

## T 81: BSM Suchen V (Leptoquarks und exotische top-Quarks)

Zeit: Mittwoch 16:45–19:00

Raum: VMP9 SR 28

T 81.1 Mi 16:45 VMP9 SR 28

**Search for scalar leptoquarks with the ATLAS experiment** — ●VOJTECH PLESKOT and STEFAN TAPPROGGE — Institut für Physik, JGU Mainz, Staudinger Weg 7, D-55099 Mainz

Scalar leptoquarks are hypothetical particles predicted by many theories beyond the Standard Model. They carry both color and electric charge. They couple to leptons and quarks via a Yukawa interaction lagrangian term. In a minimalistic Buchmueller-Rueckl-Wyler model, there are three generations of leptoquarks each of which couple to one lepton family only. In proton-proton collisions, leptoquarks can be produced in pairs.

The talk will summarize recent efforts of the ATLAS collaboration in the search for the pair production of scalar leptoquarks in proton-proton collisions at a centre-of-mass energy of 13 TeV. The detector signature searched for are two electrons (muons) and two jets in the case of a first (second) generation leptoquark pair production.

T 81.2 Mi 17:00 VMP9 SR 28

**ATLAS search for 1st and 2nd generation Leptoquarks at  $\sqrt{s} = 13$  TeV** — ●RUTH PÖTTGEN — Universität Stockholm

In the Standard Model, there are many striking similarities between the quark and the lepton sector. Leptoquarks are hypothetical particles that are part of many models for physics beyond the Standard Model and provide a connection between the two sectors. They are commonly assumed to couple to quarks and leptons of only one generation. This contribution gives an overview of the motivation for and presents important aspects of the search for 1st- and 2nd-generation leptoquarks performed by the ATLAS collaboration using  $3.2 \text{ fb}^{-1}$  of data collected at a centre-of-mass energy of  $\sqrt{s} = 13 \text{ TeV}$  during 2015.

T 81.3 Mi 17:15 VMP9 SR 28

**Search for Scalar Leptoquarks with the ATLAS detector. - Recent results and prospects** — ●GIOVANNI SIRAGUSA — Julius-Maximilians-Universität, Würzburg, Germany

Similarities between leptons and quarks in the SM suggest the existence of symmetries beyond the EW symmetry breaking scale. Leptoquarks (LQ) are hypothetical charged particles which carry both quark and lepton flavour quantum numbers. They appear naturally in many BSM theories and there have already been searches at previous collider experiments. A model independent search of pair-produced LQs with the ATLAS detector, based on a effective theory, will be reported, together with the prospects for LQ searches at the Large Hadron Collider.

T 81.4 Mi 17:30 VMP9 SR 28

**Search for pair production of leptoquarks decaying into a top quark and a muon at the CMS experiment** — JOHANNES HALLER, ROMAN KOGLER, THOMAS PEIFFER, ●ARNE REIMERS, and MARC STÖVER — Institut für Experimentalphysik, Universität Hamburg

In this talk we present a search for pair produced scalar leptoquarks in pp-collisions of  $\sqrt{s} = 13 \text{ TeV}$ . The data have been collected by the CMS experiment in 2015. Leptoquarks are hypothetical particles with simultaneous couplings to quarks and leptons. In this analysis, the decay channel of scalar leptoquarks decaying into a top quark and a muon is studied. Therefore the basic event signature are muons and jets.

In the event selection possible leptoquark events are enriched and the standard model background is reduced as much as possible. In events containing additional electrons, the 4-momentum of top quark candidates is calculated from information of the leading electron, missing transverse energy and at least one jet. Leptoquark hypotheses are then tested via a  $\chi^2$  minimization using top quark candidates and muons. A data driven method for the estimation of the dominant standard model background is presented. The expected sensitivity to leptoquarks and exclusion limits are derived.

T 81.5 Mi 17:45 VMP9 SR 28

**Search for pair production of leptoquarks decaying into a top quark and a tau lepton at the CMS experiment** — JOHANNES HALLER, ROMAN KOGLER, THOMAS PEIFFER, ARNE REIMERS, and ●MARC STÖVER — Institut für Experimentalphysik, Universität Hamburg

A search for third generation leptoquarks at the LHC is presented. Leptoquarks are hypothetical gauge bosons which are predicted by many theories beyond the standard model. They couple to both quarks and leptons. In this analysis, the pair production of leptoquarks decaying into a top quark and a tau lepton is studied.

We focus on the lepton + jets channel where one of the top quarks decays hadronically and the other one leptonically. The study uses the full dataset of the year 2015 which was collected with the CMS detector at  $\sqrt{s} = 13 \text{ TeV}$ . The event selection is optimized such that the standard model background is reduced as much as possible. Finally, the expected limits on the leptoquark production cross section with the current and the forthcoming datasets will be discussed.

T 81.6 Mi 18:00 VMP9 SR 28

**Studie zum Zerfall angeregter Top-Quarks durch Abstrahlung von Gluonen mit Hilfe des CMS-Detektors** — JOHANNES HALLER, ROMAN KOGLER und ●JENS MULTHAUP — Institut für Experimentalphysik Universität Hamburg

Das Top-Quark nimmt durch seine hohe Masse eine Sonderrolle im Standardmodell ein und macht es zudem für Hinweise auf eine Physik jenseits des Standardmodells interessant. In der hier vorgestellten Erweiterung des Standardmodells wird angenommen, dass es sich bei dem Top-Quark um ein zusammengesetztes Teilchen handelt. Eine Anregung auf ein höheres Energieniveau und die anschließende Abregung durch die Abstrahlung von Gluonen, dient dabei als Signatur nach der in der präsentierten Studie gesucht wird. Um diese nachzuweisen wurden Daten des CMS-Experimentes aus pp-Kollisionen bei einer Schwerpunktsenergie von 13 TeV untersucht. Im Vortrag wird der aktuelle Stand der Analyse präsentiert.

T 81.7 Mi 18:15 VMP9 SR 28

**Search for  $t\bar{b}$  resonances with the ATLAS detector at the LHC** — ●GEOFFREY GILLES for the ATLAS Pixel-Collaboration — Bergische Universität Wuppertal, Wuppertal, Germany

Despite the success of the Standard Model (SM) all along the last fifty years, conceptual limitations do not allow it to answer to some theoretical questions or justify certain experimental observations. These elements let us think that the SM would be only an approximation at low energy of a more fundamental theory. The challenge of particle physics is to search for new phenomena at high-energy not included in the SM. The unique properties of the top quark make it an outstanding tool to probe new dynamics beyond the SM, where it should play a key role, especially by coupling to new heavy resonances.

This presentation will report on searches for new heavy charged vector or scalar bosons, usually called  $W'$  and  $H^+$ , decaying into a top and a bottom quark through effective coupling approaches, in lepton plus jets final states. These searches are performed with  $20.3 \text{ fb}^{-1}$  of proton collision data, produced by the LHC at Run I, at a center-of-mass energy of 8 TeV and collected by the ATLAS detector in 2012. This talk intends to present the analysis strategy using multivariate techniques based on boosted decision trees to search for an excess of  $W'$  or  $H^+$  signal processes in the recorded data, and the statistical analysis performed to extract exclusion limits on the mass, the production cross section or the effective couplings of these particles. It will finally conclude on the perspectives of these searches at the LHC Run II.

T 81.8 Mi 18:30 VMP9 SR 28

**Search for a  $Z'$  heavy resonance decaying to top and vector-like quarks in the all hadronic channel at 13 TeV with CMS** — IVAN MARCHESINI, ALEXANDER SCHMIDT, and ●EMANUELE USAI — Universität Hamburg

Many models predicting a heavy neutral spin-1 resonance also predict the existence of vector-like quarks. A hypothetical resonance might then predominantly decay to these heavy quark partners rather than SM particles.

We present a search for a  $Z'$  heavy resonance decaying in a top and a heavy vector-like top partner ( $T'$ ). The analysis is tailored for the final state where the  $T'$  decays in a W boson and a b quark. We focus on the all hadronic channel where both the top and the W quark coming from the  $T'$  decay hadronically.

In this kind of searches, the decay products of the top quark and the

W boson are highly boosted and cannot be reconstructed as separate jets. Top and boson tagging algorithms are then used to reconstruct the decays.

Jet substructure tools, in addition to b-tagging in boosted topologies, are employed to reduce the QCD multijet background and improve the sensitivity of the analysis.

T 81.9 Mi 18:45 VMP9 SR 28

**Search for singly produced  $Z'$  boson decaying into  $T't$  at the CMS experiment** — •ANNA BENECKE, JOHANNES HALLER, and ROMAN KOGLER — Institut für Experimentalphysik, Universität Hamburg

Many models of physics beyond the standard model predict vector-like quarks ( $T'$ ) and in addition a new heavy gauge boson ( $Z'$ ). While decays of the  $Z'$  and  $T'$  into standard model particles have been studied already, no experimental results for the decay  $Z' \rightarrow T't$  are available so far. In this talk a search for singly produced  $Z'$  bosons decaying into  $T't$  in pp collisions at  $\sqrt{s}=13$  TeV is presented. The analysis is performed in the lepton + jets channel. Two decay channels of the  $T'$  into the Higgs boson and a top quark or a Z boson and a top quark are considered. For this purpose the full dataset collected by the CMS experiment at  $\sqrt{s}=13$  TeV is used. The status of this analysis will be shown, including the event selection and the reconstruction of the decay chain.