

# Data acquisition and Software the ATLAS Tile Calorimeter Phase-II Upgrade Demonstrator

*Tuesday 10 July 2018 16:40 (20 minutes)*

The LHC has planned a series of upgrades culminating in the High Luminosity LHC (HL-LHC) which will have an average luminosity 5-7 times larger than the design LHC value. The Tile Calorimeter (TileCal) is the hadronic sampling calorimeter installed in the central region of the ATLAS detector. It uses iron absorbers and scintillators as active material. TileCal will undergo a substantial upgrade to accommodate to the HL-LHC parameters. The TileCal read-out electronics has been fully redesigned introducing a new read-out strategy. The photomultiplier signals will be digitized and transferred to the TileCal PreProcessors (TilePPr) located off-detector for every bunch crossing, requiring a data bandwidth of 40 Tbps. The TilePPr will provide pre-processed information to the first level of trigger through a low and deterministic data path for every bunch crossing (40 MHz). In parallel, the data samples will be stored in pipeline memories and the data of the events selected by the ATLAS central trigger system will be transferred to the ATLAS global Data Acquisition (DAQ) system for further processing.

Extensive standalonetests have been performed recently with beam at the CERN accelerator facilities. External beam detectors have been used to measure the beam position and to generate a trigger signal when the beam impinges the detector module, while a Demonstrator system of the TileCal electronics for the HL-LHC upgrade has been successfully employed to read-out the calorimeter signals.

This contribution describes in detail the data processing and the hardware, firmware, software and simulation components of the TileCal Demonstrator readout system. It presents the beam detector elements and the logic to detect different beam particles and to generate the trigger signals. In addition, the system integration tests and results from the tests with beam performed at CERN will be presented.

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**Session Classification:** Posters

**Track Classification:** Track 1 - Online computing