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Upgade of the ATLAS hadronic calorimeter for high-luminosity LHC run

The Tile Calorimeter is the hadronic calorimeter covering the central region of the ATLAS detector at the Large Hadron Collider. It is a sampling calorimeter consisting of alternating thin steel plates and scintillating tiles. Wavelength shifting fibers coupled to the tiles collect the produced light and are read out by photomultiplier tubes. An analog sum of the processed signal of several photomultipliers serves as input to the first level of trigger. Photomultiplier signals are then digitized and stored on detector and are only transferred off detector once the first trigger acceptance has been confirmed. TileCal will undergo a major replacement of its on- and off-detector electronics for the high luminosity program of the LHC in 2024. All signals are digitized and then transferred directly to the off-detector electronics, where the signals are reconstructed, stored, and sent to the first level of trigger at a rate of 40 MHz. This will provide better precision of the calorimeter signals used by the trigger system and will allow the development of more complex trigger algorithms. Changes to the electronics will also contribute to the reliability and redundancy of the system. Three different front-end options are presently being investigated for the upgrade and will be chosen after extensive test beam studies. A hybrid demonstrator module has been developed. The demonstrator is undergoing extensive testing and is planned for insertion in ATLAS.

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