T 6: Other Exp., EW

Time: Monday 16:30–18:00 Location: HSZ/0103

T 6.1 Mon 16:30 HSZ/0103

High-p_T electron performance in proton-lead collisions in the ATLAS experiment at the LHC — •Patrycja Potepa for the ATLAS-Collaboration — Johannes Gutenberg-Universität Mainz, Germany

Electrons constitute an essential ingredient of final states from the leptonic decay channels of W and Z bosons. Their reconstruction and identification are especially challenging in heavy-ion collisions due to high detector occupancy. Therefore, the evaluation of electron performance is crucial for precision measurements of properties of quark-gluon plasma produced in heavy-ion collisions at the LHC energies. The presented measurement focuses on electron reconstruction, identification, isolation, and trigger efficiencies in proton-lead collisions collected at 8.16 TeV in 2016. The tag-and-probe method allows to derive electron efficiencies in data and MC simulation independently, and compare the results.

T 6.2 Mon 16:45 HSZ/0103

Towards a new test of lepton flavor universality using $B^0 \to K^{*0}e^+e^-$ decays in the high di-lepton invariant mass region — Martino Borsato and •Miguel Ruiz Díaz — Physikalisches Institut, Universität Heidelberg

Lepton Flavor Universality (LFU) tests using rare B-meson decays are amongst the most sensitive probes of the Standard Model (SM) flavor structure. They are mediated by a $b \to sl^+l^-$ transition which is loop suppressed in the SM. However, new physics (NP) processes involving new particles and interactions could lead to a measurable contribution.

Many NP models predict a sizable violation of LFU in $b \to sl^+l^-$ decays. A commonly used observable is the ratio $R_{K^{*0}} \equiv B(B^0 \to K^{*0}\mu^+\mu^-)/B(B^0 \to K^{*0}e^+e^-)$, defined within a given interval of the di-lepton invariant mass, q^2. This observable benefits from a clean theoretical prediction since most theoretical uncertainties cancel in the ratio in the SM.

This talk presents the current state of the analysis towards a new measurement of $R_{K^{*0}}$ in the experimentally more challenging high-q^2 region, using data from LHCb recorded between 2011 and 2018. It is the first measurement performed by the LHCb collaboration in this kinematic region. Being a relatively independent measurement it will serve to validate and cross-check the results obtained in lower-q^2 regions as NP effects are expected to be roughly q^2 independent.

T 6.3 Mon 17:00 HSZ/0103

Muon Momentum Calibration in ATLAS experiment — •Dionysios Fakoudis[1] and Stefan Tapprogge[2] for the ATLAS-Collaboration — [1]Johannes Gutenberg University, Mainz, Germany — [2]Johannes Gutenberg University, Mainz, Germany

In this contribution the momentum calibration of (anti-)muons for the ATLAS detector will be discussed. Precise measurements of the W and Z boson mass using the data from the full Run2 of LHC provide new challengeS for an even more accurate muon calibration. Firstly the overall method with the constraints, the systematics and the limits of the current calibration will be presented. The muon calibration scheme provides tools for reconstructed muons using information from the Inner Detector or the Muon Spectrometer and also using the so called combined muons, by comparing Monte Carlo generated events with ATLAS data using the well known 'standard candles' J/Psi and Z. Some of the major issues are going to be discussed (for example the extrapolation from the kinematic region of the J/Psi to the Z region) as well as their possible impact on precision measurements. Current solutions and further challenges will be presented.

T 6.4 Mon 17:15 HSZ/0103

Study of polarization fractions in same-sign W boson scattering — •Prasham Jain, Beate Heinemann, and Oleg Kuprash — Albert-Ludwigs-Universität Freiburg, Freiburg, Germany

Polarized same-sign W boson pair production is a crucial process to examine the electroweak symmetry breaking mechanism. A measurement of the fraction of longitudinally polarized W bosons, $W_L^\pm W_L^\pm$, directly probes the unitarization mechanism of the vector boson scattering amplitude through Higgs boson contributions, and is sensitive to potential new physics effects. This talk presents machine learning (ML) methods for classification of $W^\pm W^\pm$ polarization modes. Results are shown of applying the ML for the extraction of longitudinal polarization fraction.

T 6.5 Mon 17:30 HSZ/0103

Machine Learning Application for Single Boson Polarization Measurement in Same-Charged WW Scattering Within the Atlas Experiment — •Max Vincent Stange for the ATLAS-Collaboration — Institut für Kern- und Teilchenphysik, Technische Universität Dresden

In 2019, the scattering of same-charged W bosons was measured for the first time in the ATLAS experiment. This process provides a strong dependence on the exact mechanism of electroweak symmetry breaking. Since the W bosons obtain their mass and thus their longitudinal polarization directly from the Higgs mechanism, the longitudinal parts of the W boson scattering are particularly promising for studying the Higgs mechanism and finding physics beyond the Standard Model. Since the scattered W bosons decay into one charged lepton and one neutrino each, the original polarizations of the W bosons can no longer be reconstructed directly from the measurement. To be able to measure the contribution of WW scattering with at least one longitudinal boson, multi-variable analysis techniques are applied in the analysis. In this regard, this talk will demonstrate the application of neural networks trained to distinguish signal from background and polarizations. The focus is on comparing different methods to maximize the expected significance.

T 6.6 Mon 17:45 HSZ/0103

Same-sign WW scattering in the semi-leptonic channel at the CMS experiment — Thorsten Chwalek[1], Nils Faltermann[1], Abideh Jafari[2], Thomas Müller[1], and •Komal Tauqeer[1] — [1]Institut für Experimentelle Teilchenphysik (ETP), Karlsruher Institut für Technologie (KIT) — [2]Deutsches Elektronen-Synchrotron (DESY), Hamburg

Vector boson scattering (VBS) provides an opportunity for testing the Higgs mechanism in the electroweak sector of the standard model. At the LHC, the scattering of the weak gauge bosons can reveal the actual process by which they get their masses.

The most promising VBS channel for this type of study is same-sign WW scattering, which has a good balance between signal and backgrounds. In particular, the semi-leptonic decay channel provides a larger cross section than the fully leptonic decay channel; however, this channel faces large background contributions from V + jets and $t\bar{t}$ processes. Also, to study same-sign WW process, one needs to seperate it from processes like WZ, ZZ, and opposite-sign WW scattering. To do this in the semi-leptonic channel is very challenging because of very small W/Z reconstructed mass seperation.

To extract our signal, we have developed a ParticleNet based jet charge tagger to identify boosted W-jet charge. In this talk, I will discuss about the features and performance of this jet charge tagger and its implementation in this analysis. I will also discuss the overall analysis strategy and some important kinematic distributions for signal vs. background discrimination.