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Production and quality control of the GEM GE2/1 detector for the upgrade of the CMS endcap muon system

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The Compact Muon Solenoid (CMS) experiment is a general-purpose detector installed in the Large Hadron collider (LHC). The High Luminosity-LHC (HL-LHC) will provide 10 times higher luminosity compared to the design of the LHC. To accommodate this increase and to enhance the performance of the CMS experiment, the forward region of the muon system will be equipped with 3 new sets of stations employing triple-foil Gas Electron Multiplier (GEM) detectors. These stations, GE1/1, GE2/1, and ME0, will enhance acceptance, longevity, redundancy, and triggering efficiency while operating in the harsh radiation environment of the HL-LHC. The GE1/1 stations were installed during the technical stop of 2016/2017. The GE2/1 stations will be installed during the year end technical stop (YETS) of 2023/2024. GE2/1 detector construction started in 2021 utilizing advanced quality controls (QC) and performance checks. We describe the GE2/1 chamber geometry, the multi-institutional production of chambers, the chamber assembly and QC procedures, and results from QC measurements.

In-person participation

Yes

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