

T 5: Suche nach Neuen Teilchen I

Zeit: Montag 16:00–18:35

Raum: H07

Gruppenbericht

T 5.1 Mo 16:00 H07

Searching for the single production of vector-like quarks in the Wb final state with the ATLAS detector at 13TeV — ●FERDINAND SCHENCK¹, FRANCESCO PERI¹, ANJISHNU BANDYOPADHYAY², JANET DIETRICH¹, HEIKO LACKER¹, and IAN BROCK² — ¹Humboldt-Universität zu Berlin — ²Rheinische Friedrich-Wilhelms-Universität Bonn

This talk will cover the results from an ATLAS search for the single production vector-like $T^{2/3}$ or $Y^{4/3}$ quarks decaying to a Wb final state using 36.1 fb⁻¹ of proton-proton data collected at 13TeV by the ATLAS experiment, as well as a new search aiming to expand upon these results.

The initial search focused exclusively on a 1-lepton final state, while the new search aims to improve on this by the addition of a 0-lepton final state, the use of approximately 140 fb⁻¹ of data, as well as by the addition of Machine Learning based discriminants and taggers.

T 5.2 Mo 16:20 H07

First search for single production of vector-like B quarks in the $B \rightarrow bH(\rightarrow \gamma\gamma)$ decay channel with the ATLAS detector at $\sqrt{s} = 13$ TeV — ●BJÖRN WENDLAND¹, FREDERIC SCHRÖDER², ISABEL NITSCHKE¹, DIANE CINCA¹, ELIZABETH BROST³, JOHANNES ERDMANN¹, JAHRED ADELMAN³, and KEVIN KRÖNINGER¹ — ¹TU Dortmund, Experimentelle Physik IV — ²Bergische Universität Wuppertal — ³Northern Illinois University

The first search for the single production of vector-like B quarks decaying into a b quark and a Higgs boson where the Higgs boson decays into a pair of photons is presented.

The analysis strategy is based on the characteristic B quark event topology, which consists of two high-momentum photons, a high-momentum b -jet and a more forwardly produced jet. The B quark is reconstructed from its decay products and its reconstructed mass is used as final discriminant against background contributions. The dominant background contribution arises from non-resonant diphoton processes with additional jets in the final-state, where the photons arise either from Standard Model (SM) diphoton production or from jets mis-identified as photons. Additional small background contributions arise from SM Higgs boson production processes where the Higgs boson decays into a pair of photons.

No significant excess over the background-only hypothesis is observed. Assuming the (B, Y) doublet model and a generalized coupling $\kappa_B = 0.5$ of the B quark to SM quarks, B quark masses below 1210 GeV are excluded at 95% confidence level.

T 5.3 Mo 16:35 H07

Search for single production of vector-like quarks using boosted techniques with the ATLAS detector — ●ANJISHNU BANDYOPADHYAY¹, IAN BROCK¹, JANET DIETRICH², HEIKO LACKER², and FERDINAND SCHENCK² — ¹University of Bonn — ²Humboldt University Berlin

Vector-like quarks are hypothetical spin 1/2 fermions predicted by various Beyond the Standard Model (BSM) theories. A search for $Y^{4/3}$ and $T^{2/3}$ is performed. The search is conducted in the Wb decay mode. In addition to the semi-leptonic final state, a search in the fully hadronic final state is also performed using the full Run 2 dataset (140 fb⁻¹) collected by the ATLAS detector. This talk will focus on boosted techniques, one of them being boosted taggers, used in analysing the hadronic final state of $pp \rightarrow Y/T \rightarrow Wb$.

T 5.4 Mo 16:50 H07

Additional studies in the search for the single production of vector-like quarks decaying to a Wb final state. — ●MICHEL SMOLA — Humboldt Universität zu Berlin

Vector-like quarks (VLQs) are hypothetical spin-1/2 fermions suggested by various BSM models. Based on a 36.1 fb⁻¹ data set, an ATLAS analysis has searched for singly produced VLQs decaying to Wb final states using one-lepton final states. The analysis is now extended to the complete LHC Run 2 data set. This talk reports on studies for the new analysis: 1) background suppression by identifying jets in the forward detector region $|\eta| > 2.5$, 2) evaluation and comparisons of methods to estimate multijet background.

T 5.5 Mo 17:05 H07

Suche nach vektorartigen Top-Quarks in Endzuständen mit einem Lepton, Jets und fehlendem transversalem Impuls bei $\sqrt{s} = 13$ TeV am ATLAS Experiment — FRANK ELLINGHAUS und ●JENS ROGDEL — Bergische Universität Wuppertal

Verschiedene Modelle für Physik jenseits des Standardmodells sagen vektorartige Top-Quarks voraus, d.h. schwere Parterteilchen des Top-Quarks, deren rechts- und links-händige Komponenten gleichartig unter der schwachen Wechselwirkung transformieren.

Die Analyse fokussiert sich auf die Suche nach vektorartigen Top-Quarks aus Paarproduktion mit einem Zerfall in Top-Quark und Z -Boson, wobei das Z -Boson in Neutrinos zerfällt. Die betrachteten Ereignisse werden durch ein Lepton, Jets und einen hohen fehlenden transversalen Impuls im Endzustand gekennzeichnet. Weiter führen die hohen Massen der vektorartigen Top-Quarks zu einem starken Boost der Zerfallsprodukte, was zu einer kollimierten Zerfallstopologie führt. Die Strategie für die Analyse der ATLAS pp Daten bei $\sqrt{s} = 13$ TeV wird diskutiert.

T 5.6 Mo 17:20 H07

Studies for the search for pair produced leptoquarks decaying into top quarks and electrons or muons in final states with ≥ 3 leptons — JOHANNES ERDMANN, ●ABDULKÄRIM FREMPONG, ELENA FREUNDLICH, and KEVIN KRÖNINGER — TU Dortmund, Lehrstuhl für Experimentelle Physik IV

Recent flavour physics results from the LHCb collaboration of R_{K^*} , the ratio of the branching fractions $B \rightarrow K^* \mu\mu$ and $B \rightarrow K^* ee$, was found to deviate 2.5σ from Standard Model predictions. One explanation for a possible lepton non-universality are leptoquarks with cross-generation couplings to Standard Model fermions, meaning that the new introduced particle couples to quark and leptons from different generations with a different coupling for each quark-lepton combination. For the search for pair produced leptoquarks decaying into electrons and muons in final states with ≥ 3 leptons using the full run 2 dataset collected by the ATLAS detector, optimisation studies of an event selection using Monte Carlo events are presented. Expected limits on the signal strength, calculated by considering only statistical uncertainties, were calculated for different additional selection criteria, leading to the proposal of an optimised event selection.

T 5.7 Mo 17:35 H07

Searches for pair production of leptoquarks decaying into top quarks and muons at the CMS experiment — ●NINO EHLERS, JOHANNES HALLER, ROMAN KOGLER, and ARNE CHRISTOPH REIMERS — Universität Hamburg, Institut für Experimentalphysik

In this talk we present a search for pair-produced leptoquarks in pp-collisions at a center-of-mass energy of $\sqrt{s} = 13$ TeV. The data have been collected in 2016, 2017 and 2018. In this analysis the production of leptoquark pairs decaying into a top quark and a muon is studied.

The search is carried out in the final state with at least two isolated muons and at least two jets. In events with at least three charged leptons the leptoquark mass is reconstructed. The event selection is optimized for a wide range of leptoquark masses. The dominating standard model backgrounds of $t\bar{t}$ and Drell-Yan + jets are estimated by selecting control regions and extrapolating the data, using additional shape and normalization information from simulated events. The expected sensitivity and expected exclusion limits are derived and compared to the public result, based on 2016 data only.

T 5.8 Mo 17:50 H07

Search for pair-produced leptoquarks decaying into quarks of the third and leptons of the first or second generation with the ATLAS experiment at $\sqrt{s} = 13$ TeV — ●VOLKER AUSTRUP and FRANK ELLINGHAUS — Bergische Universität Wuppertal

Motivated by similarities between the quark and lepton sectors in the Standard Model, leptoquarks (LQs) are hypothetical bosons that are assumed to couple to quarks and leptons at the same time. First proposed in the 1980s, the initial model includes couplings only within one generation. However, hints at flavor anomalies recently observed by various experiments such as LHCb, BaBar, and Belle have sparked interest in extended models with LQs coupling to quarks and leptons of different generations.

In this talk, the status of a search for pair-produced up-type ($q = +2/3e$) and down-type ($q = -1/3e$) LQs decaying into quarks of the third and leptons of the first or second generation is presented.

For this analysis, the final state of interest is $LQ_u LQ_u \rightarrow t\nu + be/\mu$ and $LQ_d LQ_d \rightarrow te/\mu + b\nu$. With a high momentum lepton and large missing transverse energy, this channel provides good separation between signal and background processes.

An overview of the analysis strategy, including the definition of signal and control regions, is given. The studies shown are based on pp -collision data at a centre-of-mass energy of $\sqrt{s} = 13$ TeV measured by the ATLAS experiment at the LHC between 2015 and 2018.

T 5.9 Mo 18:05 H07

Sensitivity Study on Single Leptoquark Production at CMS

— ●HENRIK JABUSCH, PAOLO GUNNELINI, ROMAN KOGLER, and JOHANNES HALLER — Institut für Experimentalphysik, Universität Hamburg

In this talk we present a sensitivity study of a specific leptoquark model recently proposed to explain the measured B -anomalies. We focus on single and pair production of scalar leptoquarks and the final state with two leptons plus hadronic jets.

Our study is performed at generator level and at detector level using a DELPHES simulation of the CMS detector. We show limits on this leptoquark production model and compare them to an analysis of

CMS data.

T 5.10 Mo 18:20 H07

Search for singly produced Lepto-Quarks decaying into a Quark and charged Leptons of the first and second generation with ATLAS — ●HOLGER HERR and STEFAN TAPPROGGE — Johannes-Gutenberg Universität Mainz

The most significant deviations from the Standard Model observed in recent years are flavour anomalies. Introducing new particles which carry lepton and baryon number - the so called Lepto-Quarks - to the Standard Model can explain the deviations measured in a convenient way. Since 2015 the LHC collides protons at a center of mass energy of 13 TeV at the interaction point of the ATLAS experiment. This inelastic scattering data at the highest energies ever reached in an earth based collider experiment gives great opportunity to search for these new particles at the high energy frontier. The single production channel allows to probe a higher mass range at cost of introducing some model dependency. For simplicity reasons only the decay into a quark and charged leptons of the first and second generations are considered for now. In this talk results of the search using the full Run 2 dataset recorded in proton-proton collisions by ATLAS will be presented. This includes the definition of control and validation regions to ensure good background modelling in our simulation.