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The test and calibration system for the SiPM arrays of the Cherenkov Camera for the PBR Mission

The development of detectors using Silicon PhotoMultipliers (SiPMs) for acquisition of fast light signals coming from Cherenkov and fluorescence emissions started by particle showers in the Earth's atmosphere is the main goal of the Italian ASI/INFN Agreement n. 2021-8-HH.2-2022, named "EUSO-SPB2 (Extreme Universe Space Observatory –Super Pressure Balloon 2)", in view of the next generation of telescopes in balloon-borne and space-based experiments. A survey of performances of different SiPMs available on the market has been performed to identify the best sensors for space applications, where high thermal excursions and environmental radiation must be mainly taken into account in contrast to ground-based experiments. In particular, a characterization protocol for SiPM qualification has been specified to Hamamatsu S13161-3050AE-08 SiPM (8×8) array in the $(-40, +30)^{\circ}\text{C}$ temperature range. The protocol specifies measurements of breakdown voltage, quenching resistance, gain, dark count rate and the probability of cross-talk. These parameters have been measured as a function of temperature at fixed overvoltage. Based on these previous measurements, a dedicated set-up is near completion for performing massive tests to validate and calibrate 32 SiPMs (Hamamatsu S13361-3050 series, 64 channels each), composing the (2048 pixels, $12^{\circ} \times 6^{\circ}$ FoV) focal surface of the Cherenkov Camera that will fly on the POEMMA-Balloon with Radio (PBR) mission. The technical details and description of this system and the procedural steps implemented will be reported, measurements on a set of SiPMs will be shown and results concerning their performances discussed.

Collaboration(s)

JEM-EUSO Collaboration

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