

Performance of the ATLAS Tile Calorimeter

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The Tile Calorimeter (TileCal) is a sampling hadronic calorimeter covering the central region of the ATLAS experiment, with steel as absorber and plastic scintillators as active medium. The scintillators are read out by wavelength shifting fibres to photomultiplier tubes (PMTs) at the back of each wedge-shaped calorimeter module. The analogue signals from the PMTs are amplified, shaped, and digitised on the detector every 25 ns, and stored on detector in digital pipeline buffers until a trigger decision is received. The data are then read out to the off-detector systems for further processing.

TileCal employs several calibration systems that, together with the collected collision data, provide the basis for response equalisation and monitoring at each stage of the readout path; from scintillation light production to energy and time reconstruction. Furthermore, the calorimeter performance has been established with test beam data, cosmic ray muons and large samples of proton-proton collision data.

Beam tests using three spare TileCal modules at the CERN SPS accelerator in 2017 measured the energy response and resolution for pions, kaons and protons, and results were compared against a Geant4 based simulation. During LHC run-2, high-momentum isolated muons have been used to study and validate the electromagnetic scale, while hadronic response has been probed with isolated hadrons. The calorimeter time resolution has been studied with multi-jet events.

We present and summarise results of the calorimeter calibration and performance.

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