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Impact of the GE1/1 station on the performance of the muon system in CMS

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After the upgrades of the Large Hadron Collider planned for the second and the third Long Shutdown, the LHC luminosity will approach values like $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ and $5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ respectively.

Such conditions will deeply affect the performance of the CMS muon system, especially in the very forward region, due to the harsh expected background environment and the reduced magnetic field. The proposed GE1/1 upgrade consists in implementing an additional muon measurement station based on the Gas Electron Multipliers technology and covering the pseudorapidity region $1.6 < |\eta| < 2.2$.

Operating jointly with the existing Cathode Strip Chambers detectors, the GE1/1 station would ensure detection redundancy and would allow to maintain efficient triggering and good momentum resolution in the most critical region of the muon system.

This presentation will review studies performed with different simulation tools to assess the capability of GEM detectors to operate in the expected radiation environment, the impact of GE1/1 on the muon trigger rate, on the quality of muon reconstruction and on the momentum resolution. Moreover, the benefits the GE1/1 system would bring to representative physics channels, both in the Standard Model and in the extended Higgs sector, will be discussed.

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