

Novel approach for calibration breakdown voltage of large area SiPM.

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SiPMs have a very good single photoelectron pulse (SPE) response which can be used for absolute calibration of them and defining breakdown voltage. Unfortunately with increasing size of SiPM it becomes more difficult to measure the SPE pulse due to pile up from the increased dark counts. Also this SPE calibration method requires high gain low noise amplifier, which makes it impossible to use with readout electronics designed for detection relatively big signals from scintillators.

In this work we propose a novel method for SiPM calibration using high intensity light pulse. The duration of pulse must be much smaller than recovery time of SiPM and the intensity of light pulse must be chosen big enough to trigger all u-cells simultaneously (~10-30 primary e-h/ucell/pulse). In this case, the signal is proportional to gain and number of cells in the device and practically linear even at small over voltage. Since the amplitude of the pulse is big, it does not need a preamplifier for measurements, even when SiPM operates as a regular avalanche photodiode below the breakdown voltage. We will present this calibration method for different SiPMs. Also this method allows investigation of SiPM operating in the linear and avalanche (non-Geiger regime) modes and can be very useful for study of the break down avalanche process and transition in to the Geiger mode.

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