T 35: Top-Physik I

Zeit: Dienstag 16:00–18:15 Raum: S10

T 35.1 Di 16:00 S10

Measurement of the Single-Top production cross section in the s-channel at $\sqrt{s} = 13$ TeV with the ATLAS detector — •Stephan Kaphle — Humboldt-Universität zu Berlin

The production fo single top-quarks in electroweak processes (Single-Top) is an important part for the study of the Standard Model and possible extensions. Single-Top production is possible in three channels: t-channel, s-channel and via associated production of a W-boson. In proton-proton collisions at the Large Hadron Collider (LHC), the s-channel has the lowest production cross section and is dominated by many background processes. During the LHC run at 8 TeV, the s-channel was already observed with a significance of 3.2σ using the Matrix Element Method. In this method, the matrix elements for the most important signal and background processes are integrated over the available phase space to compute process likelihoods, which can then be combined to a discriminant. The method is now applied to current ATLAS data at $\sqrt{s} = 13$ TeV to improve the previous result using the higher luminosity of up to $140\,\text{fb}^{-1}$.

T 35.2 Di 16:15 S10

Suche nach der Einzel-Top-Quark-Produktion im *s*-Kanal bei einer Schwerpunktsenergie von 13 TeV mit dem CMS-Experiment — Thorsten Chwalek, Nils Faltermann, •Denise Müller und Thomas Müller — Institut für Experimentelle Teilchenphysik (ETP), Karlsruher Institut für Technologie (KIT)

Die Produktion einzelner Top-Quarks erfolgt, im Gegensatz zur Top-Quark-Paarproduktion, über die elektroschwache Wechselwirkung. Daher ist dieser Prozess sensitiv auf mögliche Abweichungen im elektroschwachen Sektor des Standardmodells. Eine besondere Herausforderung stellt hierbei die Produktion über den *s*-Kanal dar. Dieser Produktionsmodus ist zwar theoretisch exakt beschrieben, weist jedoch nur einen geringen Anteil an der gesamten Produktion einzelner Top-Quarks auf. Dies erfordert eine gute Trennung zwischen Signal- und Untergrundereignissen mittels multivariater Analysemethoden.

Dieser Vortrag beschreibt die Suche nach der Einzel-Top-Quark-Produktion im *s*-Kanal unter Verwendung der 2016 und 2017 bei einer Schwerpunktsenergie von 13 TeV gemessenen Daten des CMS-Experiments.

T 35.3 Di 16:30 S10

Measurement of the Single Top tW Inclusive Cross-Section in the Single Lepton Final State at 13 TeV with ATLAS — Ian C. Brock and •Federico G. Diaz Capriles — Physikalisches Institut, University of Bonn

Single top-quark production in association with a W boson (known as the tW channel) is measured in the ATLAS detector at the Large Hadron Collider. Single top-quark cross-section measurements allow for a precise test of Standard Model physics and can aid in the discovery of new physics. The tW channel has the second largest cross-section of the three main single top production processes and it is sensitive to different new physics from that of the s- and t-channels. In this work, tW production is studied in the lepton plus jets channel by selecting events with three jets, one lepton and some amount of missing transverse momentum. Separation of signal and background events is performed by a neural network trained on Monte Carlo samples. This training helps identify the tW signal from its more prominent backgrounds, top-quark pair production and W in association with jets events, which share similar signatures but have much larger cross-sections. Lastly, a likelihood fit is performed to extract the signal cross-section.

T 35.4 Di 16:45 S10

Constraining anomalous Wtb couplings using measurements of top quark polarization vector components in t-channel single top quark events — •David Seith, Thorsten Chwalek, Thomas Müller, Denise Müller, Soureek Mitra, and Nils Faltermann — Institut für Experimentelle Teilchenphysik(ETP), Karlsruher Institut für Technologie (KIT)

Top quarks are produced polarized at the LHC. Their polarization is highly sensitive to anomalous contributions to the Wtb vertex. Deviations in the top quark polarization from the predictions of the Standard Model could therefore hint at new physics. The high statistics provided by the LHC in Run II allow to measure the polarization of the top quark to yet unrivaled precision and to further constrain any new physics contribution. In this talk the analysis of the top quark polarization with the CMS experiment is presented.

T 35.5 Di 17:00 S10

Search for FCNC in strong interactions with the ATLAS detector — •Gunnar Jäkel, Wolfgang Wagner, and Dominic Hirschbühl — Bergische Universität Wuppertal

Flavor changing neutral currents (FCNC) are forbidden at tree level and highly suppressed at higher orders in the standard model. In some new physics models leading order contributions could enhance cross sections for FCNC processes by many orders of magnitude. A search for direct top quark production is presented. In this process a u(c)-quark interacts with a gluon and produces a top quark. Different cuts and neural networks are studied to increase the sensitivity of the search.

T 35.6 Di 17:15 S10

Studies on interference effects in processes with flavor-changing neutral currents and tqγ coupling — •Salvatore La Cagnina[1], Maura Barros[2], Gregor Gessner[1], Ana Peixoto[2], Johannes Erdmann[1], Nuno Castro[2], and Kevin Kröninger[1] — [1]TU Dortmund, Lehrstuhl für Experimentelle Physik IV — [2]Universidade do Minho, Laboratório de Instrumentação e Física Experimental de Partículas

In the Standard Model, flavor-changing neutral currents (FCNC) at tree level are forbidden and are highly suppressed by the GIM mechanism at higher orders. Beyond Standard Model theories, however, can allow FCNCs at tree level. One possible process containing an FCNC includes a top quark that interacts with an up-type quark and a photon ($tq\gamma$ coupling with $q = u, c$). The production mode, in which a single top quark is produced, and the decay mode, in which one of the top quarks of a $t\bar{t}$ system decays through an FCNC interaction, are distinguished. In next-to-leading order, both modes interfere. This interference might lead to changes of kinematic properties. The effect of scale variation on the kinematic variables is studied at leading order and is used to determine an estimation of the systematic uncertainty on their distributions. It is shown that the influence of interference effects is negligible compared to the uncertainty caused by such scale variations. This conclusion equally applies for distributions of kinematic variations after detector simulation.

T 35.7 Di 17:30 S10

Search for charged lepton-flavour violation in top-quark decays at the LHC with the ATLAS detector — Carlo A. Gottardo, Sebastian Heer, Vadim Kostyukhin, Ö. Oğul Öncel, Keshava Prasad, Andrea Sciandra, and •Markus Cristinziani — Physikalisches Institut, Universität Bonn

A direct search for charged lepton-flavour violation in top-quark decays is presented. The data analysed correspond to 79.8 fb^{-1} of proton–proton collisions at a centre-of-mass energy of $\sqrt{s} = 13$ TeV delivered by the LHC. The process studied is the production of top-quark pairs, where one top quark decays into a pair of opposite-sign different-flavour charged leptons and an up-type quark, while the other decays semileptonically according to the Standard Model. The signature of the signal is thus characterised by the presence of three charged leptons, a light jet and a b-jet. A multivariate discriminant is deployed and its distribution used as input to extract the signal strength. In the absence of a signal, an upper limit on the branching ratio of $\text{BF}(t \to \ell\ell' q) < 1.86 \cdot 10^{-5}$ is set at 95% confidence level.

T 35.8 Di 17:45 S10

Search for tH production via FCNC in the H->$b\bar{b}$ decay channel — •Arunika Sahu — Bergische Universitaet Wuppertal

Processes involving flavour-changing neutral currents (FCNC) are highly suppressed in the top-quark sector. Any observations of such processes would therefore be a signal for physics beyond the Standard Model. The FCNC contributions in pp->tH process comes from qtH and qtg interactions at leading order. We assume the qtg coupling contributions to be negligible and consider only qtH coupling contributions. In the presented analysis, we search for the pp -> tH process, involving ctH and utH FCNC vertices. Final states are considered in

which the top quark decays semi-leptonically and the Higgs boson decays into a pair. The challenging $t\bar{t}+b\bar{b}(c\bar{c})$ background is estimated via dedicated control regions. Neural networks are employed to separate signal and background events in the signal region.

T 35.9 Di 18:00 S10

Search for tqH FCNC couplings at the ATLAS experiment — •Oliver Thielmann, Wolfgang Wagner, Geoffrey Gilles, and Arunika Sahu — Bergische Universität Wuppertal (BUW)

Processes involving flavour-changing neutral currents (FCNC) are highly suppressed in the top-quark sector and an observation of such processes would signal physics beyond the Standard Model. An important example are the ctH and utH FCNC vertices which lead to the production process pp ->tH and the decay t -> c(u) H in t tbar events. Different reconstruction techniques of the associated final states are compared. Neural networks are employed to separate signal and background events in the signal region. A potential signal is searched for by means of a profile likelihood fit to the neural network discriminants. The sensitivity of the search is quantified in terms of upper limits of the ctH and utH couplings in the context of an Effective Field Theory.