

Overview of large-area gas electron multiplier detectors for the forward muon system of the CMS experiment at the high-luminosity LHC

We report on the status of the project to install large-area triple-foil gas electron multiplier (GEM) detectors in the end-cap muon system of the Compact Muon Solenoid (CMS) experiment at the LHC operating at the high luminosity planned after the current period of data-taking (run 2). In the pseudo-rapidity region $1.6 < \eta < 2.4$, the GEM detectors will suppress the rate of background triggers while maintaining high trigger efficiency for low transverse momentum muons, and enhancing the robustness of muon detection in the high-flux environment of the end-cap region. GEM detectors will also be used to extend the range of muon identification up to about $\eta = 3.0$.

We describe the design of the GEM chambers, readout electronics, and data acquisition system for the three stations in each endcap, located at increasing distances from the interaction point. For the intermediate station, the design is fixed and we describe plans to install several of the intermediate station detectors in the CMS detector during the current data-taking period, run 2.

We describe the design and requirements for GEM (and other micro-pattern gas detector) systems for the innermost and outermost stations. Compact, fast-timing designs are under consideration for the innermost station. Mechanical design for the outermost station, which requires the largest detector area of the three stations, is also described.

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