

Title: Study of fake-tau background with the ATLAS experiment

Author: Gabriela Martinovicová

Institute: Institute of Particle and Nuclear Physics

Supervisor: Mgr. Vojtěch Pleskot, Ph.D., Institute of Particle and Nuclear Physics

Abstract:

The τ -leptons are the important final-state components, not only in the Standard Model processes but also in the processes beyond the Standard Model studied at the ATLAS experiment at CERN. They are characterized by mostly decaying into hadrons with one or three charged particles and, in most cases, with at least one neutral pion in the final-state. Due to their short decay length, only their decay products are observed in the detector. Jets naturally fake hadronically decaying τ leptons, so it is necessary to estimate such a fake- τ background. The Fake Factor method uses a correction factor, called fake factor (FF), measured from the data and applied to the data to estimate the fake- τ background in a given signal region. One of the complications is that FF differs for τ candidates faked by jets derived from quarks or gluons and thus must be measured in the control region with the same fraction of quark jets as in the signal region. The solution to this problem is the universal FF method, which proposed that from the FFs measured in samples with a large difference in the fraction of jets originating from quark (Z +jets) and gluon (multi-jet), the FF in any particular signal region can be interpolated. This thesis focuses on measuring FF in Z +jets events, in which most of the fake- τ candidates originate from quarks, and studying various aspects that may affect this measurement.

Keywords: CERN, ATLAS, LHC, tau lepton, fake-tau