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Performance of the ATLAS hadronic Tile calorimeter

The Tile Calorimeter (TileCal) of the ATLAS experiment at the LHC is the central hadronic calorimeter designed
for energy reconstruction of hadrons, jets, tau-particles and missing transverse energy. TileCal is a scintillator-steel sampling calorimeter and it covers the region of pseudorapidity < 1.7. The scintillation light produced in the scintillator tiles is transmitted by wavelength shifting fibers to photomultiplier tubes (PMTs). The analog signals from the PMTs are amplified, shaped and digitized by sampling the signal every 25 ns.
The TileCal frontend electronics reads out the signals produced by about 10000 channels measuring energies ranging from ˜30 MeV to ˜2 TeV. Each stage of the signal production from scintillation light to the signal reconstruction is monitored and calibrated.

The performance of the calorimeter have been studied in-situ
employing cosmic ray muons and a large sample of proton-proton collisions acquired during the operations of
the LHC. Prompt isolated muons of high momentum from electroweak bosons decays are employed to study the energy
response of the calorimeter at the electromagnetic scale. The calorimeter response to hadronic particles is evaluated with a sample of isolated hadrons and the modelling of the response by the Monte Carlo simulation is
discussed. The calorimeter timing calibration and resolutions are studied with a sample of multijets events.

Results on the calorimeter operation and performance are presented, including the calibration, stability, absolute energy scale, uniformity and time resolution. These results show that the TileCal performance is within the design requirements and has given essential contribution to reconstructed objects and physics results.

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