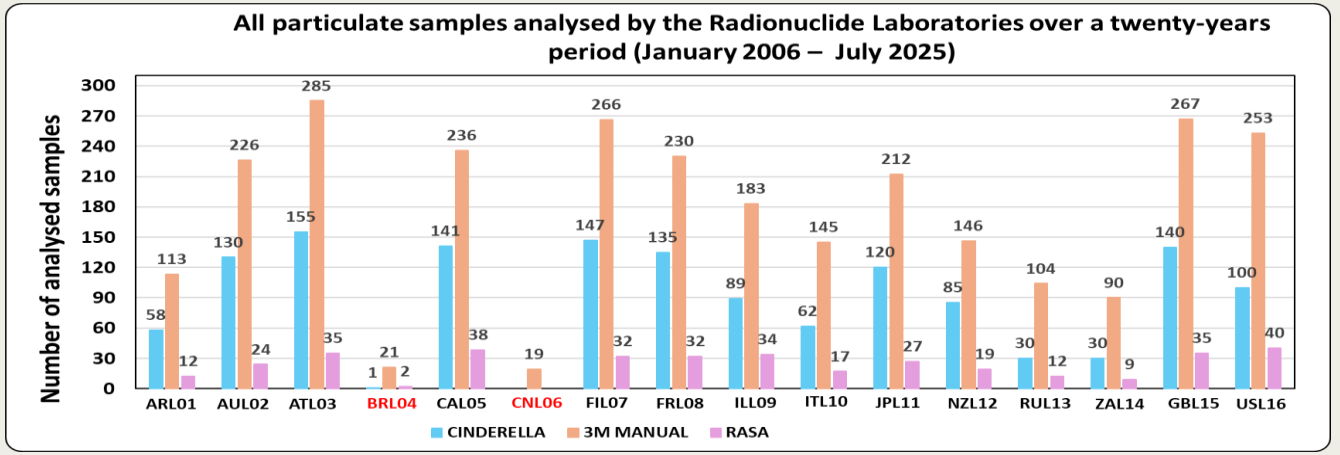
- Radionuclide Network QA/QC programme (Network QC and Level 5 samples);
- Proficiency test (PT) and Interlaboratory comparison (ILC) exercises;
- Surveillance assessments.

If the set-up criteria are not met by the radionuclide laboratory, corrective actions are introduced and/or revalidation of the RL is performed.



Two decades of particulate samples analysis

In total, 4587 particulate samples (Category A, B, C and E-other) were analysed by certified RLs during the period January 2006 – July 2025.



Radionuclide Network QA/QC programme

"The Technical Secretariat runs a quality control programme for samples measured in International Monitoring System stations on a periodic and ongoing basis. Samples collected during normal operations are sent from stations to certified laboratories on a periodic basis to verify system calibrations as part of this programme."

CTBT/WGB/TL-11,17/18/Rev..7 (Section 4.3)

The purpose of the RN Network QA/QC programme is to:

1. Verify the station performance, e.g. to ensure that:
   - data produced are of acceptable quality;
   - the station poses requested sample handling and shipment capability;
   - the station is working within its certified operational specifications;
2. Initiate corrective action if non-conformities are found.
3. Take preventive action to avoid non-conformities.

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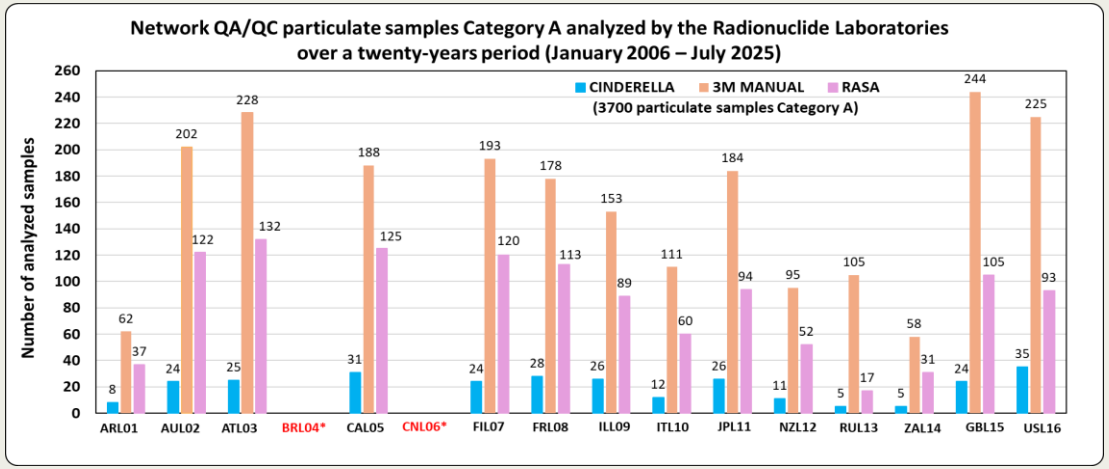
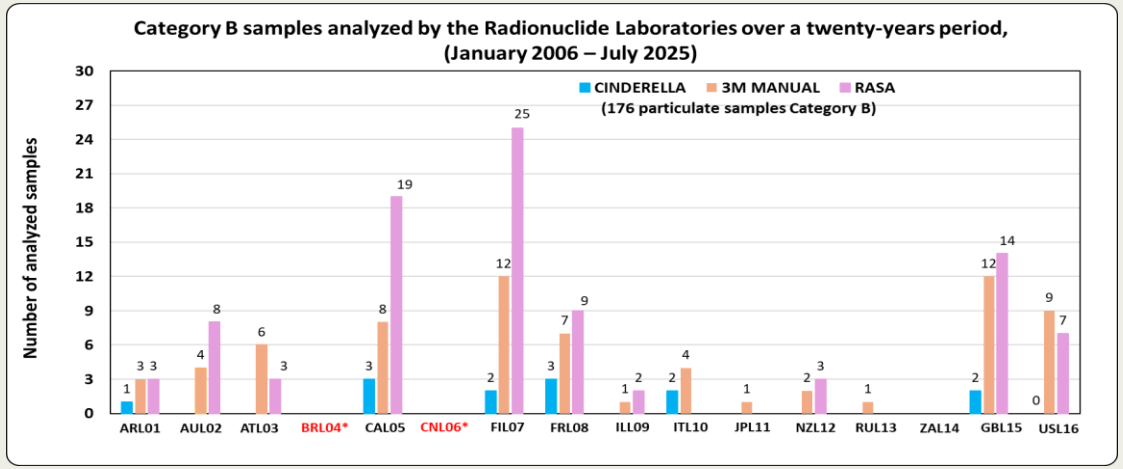
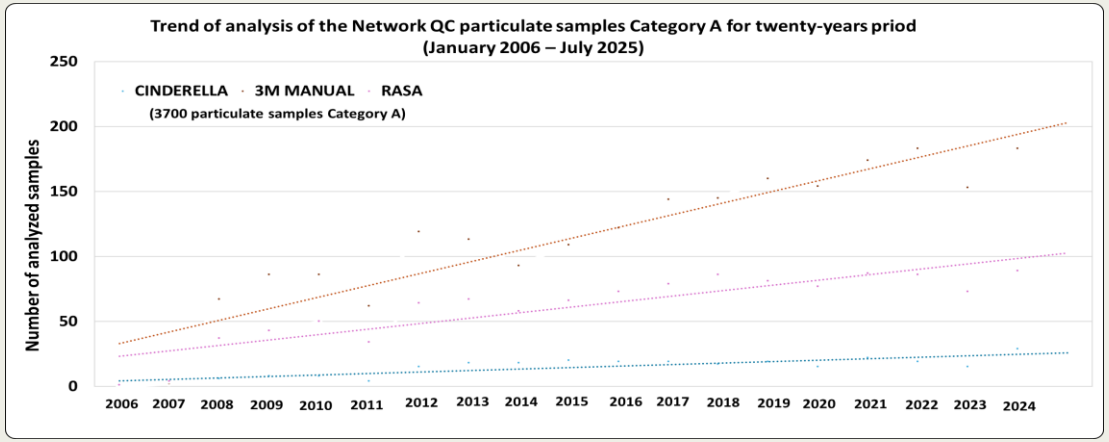
Radionuclide Network QA/QC programme

In total, 3700 Network QC particulate samples Category A were analysed by certified RLs during the period January 2006 – July 2025.

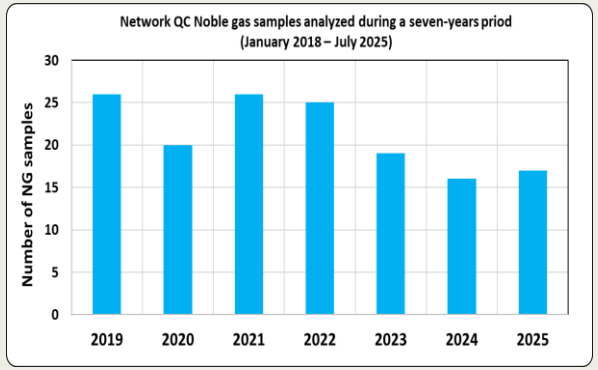


In total, 176 Category B (Level 5) particulate samples were analysed by certified RLs during the period January 2006 – July 2025.





In total, 149 Noble gas samples were analysed by certified RLs during the period January 2019 – July 2025.



LabOPS is used as a source of presented data.

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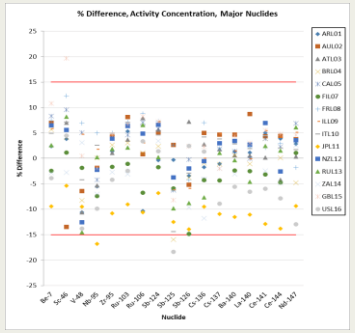
Proficiency test exercises (PTEs)

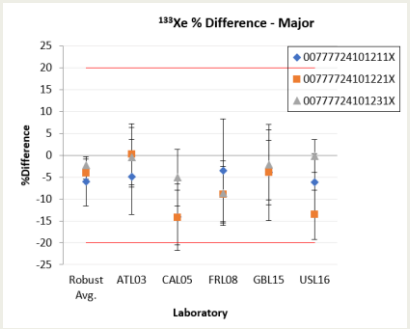
Radionuclide laboratories have to participate regularly (on annual basis) in PTEs organized by the PTS.

The primary objective of the PTEs is to:

- assess the laboratories capability to correctly identify the radionuclides in a test sample;
- traceably measure the activity;
- accurately report the activity concentration of these radionuclides.

The PTEs are also useful in assessing the capability of a RL to determine zero time (if applicable), checking uncertainty budgets, ensuring conformity of the radionuclide laboratory reports with IDC/ENG/SPC/103 and evaluate reporting timeliness.





Particulate PTE's are organized since 2000 (except in 2020). In the last 10 years 95% of the reported results have been a " pass".
Noble Gas informal exercises were organized in 2008-2021 and formal PTEs started in 2021.

Surveillance assessments

The PTS is conducting an ongoing evaluation of the performance of a certified RL to ensure that the laboratory continues to fulfil the certification requirements.

As part of the ongoing evaluation, a surveillance assessment visit (SAV) is carried out every three years, by default.

*PTS close the PR when all corrective actions are taken in place and approved

Approximately 70 SAVs have been performed by the PTS over the past 20 years (in average 5 SAVs per each of the 14 RLs including the re-validation visits).

Between 10 and 20 corrective actions are usually identified at a RL by the PTS during the SAV.

It typically takes 2 to 6 months for a RL to address the identified corrective actions.

Conclusion

Radionuclide laboratories are providing high quality and timely services in supporting the IMS Network. They are responsible for the impartiality and confidentiality of all of its CTBT specific activities.
The purposes of the laboratory analysis are to corroborate the results of the routine analysis of a sample from an IMS station, to provide more accurate and precise measurements, to clarify the presence or absence of fission and/or activation products in the case of a suspect or irregular analytical result from a particular station and in the case of failure in the measurement capability at a radionuclide station, to temporarily analyse the sample from that station.

References

1. ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories
2. CTBT/WGB/TL-11,17/18/Rev.7 Operational Manual for Radionuclide Monitoring and the International Exchange of Radionuclide Data
3. CTBT/PTS/INF.96/Rev.10 Certification and Surveillance Assessment of Radionuclide Laboratories for Particulate and Noble Gas Sample Analysis
4. IDC/ENG/SPC/103/Rev.8 Formats and Protocols for Messages
5. ECS-WGB-49-PTS-6 Particulate and Noble Gas Quality Assurance Plan