

GEM detectors for the upgrade of the CMS Muon Spectrometer

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The Large Hadron Collider (LHC) will restart in 2022 (Run-3), colliding protons with an instantaneous luminosity of $2 - 3 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. A subsequent upgrade in 2025-27 (Long Shutdown 3 - LS3) will increase the luminosity up to $5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. The CMS muon system must enable a physics program that maintains sensitivity for electroweak measurements and for Beyond the Standard Model searches. To cope with the corresponding increase in trigger rates and to provide additional coordinate measurements in the high background environment, a first set of Gas Electron Multiplier (GEM) detectors have been installed and are currently being commissioned (GE11), while two more sets of GEM detectors (GE21, ME0), are finalizing R&D and preparing for construction. We present an overview of the muon spectrometer upgrade using the GEM technology, the performance of the GE11 chambers during Quality Control tests and in cosmic ray tests, and the design of the GE21 and ME0 chambers.

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