Abstract Submitted
for the TSF19 Meeting of
The American Physical Society

Gain Measurements of a Three-layer Gas Electron Multiplier Detector JAKOB SCANTLIN, DONGHYUN KIM, JAEHOON YU, STEVEN BOUCHER, CRISTOBAL GARCES, CRISTAIN GARCES, MATTHEW BEUTEL, ARCHIT JAISWAL, AKOLADE ADEBAYO, AAYUSH BHATTARI, UTA HEP group, UTA HEP GROUP TEAM — The Gas Electron Multiplier (GEM) is a detector designed to detect tracks of ionizing radiation. It detects radiation by having a high voltage applied usually around 2-3kV that is divided among 3 GEM foils. These GEM foils have tiny holes etched into them in order to increase the electric field inside them to ˜10,000V/cm which accelerates the electrons released from the ionized gas mixture. After the electrons are accelerated through the first layer of GEM foil, those electrons ionize other gas molecules between the first and second layer, creating an electron multiplication, or avalanche effect. This effect is cascaded in a three-layer GEM to increase the avalanche even more than with just one layer. At the induction layer, the electrons induce a current in 128 different metal strips. Based on the current and the time of each event, the charge on each strip can be determined by the readout system. Once the total charge collected is found, and the number of primary electrons generated by the initial ionizing radiation source are found, the gain of the GEM can be calculated. In this talk, I will present the gain measurement of a three-layer GEM chamber constructed for medical imaging. The gain is plotted as a function of the applied high voltage and the radiation source.

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Date submitted: 30 Sep 2019 Electronic form version 1.4