

# The ATLAS Trigger Muon "Vertical Slice"

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The ATLAS experiment at the LHC proton-proton collider at CERN will be faced with several technological challenges. A three level trigger and data acquisition system has been designed to reduce the 40 MHz bunch-crossing frequency, corresponding to an interaction rate of 1GHz at the design instantaneous luminosity to about  $\sim 100$  Hz allowed by the permanent storage system. The capability to select events with muons at an early stage of the trigger system is therefore crucial to cope with the expected rates. In this paper we will describe the whole trigger and data acquisition system of the muon system (Muon Trigger "Vertical Slice"). The first level of trigger (LVL1) is implemented on hardware, it selects high- $p_t$  muons with transverse momentum above programmable thresholds with a coarse evaluation of the eta and phi coordinate (the so called RoI, the "Region of Interest") using hits coming from the trigger chambers of the Muon Spectrometer (MS), the rate is reduced to  $\sim 75$ -100 kHz. The RoI are then passed to the second trigger lever (LVL2) implemented on an on-line software architecture. The muFast algorithm reconstructs muons with transverse momentum larger than  $\sim 6$  GeV combining full granularity information inside RoIs from trigger and precision chambers of the MS. Other algorithms will then combine outputs coming from different ATLAS sub-detectors to further select muons with different topologies. The rate is reduced to 1 kHz with a mean processing time of 10ms. A third trigger level, the Event Filter (EF) will access the full event to reduce the rate. Different algorithms will be implemented reconstructing events inside the MS and combining the measurements of all ATLAS sub-detectors in order to provide the best estimate of their momentum at the production vertex. Along with the algorithm implementation and description we will also present the expected performances relative to signal efficiencies, background rejection and execution time.

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