

# Upgrades of the CMS muon system in preparation of HL-LHC

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The present CMS muon system operates three different detector types: in the barrel - drift tubes (DT) and resistive plate chambers (RPC), in the endcap - cathode strip chambers (CSC) and another set of RPCs. In view of the operating conditions at HL-LHC, it is vital to assess the detector performance for high luminosity. New irradiation tests planned to ensure that the muon detectors survive the harsher conditions and operate reliably. The new CERN GIF++ (Gamma Irradiation Facility) allowed to perform aging tests of these large muon detectors. We present results in terms of system performance under large backgrounds and after accumulating charge through an accelerated test to simulate the expected dose. New detectors will be added to improve the performance in the critical forward region: large-area triple-foil gas electron multiplier (GEM) detectors will be installed in the pseudo-rapidity region  $1.6 < \eta < 2.4$ , aiming at suppressing the rate of background triggers while maintaining high trigger efficiency for low transverse momentum muons. For the HL-LHC operation the muon forward region should be further enhanced with another large area GEM based station, called GE2/1, and with two new generation RPC stations, called RE3/1 and RE4/1, having low resistivity electrodes. These detectors will combine tracking and triggering capabilities and can stand particle rates up to few kHz/cm<sup>2</sup>. In addition to take advantage of the pixel tracking coverage extension a new detector, ME0 station, behind the new forward calorimeter, covering up to  $|\eta| = 2.8$ .

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