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Performance of the ATLAS hadronic Tile calorimeter

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The Tile Calorimeter (TileCal) of the ATLAS experiment at the LHC is the central hadronic calorimeter designed for the 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 every 25 ns by sampling the signal. About 10000 channels of the front-end electronics measure the signals of the calorimter with energies ranging from ~30 MeV to ~2 TeV. Each step of the signal reconstruction from scintillation light to the digital pulse reconstruction is monitored and calibrated.

The performance of the calorimeter has been studied in-situ employing cosmic ray muons and a large sample of proton-proton collisions acquired during the operations of the LHC. 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 jets.

Results on the calorimeter performance on absolute energy scale, timing, noise and associated stabilities are presented. 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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