Neutron-Irradiation Effects on SiPM Stability and Annealing Behavior

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Abstract:

Silicon photomultipliers (SiPMs) are widely used for scintillator readout in particle and nuclear physics experiments, but their performance can degrade in neutron-rich environments. In this study, we irradiate two Hamamatsu SiPM models (S13361 and S14161) with neutrons and characterize irradiation-induced changes in gain, baseline behavior, and dark count. LED-triggered waveforms are continuously recorded with a 500-MHz flash ADC to monitor response stability during irradiation, and pre-/post-irradiation I–V measurements are performed to quantify leakage current increases and evaluate possible changes in breakdown voltage. We also study annealing to assess the extent of performance recovery over time, with implications for long term detector operation and sensor selection in high radiation conditions.

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