Fast pattern recognition for ATLAS track triggers in HL-LHC
CHARLES KALDERON, VIVIANA CAVALIERE, Brookhaven National Laboratory, ATLAS COLLABORATION — A fast hardware based track trigger is 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). A method for fast pattern recognition using the Hough transform is investigated. In this method, 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 the Hough transform is studied at different pile-up values (140 and 200) and compared, using full event simulation, with a method based on matching detector hits to pattern banks of simulated tracks stored in a custom made Associative Memory ASICs. The use of track stub finding and extrapolation is investigated to take advantage of the new ATLAS Inner Tracker in order to reduce the number of hit clusters considered by the system. A preliminary discussion of the resulting hit reduction and associated speedup, and any associated performance loss, will be presented.

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