

IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

Author: Ms. Lolowa Alkindi
Taiwan Space Agency (TASA), United Arab Emirates, lolowa.alkindi@gmail.com

LIGHT-1 CUBESAT DETECTOR (RAAD) FOR THE STUDY OF TERRESTRIAL GAMMA-RAY
FLASHES: SPACE QUALIFICATION, FIRST DATA SET, AND CORRELATIONS WITH LIGHTNING

Abstract

RAAD (Rapid Acquisition Atmospheric Detector), the winner of the UAE Space Agency's Mini-Sat Competition in 2018, is the payload of the Light-1 3U CubeSat. RAAD is composed of two detectors designed and optimized for studying Terrestrial Gamma-Ray Flashes (TGFs) through the use of two different types of scintillating crystals (Cerium Bromide and Lanthanum BromoChloride) coupled to S13361-6050AE-04 Hamamatsu Silicon Photomultipliers (SiPMs) and R11265-200 Hamamatsu Photomultiplier Tubes (PMTs). Each detector consists of a 2 x 2 array of crystals and photosensors, each fitting into 1U of a CubeSat and less, providing an effective area of 40cm² at 50keV, and 20cm² at 511keV. RAAD's unique combination of scintillating crystals and photosensors, along with the custom-designed readout electronics, overcomes the deadtime and timing precision limitations along with the low resolution at lower energies (>50keV) that are found in previous missions that had tried to detect TGFs. The custom-designed payload electronics provide the required spectroscopic and timing capabilities within the low power budget constraints (<4.5W on average) of the mission. We're aiming at the 20keV – 3000keV energy range, few hundreds ns time response, and good energy resolution (around 5 percent @ 511keV). We present the performed space qualification tests, the payload mechanics, its calibrations, and pre-flight particle and signal simulations for the characterization of the expected response. We also present for the very first time the first set of data obtained from Light-1 CubeSat, correlated with lightning strikes from Blitzortung Lightning Network.