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Performance of the HEPD-02 LYSO calorimeter and expected sensitivity to GRBs detection

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A High-Energy Particle Detector will be launched on board the CSES-02 satellite with the main purpose of deepening our comprehension of the Earth magnetosphere, investigating the Inner Van Allen belts and contributing to the understanding of sub-GeV cosmic rays.
HEPD-02 is composed of two segmented scintillator layers for the trigger, a silicon pixel tracker and a calorimeter. The detector is surrounded by a plastic scintillator veto, except for the front side.
The calorimeter is composed of twelve layers of $1.1 \times 15 \times 15\,\mathrm{cm}^3$ plastic scintillator pads and two layers of 3 LYSO bars, as large as $2.5 \times 4.9 \times 15\,\mathrm{cm}^3$, disposed orthogonally to each other.
Thanks to its features, HEPD-02 could identify gamma-rays converting in the LYSO crystals by requiring all the other sub-detectors to act as a veto.
In particular, Gamma Ray Bursts (GRBs) are extremely energetic events generated billions of light years away from the Earth, possibly during neutron star mergers or supernova explosions. HEPD-02 would join the fleet of space detectors continuously monitoring the sky and searching for GRBs, widening the sky coverage and contributing to the knowledge of these phenomena.
We report the measured radioactive background of a HEPD LYSO crystal due to the decay of ^{176}Lu (2.6% ab., $T_{½} = 3.78 \times 10^{10}$ y), then describing a possible triggering scheme for GRBs and the expected sensitivity to GRBs in the $2 - 20$ MeV energy window.

Keywords

“GRBs; HEPD; LYSO; scintillator; calorimeter; space detector; radioactive background”

Collaboration

other (fill field below)

other Collaboration

CSES-Limadou

Subcategory

Experimental Methods & Instrumentation

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