

Project name

Fabrication and investigation of Gas Electron Multipliers for charged particle tracking

Classification (accelerator/detector:subsystem)

Detector:tracking

Institution(s) and personnel

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Project Overview

Gas Electron Multipliers (GEMs) provide an alternative means of gas amplification of drift electrons in Time Projection Chambers and other gas tracking chambers. A GEM consists of a 50 - 100 μ m thick insulating foil with metallic coating on both sides. Small (50 – 100 μ m) holes create a region of high (~6 MV/m) electric fields where multiplication can occur, which would give a gain of 300-500 over the thickness of the GEM. We have undertaken the fabrication and study of GEMs for particle detection for a variety of new applications, including a large TPC for a linear collider.

Description of first year project activities

The fabrication will take place in the Microsystems Technology Laboratory (MTL) at MIT. The Experimental Materials Laboratory in MTL has the capability to make micro-mechanical devices up to 4 inches in diameter using almost any substrate. As a first step, we are fabricating GEMs using copper plated Kapton. The masks have been fabricated, Figure 1 and the fabrication process is in development. The performance of these GEMs will be assessed using the small TPC we have built, which is currently operating with a GEM made at CERN. We have also developed an electrostatic simulation of our first GEM devices, Figure 2, which we will use to optimize the geometry.

If our efforts to fabricate GEMs are successful, we will provide GEMs to other members of the NLC R&D community for testing and further development of mounting techniques, readout and performance studies.

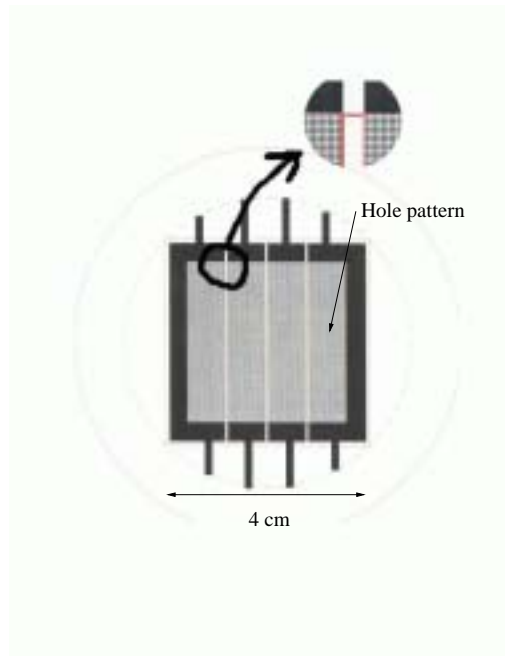


Figure 1 - GEM mask showing four separate device configurations.

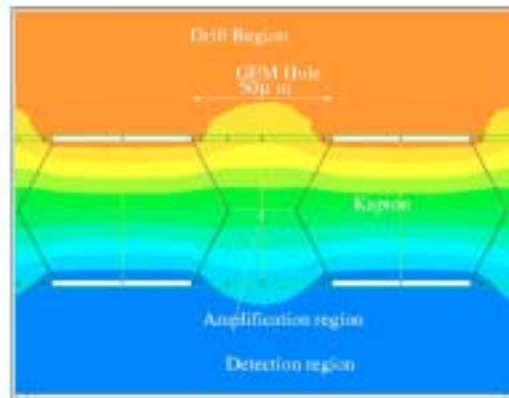


Figure 2 - Potential map of a single GEM hole.

Budget

This work is supported by existing funds and we are not making a request for funds in the first year. In the second year, we may request travel funds to attend NLC meetings and any additional funds necessary for NLC specific work.