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Dedicated power supply system for silicon photomultipliers

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Silicon photomultipliers (SiPMs) have replaced traditional photomultiplier tubes bit by bit in high-energy physics experiments in the last years. This includes the scientific fields where the demand for highly efficient and stable photo sensors outweigh the need for large active areas. Silicon photomultipliers offer high photon detection efficiencies, low supply voltages and stable operation even under harsh environments, for example bright moon-light conditions. The temperature dependence, however, presents a challenge to the power supply system which has to compensate for this effect along with biasing the SiPMs with a stable voltage with mV precision at up to 100 V (10^{-5} accuracy).

Here, we present an intelligent power supply system for silicon photomultipliers. Up to 64 SiPM channels can be driven with one module, where more than 1 mA of power can be drained per channel. The operating-voltage can be changed in 1 mV steps to allow for temperature variations of the power supply system itself, which is well below 1 mV K^{-1}. A built-in micro-controller applies the voltage correction for temperature changes on the SiPM automatically using up to 64 analogue temperature sensors. The data, like the mean current per channel, temperature and applied voltage is communicated via Ethernet, while the user is able to set the bias-voltage to his needs. Measurements concerning the performance of the power supply system are being shown.

Collaboration

– not specified –

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