Contribution ID : **66** Type : **Poster**

GAMMA3: latest improvements and coincidence measurements

Wednesday, 28 September 2016 14:48 (0:02)

Content

In the framework of the verification of international treaties, nuclear forensics or site survey, the detection and measurement of anthropogenic radionuclides at trace levels in the environment is of great interest. For constant improvement of these measurements, the CEA/DAM-Ile de France has developed a new versatile surface gamma spectrometer. Named GAMMA3, the spectrometer was installed in July 2013 at the low-level radioactivity laboratory of CEA/Bruyères-Le-Châtel. It features a specially designed shielding and three high purity germanium detectors (BEGe5030P type). Its radioactive background and its performance for measurement of traces of radioactivity by means of high efficiency gamma measurement were already presented (see [1], [2]).
Upgrades of the spectrometer's active shielding (cosmic veto and nitrogen injection) will be presented. These evolutions led to a normalized integral background count rate as low as 2.8 counts/min/kg(Ge) (from 40 to 2500 keV). This reduction of the integral count rate is mainly due to the upgrade of the cosmic veto which reduces it by a factor of 15. Because it involves up to three high purity germanium detectors, the spectrometer can be used to conduct coincidence measurements. In this case, recorded events have triggered a signal in at least two detectors simultaneously. Coincidence measurements are of great interest for searching the signature of a multi-gamma emitter radionuclide hidden in the gamma spectrum of active environmental samples. These can be fresh environmental filters, contaminated water volumes, soils etc. For a given radionuclide, coincidence measurements lead to reduced background count rates but also to lower detection efficiency. Their implementation is therefore controversial and must be optimized. It will be demonstrated that for specific multi-gamma emitters, an analysis methodology involving counts from multiple regions of interest can lead to an improved Minimum Detectable Activity (Co-60 for two regions, Cs-134 and Ag-110m for 4 to 6 regions). Sensitivity of the spectrometer (as a function of the total activity of the sample) for these radionuclides when performing direct or coincidence measurement will be compared.
[1]: A. Cagniant, et al. Appl. Radiat. and Isot., 98 (2015) 122-133.
[2]: A. Cagniant, PhD dissertation, Université Pierre et Marie Curie Paris 6 – France (2015).

About the Presenter

The presenter is Antoine CAGNIANT from CEA/DAM/DIF.

Primary author(s) : Dr. CAGNIANT, Antoine (CEA/DAM/DIF)

Co-author(s) : Dr. DELAUNE, Olivier (CEA/DAM/DIF); Dr. DOUYSSET, Guilhem (CEA/DAM/IDF); Mr. GROSS, Philippe (CEA/DAM/DIF)

Presenter(s) : Dr. CAGNIANT, Antoine (CEA/DAM/DIF)

Session Classification : Radiometrics

Track Classification : Radiometrics