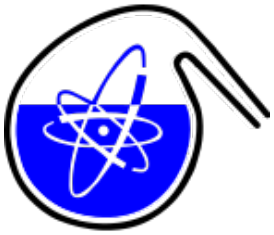

Contribution ID: **664** Type: **Poster**

Precise Determination of U-235 and Ra-226 Photopeak Intensities in Naturally Occurring Radioactive Materials Using Optimization Subroutine Function

Monday, May 14, 2018 6:30 PM (15 minutes)

The need for determining the U-235/U-238 isotopic ratio in a naturally occurring radioactive material (NORM) is increasing to warn a leakage of uranium into the environment. During the process of seeking a non-destructive method of analyzing natural matrices for uranium isotopes U-235 and U-238, a major source of uncertainty was found to be the gamma-ray intensities. Ra-226 and U-235 are always found in the presence of each other in soil samples, and each has primary gammas whose energies differ by only 0.496 ± 0.014 keV. The least squares fitting method, using the MIGRAD function optimization subroutine in ROOT framework was implemented to obtain reliable values for the two photopeak intensities of Ra-226 and U-235. This framework was developed to examine the effect of increasing or decreasing the number of degrees of freedom in the fit on the confidence intervals of the fitted intensity parameters (heights of the two Gaussians). An IAEA U1GX natural uranium reference material known to be in secular equilibrium has been counted using an ORTEC HPGe detector with the sample in a Marinelli beaker geometry. It was found that the increased number of degrees of freedom approach (i.e., with a reduced number of free parameters) gives more accurate results for the photopeak intensities, with the determined ratio of U-235 to Ra-226 intensities having discrepancies in the range 0.27-2.8% from the expected ratio for natural uranium that is in secular equilibrium.
Keywords: Uranium, HPGe, NORM, Gamma-ray.

Primary author: Dr HOANG, Sy Minh Tuan (Duy Tan University)

Co-authors: Mr DINH, Khoa Tran (Nuclear Research Institute -VINATOM); Dr SUN, Gwang Min (Korea Atomic Energy Research Institute); Mr KIM, Jiseock (Korea Atomic Energy Research Institue)

Presenters: Dr HOANG, Sy Minh Tuan (Duy Tan University); Dr SUN, Gwang Min (Korea Atomic Energy Research Institute); Mr KIM, Jiseock (Korea Atomic Energy Research Institue)

Session Classification: Poster NAM

Track Classification: Nuclear Analytical Methods