MeVCube:
a CubeSat for MeV astronomy

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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

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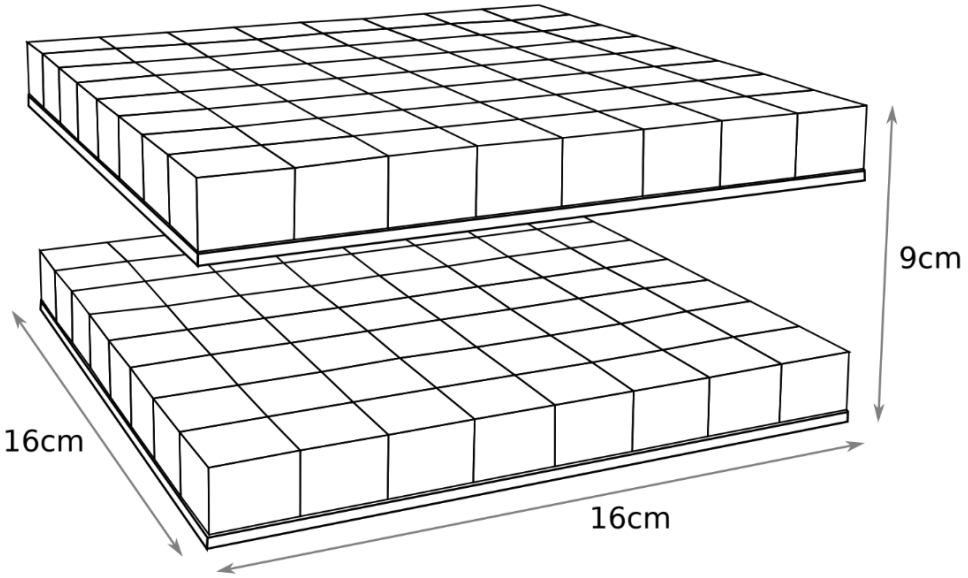
The “MeV gap” and MeVCube concept

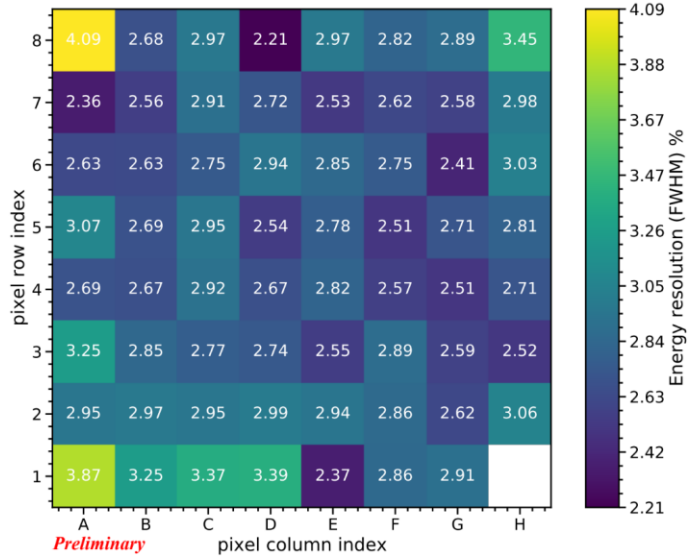
- Despite the impressive progresses achieved both by X-ray and gamma-ray observatories the MeV energy range remains poorly explored.
- Missions like AMEGO have been proposed, in order to fill this gap in observation, but the time-scale for development and launch is long.
- Different approach: MeV observations can be performed by a Compton telescope based on the CubeSat standard, with small cost and relatively short development time.

MeVCube is a 6U CubeSat (10cm x 20cm x 30cm volume) based on pixelated Cadmium-Zinc-Telluride semiconductor detectors.

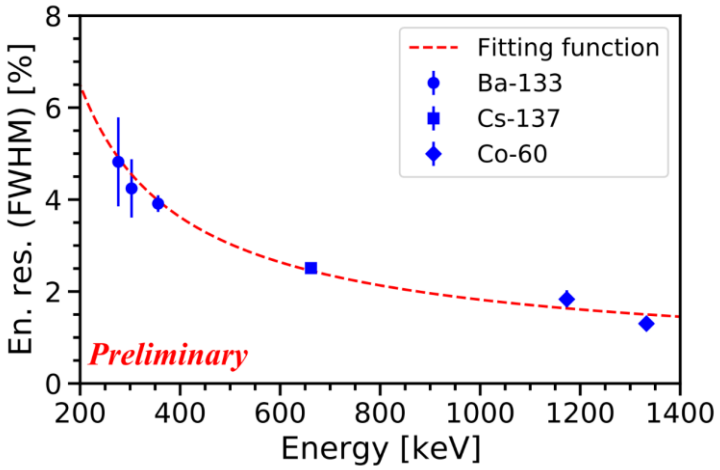


MeVCube schematic model

Experimental results on a CdZnTe detector

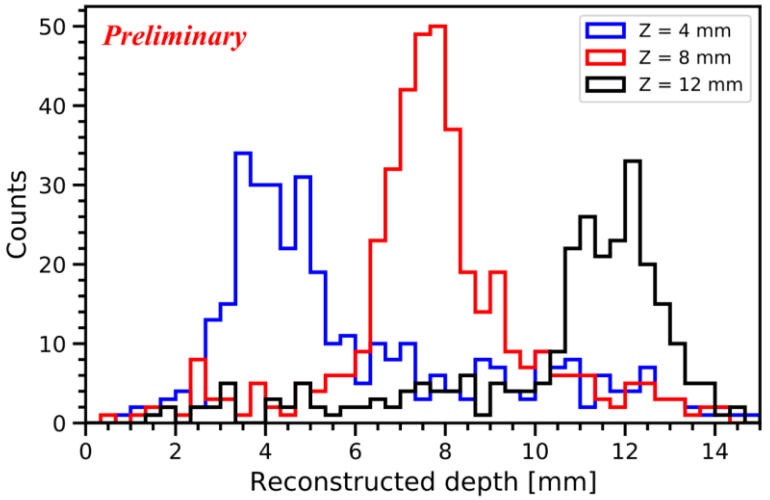


Energy resolution (FWHM) for the Cs 662 keV line



Energy resolution for different radioactive sources

- Energy resolution ranges from ~ 6% around 200 keV to 2% above 1 MeV (FWHM).
- Depth resolution is around 1.5−1.7 mm.

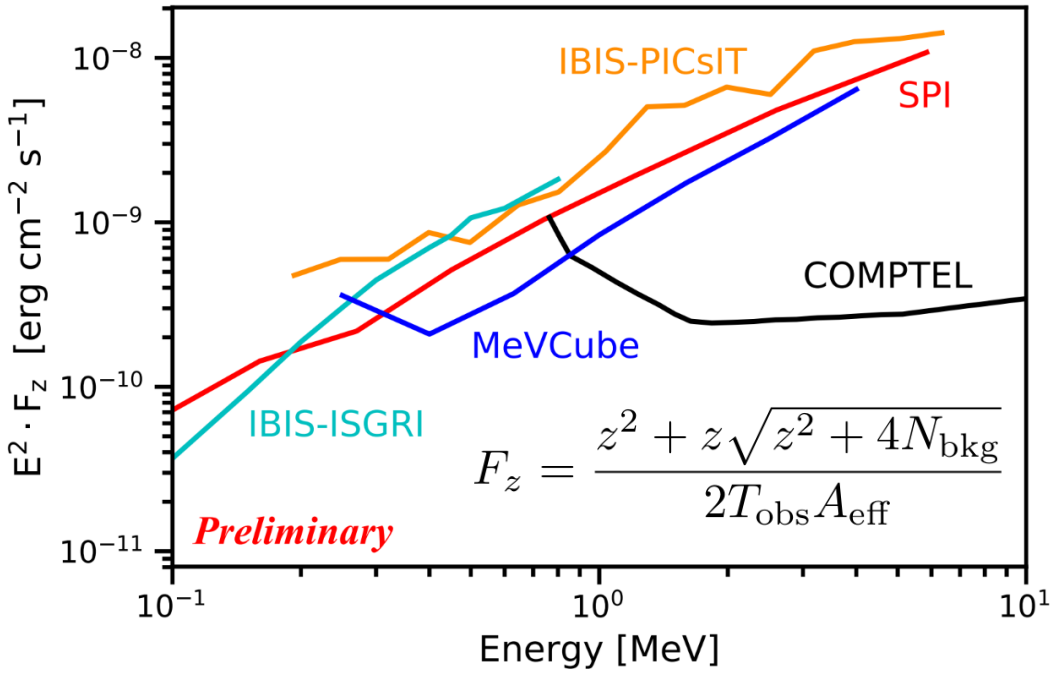


Interaction depth for three different scanning positions.

MeVCube performance

- MeVCube response evaluated with the simulation toolkit *MegaLib* and background model adapted from Cumani et al., *Exp. Astron.*, 47 (2019).

- MeVCube sensitivity computed for a 3σ detection and 100ks observation time. Even a Compton camera, flying on a CubeSat, can reach the sensitivity of COMPTEL or INTEGRAL.



MeVCube expected sensitivity

COMPTEL data from Schönfelder, *New Astron. Rev.,* 48 (2004).
INTEGRAL-SPI from Roques et al., *A & A*, 411 (2003).
INTEGRAL-IBIS from Ubertini et al., *A & A*, 411 (2003).