T 2: Higgs-Boson (Zerfall in Tau-Leptonen) I

Zeit: Montag 11:00–12:30 Raum: VMP5 HS A

T 2.1 Mo 11:00 VMP5 HS A

Measurement of the Z $\rightarrow \tau\tau$ cross-section at 13 TeV with the CMS experiment — •Fabio Colombo, Rene Caspart, Raphael Friese, Andrew Gilbert, Thomas Müller, Günter Quast, and Roger Wolf — Institut für Experimentelle Kernphysik (IEKP), KIT

With the restart of operation in the summer of 2015, the Large Hadron Collider, LHC, has provided proton-proton collisions with the unprecedented center of mass energy of 13 TeV. A precise understanding of the detector and a reliable reconstruction of all physics objects under these new running conditions are mandatory for all LHC experiments. For complex objects like tau leptons, whose reconstruction relies on different sub-detectors, the decay of Z bosons can be used as a standard candle. In the talk, the measurement of the $Z \rightarrow \tau\tau$ cross-section with the data collected by the CMS experiment during the 2015 run period will be presented. Besides technically proving the performance of the reconstruction algorithms, it will pave the way for future short and long term measurements targeting at the study of the properties of the discovered Higgs boson in the decay mode with two tau leptons in the final state or at searches for additional resonances in this final state pointing to new physics.

T 2.2 Mo 11:15 VMP5 HS A

The Z$\rightarrow \tau\tau \rightarrow e + \mu$ cross section measurement in Run 2 with the CMS experiment — •Yiwen Wen — DESY, Hamburg, Germany

The discovery of a 125 GeV Higgs boson at the Large Hadron Collider was a great success for standard model particle physics. Drell-Yan $Z \rightarrow \tau\tau$ production can be used as standard candle for the $H \rightarrow \tau\tau$ analysis. This work focuses on $Z \rightarrow \tau\tau$ decay in $e + \mu$ final states with Run 2 data, collected at a proton-proton centre of mass energy of 13 TeV by the CMS experiment, and corresponding to an integrated luminosity of 2.1 fb^{-1}.

T 2.3 Mo 11:30 VMP5 HS A

Study of Z boson events in the decay to a tau lepton pair in the semileptonic channels with the CMS experiment at 13 TeV — •Valeria Botta — DESY, Hamburg

The talk focuses on the commissioning of the tau lepton objects using Z boson events as standard candle, which is the first step towards the analysis of the Higgs boson decays to a pair of tau leptons. The analysis is performed with data from proton-proton collisions at a centre-of-mass energy of 13 TeV, recorded with the CMS detector at the LHC during 2015. Semileptonic final states are considered, in which one tau lepton decays to hadrons and the other one decays to a muon or an electron (and neutrinos). The presence of an isolated lepton in the final state provides a handle for triggering and rejecting the background from QCD processes. The trigger and lepton identification efficiencies have been measured with a tag-and-probe method using electron and muon pairs from Z boson decays. The cross section of Z-boson production in the di-tau final state has been measured and compared to standard model predictions.

T 2.4 Mo 11:45 VMP5 HS A

Lepton efficiency measurements in the context of a $Z \rightarrow \tau\tau$ cross section measurement — •Gregor Köhler, Fabio Colombo, Thomas Müller, Roger Wolf, and Günter Quast — Institut für Experimentelle Kernphysik, KIT

In all of High Energy Physics Monte Carlo methods are used to simulate physics processes and detector response to predict the outcome of the experiment and to determine estimates for systematic uncertainties on this outcome. Parts of the simulated detector performance can be cross checked and the agreement between data and simulation generally improved via experimental techniques like the tag and probe method. This presentation illustrates the application of a tag and probe method for the determination of the efficiencies to trigger and to reconstruct leptons in the context of a $Z \rightarrow \tau\tau$ cross section measurement based on the LHC run-2 data at 13 TeV that have been taken already with the CMS detector.

T 2.5 Mo 12:00 VMP5 HS A

Measurement of fake rates for hadronically decaying τ leptons in the ATLAS experiment — •Timo Dreyer, Michel Janus, and Stan Lai — II. Physikalisches Institut, Georg-August-Universität Göttingen

The τ lepton is the heaviest lepton in the standard model and an important probe of physics at high energy scales. The joint observation of the $H \rightarrow \tau\tau$ signal in 2015 by the CMS and ATLAS experiments, for example, was the first direct observation of the Higgs boson coupling to fermions.

For signatures involving hadronically decaying τ leptons, it is important to have a good understanding of the τ reconstruction and identification algorithms that are used for data analysis in the ATLAS experiment. In particular, the probability for jets originating from quarks and gluons to be misidentified as hadronically decaying τ leptons (the so-called *fake rate*), is important for background estimation from a variety of sources. This fake rate depends on many kinematic variables, as well as the quark-gluon composition of the process in question.

This talk presents an approach using 13 TeV ATLAS data, to measure the fake rate using the tag-and-probe technique. The dependence of the fake rate on the above mentioned factors is also discussed.

T 2.6 Mo 12:15 VMP5 HS A

Search for H–>tautau decays in the semi-leptonic final state and measurement of the tau identification efficiency using LHC pp data at sqrt(s)=13 TeV collected with the ATLAS detector — •Théo Megy, Lei Zhang, and Karsten Köneke — Albert-Ludwigs-Universität Freiburg

The discovery of a Higgs-like particle in 2012 led to several studies aiming to measure the properties of this new particle, amongst which are the measurements of its couplings to Standard Model particles. The most accessible way to measure Higgs couplings to leptons is to study its decay into a pair of taus. A discovery of this decay channel of the Higgs boson was made in a combined analysis of the full LHC run 1 data collected by the ATLAS and CMS detectors. The large expected integrated luminosity of the LHC run 2 will enable enable an observation of the H->tautau decays using data collected by the ATLAS detector alone. Therefore, this talk will discuss the techniques that will be used for this analysis for the case where one tau decays leptonically and the other hadronically. A prerequisite for such an analysis is a precise understanding of the reconstruction and identification of hadronically decaying tau leptons. The methodology of determining the hadronic-tau identification efficiency with 13 TeV data will be descibed and the results of this measurement will be discussed.