T 76: Suche nach Physik jenseits des Standardmodels IV

Zeit: Donnerstag 16:30–19:00

Raum: Philo-HS4

T 76.1 Do 16:30 Philo-HS4

Search for new physics in events with one lepton and high missing transverse energy with the ATLAS detector — •Eike Becher and Stefan Tapprogge — Johannes Gutenberg Universität Mainz

Many models of physics beyond the Standard Model (SM) predict the existence of new spin 1 gauge bosons that could be discovered by experiments at the Large Hadron Collider (LHC). In the leptonic decay channel the massive charged W' boson decays into a lepton and a neutrino.

The analysis requires a single high-p_T isolated lepton ($l = e, \mu$) and substantial missing transverse energy E_T^{miss} originating from the undetected neutrino. The signal discriminant is the transverse mass

$$m_T = \sqrt{2p_T E_T^{\mathrm{miss}}(1 - \cos\varphi_{l\nu})} \qquad (1)$$

where $\varphi_{l\nu}$ ist the angle between the lepton and E_T^{miss} in the transverse plane.

The existence of a W' boson could lead to an excess of data in the high transverse mass region. From 2015 to 2017 the LHC provided proton collisions at a center of mass energy of 13 TeV. Data corresponding to an integrated luminosity of about 70 fb^{-1} has been recorded by the ATLAS experiment. The analysis strategy and an understanding of the data used in the search for narrow resonance like structure in $l + E_T^{\mathrm{miss}}$ final state will be presented.

T 76.2 Do 16:45 Philo-HS4

Analysis of high mass lepton flavour violating processes with CMS — •Aaron Hornschild, Thomas Hebbeker, Sören Erdweg, Arnd Meyer, and Swagata Mukherjee — III. Physikalisches Institut A, RWTH Aachen University

Lepton flavour violating processes are common in several models of physics beyond the standard model. Some models predict objects at the TeV scale that can decay into two charged standard model leptons of different flavour, like electron + muon or muon + tau. For example supersymmetry with R-parity violation can permit resonant sneutrino production which could decay into such two different leptons. This scenario results in an excess of events at high invariant masses, thus leading to a striking signature with low standard model background.

In this talk the analysis of such a lepton flavour violating process is presented, based on the 2016 CMS dataset corresponding to an integrated luminosity of 36 fb^{-1} at a pp center of mass energy of 13 TeV.

T 76.3 Do 17:00 Philo-HS4

Unfolding of control regions in the search for lepto-quarks using the 2015 and 2016 datasets from ATLAS — •Alexander Sydorenko — Institut für Physik, Uni Mainz

Many Exotics and SUSY analyses use control regions in interesting regions of phase space to perform their searches. The information obtained from these control regions could have applications beyond the original search. For example, unfolded distributions of certain observables in these regions could be used for re-interpretations or tuning of Monte Carlo generators. This note is intended as a demonstration of the unfolding of search control regions. The unfolding is based on a search for leptoquarks performed using data collected by the ATLAS experiment during LHC pp collisions at 13 TeV in 2015 and 2016. A simple bin-by-bin unfolding is performed on a number of variables in eejj, $\mu\mu$jj and eμjj control regions of the search.

T 76.4 Do 17:15 Philo-HS4

Search for singly produced lepto-quarks decaying into a quark and a charged lepton of the first or second generation with ATLAS — •Holger Herr and Stefan Tapprogge — Universität Mainz

Recent anomalies observed in flavour physics challenge the very successful standard model. The introduction of new particles which carry lepton and baryon number - the so called lepto-quarks (LQ) - could explain these in a convenient way.

The ATLAS experiment collects data of proton-proton collisions at a center of mass energy of 13 TeV since 2015. The single production channel allows to extend the mass reach probed compared to the search

for pair produced lepto-quarks. This comes at the cost of introducing an additional dependency on the quark-lepton-LQ coupling. The quark emitting the LQ transitions into a charged lepton. This leads to a final state containing a charged lepton and anti-lepton as well as a quark. So far only charged leptons of the first and second generation are considered.

In this talk signal kinematics, expected backgrounds, the selection strategy as well as first sensitivity estimates will be presented.

T 76.5 Do 17:30 Philo-HS4

Search for pair-produced first and second generation scalar leptoquarks in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector at the LHC — Stefan Tapprogge and •Anton Wolf — Institut für Physik, Johannes Gutenberg-Universität Mainz

Leptoquarks (LQs) are predicted in many extensions of the Standard Model (SM) and may provide an explanation for many observed similarities between the quark and lepton sectors of the SM. LQs are commonly assumed to couple to quarks and leptons of the same generation.

The talk will summarize results of a search for pair-produced first and second generation LQs. Channels where both LQs decay to a charged lepton and a quark are considered. The probed final states consist of exactly two same flavour opposite sign leptons (electrons or muons) and at least two jets. The dataset used was recorded in 2015 and 2016 by the ATLAS experiment. It corresponds to 36.1 fb^{-1} of pp collision data at a center-of-mass energy of 13 TeV.

T 76.6 Do 17:45 Philo-HS4

Searches for pair production of leptoquarks in top quark final states at the CMS experiment. — Johannes Haller, Roman Kogler, •Arne Christoph Reimers, and Marc Stöver — Institut für Experimentalphysik, Universität Hamburg

In this talk we present searches for pair produced scalar leptoquarks in pp-collisions of $\sqrt{s} = 13$ TeV. The data have been collected by the CMS experiment in 2016. In these analyses, the production of scalar leptoquarks decaying into a top quark and a muon or a tau lepton is studied.

The searches are carried out in final states with either two isolated muons or at least one hadronically decaying tau lepton and one additional electron or muon. Both channels are divided into sub-categories in order to maximize the sensitivity to a wide range of leptoquark masses. The dominating standard model backgrounds ($t\bar{t}$ and Drell-Yan or W+jets, respectively) are estimated by selecting control regions and extrapolating the data using additional shape and normalization information from simulation. A combination of both analyses is performed to achieve the best overall sensitivity.

T 76.7 Do 18:00 Philo-HS4

Suche nach skalaren Leptoquarks der dritten Generation am ATLAS Experiment — Daniela Börner, Frank Ellinghaus, Jan Küchler und •Jens Roggel — Bergische Universität Wuppertal

Leptoquarks werden in vielen Erweiterungen des Standardmodells vorhergesagt und wären in der Lage Ähnlichkeiten zwischen Quark- und Leptonsektor zu erklären.

Dieser Vortrag beschreibt die Suche nach skalaren Leptoquarks aus Paarproduktion mit einer Ladung von +2/3, die in ein Top-Quark und ein Tau-Neutrino zerfallen. Aufgrund der Ähnlichkeit des Endzustandes zu einer Suche nach supersymmetrischen Top-Squarks mit einem Lepton, Jets und fehlender transversaler Energie im Endzustand kann letztere im Sinne einer Suche nach Leptoquarks uminterpretiert werden. Limits auf den Wirkungsquerschnitt für die Leptoquark Produktion werden basierend auf den vom ATLAS Detektor in den Jahren 2015 und 2016 gesammelten Daten berechnet. Es wird angenommen, dass Leptoquarks nur in ein Quark und ein Lepton derselben Generation zerfallen und somit zusätzlich nur ein Zerfall in ein Bottom-Quark und ein Tau-Lepton möglich ist. Daher werden auch Limits als Funktion des Verzweigungsverhältnisses in die beiden Zerfallskanäle präsentiert.

T 76.8 Do 18:15 Philo-HS4

Reinterpretation of the ATLAS search for stop quarks decaying through tau sleptons as a search for 3rd generation

leptoquarks — Alexander Mann and •Alexander Mario Lory — Ludwig-Maximilians-Universität München

Leptoquarks appear in many extensions of the Standard Model and can potentially help us understand the similarities between quark and lepton generations. A recent study, motivated by supersymmetry, analysed events with final states with tau leptons, b-quarks and missing transverse momentum in the dataset recorded with the ATLAS detector in 2015 and 2016. No deviation from the Standard Model was observed. The results of a reinterpretation of this analysis in terms of third generation leptoquarks of up- and down-type is presented. Leptoquark signal models are analysed and compared to the supersymmetric benchmark models. The reinterpretation has good exclusion power for intermediate values of the model paramater β, which determines the branching ratio of a leptoquark decaying to a charged lepton and a quark. For $\beta = 0.5$, the up-type and down-type models are excluded for leptoquark masses up to 780 and 800 GeV, respectively.

T 76.9   Do 18:30   Philo-HS4
Flavorful Leptoquarks at Hadron Colliders — •Dennis Loose — TU Dortmund

Driven by the $b \to s$ anomalies, we study bottom-up leptoquark scenarios and explore the flavor structure of the associated couplings in the context of flavor symmetries that can explain masses and mixings of the standard model fermions. We work out collider signatures focusing on single leptoquark production, which is sensitive to the couplings and their structure. The flavor patterns that are in accordance with the data put an emphasis on the processes $pp \to b\mu\mu$ and $pp \to t\mu\nu$ and allow for leptoquark masses as low as a few TeV.

T 76.10   Do 18:45   Philo-HS4
Diskriminierung von Quark- und Gluonjets mit dem ATLAS-Detektor — •Johannes Balz, Katharina Bierwagen, Volker Büscher, Andreas Reiss, Jan Schäffer und Christian Schmitt — Institut für Physik, Johannes Gutenberg-Universität Mainz

Eines der gegenwärtig wichtigsten Ziele für das ATLAS Experiment ist neben der präzisen Vermessung des Standardmodells (SM) die Suche nach Physik jenseits des SM (BSM).

In nahezu jeder BSM-Suche spielen Jets eine wichtige Rolle, da diese aus der Hadronisierung von Quarks und Gluonen entstehen. In vielen BSM-Modellen sind die Untergrundprozesse durch Jets aus Gluonen dominiert, während in den Signalprozessen Quarkjets dominieren. Daher is eine Unterscheidung von Jets aus Quarks und Gluonen (Quark-Gluon-Tagging) ein wichtiges Hilfsmittel zur weiteren Diskriminierung von Signal- und Untergrundereignissen.

In diesem Vortrag wird ein Verfahren/Methode vorgestellt, in dem mithilfe eines BDT einige diskriminierende Messgrößen aus Spurdetektor und Kalorimeter kombiniert werden, die sensitiv auf die Substruktur der Jets sind. Die Performanz des Taggers wurde mithilfe von Dijet-Monte-Carlo- und Daten-Ereignissen bei einer Schwerpunktsenergie von $\sqrt{s}$=13 TeV studiert.