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Test beam and irradiation test results of Triple-GEM detector prototypes for the Upgrade of the Muon System of the CMS experiment

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The CMS Collaboration is evaluating Gas Electron Multiplier (GEM) chambers for the Upgrade of the High Eta region of the Muon System. Together with a rate capability fitting the extremely high particle rates expected in the forward regions, the use of GEM technology will lead to a significant improvement of tracking and triggering capabilities, muon identification and track reconstruction. The installation of a first GEM station is already foreseen during the 2nd LHC Long Shutdown (LS2), for joint operation with the existing Cathode Strip Chambers (CSC) stations.

This contribution will review the status of the CMS GEM project, focusing on the R&D performed on chambers design features and readout electronics. Referring to the results of several test beams performed at the CERN SPS and at Fermilab in the last years, the performances of the upgraded detector will be discussed. In particular the response uniformity, the detection efficiency, the angular and spatial resolutions and the timing resolution as well as the performance in magnetic field have been measured with two different gas mixture (Ar/CO₂ and Ar/CO₂/CF₄) using muon and pion beams.

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