



CTBTO
PREPARATORY COMMISSION

COMPREHENSIVE
NUCLEAR-TEST-BAN
TREATY ORGANIZATION

The International Monitoring System

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The CTBT

The CTBT bans all nuclear explosions on Earth whether for military or for peaceful purposes.

The International Monitoring System (IMS)

The International Monitoring System (IMS) consists of 321 monitoring stations and 16 laboratories.

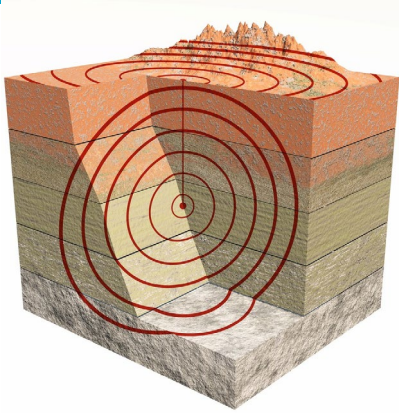
These 337 facilities monitor the planet for any sign of a nuclear explosion



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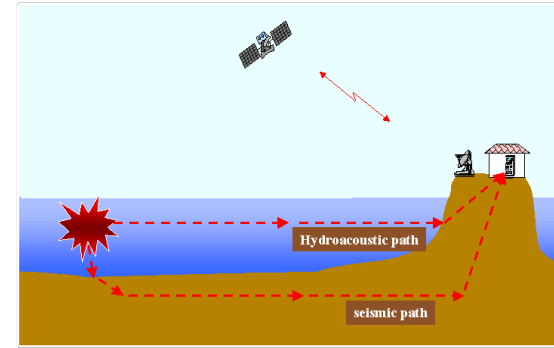
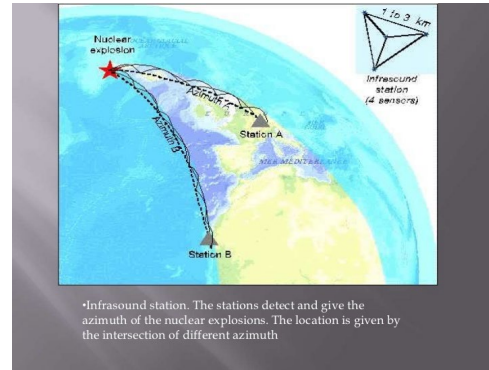
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Monitoring Technologies



seismic

infrasound

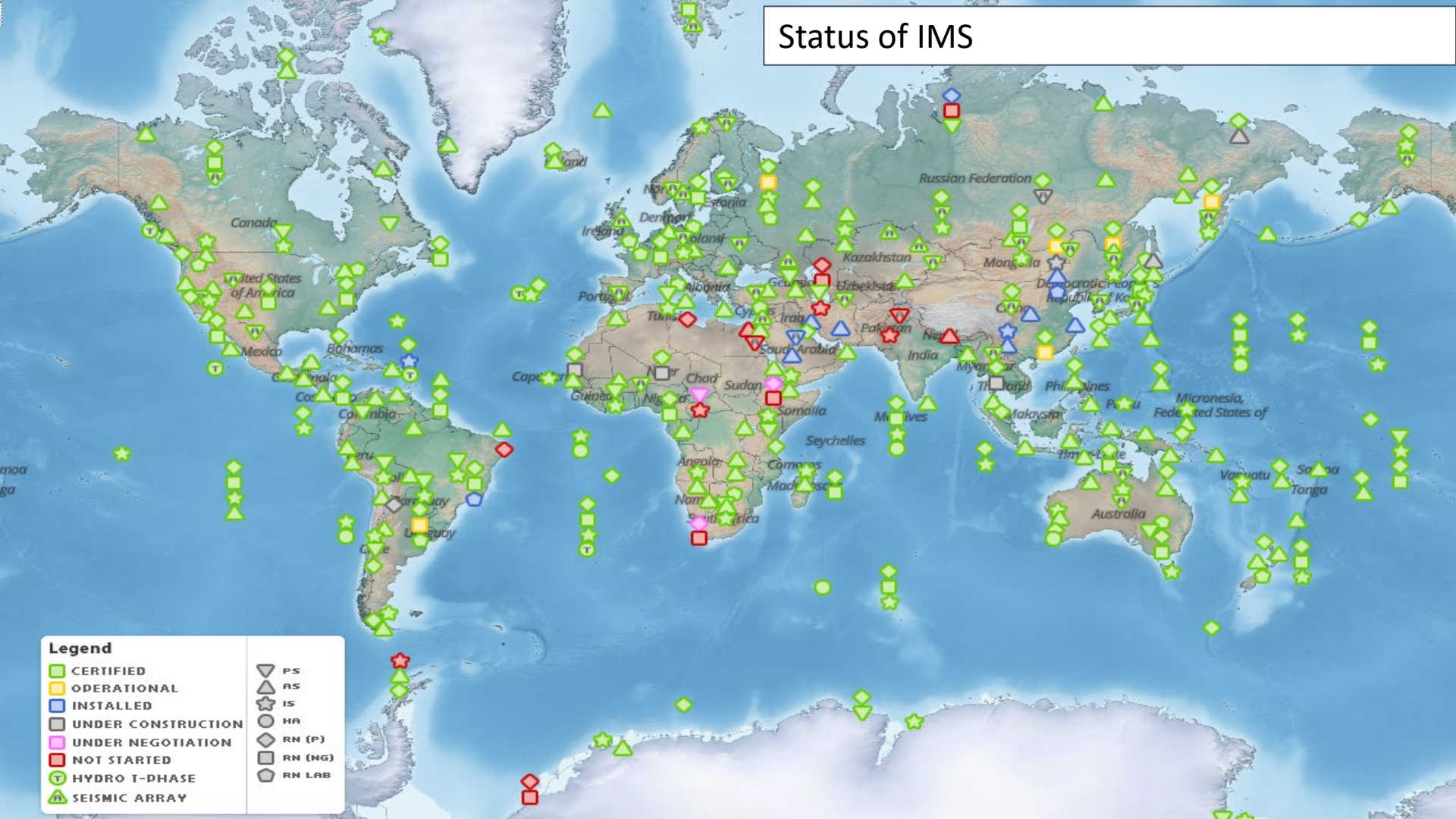


Hydro-acoustic

radioactivity



Status of IMS



Legend

CERTIFIED

OPERATIONAL

INSTALLED

UNDER CONSTRUCTION

UNDER NEGOTIATION

NOT STARTED

HYDRO T-PHASE

SEISMIC ARRAY

PS

AS

IS

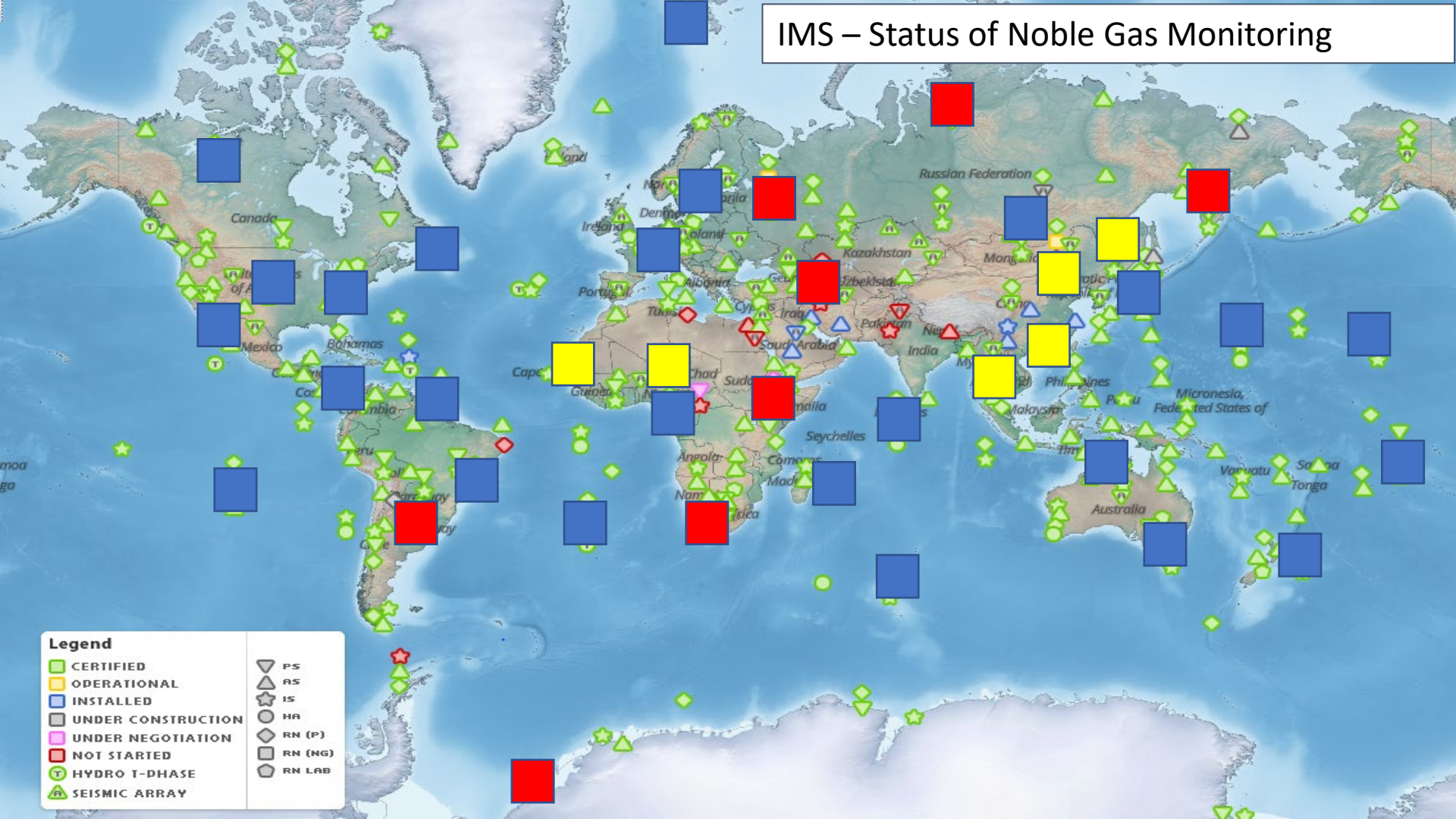
HA

RN (P)

RN (NG)

RN LAB

IMS – Status of Noble Gas Monitoring



Legend

CERTIFIED

OPERATIONAL

INSTALLED

UNDER CONSTRUCTION

UNDER NEGOTIATION

NOT STARTED

HYDRO T-PHASE

SEISMIC ARRAY

PS

AS

IS

HA

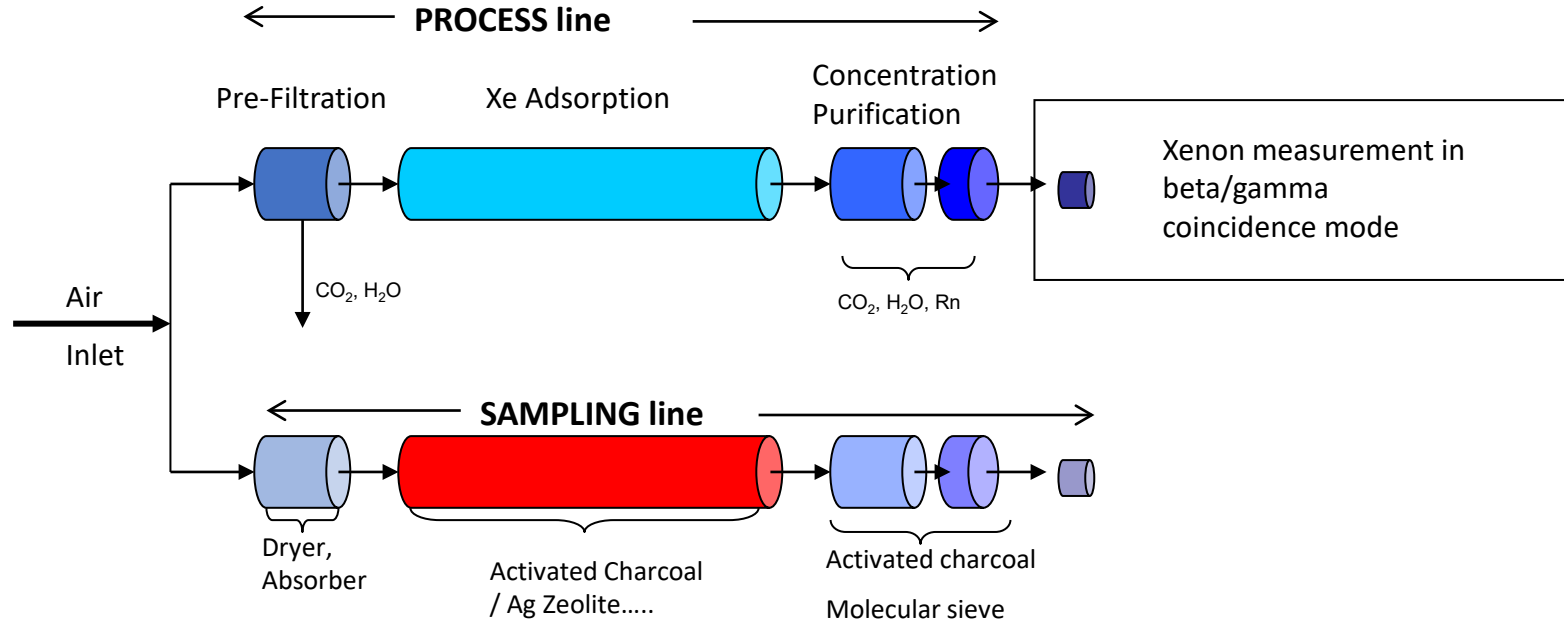
RN (P)

RN (NG)

RN LAB



Basic sampling scheme



Minimum requirements for Noble Gas Measurements CTBT/PC/II/1/Add.2

Characteristics	Minimum requirements
Air flow	$0.4 \text{ m}^3 \text{ h}^{-1}$
Total volume of sample	10 m^3
Collection time	$\leq 24 \text{ h}$
Measurement time	$\leq 24 \text{ h}$
Time before reporting	$\leq 48 \text{ h}$
Reporting frequency	Daily
Isotopes measured	$^{131\text{m}}\text{Xe}$, $^{133\text{m}}\text{Xe}$, ^{133}Xe , ^{135}Xe
Measurement mode	beta - gamma coincidence or high resolution gamma spectrometry
Minimum Detectable Concentration	1 mBq/m^3 for ^{133}Xe
State - of - Health	status data transmitted to IDC
Communication	two - way
Data availability	95%
Down time	≤ 7 consecutive days ≤ 15 days annually





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Next Generation Noble Gas Systems

Testing and Development of next generation noble gas systems continues:

- SAUNA III has been accepted for use in the IMS.
- The SPALAX NG has completed full 1-year pre-deployment testing and final on-site test.
- MIKS (VNIIA) and XEInt (Teledyne Brown) are in pre-deployment testing phase.



Xe-International (USA)



SPALAX-NG (France)



MIKS (Russian Federation)



SAUNA III (Sweden)



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Next Generation Noble Gas Systems

•Current

- beta-gamma coincidence systems or gamma
- time resolution (12h, 24h)
- $\text{MDC} < 1\text{mBq/m}^3$ for ^{133}Xe

New

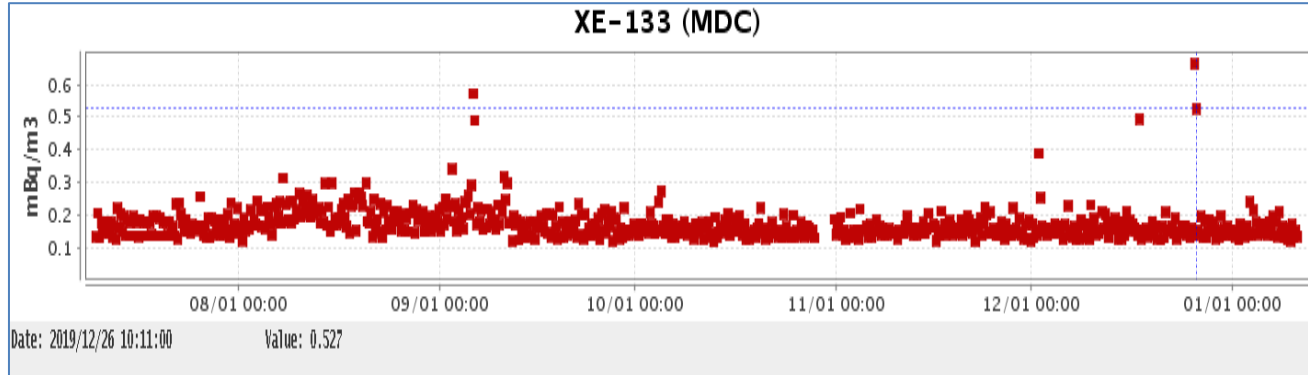
- beta-gamma coincidence systems
- time resolution (6h, 8h, 12h)
- $\text{MDC} < 1\text{mBq/m}^3$ for all nuclides
- Increase signal to noise ratio background
- Increased reliability and maintainability



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Next Generation Noble Gas Systems



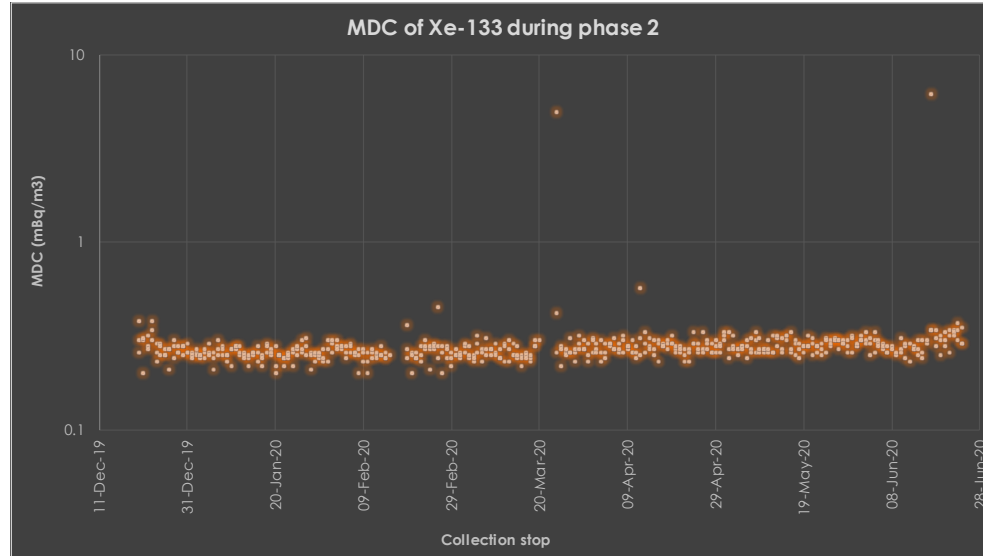
SAUNA III:
6 month of test data
Xe-133 MDC
6 hour sampling



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Next Generation Noble Gas Systems



SPALAX NG:
6 month of test data
Xe-133 MDC
8 hour sampling



Next Generation Noble Gas System Rollout Plan

First generation noble gas systems status

SAUNA II

Production is completed,
reaching obsolescence

SPALAX

Production is completed,
reaching obsolescence

Rollout Plan*

* Subject to budget constraints, PTS & manufacturer resources

Phase	When	System Upgrade or installation
1	2021-2025	9 systems
2	2025-2030	15 systems
3	2030-2035	10 systems
4	2035-2040	6 systems

Next generation noble gas systems

SAUNA III

Acceptance completed,
Ready for deployment

SPALAX
NG

At final Acceptance stage.

XeInt

Acceptance testing stage.

MIKS

Acceptance testing stage.



The International Monitoring System is developing

- The number of deployed xenon systems will increase
- Installation of new generation systems will further increase sensitivity
- The sensitivity of IMS to xenon isotopes will continue to increase

BUT

- The radioxenon component of the IMS is a sparse network
- Radioxenon background acts to dilute & mask releases from Treaty violations
- Increased background will offset the sensitivity gains made

The background is a solid blue color. It features a series of concentric circles centered in the middle, with a darker blue circle in the center and several lighter blue circles of increasing radii. Overlaid on these circles is a large, stylized, light blue 'S' shape that curves around the central area.

thank you