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# of indirect quantification of Xe-133m to calibration of HPGe Detector

The INL Noble Gas Laboratory provides intercomparison samples for the noble gas analysis laboratories as part of the International Monitoring System. Xe-133m is one of the four relevant radionuclides in nuclear explosion monitoring. Without commercially available Xe-133m calibration standards laboratories must create and improve calibration methods. Improvements in calibration methods at the INL NGL benefit the CTBTO through better certified values for Xe-133m intercomparison samples. Calibration of high purity germanium detectors for Xe-133m quantification is complicated by the coexistence of Xe-133 in samples under analysis. Xe-133 is typically produced in larger quantities, has higher gamma emission probabilities, and its gammas are detected more efficiently than Xe-133m. Xe-133m activity of samples can be indirectly inferred through the 133:133m activity ratio of a batch of material, and the Xe-133 counts in the assay of a small aliquot of the same material. This indirect quantification method can be leveraged to perform detector calibrations for quantification of Xe-133m. Calibrations can be performed by inferring the Xe-133m to certify the sample, and direct counting to determine detector efficiency. A comparison of method results will be shown.

E-mail

troy.robinson@inl.gov

In-person or online preference

Primary author: Mr ROBINSON, Troy (Idaho National Laboratory)

Presenter: Mr ROBINSON, Troy (Idaho National Laboratory)

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