

Investigating a Mystery: Poor Modelling of Forward Jet Production Rate For Recent ATLAS Data

Saturday, 15 February 2025 19:15 (15 minutes)

The ATLAS experiment, located at CERN, studies high energy proton-proton and heavy-ion collisions produced by the Large Hadron Collider (LHC), the world's largest particle accelerator. One of the main goals of the ATLAS experiment is to study the properties of the Higgs boson. With the discovery of the Higgs boson at ATLAS and CMS in 2012, the focus has shifted to studying the properties of the Higgs, such as rarer interactions like the Higgs decay into a muon-antimuon pair, which has yet to be observed. With an increased collision energy of 13.6 TeV for the 2022-2026 run of the LHC a larger data set is expected to be produced, and with it an improved opportunity to investigate these rarer processes. It is important to produce high-quality simulated data as an expectation for what may be observed with the real data. For the simulated event samples used to compare to the data collected in 2022-2024, it has been predicted that there are 50% less simulated jets than observed data jets in the forward regions, corresponding with the locations of the experiment's forward calorimeters. This differs from what was seen in the 2015-2018 run. A study found that introducing a correction that reduces the energy of the data jets by 10% can compensate for this mismodelling; however, such an ad-hoc correction does not identify the source of the issue. This talk will present a series of studies done to identify what may be contributing to this disagreement, including modelling issues of hadronic energy, the pileup modelling, and overall calibration issues.

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