

Software based control and monitoring of a hardware based track reconstruction system for the ATLAS experiment

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During the Run-2 of the Large Hadron Collider (LHC) the instantaneous luminosity exceeds the nominal value of $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ with a 25 ns bunch crossing period and the number of overlapping proton-proton interactions per bunch crossing increases up to about 80. These conditions pose a challenge to the trigger system of the experiments that has to control rates while keeping a good efficiency for interesting physics events.

This document summarizes the software based control and monitoring of a hardware-based track reconstruction system for the ATLAS experiment, called Fast Tracker (FTK), composed of associative memories and FPGAs operating at the rate of 100 kHz and providing high quality track information within the available latency to the high-level trigger. In particular, we will detail the commissioning of the FTK within the ATLAS online software system presenting the solutions adopted for scaling up the system and ensuring robustness and redundancy. We will also describe the solutions to challenges such as controlling the occupancy of the buffers, managing the heterogeneous and large configuration, and providing monitoring information at sufficient rate.

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