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AN INNOVATIVE RADIATION MONITOR AND EPS SYSTEM FOR FUTURE CUBESAT MISSIONS

Abstract

The next CubeSat mission of the university of applied science Wiener Neustadt – to be launched 2023 – will employ a FEEP nano R^3 propulsion system in order to increase the altitude of its orbit and characterize the radiation environment at different altitudes. For this purpose, a generic EPS and dosimeter payload have been developed, which will extend the capabilities of future nanosatellites. The EPS system makes use of cost-efficient COTS and is capable of providing up to 40 Watts peak power within a 3 U form factor. Such a high-power consumption exposes the satellite bus to stressful conditions. The thermal and EMC properties of the system were simulated and studied during a vast testing campaign. This technology demonstrates the feasibly of high energy densities in nanosatellite, which will be increasingly required for future power demanding payloads. The dosimeter makes use of a RADFET technology and optionally a simplified linear energy transfer (LET) spectrometer. The dosimeter concept intends to enable scientific measurements and as well provide a characterization of the total ionizing dose (TID) and heavy particle spectrum. This information is necessary to adapt the operation mode of complex missions at critical exposure levels. Operational tests of the dosimeter include TID (at a ^{60} Co source) and LET (at a proton synchrotron). We will present performance tests and a characterization of both subsystems. This includes the modelling with specific tools and specific environmental tests. They include thermal vacuum, radiation environment and zero-gauss facilities. Both subsystems are expected to significantly extend the capabilities of future CubeSat missions.