A Geant4 based framework for the simulation of background of high-energy satellites caused by activation, cosmic, trapped and albedo particles

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Abstract. Abstract

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1 Introduction

Particle background for satellites, mostly the ones aiming to investigate the high-energy Universe is considerable constraint. It is especially important for satellites without an anti-coincidence shield, e.g. for the more and more CubeSats which have recently been applied for scientific missions.

A Geant4 based simulation framework is presented in this paper, which aims to aid future missions by providing a flexible, easy to use tool to quantify particle background. The simulation consists of two modules. The first determines the proton induced activation of the satellite. The second module quantifies the background signal which is induced by particles being present on the given orbit (e.g. cosmic, trapped and albedo particles).

In order to keep the implementation of the simulation of a new satellite straightforward, the CAD model of the satellite is automatically read in by CADMesh []. The background of the HERMES and the CAMELOT CubeSat missions were determined. The input particle spectra (cosmic, trapped and albedo particles) for the background simulation of these missions were computed [JAKUB NE] by SPENVIS and several other models [mizuno].

The validation of the simulation framework was carried out by a set of dedicated experiments and simulations [Kento, the measurement of activation].

2 The simulation framework

The differential flux is normed. Afterwards the normed integral flux is calculated for each bin. From 0 energy to the given energy.

$$\int 12$$

A random number between zero and one is drawn. The bin that has

Check particle energy distirbution

cxb high energy

mizuno raised concern about cxb and gamma albedo??

3 Methodology

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A random number between zero and one is drawn. The bin that has

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4 Simulation of GRB induced signal in the detector

tbd: what is the background after polar orbits? casing thickness needs to be optimized for: more GRB signal less CXB signal less electrons...

5 Results

Appendix A: Miscellaneous Formatting Details

Disclosures

Acknowledgments

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