



Contribution ID: 166

Type: Oral

## The ATLAS Fast Tracker System

*Thursday 14 September 2017 15:40 (25 minutes)*

The Fast Tracker (FTK) system, one of the ATLAS trigger upgrades, is presently being commissioned. The information from the 100 million channels of the tracking detectors is presently exploited at the HLT only for a subset of the events or for limited detector regions due to timing limitations. The FTK system is designed to deliver full event track reconstruction for all tracks with  $p_T$  above 1 GeV at a Level-1 rate of 100 kHz. This provides full track information with excellent quality at the HLT input. This high performance is obtained by using a combination of dedicated ASIC hardware based on associative memories and high performance Field Programmable Gate Arrays.

### Summary

From 2010 to 2012 the Large Hadron Collider (LHC) operated at a centre-of-mass energy of 7 TeV and 8 TeV, colliding bunches of particles every 50 ns. During operation, the ATLAS trigger system has performed efficiently contributing to important results, including the discovery of the Higgs boson in 2012. The LHC restarted in 2015 and will operate for four years at a mass energy of 13 TeV and 14 TeV and bunch crossing of 50ns and 25ns. These running conditions result in the mean number of overlapping proton-proton interactions per bunch crossing increasing from 20 to 60. The FTK will allow the trigger to utilize tracking information from the entire detector at an earlier event selection stage than ever before, allowing for more efficient event rejection. This hardware system is designed to perform full scan track reconstruction of every event accepted by the ATLAS first level hardware trigger. To achieve this goal the system uses a parallel architecture, with algorithms designed to exploit the computing power of custom Associative Memory chips, and modern field programmable gate arrays. The processor will provide computing power to reconstruct tracks with transverse momentum greater than 1 GeV in the whole tracking volume. The tracks will be available at the beginning of the trigger selections, allowing for the development of more pileup resilient triggering strategies. The Fast Tracker system will be massive, with about 8000 Associative Memory chips and 2000 field programmable gate arrays, providing full tracking with a rate up to 100 KHz and an average latency below 100 microseconds. A partial FTK system has been built in 2016. Additional production is on going. It will be installed as it is delivered. The system is currently under commissioning. The final version of the electronic boards is presented, with details covering the hardware status and installation of the system. An overview of the commissioning status and first data-taking experience is presented.

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**Session Classification:** Trigger

**Track Classification:** Trigger