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Tau reconstruction, identification and calibration of the ATLAS experiments at the LHC

The tau lepton is the heaviest known lepton with a relatively long lifetime and approximately 65% hadronically decays, including undetectable neutrinos, leaving characteristic displacement, multiplicity, and kinematic properties, making the reconstruction, identification, and calibration very challenging. But the final states with hadronically decaying tau leptons play an important part in the physics programme of the ATLAS experiment, such as the precision measurement of the Yukawa coupling between the Higgs and the tau leptons, extended Higgs sector searches, and searches for new physics phenomena such as supersymmetry, new heavy gauge bosons, and leptoquarks, making the tau reconstruction, identification, and calibration very important in the ATLAS experiment. In this talk, we will give an overview of the ideas and methods used to reconstruct, identify, and calibrate the hadronically decaying tau leptons in the ATLAS experiment for Run 3 and the reprocessed full Run 2 dataset of the LHC, highlighting the recent progress and improvements using modern machine learning techniques, and summarize the possible future for tau reconstruction, identification, and calibration in the ATLAS experiment.

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