

# Commissioning of a Pair of Commercial Gas Electron Multipliers (GEM) for the Position Calibration of HVMAPS Using Cosmic-Ray Muons

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The High Voltage Monolithic Active Pixel Sensors (HVMAPS) will be used as electron detectors in The Measurement of a Lepton-Lepton Electroweak Reaction (MOLLER) experiment. The HVMAPS will map the response across the face of the quartz integrating detectors. Using two commercial GEM detectors, a position calibration system for the MOLLER's HVMAP was commissioned. The pair of GEMs are aligned vertically with an HVMAP detector in between. Cosmic-ray muon tracks are identified using coincidence timing between the GEM detectors. From the track position and angle information, the HVMAP pixel by pixel efficiency and the overall position resolution can be determined. Each of the GEM detectors is filled with a gas mixture of Argon and Carbon Dioxide with a ratio of 80/20 at room temperature 293.15 K at 250 Torr. Finally, the muon-data position calibration is achieved by comparing measured spectra with detailed Monte Carlo simulations performed using GEANT4 and CRY codes. Preliminary results in this regard will be presented.

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