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Measurement of the background in the Muon system of CMS during Run 2

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The Compact Muon Solenoid (CMS) a general purpose experiment to explore the physics of the TeV scale in pp -collisions provided by the CERN LHC. Muons constitute an important signature of new physics and their detection, triggering, reconstruction and identification is guaranteed by various subdetectors using different detection systems: Drift Tubes (DT) and Resistive Plate Chambers (RPC) in the central region and Cathode Strip Chambers (CSC) and RPC in the endcap. During Run 2 the higher instantaneous luminosity lead to a substantial background in the muon system. In this contribution we will describe the various methods used to measure these backgrounds in the different muon subdetectors, and we will report the observed particle rates. The analysis is based on data collected in 2018 pp collisions at $\sqrt{s} = 13$ TeV with instantaneous luminosities up to $2.2 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$. Thorough understanding of the background rates provides the base for the upgrade of the muon detectors for the High-Luminosity LHC, where the instantaneous luminosity will reach $5 - 7.5 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$, resulting in 140-200 simultaneous pp -collisions. We will discuss in detail the origin and characteristics of the background introduced by the pp -collisions, we analyze the response of the various detectors and illustrate the dependence of the background on the instantaneous luminosity and the LHC fill scheme. We will show it is possible to estimate the the contribution from long-lived background rates separately from the promptly induced background. Finally we will look forward to the expected background at the High-Luminosity LHC.

In-person participation

Yes

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