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Impact of the GEM-based Upgrade of the CMS Forward Muon System on Trigger Performance

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A large increase in the instantaneous luminosity of the upgraded LHC complex has the potential of significantly degrading the performance of the CMS Level-1 muon trigger in the forward region. Deployment of a new GE1/1 detector system based on the novel GEM technology and its integration with the existing CSC chambers allows to alleviate these concerns. The exceptionally high rate of incident particles in the very forward region makes GEM an excellent technology choice to ensure high muon hit reconstruction efficiency. We will show that integration of the information from the new GE1/1 and existing CSC chambers in station ME1/1 at the level of online electronics allows for a vastly improved muon momentum resolution of the Level-1 trigger. With the upgrade, the CMS muon trigger in the very forward region will see an order of magnitude decrease in the trigger rate and an increase in trigger efficiency allowing CMS to maintain low muon p_T thresholds. The latter is critical for many searches and measurements, both in the Higgs domain as well as in scenarios with hidden sectors, SUSY in compressed scenarios etc. Similar upgrade of CMS with GE2/1 system will reinforce physics performance gains in the high-luminosity LHC operations. The importance of the GEMs upgrade will be high even in the highest luminosity operating regime when the CMS deploys a tracking trigger system, as standalone muon trigger will maintain CMS sensitivity to new physics scenarios predicting existence of new long-lived particles decaying away from the interaction point.

Oral or Poster Presentation

Oral

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