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Readiness of the Phase-II upgrade electronics of the ATLAS Hadronic Tile Calorimeter for the High Luminosity LHC

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The ATLAS hadronic Tile Calorimeter (TileCal) will undergo major upgrades to the on- and off-detector electronics in preparation for the high luminosity programme of the LHC in 2026, so that the system can cope with the HL-LHC increased radiation levels and out-of-time pileup. The on-detector electronics of the upgraded system will continuously digitize and transmit all photomultiplier signals to the off-detector systems at a 40 MHz rate. The off-detector electronics will store the data data in pipeline buffers, produce digital hadronic tower sums for the Level-1 calorimeter trigger system, and read out selected events. The modular front-end electronics feature radiation-tolerant commercial off-the-shelf components and redundant design to minimise single points of failure. The timing, control and communication interface with the off-detector electronics is implemented with modern Field Programmable Gate Arrays (FPGAs) and high speed fibre optic links running up to 9.6 Gb/s.

The TileCal upgrade program has included extensive R&D and test beam studies, and a Demonstrator module with reverse compatibility with the existing system inserted in ATLAS in August 2019 for testing in actual detector conditions. We present the status and results of Demonstrator tests and calibration runs to assess the readiness of the upgraded design.

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