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[B03] Level-1 Track Finder for the CMS Upgrade for HL-LHC

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The upgrade of the Large Hadron Collider (LHC) to the High-Luminosity LHC (HL-LHC) will provide a greater number of simultaneous proton-proton collisions, yielding more data for physics analysis, but imposing greater demands on the triggering systems of the detectors. In response, the CMS Collaboration is designing a novel Level-1 (hardware) track trigger using data from the outer tracker. Its aim is to reconstruct, within 4 μs , the tracks of all charged particles with $p_T > 2$ GeV. This has never been done before at CMS and depends on the innovative design of the outer tracker that enables it to transmit only the hits compatible with particles of $p_T > 2$ GeV to the off-detector track-finder electronics. There, tracks will be reconstructed by an algorithm implemented on programmable chips (FPGAs) and sent to the Level-1 trigger.

This presentation will give an overview of the L1 track finder and the corresponding firmware algorithm. It will also discuss the current state of the testing of the firmware in both simulations and hardware, the unique challenges faced so far, and possible challenges in the future.

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