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#2-162 MC2-1K, a novel 250 μm CdTe based imaging spectrometer for space science

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Hard X-ray focusing optics technologies for solar physics space missions aiming at direct imaging of solar flares or hard X-ray space astronomy are challenging the development of time-resolved, high spectral and spatial resolution CdTe detectors.

CEA and 3D PLUS, in the frame of ALB3DO laboratory with support of CNES, the French space agency, have initiated the development of an entirely new detector, namely MC2. On the mid-term, the detector will be a scalable, 4-side buttable 3D module including a pixelated CdTe detector with 64x64 pixels, with 250 μm pitch. The patterned pixel sensor is flip-chip on top of a mosaic of full custom readout ASIC named IDeF-X D2R2.

In the development path, a preliminary prototype MC2-1K has been constructed and operated successfully. The device consists of a quarter of the MC2 module, i.e. a 32x32 CdTe detector with 250 μm pitch flip chipped on top a unique IDeF-X D2R2 ASIC circuit. The detector is mounted onto a 2D printed circuit board and installed into a vacuum chamber associated to a dedicated readout bench for system studies and performance assessment. A fully energy calibrated spectrum involving most of the 1024 channels has been successfully recorded under illumination of a ^{241}Am source. An energy resolution of 900 eV FWHM at 59.54 keV have been measured.

In this paper, the construction of the detector prototype will be described and first performance results will be demonstrated. Performance limitations will be discussed and future work towards an entire module which will be integrated in 3D will be described.

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