

## Development activities of a CdTe/CdZnTe pixel detector for gamma-ray spectrometry with imaging and polarimetry capability in astrophysics

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### Abstract

In the last few years we have been working on feasibility studies of future instruments in the gamma-ray range, from several keV up to a few MeV, in collaboration with other research institutes. High sensitivities are essential to perform detailed studies of cosmic explosions and cosmic accelerators, e.g., Supernovae, Classical Novae, Supernova Remnants (SNRs), Gamma-Ray Bursts (GRBs), Pulsars, Active Galactic Nuclei (AGN). Cadmium Telluride (CdTe) and Cadmium Zinc Telluride (CdZnTe) are very attractive materials for gamma-ray detection, since they have already demonstrated their great performance onboard current space missions, such as IBIS/INTEGRAL and BAT/SWIFT, and future projects like ASIM onboard the ISS. However, the energy coverage of these instruments is limited up to a few hundred keV, and there has not been yet a dedicated instrument for polarimetry. Our research and development activities aim to study a gamma-ray imaging spectrometer in the MeV range based on CdTe detectors, suited either for the focal plane of a focusing mission or as a calorimeter for a Compton camera. In addition, our undergoing detector design is proposed as the baseline for the payload of a balloon-borne experiment dedicated to hard X- and soft gamma-ray polarimetry, currently under study and called C $\mu$ SP (CZT  $\mu$ -Spectrometer Polarimeter). Other research institutes such as INAF-IASF, DTU Space, LIP, INEM/CNR, CEA, are involved in this proposal. We will report on the main features of the prototype we are developing at the Institute of Space Sciences, a gamma-ray detector with imaging and polarimetry capabilities in order to fulfil the combined requirement of high detection efficiency with good spatial and energy resolution driven by the science.