



LNGS SEMINARS

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The RAADsat Mission for Studying Terrestrial Gamma-Ray Flashes

Abstract

RAAD (Rapid Acquisition Atmospheric Detector) is a 3U Cubesat (**and low cost**) space mission designed to study Terrestrial Gamma-ray Flashes (TGFs). TGFs are sudden bursts of gamma-ray radiation occurring on millisecond timescales, which are triggered by lightning or thunderstorms and channeled into outer space. Several TGF models have been proposed over the last decade however, due to the lack of experimental data, production mechanism, propagation and typical energy range are still open questions.

The RAADsat payload, developed at New York University Abu Dhabi (NYUAD), is sensitive to the energy range 20 keV – 3000 keV. It consists of two arrays of crystals, the first array (CUBE 1) is equipped with four Low Background Cerium Bromide ($\text{CeBr}_3(\text{LB})$) crystals of 23 mm X 23 mm X 45 mm (LxWxH) dimension and four R11265U-200 photomultiplier tubes manufactured by Hamamatsu, while the second (CUBE 2) with two $\text{CeBr}_3(\text{LB})$ crystals and two Lanthanum Bromo Chloride (LBC) crystals of the same dimension and four S13361-6050AE-04 MPPC manufactured by Hamamatsu. The electronics readout of CUBE1 and CUBE2 has been designed in collaboration with AGE Scientific srl taking into account the constraints of a space mission: redundancy, radiation hardness, reliability and low power operations. The time resolution of the system is 100 ns and it will provide microsecond absolute timing for correlation with lightning data.

The immediate scientific goals are to explore the average atmospheric cut-off at low energies, search for a 511 keV electron-positron annihilation line, and search for microsecond structure in the light curves of the brightest TGF bursts.

The mission will be also used as proof of concept and to space-qualify the proposed technology opening for the deployment of a constellation of Cubesats to improve the collection efficiency, the sensitivity and to localize the origin of TGF events.

The RAAD mission is the winner of the Mini-satellite competition held by the UAE Space Agency in 2018, and is expected to be fully developed and launched by JAXA for deployment from the ISS by the end of 2020.

July 18, 2019 - h 2:30 pm

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