T 58: Other Exp., $t\bar{t}$

Time: Wednesday 15:50–17:20 Location: HSZ/0103

T 58.1 Wed 15:50 HSZ/0103

Charge detection via proportional scintillation in a single-phase liquid xenon TPC — •Florian Tönnies — Albert-Ludwigs-Universität Freiburg

Dual-phase liquid/gas xenon TPCs are a well-established detector technology to search for WIMP Dark Matter. Nevertheless, the spatially uniform detection of the charge signal in the standard way, i.e., via proportional scintillation in the gaseous xenon, will be challenging at the scale of the next-generation detectors due to the size of the TPCs. The detection of the charge signal in the liquid phase of a single-phase TPC is a promising option to circumvent this issue. In Freiburg we successfully operated a single-phase TPC demonstrator which exploits proportional scintillation in the strong electric field around very thin wires. Some of the most recent results will be presented in this talk.

T 58.2 Wed 16:05 HSZ/0103

Luminosity measurements using the ATLAS Forward Proton (AFP) detector — •Petr Fiedler and Andre Sopczak — CTU in Prague

The latest results of luminosity measurements using the AFP detector are presented.

T 58.3 Wed 16:20 HSZ/0103

Measurement of the top-quark pair to Z-boson production cross-section ratio at a centre-of-mass energy of 13.6 TeV with the ATLAS detector — •Donna Maria Mattern, Tomáš Dado, and Kevin Kröninger — TU Dortmund, Fakultät Physik

The ratio of the top-quark-pair production cross-section to the Z-boson production cross-section is sensitive to the gluon-to-quark ratio of parton distribution functions and other parameters that allow to study the Standard Model, such as the strong coupling constant and the top-quark mass.

A measurement of the top-quark-pair and Z-boson production cross-section, as well as the cross-section ratio, using data collected in proton-proton collisions in 2022 during the early Run 3 of the Large Hadron Collider (LHC) at a center-of-mass energy of 13.6 TeV with the ATLAS experiment, corresponding to an integrated luminosity of 1.2 fb^{-1}, is presented.

Events with an oppositely charged electron-muon pair, as well as b-tagged jets, are used for the top-quark-pair production, while same-flavor dileptonic events are used for the Z-boson production cross-section measurement.

The probability to reconstruct and tag a b-jet is measured in-situ. A large cancellation of the luminosity uncertainty is achieved in the ratio, while this uncertainty is otherwise dominant in cross-section measurements in the early stages of the Run 3 of the LHC. This early result at the new center-of-mass energy at the LHC also serves to validate data quality, hardware and software updates.

T 58.4 Wed 16:35 HSZ/0103

top-Yukawa coupling extraction from $t\bar{t}$ cross-section using ATLAS data — •Supriya Sinha for the ATLAS-Collaboration — DESY Zeuthen

The aim of this analysis is to extract the top-Yukawa coupling (Y_t) from the $t\bar{t}$ cross-section close to the threshold. The presence of a virtual Higgs boson in the loop for the $t\bar{t}$ production process affects several kinematic distributions. This boson exchange mainly modifies the differential distributions near the $t\bar{t}$ production threshold energy. It becomes highly sensitive to Y_t, and hence, is used to extract its value.

This talk introduces the involved physics processes and gives an insight to the analysis strategy. It also highlights a method to reconstruct the $t\bar{t}$ mass efficiently with a minimal bias. The decay channel considered for this analysis is the lepton+jets final state. Full Run-II data with an integrated luminosity of 139 fb^{-1} taken by the ATLAS experiment at 13 TeV, is used.

T 58.5 Wed 16:50 HSZ/0103

First measurement of the top quark pair production cross section at $\sqrt{s} = 13.6\,\text{TeV}$ at the CMS experiment — Maria Aldaya, Alexander Grohsjean, •Laurids Jeppe, Andreas Meyer, Evan Ranken, and Christian Schwanenberger — Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, D-22607 Hamburg

Recently, the Large Hadron Collider (LHC) at CERN reached a new, unprecedented center-of-mass energy of $\sqrt{s} = 13.6\,\text{TeV}$, starting LHC Run 3. This presents the opportunity to measure relevant physical quantities at the new energy frontier, thereby checking the predictions of the standard model.

In this talk, we present the first measurement of the top quark pair production cross section at $\sqrt{s} = 13.6\,\text{TeV}$, using data recorded at the CMS detector. The analysis uses a new method combining dilepton and lepton+jets decay channels, constraining several experimental uncertainties such as lepton selection and b jet identification efficiencies in situ. This result also constitutes a first validation of the new data taken by CMS in LHC Run 3.

T 58.6 Wed 17:05 HSZ/0103

Measurement of the dileptonic $t\bar{t}$ differential cross section in a BSM phase space at CMS — Lutz Feld, •Danilo Meuser, Philipp Nattland, and Marius Teroerde — I. Physikalisches Insitut B, RWTH Aachen University

Measurements of the $t\bar{t}$ production cross section yield important precision tests of the Standard Model (SM), while also probing scenarios for physics beyond the SM (BSM).

This analysis aims to measure the $t\bar{t}$ cross section in a phase space where additional contributions from BSM scenarios could be present. It is based on the data set recorded by CMS in the years 2016 to 2018 at a center-of-mass energy of 13 TeV, corresponding to an integrated luminosity of 138 fb^{-1}. The BSM scenarios considered include supersymmetric and dark matter models, where, similarly to the dileptonic $t\bar{t}$ channel, two leptons, b jets and undetected particles are produced.

Unlike previous measurements, where the differential cross sections were mainly measured as a function of kinematic variables of the leptons or top quarks, this analysis focuses on observables related to the neutrinos, like the missing transverse momentum and the angular distance between the missing transverse momentum and the nearest lepton, to separate BSM from SM $t\bar{t}$ events. In order to increase the sensitivity of the analysis multivariant techniques are used which improve the resolution of the missing transverse momentum in SM $t\bar{t}$ events. In this talk the analysis strategy will be presented and preliminary results on the improved missing transverse momentum resolution and on systematic uncertainties will be shown.