

## T 54: Suche nach neuen Teilchen 3

Zeit: Dienstag 16:45–19:00

Raum: JUR 2

T 54.1 Di 16:45 JUR 2

**Model Unspecific Search in CMS - Introduction** — •TOBIAS POOK, DEBORAH DUCHARDT, THOMAS HEBBEKER, SIMON KNUTZEN, JONAS LIEB, ARND MEYER, and JONAS ROEMER — III. Physikalisches Institut A, RWTH Aachen University

The CMS Detector recorded a dataset of about  $39\text{fb}^{-1}$  during 2015 and 2016 at a center of mass energy of 13 TeV. This dataset presents a unique opportunity to find new phenomena. However no clear signs of physics beyond the Standard Model were detected yet and a broader view might be necessary to detect signals from not yet searched for or even thought of theories.

The majority of searches for new physics are optimized for an established signal hypothesis in one or few decay channels. These searches cover only a fraction of all observed final states with model dependent analysis strategies. The Model Unspecific Search in CMS (MUSiC) provides a unique procedure to prevent the CMS collaboration from missing new physics. This is ensured by an automated search for deviations between the measurement and standard model (SM) expectation after a complete detector simulation within every observed final state. Each event is categorized based on its object content (leptons, jets, etc.) in so called event classes. Distributions for three kinematic variables and their differential uncertainties are calculated and compared with the standard model expectation. This talk presents the motivation and methods used for the MUSiC analysis and gives an introduction to the interpretation of a global comparison of simulation and data.

T 54.2 Di 17:00 JUR 2

**Model Unspecific Search in CMS - Signal Studies** — •JONAS LIEB, DEBORAH DUCHARDT, THOMAS HEBBEKER, SIMON KNUTZEN, ARND MEYER, TOBIAS POOK, and JONAS ROEMER — III. Physikalisches Institut A, RWTH Aachen University

In 2015 and 2016, the CMS detector recorded proton-proton collisions at an unprecedented center of mass energy of  $\sqrt{s} = 13$  TeV. The Model Unspecific Search in CMS (MUSiC) offers an analysis approach of these data which is complementary to dedicated analyses: By taking all produced final states into consideration, MUSiC is also sensitive to indicators of new physics appearing in final states that are usually not investigated.

In a two step process, MUSiC first classifies events according to their physics content and then searches kinematic distributions for the most significant deviations between Standard Model Monte Carlo simulations and observed data.

To assess MUSiC's sensitivity, simulated signal events of new physics processes are mixed with Standard Model Monte Carlo background. The automated search is repeated on pseudo-data dived with this expectation and the analysis' response is statistically analyzed.

Complementing introductory presentations on the MUSiC event selection and classification, this talk will show how new physics would show up in MUSiC results.

T 54.3 Di 17:15 JUR 2

**Model Unspecific Search in CMS - Preliminary Results of the 2016 Data Analysis** — •JONAS ROEMER, DEBORAH DUCHARDT, THOMAS HEBBEKER, SIMON KNUTZEN, JONAS LIEB, ARND MEYER, and TOBIAS POOK — III. Physikalisches Institut A, RWTH Aachen University

In 2015 the LHC reached the unprecedented center of mass energy of  $\sqrt{s} = 13$  TeV. Due to the excellent performance of the LHC in 2016, CMS was able to record more than ten times the amount of data taken in 2015 which corresponds to an integrated luminosity of  $36.46\text{fb}^{-1}$ . With this increase in energy and luminosity, sensitivity to all theoretical models is gained in comparison to the  $\sqrt{s} = 8$  TeV dataset taken in 2012.

The Model Unspecific Search in CMS (MUSiC) searches for physics beyond the Standard Model independent of theoretical models. Using an automatic method, kinematic distributions of the data are compared with the Standard Model expectations in every final state. Therefore, MUSiC reduces the chance of overlooking new physics, since even distributions not covered by dedicated analyses are investigated.

This talk presents the analysis of the whole 2016 dataset with lepton triggered events.

T 54.4 Di 17:30 JUR 2

**Search for first and second generation scalar leptoquarks in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector at the LHC: dilepton channel** — VOJTECH PLESKOT, STEFAN TAPPROGGE, and •ANTON WOLF — Institut für Physik, Johannes Gutenberg-Universität Mainz, Deutschland

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  $36.5\text{fb}^{-1}$  of  $pp$  collision data at center-of-mass energy of 13 TeV.

T 54.5 Di 17:45 JUR 2

**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, where 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. In addition, at least one tau lepton is required to decay hadronically. The study uses the full dataset of the year 2016 which was collected with the CMS detector at  $\sqrt{s} = 13$  TeV. The event selection is optimized for highest sensitivity. A data driven approach is used to estimate the standard model background arising from fake taus. Finally, the expected limits on the leptoquark production cross section are presented.

T 54.6 Di 18:00 JUR 2

**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 CHRISTOPH 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  $\sqrt{s} = 13$  TeV. The data have been collected by the CMS experiment in 2016. In this analysis, the production of scalar leptoquarks decaying into a top quark and a muon is studied.

Events are selected by requiring two isolated muons. In events containing an additional electron, the 4-momentum of a top quark candidate is calculated from information of the leading electron, missing transverse energy and at least one jet. Leptoquark hypotheses are then constructed via a  $\chi^2$  minimization using top quark candidates and muons. The dominating standard model background ( $t\bar{t}$ ) is estimated from data by selecting a control region and extrapolating the data using additional shape and normalization information from simulation. The expected sensitivity of the analysis and exclusion limits are derived.

T 54.7 Di 18:15 JUR 2

**Search for excited leptons in the four-lepton final state with CMS** — •CHRISTOPH SCHULER, KERSTIN HOEPFNER, THOMAS HEBBEKER, and THOMAS ESCH — III. Physikalisches Institut A, RWTH Aachen

In 2016, the CMS experiment at CERN has taken large amounts of data at a center of mass energy of 13 TeV ( $pp$  collision). These data allow to search for physics beyond the Standard Model. One possibility is the existence of excited leptons.

These excited leptons could be produced via contact interaction with an additional lepton, and subsequently decay via contact interaction to three leptons, giving a four lepton final state.

We searched for the existence of excited electrons and muons with the full 2016 CMS dataset.

T 54.8 Di 18:30 JUR 2

**Suche nach angeregten Top-Quarks mit dem CMS-Experiment** — JOHANNES HALLER, ROMAN KOGLER und •JENS MULTHAUP — Institut für Experimentalphysik, Universität Hamburg

Im Standardmodell der Teilchenphysik nimmt das Top-Quark durch seine hohe Masse eine Sonderrolle ein und macht es zudem für Hinweise auf Physik jenseits des Standardmodells interessant. In einer möglichen 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. Für den Nachweis angeregter Top-Quarks werden Daten des CMS-Experimentes aus pp-Kollisionen bei einer Schwerpunktsenergie von 13 TeV untersucht. In der präsentierten Analyse werden Ereignisse mit einem nicht-isolierten Myon und hoher Jetmultiplizität selektiert. Die Sensitivität der Suche wird durch die Forderung nach einem identifizierten Jet aus einem Top-Quark Zerfall verbessert. Des Weiteren wird die Massenrekonstruktion, basierend

auf einer  $\chi^2$ -Minimierung, und die parametrisierte Untergrundbestimmung aus Daten in diesem Beitrag besprochen.

T 54.9 Di 18:45 JUR 2

**Status of the search for excited bottom quarks decaying to tW at  $\sqrt{s} = 13$  TeV** — •ALEXANDER FROEHLICH, JOHANNES HALLER, and ROMAN KOGLER — Universität Hamburg

A search is presented for an excited b quark ( $b^*$ ) decaying to tW, singly produced in proton-proton collisions at  $\sqrt{s} = 13$  TeV. The data used has been recorded with the CMS experiment in 2016. The search is performed in the semi-leptonic channel for  $b^*$  masses ranging from 1200 GeV to 3000 GeV. For increasing  $b^*$  masses, the resulting top quark decay products have an increasing probability to be merged into a single jet. In order to achieve high selection efficiency over the whole mass region, a new top tagger, the Heavy Object Tagger with Variable R (HOTVR), is tested and its performance is compared to standard algorithms used in CMS.