

## Simulations of gamma ray spectra of fission samples

Radionuclide laboratories affiliated with the CTBTO use high-resolution gamma-ray spectrometry to determine the presence of certain fission and activation products, which indicate the occurrence of a nuclear explosion. Annual proficiency tests are used to assess the performance of the radionuclide laboratories. While proficiency test samples are usually quite expensive to prepare and allow only limited radionuclide content (due to radioactive decay and safety issues), synthetic spectra can be used to model practically any scenario at relatively low cost. Gamma-ray spectra of fission samples of varying ages were accurately modeled using a combination of two tools: (i) Koala code was used to calculate the time-dependent activities of fission products [1]. (ii) GEANT4 software was used to simulate the response functions of a germanium detector to photons of varying energies. The numerical simulations were validated experimentally by irradiation of HEU samples in a reactor and later measuring them periodically. Synthetic spectra were used to test an algorithm for measurement restrictions within the framework of OSI [2]. The numerical method and obtained results, as well as possible applications (e.g. nuclear forensics), will be presented and discussed. [1] Proceedings of the 27th conference of the Israel Nuclear Societies (2014). [2] Journal of Instrumentation P05006(2018).

**Primary author:** AVIV, Ofer (Soreq Nuclear Research Center)

**Presenter:** AVIV, Ofer (Soreq Nuclear Research Center)

**Track Classification:** Theme 3. Verification Technologies and Technique Application