Energetic particle flux variations detected at low altitudes by Space Application of Timepix Radiation Monitor (SATRAM)

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The Space Application of Timepix Radiation Monitor (SATRAM) on board the Proba-V satellite of the European Space Agency (ESA) was launched in May 2013 into a sun-synchronous orbit with an altitude of about 820 km. This technology demonstration payload is based on the Timepix technology developed by the CERN-based Medipix2 Collaboration. It is equipped with a 300 \textmu m thick silicon sensor with a pixel pitch of 55 \textmu m in a 256 x 256 pixel matrix. The device is sensitive to X-rays and all charged particles. A Monte Carlo simulation was conducted to determine the detector response to electrons (0.5–7 MeV) and protons (10–400 MeV) taking into account the shielding of the detector housing and the satellite. With the help of the simulation, a strategy was developed to estimate omnidirectional electron, proton, and ion fluxes around Earth using stopping power, maximum energy deposition per pixel of the particle track, and the shape of the particle tracks in the sensor. Presented are typical overall dose rates as well as fluxes of individual particle species. A superposed epoch analysis is used to analyze variations of particle fluxes related to geomagnetic storms and interplanetary shock arrivals as a function of time and L-shell.