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Study of GEM detectors and their applications to Imaging

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The Gas Electron Multiplier (GEM) Detector is being used extensively to handle a fairly large flux environment in high energy and other related experiments. Due to the ease of operation with environment friendly gases, this detector can be deployed to wider range of experiments as well as in applications to developing the instruments for humanitarian aid purposes. In this talk, we will present results from one such effort. We collaborated with the industry to produce the GEM foils of various specifications and then made an effort to use GEMs as an imaging detector for medical as well as security purposes. The key component of a GEM detector is the GEM foil which has very dense go-through holes on a 50μm highly insulating foil (Kapton/Apical) coated on both sides with 5μm layers of copper. Before these GEM foils can be used for assembling the GEM detector the foils electrical and optical properties have to be tested to find defects and correct it. We report on the development of techniques used to study the GEM foils electrically and optically. The polarisation and charging up effects of these foils will also be discussed along with the ways to better handle these effects . A feasibility study to utilize GEM detectors for imaging objects with varying densities with x-rays were carried out. The reconstructed images shows a good distinction between materials of different densities, which opens the possibility to further explore the applications of GEM detectors to medical imaging or cargo imaging.

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