



SELECTIVE NOBLE GASES MONITOR

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The monitoring of real releases from a ventilation stack of VVER NPP requires a system by several orders more sensitive than currently used radiometer Kalina, designed to cover the range up to a design-based accident. To reach this goal a noble gases monitor with a germanium detector (MPVG) has been developed. It enables nuclide selective monitoring of current value of volume activity of particular nuclides in ventilation stack and daily releases of noble gases (balancing).

MPVG can be viewed as a system build of three levels of subsystem:

- measuring level
- control level
- presentation level

Measuring level consists of gamma-spectrometry system and operational parameters monitoring unit (flow rate, temperature, humidity)

Control level provides communication between presentation and measuring level, acquisition of operational parameters and power supply.

The presentation level of MPVG enables:

- the measured data storage in predetermined time intervals
- the presentation of measured and evaluated values of radiation characteristics.

The interconnection of different MPVG levels is ensured by serial data links.

The performance of an experimental MPVG based on GEM-10175-P-Plus detector with relative efficiency 10 % and resolution 1,75 keV is characterized by:

Limit of detection for 24 hours balancing of releases:

1200 Bq/m³ for ¹³³Xe (without a cartridge)

1 to 3 Bq/m³ for ¹³³Xe (with a cartridge)

Limit of detection for monitoring with 60 min. response time:

5,9 kBq/m³ for ¹³³Xe (without a cartridge)

5-15 Bq/m³ for ¹³³Xe (with a cartridge)

The range of volume activities monitoring with inserted sorbent cartridge:

from 10 to 10⁶ Bq/m³ (for ¹³³Xe)

The range of volume activities monitoring without sorbent cartridge:

from 10⁴ to 10⁹ Bq/m³ (for ¹³³Xe)

The monitored radionuclides - default set:

⁴¹Ar, ^{85m}Kr, ⁸⁷Kr, ⁸⁸Kr, ⁸⁹Kr, ^{131m}Xe,

¹³³Xe, ^{133m}Xe, ¹³⁵Xe, ^{135m}Xe, ¹³⁷Xe, ¹³⁸Xe.

(Modification is possible.)

Basic time interval for monitored data update:

- configurable in minutes

Time interval for balancing releases:

- the balancing is performed for the previous day

Data storage (archive generation):

- volume activities for monitored radionuclides for last 720 measurements
- balancing data for the last 365 days.

The prototype monitor has been operated during the whole 1993. The stability of the preset parameters made any resetting needless. The monitored data have been transformed into weekly histograms of selected radionuclides volume activity and submitted to the operator (EBO).

During the whole monitor testing period the noble gases releases have been extremely low - well below the limit of detection for 1 hour measurements except for ^{135}Xe . The volume activity of ^{133}Xe only occasionally exceeded detection limit 10 Bq/m^3 while those for ^{135}Xe varied between 10 to 50 Bq/m^3 . Values for ^{41}Ar were from below detection limit (1000 Bq/m^3) up to 2000 Bq/m^3 .

The values of volume activities observed at maximum releases have been approximately ten times higher. In that case in balancing some other nuclides exceeded corresponding detection limits:

^{88}Kr (67 22) Bq/m^3

$^{85\text{m}}\text{Kr}$ (17 7) Bq/m^3

$^{135\text{m}}\text{Xe}$ (7.1 0.5) Bq/m^3

^{138}Xe (5.9 0.9) Bq/m^3