

Connecting The Dots 2023



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The Layer-1 Barrel Muon Filter for the Level-1 muon trigger upgrade of the CMS experiment at the HL-LHC

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In view of the HL-LHC, the Phase-2 CMS upgrade will replace the entire trigger and data acquisition system. The detector readout electronics will be upgraded to allow a maximum L1 accept rate of 750 kHz, and a latency of 12.5 μ s. The muon trigger is a multi-layer system that is designed to reconstruct muon stubs on each muon station and then to measure the momenta of the muon by correlating information across muon chambers on the so-called muon track finders and by matching the reconstructed stubs with the L1 tracker tracks sent by the track trigger. This is achieved with sophisticated pattern recognition algorithms that run on Virtex UltraScale+ FPGA processors. The Layer-1 Barrel Muon Filter is the second layer of this system, it concentrates the stubs and hits from the barrel muon stations and runs dedicated algorithms to refine and correlate the information of multiple chambers before sending the information to the track finders for momentum estimation. One of the proposed algorithms is meant to detect and identify muon showers allowing for tagging both hadronic showers in the muon system as well as highly-energetic muons that will be missed otherwise. We review the current status of such an algorithm, its demonstration in firmware and its measured physics performance.

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