Data acquisition and processing in the ATLAS Tile Calorimeter Phase-II Upgrade Demonstrator

Alberto Valero, on behalf of the ATLAS Tile Calorimeter System
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- The LHC has planned a series of upgrades culminating in the High Luminosity LHC with an increase in the luminosity by a factor of 5-7 times the LHC nominal value.
- TileCal will undergo an upgrade to accommodate the HL-LHC parameters where the read-out electronics will be redesigned introducing a new read-out strategy.
- The photomultipliers data will be serialized for every bunch crossing and transmitted to the PreProcessors in the back-end.
  - Bandwidth upgrade from 165 Gbps to 40 Tbps.

- Prototype detector modules ("Demonstrators") have been constructed and exposed to different particle beams and at different energies, to evaluate the performance of the detector with the new readout system.

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- Three different Front-End options are being evaluated: 3in1 with discrete components, FATALIC and QIE are custom ASICs.

- The PreProcessor is the core element of the back-end. Designed to provide backward compatibility with the current DAQ system and at the same time to permit to explore the new overall ATLAS readout architecture.

  - After Phase-II upgrade it will provide preprocessed information to the first level of trigger.

- A modified version of the ATLAS official DAQ software has been used during the tests with beam.

- Custom software packages in combination with the official ATLAS software framework are used for online monitoring and offline data reconstruction.