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Design and performance of the LISA Radiation Monitor

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LISA will be the first space-based gravitational wave observatory to scan the entire sky, offering novel insights into low-frequency gravitational waves (0.1 mHz - 1 Hz). It consists of three interferometer arms, each with its own free-falling test masses (TMs). High-energy particles from the radiation environment interacting with the LISA spacecrafts can induce a net charging rate in the TMs, resulting in acceleration noise. To prevent false signals, it is important to monitor variations in the cosmic-ray flux and solar energetic particle (SEP) events. For this purpose, we have designed a Radiation Monitor capable of detecting protons and alpha particles above ~70 and ~600 MeV, respectively. It will allow monitoring variations in the cosmic-ray flux with ~1% statistical error in ~1 hour and detect the high-energy component of SEPs. This Radiation Monitor consists of a telescopic arrangement of four plastic scintillators and three W absorbers in between them. The scintillators are coupled to silicon photomultipliers (SiPMs) and their readout is performed by the BETA ASIC, which can amplify, shape and digitise the signals of up to 64 channels with a power consumption of ~1mW/ch. We will present the Radiation Monitor design, the results of its performance evaluation through Geant4 simulations and its calibration with experimental data.

Poster

No

Primary author: ORTA TERRÉ, Marina (ICC)

Co-authors: ESPIÑA ROJAS, Albert; SANUY, Andreu (University of Barcelona); GUBERMAN, Daniel (ICCUB); MAZZANTI, David (Institut de Ciències del Cosmos (ICCUB)); ROMA, David (IEEC); MARTÍ, Laura (IEEC); NOFRARIAS, Miquel (IEEC); CATALÀ MEJIAS, Roger (UB)

Presenter: ORTA TERRÉ, Marina (ICC)

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