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Calibration and performance of the ATLAS Level-1 Calorimeter Trigger with LHC collision data

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The ATLAS Level-1 Calorimeter Trigger is one of the main elements of the first stage of event selection for the ATLAS experiment at the LHC. The input stage consists of a mixed analogue/digital component taking trigger sums from the ATLAS calorimeters. This stage determines the energies sent to the algorithmic trigger logic. The complete processing chain is performed in a digital, pipelined system, where programmable algorithms are performed in parallel with a fixed latency of 2us. The real-time output consists of counts of high-pt physics objects (jets, electron/photon and tau candidates) and global energy triggers.

While the trigger system has been operational from time of the very first LHC data, the final tuning of timing and calibration had to wait for the higher luminosity proton-proton collision data delivered by LHC in 2010. Many configurable parameters had to be optimized in order to obtain the ultimate performance of system in terms of bunch-crossing identification and energy resolution. The behaviour of the system was also studied in detail to understand unusual signals, and improve their response.

An analysis of the current status of the calorimeter trigger hardware will be presented, along with the methods used to achieve these results via increasingly precise calibrations.

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