

T 136: Higgs TH, VH

Time: Thursday 17:30–19:00

Location: HSZ/0204

T 136.1 Thu 17:30 HSZ/0204

Associated production of a Higgs boson and a single top quark from t-channel production (tHq) in channels with hadronically decaying tau leptons at ATLAS — ●CHRISTIAN KIRFEL, IAN C. BROCK, TANJA HOLM, and OLEH KIVERNYK — Physikalisches Institut Bonn

A measurement of the single top-quark production in association with a Higgs boson and a spectator light-quark (tHq) gives insight into the properties of not only the top quark but also the Higgs boson. The associated production is uniquely sensitive to the relative sign of the top quark-Higgs boson Yukawa coupling. Additionally, the ditau decay of the Higgs boson, which successively decay hadronically, allows for precise reconstruction of the Higgs mass. The desired precision is limited by the plethora of background processes with higher cross sections.

This talk will discuss the search for this channel in the Run 2 LHC dataset by ATLAS.

T 136.2 Thu 17:45 HSZ/0204

Correlation studies on particle kinematics to improve mass reconstruction in single top quark associated H boson production (tHq) in the $H \rightarrow \tau\tau$ channel at ATLAS — ●MATHIAS WEISS, TANJA HOLM, and IAN BROCK for the ATLAS-Collaboration — Universität Bonn

The associated production of a top quark and a H boson (called tHq) allows experimental tests of the relative phase between g_{HWW} and y_t , the coupling constants of the H boson to the W boson and to the top quark.

In the decay channel $H \rightarrow \tau\tau$ and $t \rightarrow l$ with one hadronic τ and two light leptons, l , in the final state, missing neutrinos are the main challenge to mass reconstruction. This talk approaches this challenge by exploiting correlations derived from Monte Carlo samples with truth information, which simulate events taken by the ATLAS detector during Run 2 of the LHC.

T 136.3 Thu 18:00 HSZ/0204

Associated production of a Higgs boson and a single top quark from t-channel production (tHq) in channels with hadronically decaying tau leptons at ATLAS — ●FLORIAN KIRFEL, TANJA HOLM, CHRISTIAN KIRFEL, and OLEH KIVERNYK for the ATLAS-Collaboration — Physikalisches Institut der Universität Bonn, Deutschland

A measurement of the single top-quark production in association with a Higgs boson and a spectator light-quark (tHq) gives insight into the properties of not only the top quark but also the Higgs boson. The associated production is uniquely sensitive to the relative sign of the top quark-Higgs boson Yukawa coupling. In this talk the ditau decay of the Higgs boson, with one hadronically and one leptonically decaying tau, is investigated. The channel where the lepton from the top quark and the one from the Higgs boson have the same sign reduces the number of background events substantially. Techniques to treat the tau fakes as well as charge flip events present in this channel will be discussed in

combination with applied TMVA methods and the fitting procedure.

T 136.4 Thu 18:15 HSZ/0204

Analysis of tH(bb) production with ATLAS Run-2 data — ●MARTIN VATRT and ANDRE SOPCZAK — CTU in Prague

The latest results on the analysis tH(bb) are presented with focus on machine learning optimization using ATLAS Run-2 data.

T 136.5 Thu 18:30 HSZ/0204

Comparison of different monte carlo generators for the simulation of ZH events in the gluon fusion production mode —

●MANUELLA GUIRGUES¹, XAVIER COUBEZ^{1,2}, SVENJA DIEKMANN¹, ALENA DODONOVA¹, MING-YAN LEE¹, LUCA MASTROLORENZO¹, SPANDAN MONDAL¹, ANDREJ NOVAK¹, ANDREY POZDNYAKOV¹, ALEXANDER SCHMIDT¹, ANNIKA STEIN¹, and VALENTYN VAULIN¹ — ¹III. Physikalisches Institut A, RWTH Aachen, Aachen, Germany — ²Brown University, Providence, USA

The associated Higgs production via Higgsstrahlung from a Z boson originating from gluon fusion is a loop-induced process with destructive interference between the triangle and box contributions at leading order. This makes the process a sensitive candidate to probe new beyond the standard model physics (BSM). Therefore, comparing different Monte Carlo generators and investigating their differences is important for the development of physics analyses to access the $gg \rightarrow ZH$ process in data. This talk will present the comparison of 4 generators for the process $gg \rightarrow ZH$ with the Higgs boson decaying via the $H \rightarrow b\bar{b}$ channel. The comparison is done using simulated CMS Run 2 datasets at $\sqrt{s} = 13$ TeV.

T 136.6 Thu 18:45 HSZ/0204

Extraction of the gluon-initiated component of the associated production of the Higgs boson and a vector boson with the CMS experiment — ●ALENA DODONOVA¹, ALEXANDER SCHMIDT¹, XAVIER COUBEZ^{1,2}, LUCA MASTROLORENZO¹, ANDREY POZDNYAKOV¹, ANDRZEJ NOVAK¹, SPANDAN MONDAL¹, MING-YAN LEE¹, ANNIKA STEIN¹, SVENJA DIEKMANN¹, NICLAS EICH¹, and MARTIN ERDMANN¹ — ¹III. Physikalisches Institut A, RWTH Aachen University, Aachen, Germany — ²Brown University, Providence, USA

Associated Higgs boson production with a Z boson (ZH) contains quark- and gluon-initiated components. The gluon-initiated component ($gg \rightarrow ZH$) could be a good probe for the physics beyond the Standard Model (SM) since the effects of the new physics for the loop-induced processes would be of the same order as the SM process. Due to destructive interference between box and triangle contributions at the leading order, this component is suppressed with respect to the dominant quark-initiated contribution to ZH production.

In this talk, I will present the prospects to set an upper limit on the $gg \rightarrow ZH$ component in the $H \rightarrow b\bar{b}$ decay channel using DNN classifier. The study is performed with the full Run 2 dataset collected with the CMS detector at the LHC at $\sqrt{s} = 13$ TeV.