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Upgrade of the ATLAS Calorimeters for Higher LHC Luminosities

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The upgrade of the LHC will bring instantaneous and total luminosities which are a factor 5-7 beyond the original design of the ATLAS Liquid Argon (LAr) and Tile Calorimeters and their read-out systems. Due to radiation requirements and a new two-level hardware trigger concept the read-out electronics will be improved in two phases. In Phase-I, a dedicated read-out of the LAr Calorimeters will provide higher granularity input to the trigger, in order to mitigate pile-up effects and to reduce the background rates. In Phase-II, completely new read-out electronics will allow a digital processing of all LAr and Tile Calorimeter channels at full 40 MHz bunch-crossing frequency and a transfer of calibrated energy inputs to the trigger. Results from system design and performance of the developed read-out components, including fully functioning demonstrator systems already operated on the detector, will be reported.

Furthermore, the current Forward Calorimeter (FCal) may suffer from signal degradation and argon bubble formation at highest instantaneous luminosities. A high-granularity replacement is thus proposed, improving on reconstruction of jets and missing energy in the presence of pile-up. The corresponding R&D and expected performance results will be presented.

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