



Contribution ID: 272

Type: **Poster submission**

Calibration and Performance of the ATLAS Tile Calorimeter During the LHC Run 2

Monday, August 5, 2019 3:40 PM (20 minutes)

Summary

The Tile Calorimeter (TileCal) is the central section of the hadronic calorimeter of the ATLAS experiment and provides important information for reconstruction of hadrons, jets, hadronic decays of tau leptons and missing transverse energy.

It also assists in muon identification. This sampling calorimeter uses steel plates as absorber and scintillating tiles as active medium.

The light produced by the passage of charged particles is transmitted by wavelength shifting fibres to photomultiplier tubes (PMTs).

The readout is segmented into about 5000 cells (longitudinally and transversally), each of them being read out by two PMTs in parallel.

TileCal exploits several calibration systems:

a Cs radioactive source that illuminates the scintillating tiles directly,

a laser light system to directly test the PMT response,

and a charge injection system (CIS) for the front-end electronics.

These systems together with data collected during proton-proton collisions provide extensive monitoring of the instrument and a means for equalizing the calorimeter response at each stage of the signal propagation.

The performance of the calorimeter has been established with cosmic ray muons and the large sample of the proton-proton collisions.

The response of high momentum isolated muons is used to study the energy response at the electromagnetic scale,

isolated hadrons are used as a probe of the hadronic response. The calorimeter time resolution is studied with multijet events.

A description of the different TileCal calibration systems and the results on the calorimeter performance during the LHC Run 2 will be presented.

The results on the pile-up noise and response uniformity studies with MC will also be discussed.

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Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP