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## Calibration of the ATLAS Tile Calorimeter Gap and Crack Scintillators Using Collision Muons in Run 3

The gap and crack scintillator cells (E1–E4) of the ATLAS Tile Calorimeter provide essential energy measurements in the transition region between the barrel and extended barrels, where accurate calibration is important for maintaining the calorimeter energy scale and overall detector performance. This contribution presents a measurement of the energy response of these cells using isolated muons from  $W \rightarrow \mu\nu$  and  $Z \rightarrow \mu\mu$  decays in 2022–2026 proton–proton collision data collected at  $\sqrt{s} = 13.6$  TeV, corresponding to the integrated luminosity for LHC Run 3. Data/Monte Carlo energy scale ratios are derived using different ATLAS simulation campaigns. Multiple energy-scale extraction techniques are evaluated, including truncated-mean methods designed to suppress the impact of electronic noise while preserving the muon signal. The response uniformity of individual calorimeter modules in the Extended Barrel A and C is assessed using a median absolute deviation (MAD)-based outlier identification procedure, with anomalous modules characterized and reported separately from the determination of the central calibration constants. The resulting Data/MC energy scale ratios are compared across the different extraction techniques to identify the method that provides the optimal balance between noise suppression and signal retention. Systematic uncertainties associated with the energy-scale extraction are estimated from the variation among the methods.

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