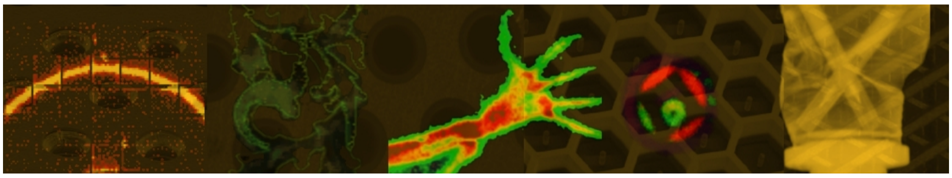
MPGD Applications Beyond Fundamental Science Workshop



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A robust large area x-ray imaging system based on 100 µm thick Gas Electron Multiplier (GEM)

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Imaging applications with Gas Electron Multipliers as amplification devices provide excellent spatial resolution (of the order of hundreds of µm) for areas as large as 10x10 cm2, making use of discrete channel readout. A drawback is the need for complex and expensive electronic systems. In applications where resolutions of the order of the mm are required, a simpler and cheaper solution is to determine the position of the interaction using the resistive charge division method. This solution requires a minimum of 4 readout channels to achieve 2D imaging over large areas, greatly simplifying the electronic system. A large signal-to-noise ratio is however required with the GEM's operating at high gain, in some cases, near the discharge limit.

We have developed a non-standard GEM, made from a 100 micron thick kapton foil (2-fold thicker than standard GEM's). The 100 micron thick GEM is produced using the same wet etching technique as the standard GEM and is virtually immune to discharges. A robust detector that can safely operate at the high gains necessary to achieve an adequate signal-to-noise ratio for imaging applications was developed.

In this work we present the results obtained with a detector composed by two 100 micron thick GEM and a 10x10 cm2 2D readout electrode with resistive lines. Energy resolution of 21% and charge gains above 104 have been measured, with a 55Fe radioactive source. Results of the detector characterization for imaging applications are also presented.

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