Robustness studies of the photomultipliers reading out TileCal, the central hadron calorimeter of the ATLAS experiment

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TileCal is the central section of the hadronic calorimeter in the ATLAS detector.

It is a sampling calorimeter (steel and scintillating tiles).

Light produced by the passage of charged particle is transmitted to PMTs by WLS fibers.

TileCal is readout by 10k PMTs.

The PMTs response is monitored every 2-3 days with the TileCal laser calibration system.

Time stability of the PMT response was studied since LHC Run 1.

PMT response loss is dominated by the amount of integrated anode charge.

A double exponential function is used to describe the PMT response evolution and to estimate the response loss until the end of HL-LHC period (up to 600 C integrated charge).

Larger amounts of anode charge were integrated from a small PMT sample on a test bench. Same model is applied and results are in agreement with those from on-detector PMTs.