T 83: Top-Physik III

Zeit: Donnerstag 16:00–18:00 Raum: S10

T 83.1 Do 16:00 S10

Messung des Produktionswirkungsquerschnittes von Top-Quark-Paaren im semileptonischen Zerfallskanal am ATLAS-Detektor bei $\sqrt{s} = 13$ TeV — Baida Achkar[1], Tomas Dado[1,2], •Kevin Moor[1], Clara Nellist[1], Thomas Peiffer[1], Arnulf Quadt[1] und Elizaveta Shabalina[1] — [1]II. Physikalisches Institut, Georg-August-Universität Göttingen — [2]Comenius-Universität Bratislava

Das Top-Quark ist das zurzeit schwerste bekannte Elementarteilchen und wird am LHC in Proton-Proton-Kollisionen, überwiegend in Paaren, in großer Zahl produziert. Eine Analyse von ATLAS-Daten bei einer Schwerpunktsenergie von 13 TeV erlaubt eine präzise Messung des Produktionswirkungsquerschnittes. Studien für eine solche Messung im semileptonischen Zerfallskanal werden vorgestellt. Ereignisse mit einem Lepton, mindestens vier Jets und mindestens einem b-Tag werden studiert und verschiedene Signalregionen definiert. Aufgrund der geplanten Nutzung des vollen Datensatzes wird erwartet, dass die Messung durch systematische Unsicherheiten, u.a. die Modellierung von Top-Quark-Paar-Produktion, limitiert sein wird. Es wird versucht, Variablen mit ausreichend guter Modellierung aber gleichzeitig auch genügend großer Trennkraft zwischen Signal und Untergrund auszuwählen. Diese Variablen werden für das Trainieren eines künstlichen neuronalen Netzwerkes verwendet, dessen Ausgabe in einem Likelihood-Fit für die Extraktion des Wirkungsquerschnittes genutzt werden kann.

T 83.2 Do 16:15 S10

Measurement of the top quark mass in the all-jets final state at $\sqrt{s} = 13\,\text{TeV}$ and combination with the lepton+jets channel — Christoph Garbers, •Johannes Lange, Peter Schleper, and Hartmut Stadie — Institut für Experimentalphysik, Universität Hamburg

The top quark mass m_t is measured using $35.9\,\text{fb}^{-1}$ of proton-proton collision data collected with the CMS experiment at the LHC at $\sqrt{s} = 13\,\text{TeV}$. The $\text{t}\bar{\text{t}}$ all-jets final state is used, i.e., events consisting of at least six jets are selected. The full $\text{t}\bar{\text{t}}$ system is reconstructed using a kinematic fit, allowing to improve the mass resolution and suppress multijet background. An estimation of the remaining background is performed using data events. Using the ideogram method, m_t is extracted, simultaneously constraining an additional jet energy scale factor.

In addition, a combined measurement using the all-jets and lepton+jets final states is presented. The likelihoods for both channels are combined and a simultaneous mass extraction is performed.

Differences in the determination of systematic uncertainties with respect to previous results obtained at $\sqrt{s} = 7$ and $8\,\text{TeV}$ are discussed.

T 83.3 Do 16:30 S10

Constraining the color reconnection uncertainty in the top-quark mass measurement — Dominic Hirschbühl, •Shayma Wahdan, and Wolfgang Wagner — Bergische Universität Wuppertal

The color reconnection (CR) modelling uncertainty could become one of the dominant sources of systematic uncertainty in the top mass determination. Ongoing top mass analyses in Run 2 of the LHC use the PYTHIA 8 generator for parton showering and hadronization. This new generator comes with several alternative CR models which should be explored to estimate the CR modelling uncertainty, providing a broader basis for the estimate compared to the PYTHIA 6 generator which was used in Run 1 analyses. An investigation to find the most discriminating observable between these models is presented in $t\bar{t}$ dilepton events. The observable is unfolded to the particle level.

T 83.4 Do 16:45 S10

Measurement of the top quark mass in single top events at the CMS Experiment — T. Aziz[2], R. Karnam[2], M. Kumar[2], •S. Mitra[1], G. Mohanty[2], and T. Müller[1] — [1]Institute for Experimental Particle Physics (ETP), Karlsruhe Institute of Technology (KIT), Germany — [2]TIFR, India

The top quark mass is one of the important parameters of the standard model (SM) of particle physics and is directly related to the stability of the electroweak vacuum. It has the largest contribution among the SM particles to the radiative correction of self-coupling of the Higgs boson. A measurement of the mass of the top quark is done using single top events with the data collected by the CMS experiment at a center-of-mass energy of 13 TeV. The analysis is performed in the leptonic decay channels of the top quark. Events are selected by requiring one energetic, isolated lepton and two hadronic jets within the pseudorapidity (η) range defined by $|\eta| \leq 4.7$, one of which is identified to originate from the hadronization of the bottom quark arising from the top quark decay. The other jet stems from the light flavor quark recoiling against the top quark. A boosted decision tree (BDT) is developed to discriminate signal events from backgrounds. In order to select a signal enriched phase space, a cut on the BDT discriminant is optimized. The top quark mass is determined by performing maximum-likelihood fit simultaneously for the muon and electron final states. The masses of the top quark and antiquark are determined separately, depending on the electric charge of the lepton in the final state, along with their difference.

T 83.5 Do 17:00 S10

Bestimmung der Energie-Asymmetrie im Top-Quark-Paar-System mit einem zusätzlichen Jet mit dem CMS-Experiment — Thorsten Chwalek, Thomas Müller und •Johann Rauser — Institut für Experimentelle Teilchenphysik (ETP), Karlsruher Institut für Technologie (KIT)

Mit dem aufgenommenen Datensatz von Run II eröffnet sich am LHC die Möglichkeit, die Eigenschaften des Top-Quarks mit noch höherer Präzision zu vermessen. Von besonderem Interesse sind hierbei Asymmetrien im Top-Quark-Paarsystem, da Abweichungen von der Theorie-Erwartung ein Indiz auf Physik jenseits des Standardmodells sein können. Bisherige Analysen am Tevatron und am LHC mit den Daten von Run I fokussierten sich auf Rapiditäts-Asymmetrien; ein Effekt, der sich mit steigender Schwerpunktsenergie verringert.

Die Energie-Asymmetrie ist eine speziell auf den LHC zugeschnittene Observable im Kanal der Top-Quark-Paarproduktion mit einem zusätzlichen Jet. Diese verspricht bei einer Schwerpunktsenergie von $\sqrt{s} = 13\,\text{TeV}$ einen signifikant messbaren Effekt. Im Vortrag wird die Messung der Energie-Asymmetrie am CMS-Experiment vorgestellt.

T 83.6 Do 17:15 S10

Studies on ttbar charge asymmetry in the photon handle with ATLAS experiment — •Amartya Rej and Ivor Fleck — Universität Siegen, Germany

Tevatron measurements show a 2.2σ deviation from the Standard Model(SM) inclusive $t\bar{t}$ forward-backward asymmetry(A_FB), whereas measurements of the $t\bar{t}$ charge asymmetry(A_C) at the LHC exhibit a good consistency with the SM expectations. It is speculated to have an excess at the Tevatron and no excess at the LHC if there is a cancellation of some type. The addition of a final state photon in the top pair production changes this: it can increase the fraction of events from quark annihilation, which increases the asymmetry. For example, $\text{A}_C(t\bar{t}\gamma)$ at $\sqrt{s} = 14$ TeV can be found to be -0.035 ± 0.010 at LO calculation. To measure it, $t\bar{t}$ production in association with a photon coming from the production processes is studied with the ATLAS detector at $\sqrt{s} = 13$ TeV with the full Run2 dataset. In the presentation, the MC production, top reconstruction and the analysis strategy will be discussed.

T 83.7 Do 17:30 S10

Measurement of the jet mass distribution in boosted top quark decays at CMS — Johannes Haller, Roman Kogler, and •Dennis Schwarz — Institut für Experimentalphysik, Universität Hamburg

The top quark plays a special role in modern particle physics since it is not only heavily involved in searches for new physics but also offers consistency tests of the standard model, especially by measuring its mass with high precision.

While typical top quark mass measurements at hadron colliders rely on the reconstruction of the decay products as separate objects, this analysis is carried out in the boosted regime where the top quark decay can be reconstructed within one single hadronic jet. Using the XCone jet clustering algorithm, the differential cross section as a function of the jet mass can be measured in pp collisions at the LHC. Furthermore, the cross section can be calculated analytically, offering the possibility

to extract a well defined top quark mass without relying on the mass parameter in Monte Carlo simulations.

The measurement is performed in the lepton+jets channel of $t\bar{t}$ using data recorded by the CMS detector in 2016 at a center of mass energy of 13 TeV.

T 83.8 Do 17:45 S10

Measurement of substructure variables in boosted top quark decays at CMS — Johannes Haller, Roman Kogler, and •Jan Skottke — Institut für Experimentalphysik, Universität Hamburg

Highly boosted top quarks play an essential role in various searches for new physics. If they carry high transverse momentum, they decay within a single jet. Highly sensitive substructure variables can be used to discriminate those jets from jets of other processes.

In this talk first studies are presented towards a measurement of substructure variables, such as N-subjettiness using data of pp collisions recorded by the CMS experiment in 2016 at a center of mass energy of 13 TeV. We select highly boosted top quarks in the lepton + jets channel of $\mathrm{t\bar{t}}$, which guarantees a good background rejection while maintaining high selection efficiency.