3D mapping of the Earth’s trapped radiation particles using ASC: from the inner zone to the magnetosphere

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Introduction

As a pioneer of the fully autonomous star trackers, the micro Advanced Stellar Compass (µASC) has brought together a suite of measurement systems that can be autonomously operated with high accuracy and reliability. These systems form the basis of the µASC, a miniature star tracker, which is capable of operating with a single failure rate within the requirements of a spacecraft mission.

Ionizing particles spectrum shield depth analysis

- Silicon carbide structure and metal CHU shielding stops charged particles with energy >20 MeV.
- Lens shield depth is 23-35 Al eq.
- CHU shielding stops charged particles with energy >20 MeV.
- P < 100 MeV omnidirectional sensitivity.
- Particles >150 MeV penetrates omnidirectionally.

Magnetosphere particles population

MMS (NASA's Magnetospheric MultiScale mission) investigates how the Sun's and Earth's magnetic fields interact with the plasma in the near-Earth space. It consists of four identical instrumented spacecraft that measure plasmas, fields, and particles. Each spacecraft is equipped with four µASC CHU's, which continuously monitor the particle population from the one to the other, regulating the geospace weather. It consists of the four MMS particle population (~8000 km).

South Atlantic Anomaly Proton Flux radial gradient

The Earth's magnetic field across the South Atlantic Anomaly has a radial gradient in the proton flux. The Swarm Alpha and Bravo spacecraft are used to monitor this gradient.

Highlights

- Global map of p+ in 40 MeV to 100 MeV.
- The radial and East-West particle flux gradient.
- Seasonal variations in high energy flux.
- Scatter times of protons migrating from trapped to SAA loss cone.
- Magnetospheric particle population.

References