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Characterization of Angular Dependency of Photon Detection Efficiency of VUV Silicon Photo-Multipliers

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During the last decade, Silicon Photo-Multipliers (SiPMs) have emerged as a compelling photo-sensor solution. Low-voltage power, optimal operation at cryogenic temperature, and low radioactivity levels with negligible gain fluctuations are among the advantages of SiPMs over the widely used PhotoMultipliers Tubes (PMTs). Accordingly, large-scale low-background cryogenic experiments, such as the next-generation Enriched Xenon Observatory experiment (nEXO), are migrating to a SiPM-based light detection system. nEXO aims to probe the boundaries of the standard model of particle physics by searching for neutrino-less double beta decay ($0\nu\beta\beta$) of Xe. This lepton number violating process would imply that neutrinos are Majorana fermions. The photo sensors of these experiments should meet some specific requirements. The aim of this presentation is to evaluate the relative photon detection efficiency of Hamamatsu VUV4 Multi-Pixel Photon Counters (MPPC)s (S/N: S13370-6152) at different incident angles which is important for simulations of the overall performance of the system.
The devices tested have a micro-cell pitch of 50µm and an effective photosensitive area of 6×6 mm2.

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