

Characterization and understanding of novel 8-inch microchannel plate photomultiplier tubes

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Microchannel plate photomultiplier tubes working in photon-counting mode to detect extremely low number of photons see adoption at the future large liquid-based neutrino detectors. By coating materials of high secondary electron yield by the atomic layer deposition at the end face of the microchannel plates, collection efficiencies of photo-electrons are pushed to 100%. That, however, introduces a single electron charge spectra departing from the Gaussian distribution. Based on laboratory measurements, we present the mechanism of electron amplification at the end face and formulate a probabilistic model of the single electron charge spectra. Our simplified model with Gamma-Tweedie mixture is straightforwardly deployed in future neutrino experiments under commissioning.

Alternate track

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