Geophysical Research Abstracts
Vol. 19, EGU2017-18181, 2017
EGU General Assembly 2017

Fast method for in-flight estimation of total dose from protons and electrons using RADE Minstrument on JUICE

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The primary concern of the ESA JUICE mission to Jupiter is the harsh particle radiation environment. Ionizing particles introduce radiation damage by total dose effects, displacement damages or single events effects. Therefore, both the total ionizing dose and the displacement damage equivalent fluence must be assessed to alert spacecraft and its payload as well as to quantify radiation levels for the entire mission lifetime. We present a concept and implementations steps for simplified method used to compute in flight a dose rate and total dose caused by protons. We also provide refinement of the method previously developed for electrons. The dose rates values are given for predefined active volumes located behind layers of materials with known thickness. Both methods are based on the electron and proton flux measurements provided by the Electron and Proton Detectors inside the Radiation Hard Electron Monitor (RADEM) located on-board of JUICE. The trade-off between method accuracy and programming limitations for in-flight computations are discussed. More comprehensive and precise dose rate computations based on detailed analysis of all stack detectors will be made during off-line data processing. It will utilize full spectral unfolding from all RADEM detector subsystems.