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Design Considerations for an Upgraded Track-Finding Processor in the Level-1 Endcap Muon Trigger of CMS for SLHC Operations

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The conceptual design for a Level-1 muon track-finder trigger for the CMS endcap muon system is proposed that can accommodate the increased particle occupancy and system constraints of the proposed SLHC accelerator upgrade and the CMS detector upgrades. A brief review of the architecture of the current track-finder for LHC trigger operation is given, with potential bottlenecks indicated for SLHC operation. The upgraded track-finding processors described here would receive as many as two track segments detected from every cathode strip chamber comprising the endcap muon system, up to a total of 18 per 60° azimuthal sector. This would dramatically improve the efficiency of the track reconstruction in a high occupancy environment over the current design, since some of the track segments are filtered out in order to reduce transmission bandwidth and track processing logic. However, such an improvement would require significantly higher bandwidth and logic resources over the current design. We propose to use fastest available serial links, running asynchronously to the machine clock. Another enhancement critical for the overall Level-1 trigger capability for physics studies in phase 2 of the SLHC is to include the inner silicon tracking systems into the design of the Level-1 trigger. This requires matching muons identified in the endcap muon system and matching them to hits in the inner tracking system and refining the momentum measurement to improved precision for better rate reduction capabilities. Some preliminary ideas on the precision of information available from the endcap track-finder trigger will be presented along with possible algorithms for the matching.

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