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Performance of the ATLAS tau-lepton trigger at the LHC in Run 2.

The ATLAS experiment has a rich physics program of Standard Model measurements and searches for physics Beyond the Standard Model involving tau leptons. Most of these analyses depend on an efficient tau-lepton trigger that can cope with the overwhelming background from multi-jet events produced in proton-proton collisions at the Large Hadron Collider. The ATLAS trigger system is composed of two stages. At Level-1, tau leptons are reconstructed as energy deposits in neighbouring towers of calorimeter cells. The High Level Trigger (HLT) exploits the full calorimeter granularity as well as inner-detector tracks, and runs reconstruction and identification algorithms similar to those used in the offline reconstruction. The performance of the tau-lepton trigger in ATLAS Run-2 data will be discussed, and trigger efficiencies measured with a tag-and-probe method will be presented. An emphasis will be made on the improved HLT algorithms deployed in 2018 and mentioned below. The association of tracks to the energy deposit in the calorimeter was tightened to reduce the contamination from fake tracks at high pileup. An energy calibration based on a Boosted Regression Tree with improved energy resolution has replaced the simpler calibration based on pileup subtraction and calorimeter response correction. An identification algorithm based on a Recurrent Neural Network was also deployed, which provides increased jet rejection compared to the previously-used Boosted Decision Tree identification algorithm.

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