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The CMS Level-1 muon triggers for the LHC Run II

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The CMS experiment implements a sophisticated two-level triggering system composed of hardware-based Level-1, and a software-based High Level Trigger. A new Level-1 trigger architecture improves the performance at high luminosity experienced during Run II. The upgraded muon trigger combines information from the three muon detectors - Cathode Strip Chambers (CSC), Drift Tubes (DT) and Resistive Plate Chambers (RPC) - to obtain a better efficiency and lower rates. The algorithms, designed both for precision measurements and searches of new physics, and the performance of the upgraded muon trigger system based on proton-proton collision data collected in Run II will be presented.

Summary

The CMS experiment implements a sophisticated two-level triggering system composed of Level-1, instrumented by custom-design hardware boards, and a software-based High Level Trigger. A new Level-1 trigger architecture with improved performance is now being used to maintain high physics efficiency for the more challenging luminosity conditions experienced during Run II. The CMS muon detector was designed for preserving the complementarity and partially redundant muon detection systems, Cathode Strip Chambers (CSC), Drift Tubes (DT) and Resistive Plate Chambers (RPC), until they are combined at the input to the Global Trigger. The upgraded muon trigger combines information from the three muon detectors in the track reconstruction in order to obtain a better efficiency and lower rates. Advanced pattern recognition and MVA (Boosted Decision Tree) regression techniques implemented directly on the trigger boards allow high-momentum signal muons to be distinguished from the overwhelming low-momentum background. The algorithms for the selection of events with muons, both for precision measurements and for searches of new physics beyond the Standard Model, will be described in detail. The performance of the upgraded muon trigger system will be presented, based on proton-proton collision data collected in Run II.

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