

IAF EARTH OBSERVATION SYMPOSIUM (B1)  
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DESIGN AND IMPLEMENTATION OF AN OPEN-SOURCE, LOW-COST RADIATION  
MEASUREMENT PAYLOAD FOR SMALL SATELLITES IN LOW EARTH ORBIT

**Abstract**

When it comes to space, particularly regarding space weather, we realize that there is still a gap related to sensors to be embedded in small satellites to perform measurements in Low Earth Orbit (LEO). When the causes of catastrophic failures in small satellites missions are analyzed, it can be observed that a significant number of these failures occur in electronic components, many of which are caused by radiation concentrated in LEO. Another major challenge faced in the space industry is the South Atlantic Anomaly (SAA), located over South America. It affects satellites with orbital inclinations between 35 and 60, which are periodically exposed to the mentioned anomaly. This paper aims to present a low-cost, low-energy consumption, and open source radiation measurement payload to be embedded on two PocketQube missions. The studies will be in the LEO orbits, with focus on measurements in the region of SAA. The payload is capable of measuring Alpha ( $\alpha$ ), Beta ( $\beta$ ) and Gamma ( $\gamma$ ) particles with an energy range from 33 keV to 8 MeV. In addition to the measurement instruments, a Global Navigation Satellite System (GNSS) module is also onboard, which will be used to generate radiation maps that will be distributed to the entire community for conducting studies related to space weather. As this is an open source project, this work will cover all the methodology used in the development of this payload. This includes the development of the particle meter prototype, calibration process, engineering model development, energy consumption analysis, electromagnetic compatibility, environmental tests, as well as the results obtained in each stage of the whole development process. In addition, the next steps in the development of this payload will be discussed.