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Initial Upgrade of the ATLAS Level 1 Calorimeter Trigger

The Level-1 calorimeter trigger (L1Calo) of the ATLAS experiment has been operating well since the start of LHC data taking, and played a major role in the Higgs boson discovery. To face the new challenges posed by the upcoming increases of the LHC proton beam energy and luminosity, a series of upgrades is planned for L1Calo. This paper presents the L1Calo upgrade program for the initial upgrade phase in 2013-14. The program includes substantial improvements to the analogue and digital signal processing to allow more sophisticated digital filters for energy and timing measurement, as well as compensate for pile-up and baseline shift effects. Two existing digital algorithm processor subsystems will receive substantial hardware and firmware upgrades to increase the real time data path bandwidth, allowing topological information to be transmitted and processed at level-1. An entirely new subsystem, the L1 topological processor, will receive real-time data from both the upgraded L1Calo and L1 muon trigger to perform trigger algorithms based on entire event topologies. The upgraded system presented is foreseen to operate for three years, after which a second, substantial upgrade phase is planned. The expected performance improvements are presented together with the upgraded hardware and firmware implementations. The status of the prototypes, integration and commissioning efforts are also reviewed.

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