The Phase-II upgrades will prepare the ATLAS experiment for the High Luminosity LHC (HL-LHC). We expect 5-7x the current instantaneous luminosity and need to transmit the full set of digitized data off-detector at 40 MHz for the new trigger.

**The ATLAS Tile Calorimeter Phase-II Upgrade**

The Tile Calorimeter (TileCal) is the central section of the hadronic calorimeter in ATLAS. In the Current system the Digital samples of the PMT (Photomultiplier Tube) signals are stored in pipeline memories while the PMT analog signals are grouped and sent to the Level 1 (L1) Calorimeter system. The digital data for events selected by the L1 trigger system are transmitted to the Read-Out Drivers (RODs) located in the back-end system at a maximum rate of 100 kHz. The planned series of upgrades will impose new requirements that TileCal will need to accommodate. The TileCal read-out chain is being redesigned to read out the digitized data from every crossing using the PreProcessors (PP) that are located off-detector.

**TileCal Demonstrator Status**

The Demonstrator Prototypes were built to evaluate the new electronics and read-out while maintaining backwards compatibility with the current setup. The demonstrator has been tested in various test-beam campaigns.

**PREPROCESSOR**

The PreProcessor (PP) is the core element of the back-end system, providing communication with the front-end to transmit commands and to receive the digitized PMT data. Once a trigger signal is received the data is formatted and transmitted to the legacy Read-Out Driver, maintaining compatibility. During the HL-LHC the Trigger and DAQ interface (TDQAQ) will provide preprocessed information to the new trigger and Front-End Link eXchange (FELIX) systems, the core of the new ATLAS Trigger/DAQ architecture.

**Test Beam**

The demonstrator was inserted into a long barrel module and equipped with 3in1 cards. The data selected by the trigger system is stored in raw data files through the legacy Read Out System (ROS) and the new FELIX system in parallel. The ROS sends the data packets and saves the detector and beam data in a local disk. The ATLAS software framework (Athena) is used to reconstruct the raw data stored in the Event Builder and FELIX to energy and time per cell. This operation is performed online for some events for monitoring.

**Data Acquisition and Processing**

Response is calculated using the mean of a gaussian fit within ±2σ of the peak.

**Electrons**

We expect electrons to deposit all of their energy in the calorimeter.

**Muons**

Muon energy lost in ionization is proportional to path length.

**Hadrons**

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