

T 130: Top II

Time: Thursday 17:30–18:45

Location: HSZ/0401

T 130.1 Thu 17:30 HSZ/0401

Measurement of the production cross-section of a W boson in association with $t\bar{t}$ — ●MARCEL NIEMEYER, ARNULF QUADT, and ELIZAVETA SHABALINA — Georg-August-Universität Göttingen

The top-quark pair production in association with a W boson is an important background to processes like $t\bar{t}H$ or 4-tops production. Due to higher order electroweak corrections, the process is difficult to model. In consequence, a tension of the predicted and observed rate of $t\bar{t}W$ surpassing 2σ has been observed in previous analyses. Thus, it is of high importance to increase our understanding of it.

This talk will give an overview of the measurement of the $t\bar{t}W$ cross-section in the multi-lepton channel with two same sign or three leptons (electrons or muons), using the full ATLAS Run 2 dataset. In addition to a measurement in the inclusive phase space, the extraction of the cross-section in a fiducial phase space, as well as the measurement of the ratio $\sigma(t\bar{t}W^+)/\sigma(t\bar{t}W^-)$ will be discussed. The fit to extract the cross-section is performed simultaneously to a template fit estimating the main background contributions.

T 130.2 Thu 17:45 HSZ/0401

Measurement of the inclusive production cross section of a top quark pair with a Z boson in the tripletonic channel — ●STEFFEN KORN, ARNULF QUADT, BAPTISTE RAVINA, and ELIZAVETA SHABALINA — II. Physikalisches Institut - Georg-August-Universität Göttingen

The strength and structure of the coupling of the top quark and the Z boson can be measured through the associated production of a top quark pair and a Z boson. It provides sensitivity to the top quark's weak isospin in the Standard Model (SM) framework. The measurement of this parameter also serves as a probe of the SM. The process was measured by ATLAS and CMS at $\sqrt{s} = 13$ TeV with the full Run 2 dataset and a partial Run 2 dataset, respectively. In a new, refined analysis, multivariate techniques are used to improve the sensitivity of the measurement. The impact of using a multi-class deep neural network for event classification on the inclusive cross-section of $t\bar{t}Z$ final states with three charged leptons is presented.

T 130.3 Thu 18:00 HSZ/0401

Measurements of differential cross-sections of the $t\bar{t}\gamma$ production in the semileptonic and dileptonic channels in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector — ●BUDDHADEB MONDAL¹, BINISH BATOOL¹, BEATRICE CERVATO¹, MARKUS CRISTINZIANI¹, CARMEN DIEZ PARDOS¹, IVOR FLECK¹, ARPAN GHOSAL¹, GABRIEL GOMES¹, JAN JOACHIM HAHN¹, VADIM KOSTYUKHIN¹, AMARTYA REJ¹, KATHARINA VOSS¹, WOLFGANG WALKOWIAK¹, and TONGBIN ZHAO^{1,2} — ¹Center for Particle Physics Siegen, Experimentelle Teilchenphysik, Universität Siegen — ²Shandong University, China

The top quark being the heaviest fundamental particle in the Standard Model (SM) plays a very important role in the study of fundamental interactions. It has a very short lifetime and it decays before it hadronizes, passing its properties to its decay products. Top quark

pair production in association with a photon ($t\bar{t}\gamma$) is a very important process for measuring the coupling between top quark and photon. A precise measurement of this coupling is necessary for testing the SM and is also a probe for new physics effects at very high energy scale. In this talk, measurements of $t\bar{t}\gamma$ differential cross-sections using 139 fb^{-1} of data collected by the ATLAS detector in proton-proton collisions at $\sqrt{s} = 13$ TeV will be presented. They are performed in the semileptonic and dileptonic $t\bar{t}$ decay channels.

T 130.4 Thu 18:15 HSZ/0401

Measurement of $t\bar{t} + \gamma$ production with the full Run 2 ATLAS dataset — ●ANDREAS KIRCHHOFF, ARNULF QUADT, BAPTISTE RAVINA, and ELIZAVETA SHABALINA — II. Physikalisches Institut, Georg-August-Universität Göttingen

The optimal way to measure the top-photon coupling would be an e^+e^- collider with sufficient energy. As such a collider does not exist, another possibility to measure it is the production of $t\bar{t}$ pairs in association with a photon. Unfortunately, such photons will mostly originate from the decay products of the top quarks and hence do not convey any information about the top-photon coupling. However, photons radiated from the top quarks themselves (and to some extent, from the initial state quarks) can be differentiated based on their kinematics and the topology of the event. The separation between 'production' and 'decay' modes is achieved for the first time in this ATLAS analysis, thanks to a dedicated MVA approach. In this talk, the measurement of the inclusive fiducial cross section of the $t\bar{t}\gamma$ process with photons originating from production and decay in single- and dilepton channels will be presented.

T 130.5 Thu 18:30 HSZ/0401

Search for $t\bar{t}\gamma\gamma$ production in pp collisions at $\sqrt{s}=13$ TeV with the ATLAS detector — ●ARPAN GHOSAL¹, BINISH BATOOL¹, BEATRICE CERVATO¹, MARKUS CRISTINZIANI¹, CARMEN DIEZ PARDOS¹, IVOR FLECK¹, GABRIEL GOMES¹, JAN JOACHIM HAHN¹, VADIM KOSTYUKHIN¹, BUDDHADEB MONDAL¹, AMARTYA REJ¹, KATHARINA VOSS¹, WOLFGANG WALKOWIAK¹, and TONGBIN ZHAO^{1,2} — ¹Center for Particle Physics Siegen, Experimentelle Teilchenphysik, Universität Siegen — ²Shandong University, China

The top-quark pair production in association with one or more photons are important Standard Model processes that allow us to measure the strength of the electroweak coupling of the top quark with photon. While the production of $t\bar{t}\gamma$ is well-studied, the $t\bar{t}\gamma\gamma$ process has not been observed yet. The rare $t\bar{t}\gamma\gamma$ process is not only a good candidate for probing the top electroweak coupling but is also significant as an irreducible background process to the $t\bar{t}$ production with a Higgs boson decaying to two photons ($H \rightarrow \gamma\gamma$). New sources of CP-violation can appear as electric dipole moment terms in top-quark interactions, and their precise measurement is essential to determine the effects of new physics. Understanding the $t\bar{t}\gamma\gamma$ process can help set better bounds on these anomalous moments. The presentation will discuss the ongoing efforts in the search for the $t\bar{t}\gamma\gamma$ process in the semileptonic $t\bar{t}$ decay channel with a cut-and-count approach using the full Run 2 dataset collected by the ATLAS detector at $\sqrt{s} = 13$ TeV.