

MeVCube: a CubeSat for MeV astrophysics

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Despite the great success achieved both by X-ray and gamma-ray observatories in the past two decades, the region of the electromagnetic spectrum around 1 MeV remains largely unexplored. COMPTEL, on board CGRO (1991-2000), was the last telescope to observe this region, with a modest sensitivity. New gamma-ray observatories, like AMEGO and e-Astrogam, have been proposed for the future, in order to fill this gap in observations. However, the timescale for development and launch of such big missions is around 10 years, with substantial costs.

Looking at this scenario a nano-satellite Compton telescope, based on the CubeSat standard, may be profitable for the immediate future. The small cost and relatively short development time are clear advantages. Moreover such instrument could also be used as a pathfinder mission to test technologies and algorithms for future telescopes.

MeVCube is a 6U CubeSat concept currently under investigation at DESY. MeVCube will be based on Cadmium-Zinc-Telluride (CdZnTe) detectors, coupled with low-power read-out electronics (ASIC, VATA450). The high atomic number of CdZnTe enhance the interaction probability; moreover with a pixelated detectors, we can reach both good spatial resolution and energy resolution. Concerning the read-out electronics, VATA450 shows promising results in terms of dynamic range, noise and reliability. We estimated via simulations that such a small telescope could cover the energy range between 100 keV up to few MeV with a sensitivity comparable to that of missions like COMPTEL and INTEGRAL. Experimental tests on the read-out electronics and CdZnTe detectors are ongoing at DESY as well.

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