

## ATLAS Tile calorimeter calibration and PMT response

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The ATLAS Tile Calorimeter (TileCal) is the central section of the hadronic calorimeter of the ATLAS experiment. It provides important information for reconstruction of hadrons, jets, hadronic decays of tau leptons and missing transverse energy. This sampling calorimeter uses steel plates as absorber and scintillating tiles as active medium. Scintillating light is transmitted by wavelength shifting fibres to photomultiplier tubes (PMTs) in the rear girders of the wedge-shaped calorimeter modules. Photomultiplier signals are then digitized at 40 MHz and stored on detector in digital pipelines. Event data are transmitted off detector upon a first level trigger acceptance, at a maximum rate of 100 kHz). The readout is segmented into about 5000 cells, each read out by two PMTs on opposite sides of the cell. To calibrate and monitor the stability and performance of each part of the readout chain during the data taking, a set of calibration systems is used. The TileCal calibration system comprises Cesium radioactive sources, laser, charge injection elements and an integrator based readout system. Combined information from all systems allows to monitor and equalise the calorimeter response at each stage of the signal production, from scintillation light to digitisation.

After exposure to scintillator light for almost 10 years, variations in gain have been observed when the PMTs are exposed to large light currents. These variations have been studied and correlated to some intrinsic properties of the PMTs, including the quantum efficiency, as well as operation conditions like the High Voltage. Latest results and conclusions will be presented.

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