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A muon tracking algorithm for Level 1 trigger in the CMS barrel muon chambers during HL-LHC

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The electronics of the CMS (Compact Muon Solenoid) DT (Drift Tubes) chambers will need to be replaced for the HL-LHC (High Luminosity Large Hadron Collider) operation due to the increase of occupancy and trigger rates in the detector, which cannot be sustained by present system. A system is being designed that will forward asynchronously the totality of the chambers signals to the control room, at full resolution. A new backend system will be in charge of building the trigger primitives of each chamber out of this asynchronous information, aiming at achieving resolutions comparable to the ones that the offline High Level Trigger can obtain nowadays. In this way, the new system will provide improved functionality with respect to the present one, allowing to improve the resilience against potential aging situations. An algorithm for the trigger primitive generation that will run in this new backend system has been developed and implemented in firmware. The performance of this algorithm has been validated through different methods: from a software emulation approach to hardware implementation tests. A very good performance is achieved, with optimal timing and position resolutions, close to the ultimate performance of the DT chamber system.

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