T 19: Top-Quarks: Produktion II

Zeit: Montag 16:00–18:15 Raum: Z6 - SR 2.011

T 19.1 Mo 16:00 Z6 - SR 2.011

Measurements of cross-sections of $t\bar{t}$ production with additional heavy-flavour jets in the eμ channel in proton-proton collisions at $\sqrt{s}$ = 13 TeV with the ATLAS detector — •Akanksha Vishwakarma — DESY

Measurements of normalized cross-sections of top quark pair production in association with additional b-jets in proton-proton collisions at a centre-of-mass energy of 13 TeV collected by the ATLAS experiment are presented. The analysis is performed in dilepton channel by requiring an opposite-charge $e\mu$ pair using 36.1 fb^{-1} of pp collision data. Normalised differential cross-sections of top-quark pair production are presented as functions of additional b-jet multiplicity, transverse momentum p_T , the scalar sum of transverse momenta of leptons and jets H_T, and scalar sum of p_T of all jets H_{had}^T. All measurements are corrected for detector effects and presented as particle-level distributions compared to predictions with different theoretical approaches for QCD radiation.

T 19.2 Mo 16:15 Z6 - SR 2.011

Measurement of the differential top pair production cross section in dilepton events with large missing transverse momentum at CMS — •Marius Teroerde, Christian Schomakers, Christian Autermann, and Lutz Feld — I. Physikalisches Institut B, RWTH Aachen, Aachen, Germany

Top pair production is an important background in many measurements and searches for new physics at the LHC. Since top pair decays to dileptonic final states contain significant missing transverse momentum (p_T^{miss}) and at least two jets, they have a similar signature as many potential models for physics beyond the standard model, especially those that could explain dark matter.

The presented analysis is based on a search for supersymmetry in dileptonic final states and focuses on the measurement of the differential cross section of top pair production as a function of different global event variables, such as p_T^{miss}. The result can serve both as a standard model measurement and as a model-independent upper limit on physics beyond the standard model, as it can be compared to theoretical predictions. In the talk, the current state of the analysis is presented.

T 19.3 Mo 16:30 Z6 - SR 2.011

Differential cross section measurement of top quark pair production with associated bottom quarks in the dilepton channel at 13 TeV — Maria Aldaya Martin, Carmen Diez Pardos, and •Andrej Saibel — DESY, Notkestraße 85, 22607 Hamburg

Good experimental knowledge of top quark pair production with additional jets ($t\bar{t}$+jets) is essential to pave the way to the observation of top quark pair production in association with a Higgs boson ($t\bar{t}$H) which allows direct measurement of the top-Higgs Yukawa coupling. In particular, $t\bar{t}$+b($\bar{b}$), with bottom quarks originating from gluon splitting, constitutes an irreducible, non-resonant background for the $t\bar{t}$H process, where the Higgs boson decays into a bottom quark pair ($t\bar{t}$H(b$\bar{b}$). Moreover, the state-of-the-art of QCD calculations for $t\bar{t}$+b($\bar{b}$) production have significant uncertainties from missing higher-order terms, making direct experimental measurements of this process desirable.

In this talk, a differential cross section measurement of the $t\bar{t}$+b($\bar{b}$) process in the dileptonic final state at 13 TeV is presented. The main focus is to study the behavior of additional jets, those that do not originate from the decay of top quarks. The differential cross sections of the additional jets are then compared to several different particle level predictions.

T 19.4 Mo 16:45 Z6 - SR 2.011

Studies on the measurement of the $t\bar{t}Z$ production cross section in the dilepton channel — Otmar Biebel[1], •Florian Fischer[1], Thomas McCarthy[2], and Jeannine Wagner-Kuhr[1] — [1]Ludwig-Maximilians-Universität, München — [2]Max-Planck-Institut für Physik, München

In top quark physics, the associated production of top-antitop quark pairs with a Z boson plays an important role as this process is sensitive to the coupling of the Z boson to the top quark. This value can vary significantly in many models including physics beyond the Standard Model. Additionally, $t\bar{t}Z$ has a quite similar signature to e.g. the production of top-antitop quark pairs in association with a Higgs boson.

For the studies presented in this talk Monte Carlo simulations, normalised to an integrated luminosity of 120 fb^{-1}, are used. This is equal to the expected amount of proton-proton collisions taken at a centre-of-mass energy of 13 TeV by the ATLAS experiment during the entire LHC Run-2. The $t\bar{t}Z$ system with an electron-positron or muon-antimuon pair in the final state will be kinematically reconstructed under the assumption, that the charged leptons originate from the decay of the Z boson and the top quark pair decays fully hadronically. In order to separate the signal from the two most dominant background processes, $t\bar{t}$ and Z+jets, a multivariate technique will be applied.

T 19.5 Mo 17:00 Z6 - SR 2.011

Monte-Carlo generators for top-quark pair production in the ATLAS experiment — •Timothée Theveneaux-Pelzer — DESY, Zeuthen, Germany

To study top-quark pair production ($t\bar{t}$) in proton-proton data at the LHC, Monte-Carlo (MC) generators are needed to model this process accurately. This is the case either when $t\bar{t}$ is the signal - in order to model the detector acceptance and response in high-precision measurements - or when $t\bar{t}$ is one of the backgrounds - in order to model several event variables in various regions of phase-space.

MC generators are in general made of several components, each with many parameters which values can't be deduced by first principles. Therefore, a MC generator have to be wisely optimised (or *tuned*) in order to provide an accurate description of the desired process. This optimisation can take advantage of inputs from both theoretical predictions and experimental measurements.

The ATLAS collaboration performed several studies on $t\bar{t}$ MC generators since run-1. The latest model is based on the Powheg-Box Next-to-Leading Order matrix element generator, in association with Pythia8 for parton shower and hadronisation. In this talk, the optimisation of this model and the associated uncertainties will be described, and a brief overview of possible future improvements will also be given.

T 19.6 Mo 17:15 Z6 - SR 2.011

Preliminary studies on top quark+Higgs boson production through flavour-changing neutral currents — •Nicolas Lang, Wolfgang Wagner, Geoffrey Gilles, and Arunika Sahu — Bergische Universität Wuppertal

Various theories of new physics and extensions of the standard model predict the existence of flavour-changing neutral currents (FCNC), which are prohibited by the standard model on tree level and strongly suppressed on 1-loop level. Thus the observation of a process involving FCNC would hint at new physics. Preliminary studies investigate single top quark and associated Higgs boson production from a light quark and a gluon through FCNC. More specifically, the $H \to b\bar{b}$ decay channel is examined. B-tagging in conjunction with multivariate techniques aid in the separation of the backgrounds, most notably $t\bar{t}$ and $t\bar{t} + b\bar{b}$ production.

T 19.7 Mo 17:30 Z6 - SR 2.011

Verbesserung des S/R-Verhältnisses im $t\bar{t}H$-Kanal durch Ausnutzung von Top-Quark Spin-Korrelationen — Arnulf Quadt, Clara Nellist, •Paul Konstantin Krug und Thomas Peiffer — II. Physikalisches Institut, Georg-August-Universität Göttingen

In diesem Vortrag werden die Auswirkungen von Top-Quark Spin-Korrelationen auf die $t\bar{t}$-Produktion in Assoziation mit einem Higgs-Boson und entsprechende Untergrundprozesse bei einer Schwerpunktsenergie von 13 TeV am LHC mit dem ATLAS-Experiment präsentiert. Wenn $t\bar{t}$-Paare zusammen mit einem Higgs-Boson produziert werden, erwartet man eine komplementäre $t\bar{t}$-Helizitätskonfiguration in Bezug auf das Szenario ohne zusätzliches Higgs-Boson. Grund hierfür ist die Chiralitäts-Umkehr des Top-Quarks, welche durch die Higgs-Emission verursacht wird. Obwohl dieses Verhalten nur in dem naiven Bild vom chiralen Grenzfall des Top-Quarks, bzw. einer sehr hohen invarianten Masse ($m_{t\bar{t}} \gg m_t$, $m_{\bar{t}}$) erwartet wird, was für LHC-Energien unrealistisch ist, wurde bereits gezeigt, dass sich trotzdem Observablen finden lassen, die nicht nur sensitiv auf $t\bar{t}$-Spinpolarisationseffekte reagieren, sondern auch bei der Trennung des $t\bar{t}H$-Signals von dem irreduziblen

$t\bar{t}ff/VV$-Untergrund helfen können. Im Detail werden hierbei Studien zu Winkelverteilungen der Top-Quark-Zerfallsprodukte im $t\bar{t}H$-Kanal und in den Untergrundprozessen vorgestellt, mit Fokus auf den $H \to b\bar{b}$ Zerfallskanal des Higgs-Bosons. Ergebnisse der Analysen von Monte-Carlo-Simulationen für den Semi- und Dileptonischen Kanal werden präsentiert. Der Einfluss von verschiedenen Observablen und deren Sensitivität in unterschiedlichen Bezugssystemen werden diskutiert.

T 19.8 Mo 17:45 Z6 - SR 2.011

Kombinierte Elektronen- und Jet-Trigger für Top-Quark Analysen mit dem CMS-Experiment — Thorsten Chwalek, Nils Faltermann, Thomas Müller und •David Seith — Institut für Experimentelle Teilchenphysik (ETP), Karlsruher Institut für Technologie (KIT)

Die meisten Top-Quark-Analysen verlangen geladene Leptonen in ihrer Ereignisselektion. Hierzu werden unter anderem Einzel-Elektronen-Trigger benötigt. Aufgrund der gesteigerten instantanen Luminosität des LHCs im Jahr 2017 wurden die Schwellen für solche Trigger gesteigert. Dies führt zu einem Verlust an Signalereignissen, insbesondere in Prozessen mit einzelnen Top-Quarks. Alternativ können kombinierte Elektronen- und Jet-Trigger verwendet werden. Zwei solcher Trigger, die 2017 verwendet wurden, werden in diesem Vortrag vorgestellt.

T 19.9 Mo 18:00 Z6 - SR 2.011

Kalibration des ATLAS B-Taggers mittels $t\bar{t}$-Ereignissen im dileptonischen Kanal — •Jannik Geisen, Thomas Peiffer, Arnulf Quadt und Elizaveta Shabalina — II. Physikalisches Institut, Georg-August-Universität Göttingen

Das zuverlässige Identifizieren von Bottom-Quarks ist essenziell für die Experimente am LHC, denn diese Quarks spielen beim Zerfall sowohl von Top-Quarks als auch von Higgs-Bosonen und somit bei vielen aktuellen Analysen der LHC-Experimente eine signifikante Rolle. Insbesondere die Produktion eines Higgs-Bosons in Assoziation mit Top-Quark-Paaren, bei der das Higgs-Boson in ein Paar aus Bottom-Quarks zerfällt, weist vier Bottom-Jets im Endzustand auf und ist eine der großen Herausforderungen des LHC-Physikprogramms in Run II.
Die Identifikation in ATLAS geschieht mithilfe von multivariaten Analyse-Techniken, die mit Informationen aus dem inneren Detektor gespeist werden, weshalb die Verbesserung des ATLAS-Detektors im Run II des LHC die Identifikation deutlich verbessert hat.
Vorgestellt wird die Kalibrationsmethode des ATLAS B-Taggers im dileptonischen $t\bar{t}$-Zerfallskanal mithilfe der Wahrscheinlichkeitsdichte-Methode. Ergebnisse dieser Kalibration mit aktuellen Monte-Carlo-Simulationen und mit den vom ATLAS-Experiment gesammelten Datensätzen des Run II werden für die verschiedenen ATLAS B-Tagger-Algorithmen gezeigt.