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Applying an anti-coincidence system plastic-HPGe to lower the MDA of radioxenon measurement

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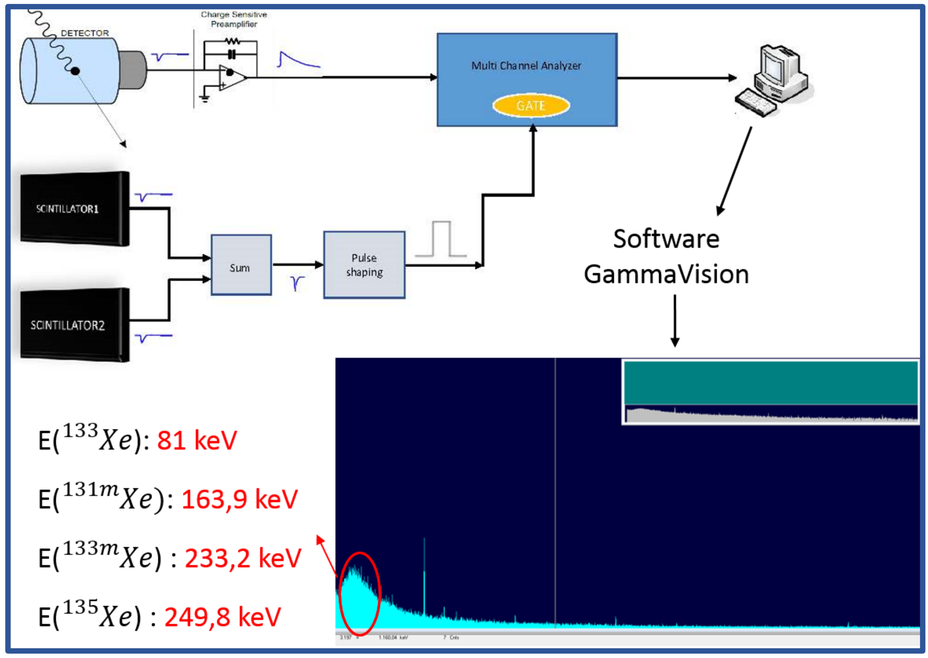
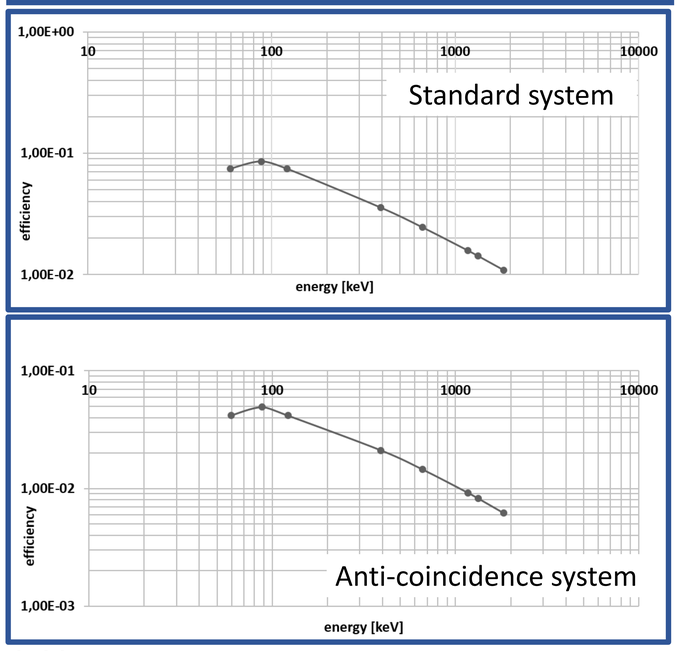
The systems developed to detect the emissions of xenon isotopes, for the verification of the CTBT treaty are required to have a very sensitive detection limit. To improve the sensitivity of the is important to reduce the background detected by the system. At ENEA Noble Gas laboratory an anticoincidence system has been developed to support the measurement of radio-xenon isotopes in atmospheric samples. Tests conducted with the anticoincidence system have shown a reduction of the Compton continuum that contributes to the spectrum background.

An anticoincidence system has been designed and set up at ENEA Noble Gas laboratory, located in the Research Centre of Brasimone (Italy).
The system consists of:
- high purity germanium coaxial detector p-type 'Extended Range' (GX6020)
- low-background shield made of ancient lead (150 mm) with a layer of electrolytic copper (35 mm)
- Two NUVIA plastic scintillators above the shielding to detect coincident cosmic-ray interactions.

MultiChannel Analyser amplifies the signal and passes it through an analogue-to-digital converter.
The pulse height is then stored in the MCA and recorded into proportional channels.
The software GammaVision is used to display and analyze the spectra.
The anti-coincidence mode is activated simply by modifying settings directly from the software.

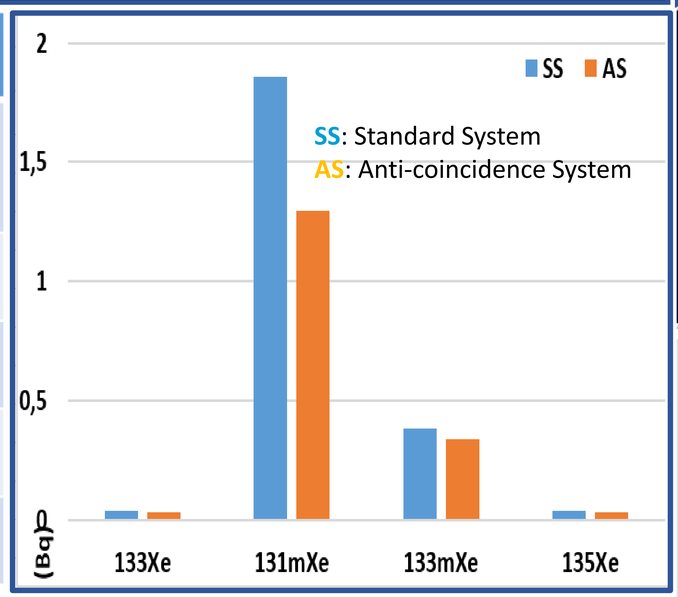


Slightly reduction of efficiency



Reduction of the MDA* using the anti-coincidence system respect to the standard system

	MDA (Bq)	
	Standard system	Anti-coincidence system
^{133}Xe	0,042	**0,034**
^{131m}Xe	1,861	**1,295**
^{133m}Xe	0,385	**0,339**
^{135}Xe	0,039	**0,038**



* Minimum detectable Activity

Reduction of MDA in the spectrum