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Development of a 32 detector CdTe matrix for the SVOM ECLAIRs X/Gamma camera

ECLAIRs, a 2D coded-mask imaging telescope on the Sino-French SVOM space mission, will detect and locate GRBs between 4 and 150 keV. The detector array is an assembly of 6400 Schottky CdTe semiconductor detectors of size 4x4x1 mm³, biased from -100V to -600V and operated at -20°C to minimize the leakage current and maximize the polarization time due to Schottky barrier lowering. The remarkable low-energy threshold for a space instrument is achieved through an extensive detectors selection, the choice of a low-noise 32 channels ASIC, and the realization of an innovative hybrid detection module formed by a thick film ceramic holding 32 detectors with their high voltage grid, and an HTCC ceramic housing the ASIC chip within an hermetic cavity.

In this paper, we describe a complete 4 by 8 hybrid matrix and explain the results of tests comparing the different sources of noise such as design capacitances, leakage currents after sticking detectors on ceramic and the ENC measured on the ASIC ceramic module. We confront these values with the energy threshold and FWHM measured on spectra made with calibrated radioactive sources such as Am-241, Co-57 and Fe-55 inside a vacuum chamber at -20°C and parameters chosen to get the best performance. Finally, we will present the superposition of 32 calibrated spectra of version 3 matrix, showing the excellent homogeneity of 32 detectors and the achievement of a detection threshold of 4 keV.

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Space CdTe Detectors

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