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Method and Experimental Setup to Measure SiPM Saturation

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We present the experimental method and a corresponding setup to measure the response of SiPM as a function of incoming light intensity. In particular, the saturation behavior is investigated. The method introduces a calibrated quantity to measure the incoming number of photons independently of the photon detection efficiency and the optical crosstalk of the SiPM. In this way, different sensors operated at different bias voltages can be compared. The experimental setup is based on a picosecond laser diode with programmable intensity. Fiber optics is used to split the beam in order to measure the laser intensity with a reference diode in parallel to the SiPM. A XYZ-positioning system in combination with an engineered diffuser is used to ensure a uniform exposure of the SiPM surface. The SiPM signal is read out with a charge-to-digital converter synchronized to the laser pulses. The measured response curves for several SiPM are presented and compared to different response models.

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