

Nondestructive nuclear measurement of radioactive waste

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A wide range of nuclear nondestructive measurements are carried out by CEA to achieve the most complete characterization of radioactive waste packages. High-energy photon imaging (radiography, tomography) allows determining the main properties of the packages, such as the density, position and shape of the waste inside the container, the quality of coating or blocking materials (resin, bitumen, hydraulic binder...), the presence of internal shields, structures, cracks, voids, defects, liquids, forbidden materials, etc. Radiological assessment is then performed using the widespread gamma-ray spectroscopy, which allows characterizing a broad range of radioactive and nuclear materials, but also passive neutron coincidence counting and active neutron interrogation with the differential die-away technique to measure nuclear materials. In view to assess the latter in the largest and densest packages, active photon interrogation with high-energy photons (above the photofission threshold of ~ 6 MeV) is a promising technique

currently under development at CEA. Prompt gamma neutron activation analysis is also being studied to detect toxic chemicals, or elements influencing the above measurements, such as neutron moderators or absorbers. The latter technique could also be used in the future to assess valuable materials in nonnuclear waste, such as precious metals (gold, platinum...) or rare earth elements in electronic waste.

Speaker Biography

Bertrand Perot was graduated in 1992 from the Physics Engineers School of Grenoble, France, and he obtained a PhD from Grenoble University in 1996. He worked for a few years at AREVA in the field of nuclear process control, mainly for AREVA La Hague reprocessing plant (Northwestern France). Then he joined CEA Cadarache (in South France) to develop nondestructive measurement methods for the nuclear fuel cycle, especially radioactive waste characterization and for homeland security through European projects. He obtained in 2012 the University accreditation to supervise PhD studies (the so-called "HDR") and he was appointed CEA International Expert in 2014. He has about 100 publications or communications and his H-index is 10.

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