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The Triple-GEM Project for the Phase 2 Upgrade of the CMS Muon System

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In view of the high-luminosity phase of the LHC, the CMS Collaboration is considering the use of Gas Electron Multiplier (GEM) detector technology for the upgrade of its muon system in the forward region. With their ability to handle the extreme particle rates expected in that area, such micro-pattern gas detectors can sustain a high performance and redundant muon trigger system. At the same time, with their excellent spatial resolution, they can improve the muon track reconstruction and identification capabilities of the forward detector, effectively combining tracking and triggering functions in one single device. The present status of the CMS GEM project will be reviewed, highlighting important steps and achievements since the start of the R&D activities in 2009. Several small and full-size prototypes have been constructed with different geometries and techniques. The baseline design of the triple-GEM detectors proposed for installation in different stations of the CMS muon endcap system will be described, along with the associated frontend electronics and data-acquisition system. The expected impact on the performance of the CMS muon system will be discussed, and results from extensive test measurements of all prototypes, both in the lab and in test beams at CERN and FNAL will be presented.

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