

Development of a new compact photon/electron detector for radioxenon measurement

An ultra-compact lightweight unshielded spectrometer for detection and analysis of atmospheric radioxenons has been developed. This system works at ambient temperature and has a 58 cm³ inner active volume. Atmospheric radioxenon activities are determined with beta/gamma coincidence technique using both NaI(Tl) detectors and large pixellized Si-PIN detectors. The concept of this detection system, especially the gas cell, is partially inspired by the PIPSTBox detector integrated into the SPALAX-NG (SPALAX New Generation). Carbon window suppression allows to operate over atmospheric pressure (~2 bar) in order to enhance the detection sensitivity at the price of a slight decrease of the energy resolution. The performances of the detection system in terms of Minimal Detectable Activities are below 20 mBq (12h acquisition, unshielded), for all radioxenon of interest (^{131m}Xe, ¹³³Xe, ^{133m}Xe and ¹³⁵Xe). Coupled with the SPALAX-NG gas enrichment system, Minimal Detectable Concentrations of this spectrometer are lower than 1 mBq/m³ for the four radioxenon of interest (12h acquisition, 60 m³ sampled volume). This new system and its performances will be presented.

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