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The ATLAS Trigger System: Performance and Evolution

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During the data taking period from 2009 until 2011, the ATLAS trigger has been used very successfully to collect proton-proton data at LHC centre-of-mass energies between 900 GeV and 7 TeV. The three-level trigger system reduces the event rate from the design bunch-crossing rate of 40 MHz to an average recording rate of about 300 Hz. Using custom electronics with input from the calorimeter and muon detectors, the first level rejects most background collisions in less than 2.5 ns. Then follow two levels of software-based triggers. The trigger system is designed to select events by identifying muons, electrons, photons, taus, jets, and B hadron candidates, as well as using global event signatures, such as missing transverse energy.

We give an overview of the performance of the different trigger selections based mainly on the experience during the 2011 LHC run. Distributions of selection variables used by the different trigger selection are shown and compared with the offline reconstruction. Examples of trigger efficiencies with respect to offline reconstructed signals are presented and compared to simulation. These results illustrate that we have achieved a very good level of understanding of both the detector and trigger performance. Furthermore, we describe how the trigger selections have evolved with increasing LHC luminosity to cope with the increasing pileup conditions. If already available the initial experience from the 2012 run will be presented.

for the collaboration

ATLAS collaboration

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