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In-flight calibrations and electron flux measurements of Aalto-1/RADMON

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Aalto-1, a three-unit CubeSat launched to Sun-synchronous Low Earth Orbit on 23 June 2017, is Finland's first satellite in orbit. It carries a payload consisting of three state-of-the-art instruments: a hyperspectral camera, a Plasma Brake for deorbiting demonstration, and a radiation monitor (RADMON) measuring the charged particle radiation in orbit. RADMON is sensitive to >10 MeV protons and >2 MeV electrons.

We present results of an ongoing work on RADMON in-flight calibrations. The RADMON flight measurements consist of two types of science data: the counter data, which is available in science mode, and the pulse height data, which is available in calibration mode. The latter makes an absolute energy calibration possible using high energy proton data registered by the radiation monitor. We present Geant4 simulations of RADMON response matrix including the whole Aalto-1 satellite assembly in the model. We apply the model to compare the measured South Atlantic Anomaly particle spectrum with reference one and show how RADMON electron channels are contaminated by penetrating protons of high energies. The response matrix is used to process the counter data to restore incident fluxes and spectra of incoming particles. Finally, we present the calibrated RADMON measurements of relativistic electrons over the measurement campaign carried out in 2017 and 2018.