3D Printed Gas Electron Multiplier

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The Gas Electron Multiplier (GEM) was first introduced at CERN by F. Sauli. This project uses 3D printing technology to manufacture a GEM. Conductive and nonconductive thermoplastics were used for printing. Graphite loaded Polylactic Acid (PLA) thermoplastic was used to create a 100um electrically conductive layer while nonconductive PLA was used as the insulating layers as well as the frame.The holes were designed into the 3D model eliminating the need for photolithography, chemical etching or mechanically drilling. A stack was created with a three GEM configuration allowing for three multiplication stages. A non-segmented anode was used to collect the signal. An apparatus was created to determine the Paschen curve which was used to determine the operating voltages. The detector output was then analyzed by a Multi Channel Analyzer. Counting rates of background vs a radium check source were compared. A 3D printed GEM detector has been realized and successfully tested, detecting gamma ray energy and muons, opening up new opportunities for detector designs.

Awards Won:
Third Award of $1,000