

## GAMMA3 : A GAMMA/ELECTRON SPECTROMETRY SYSTEM FOR DETECTION OF ENVIRONMENTAL FISSION PRODUCTS TRACES

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Identification and quantification of minute quantities of fission/activation products in environmental samples is often of primary importance for the characterization of radiological events in various fields: nuclear power plant accidents, detection of clandestine nuclear tests in the framework of CTBT (Comprehensive Test Ban Treaty), nuclear forensics... Sensitivity of conventional surface-level system is limited by natural environmental background whereas for underground systems the performances are often hampered by the Compton background signal due to natural or major anthropogenic radionuclides present in the sample.

In order to achieve the best detection capabilities for both low and high activity samples, a versatile triple crystal gamma spectrometer has been designed and is currently under implementation in our laboratory. The setup is composed of three mobile high efficiency HPGe spectrometers. This structure can accommodate several types of environmental samples: full or compressed aerosol filters, bottles ranging from 20 to 1000 cm<sup>3</sup>, gas cells.

State-of-the art passive and active shielding techniques are implemented. The multiple crystal setup allows to perform ( $\gamma$ - $\gamma$ ) coincidence/anti-coincidence measurements. This increases drastically the detection capabilities of the system for several relevant fission products. For quantification of radioactive noble gas a special 15 cm<sup>3</sup> carbon-window cylindrical measurement cell fitted with two large area passively implanted silicon detectors (PIPS) has been built. This cell is placed in between two of the HPGe detectors. This configuration allows to perform ( $X, e^-$ ) coincident detection of radionuclides isotopes. This is of particular interest for unambiguous detection of metastable radionuclides isotopes (<sup>131m</sup>Xe, <sup>133m</sup>Xe) which are relevant for discrimination between civilian and military events.

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