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EUSO-SPB2 Fluorescence Telescope trigger test within the EUSO@TurLab Project

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The Extreme Universe Space Observatory on a Super Pressure Balloon 2 (EUSO-SPB2) is a stratospheric balloon mission developed within the JEM-EUSO Program that will serve as a prototype for future satellite-based missions, including K-EUSO and the Probe of Extreme Multi-Messenger Astrophysics (POEMMA). EUSO-SPB2 consists of two telescopes. The first is a Cherenkov Telescope, based on Silicon Photomultipliers, devoted to the study of the background for future below-the-limb very-high-energy ($E > 10$ PeV) astrophysical neutrino observations. The second is a Fluorescence Telescope (FT) developed for detection of Ultra-High Energy Cosmic Rays (UHECRs). The FT consists of a Schmidt telescope and a focal plane based on Multi-anode Photomultipliers for a total of 6192 pixels. This ultraviolet camera is read out with an integration time of 1.05 μ s by a set of dedicated ASICs. A trigger code looks for multiple clusters of excess signal within a certain time window. Its hardware implementation and performance, both in terms of rejection of noise and ability to detect fast signals, is tested taking advantage of the TurLab facility, hosted at the University of Turin. TurLab is a laboratory equipped with a 5 m diameter and 1 m depth rotating tank. The TurLab tank is located in a large room more than 50 m long where the intensity of background light can be adjusted in a controlled way. In the past TurLab has been used to test and validate the data acquisition system of EUSO Balloon, EUSO-SPB1 and Mini-EUSO. The data acquisition and trigger system of EUSO-SPB2 is tested hanging to the ceiling a scaled down version of the FT, made of a square matrix of 16×16 pixels. Different passive and active light sources have been placed inside the tank, and the response of the trigger logic has been tested as different sources enter the field of view. This contribution describes the tests and discusses the obtained results.

Collaboration

JEM-EUSO collaboration

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