

A novel technique for the measurement of the avalanche fluctuation of a GEM stack using a gating foil

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Gas amplification of the electrons created by X-rays or charged particles plays an essential role in their detection with gaseous detectors. However, its gain fluctuates because of avalanche statistics, thereby degrading the energy resolution for monochromatic X-rays or the spatial resolution at long drift distances for large Time Projection Chambers (TPCs). We have developed a novel technique for the measurement of the size of avalanche fluctuation using a gating device (gating foil) for the TPC in the future linear collider experiment. In addition to the gating function, the gating foil is capable of controlling the average fraction of drift electrons to be detected after gas amplification. The energy resolution or signal width for ^{55}Fe or laser irradiation as a function of the transmission rate of the gating foil can be used to determine the relative variance of gas gain. We present the measurement principle, and the results obtained with a stack of Gas Electron Multipliers (GEMs).

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