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SÉMINAIRE

RAAD : a cubesat based soft γ-ray detector for the study of terrestrial γ-ray flashes and other short timescale phenomena

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salle des séminaires du CENBG

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RAAD (Rapid Acquisition Atmospheric Detector) is a detector in development at New York University in Abu Dhabi designed to study Terrestrial Gamma-ray Flashes (TGFs) and other fast hard x-ray and gamma-ray phenomena. TGFs are bursts of radiation from thunderstorms which occur on sub-microsecond timescales. Most detectors used to study TGFs have been limited by deadtime and timing precision, and sometimes poor calibration at lower energies. RAAD is designed to be sensitive in the 10 keV – 2000 keV range with ~100 ns time response and good spectral resolution which can be flown on a CubeSAT. The baseline design consists of 2x2 arrays of two different scintillation crystals, Cerium Bromide and/or Lanthanum Bromo Chloride, both of which have very fast decay times. We couple them to both standard photomultiplier tubes and silicon photomultipliers along with custom electronics designed to provide very fast sampling with very lowpower consumption per channel. Each crystal array fits into < 1U of a cubesat, and provides ~20 cm² of effective area to photons < 200 keV and ~10 cm² at 600keV. Two detectors, one with PMTs and one with SiPMs will be deployed on a 3U CubeSat, providing head to head performance tests for both crystal types and light sensor types. This will serve as a proof of concept showing how such detectors could be deployed in a network of CubeSats to study TGFs and other phenomena. The RAAD concept is the winner of the Mini-satellite competition heldby the UAE Space Agency in 2018, largely developed with undergraduates at NYUAD, and is expected to be fully developed and launched by 2020.

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