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Fast pattern recognition for ATLAS track triggers in HL-LHC CHARLES KALDERON, VIVIANA CAVALIERE, Brookhaven National Laboratory — Fast tracking systems are being developed in ATLAS for the High Luminosity upgrade of the Large Hadron Collider (HL-LHC). The goal is to provide the high-level trigger with full-scan tracking at 100 kHz and regional tracking at 1 MHz, in the high pile-up conditions of the HL-LHC (in pp collisions at $\sqrt{s} = 14$ TeV with the ATLAS detector). Here, methods for fast hit filtering and track seeding are investigated. In the filtering method, known as stub-finding, hit pairs in closely-spaced silicon strip layers are accepted or rejected based on their azimuthal separation. In the track-seeding method, known as the Hough Transform, detector hits are mapped onto a 2D parameter space with one parameter related to the transverse momentum and one to the initial track direction. The performance of these methods is studied at different pile-up values (140 and 200) and compared, using full event simulation, to the currently-used CPU track reconstruction, as well as with a method based on matching detector hits to pattern banks of simulated tracks stored in custom made Associative Memory ASICs. A discussion of the hit reduction from stub-finding and associated tracking speedup, and a comparison of the overall tracking performance of the methods, will be presented.

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