Contribution ID: **107** Type: **Poster (Session A)**

The Photon-Assisted Cascaded Electron Multiplier

We present a Photon-Assisted Cascaded Electron Multipliers (PACEM) which has a potential for ion back-flow blocking in gaseous radiation detectors: the avalanche from a first multiplication stage propagates to the successive one via its photons, which in turn induce photoelectron emission from a photocathode deposited on the second multiplier stage; the multiplication process may further continue via electron-avalanche propagation. The photon mediated stage allows, by a proper choice of geometry and fields, complete blocking of the ion back-flow into the first element; thus, only ions from the latter will flow back to the drift region. The PACEM concept was validated in a doubleMHSP (Micro-Hole & Strip Plate) cascaded multiplier operated in xenon, where the intermediate scintillation stage provided optical gain of ~ 60. The double-MHSP detector had a total gain above 10 4 and energy resolution of 18% FWHM for 5.9 keV x-rays. Systematic studies of this detector concept for ion back flow and optical gain as a function of the voltages applied in the different electrodes will be presented.

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