

## **Hardware-based high occupancy pattern recognition at the LHC: the ATLAS FastTracker experience and prospects**

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As the LHC settles into the energy frontier, it has begun to push hadron collision intensity limits. During the 2016 run, the average mean number of proton collisions per LHC beam crossing in was 24, with a peak mean of 50. In 2017, the machine was regularly leveling the collision intensities at close to 60 interactions per crossing. An average of up to 80 interactions per crossing are expected in Run III, which begins in 2021.

The ATLAS detector, trigger and readout systems are undergoing a number of upgrades to cope with the increased data rates. I will discuss one of these upgrades, the Fast Tracker (FTK), which is currently undergoing a phased installation. FTK uses a mix of custom and commercial electronics to perform full silicon detector tracking within 100 microseconds of a Level 1 trigger accept at Run III luminosities, improving the ATLAS high level trigger's ability to utilize charged particle information. These capabilities will be important for tau-lepton and b-jet finding, objects critical for studying Higgs production, as well as a wide variety of other processes. I will discuss the design and testing of FTK, its installation status, and planned uses.