



Contribution ID: 79

Type: Poster

Study of performances and characterization of SiPMs (Hamamatsu S13161) for the next generation of telescopes in balloon-borne and space-based experiments

Thursday 15 May 2025 22:18 (2 minutes)

Silicon PhotoMultipliers (SiPMs), constitute the enabling technology for a diverse and rapidly growing range of applications: experimental physics, medical imaging and commercial applications are only a few examples. The development of detectors based on SiPM photosensors for acquisition of fast signals coming from Cherenkov and fluorescence emission started by particle showers in the atmosphere, is the main goal of the current ASI/INFN Agreement n.2021-8-HH.2-2022, named “EUSO-SPB2 (Extreme Universe Space Observatory –Super Pressure Balloon 2)” for the next generation of telescopes in balloon-borne and space-based experiments. In such framework, the study 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 with respect of ground-based experiment. In this work, a characterization protocol for SiPM qualification has been applied to Hamamatsu S13161-3050AE-08 SiPM (8×8) array in the $(-40, +30)^{\circ}\text{C}$ temperature range. The protocol foresees to measure several parameters: breakdown voltage, quenching resistance, gain, dark count rate and probability of cross-talk. Methods to extract them and their dependence on temperature at fixed overvoltage are shown and the results are discussed.

Eligibility for “Best presentation for young researcher” or “Best poster for young researcher” prize

No

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Session Classification: Posters