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Experimental SiPMs parameter characterization from avalanche triggering probabilities

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Silicon photo-multipliers (SiPMs) are detectors sensitive to single photons that are widely used for the detection of scintillation and Cherenkov light in subatomic physics and medical imaging. In order to understand the over-voltage dependence in detail, we have built a new model by extracting the electron and hole avalanche triggering probabilities using VUV and Infra-red light sources. Then we show that we can describe the over-voltage dependence of the dark noise, after-pulsing and cross-talk rates using a minimum set of parameters and extract the relative contribution of electrons vs holes for each process. We also show that this model predicts the behaviour of the IV (current-voltage) curve. The data that are used in this analysis are for Hamamatsu VUV4 at temperatures ranging from -40 to -110 C.

Primary authors: GALLINA, Giacomo (TRIUMF); RETIERE, Fabrice (TRIUMF); Mr KROEGER, Jens

Co-authors: Mr WARD, Mark; Dr GIAMPA, Pietro; Dr ZHANG, Guoqing

Presenter: GALLINA, Giacomo (TRIUMF)

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