T 69: Eingeladene Vorträge (Invited Topical Talks) IV

Time: Thursday 14:00–16:00 Location: H-HS X

Invited Topical Talk T 69.1 Thu 14:00 H-HS X

Boosting jets in Run 2: highlights from Standard Model measurements and searches for new physics in ATLAS — •Chris Malena Delitzsch — University of Arizona, Tucson, USA

The unprecedented center-of-mass energy of the proton-proton collisions at the Large Hadron Collider enables the production of hadronically decaying particles such as W/Z/H bosons and top quarks with a transverse momentum much larger than their rest mass, resulting in the collimation of their decay products. To enhance the sensitivity to new physics, a variety of jet substructure techniques have been developed in the last decade that take advantage of the different radiation patterns within the large-radius jet depending on the initiating particle. The usage of jet substructure techniques is however not just limited to the identification of the origin of jets but also allows for the precise measurement of jet properties to probe and constrain the Standard Model in extreme regions of phase space.

This talk describes the state of the art substructure and tagging techniques and discusses highlights from Standard Model measurements and searches for new physics in ATLAS using these versatile techniques.

Invited Topical Talk T 69.2 Thu 14:30 H-HS X

The decay of Higgs bosons to a pair of tau leptons in the CMS experiment — •Hale Sert — RWTH Aachen University, Experimental Physics Institute 3B, Aachen, Germany

Studies of Higgs bosons decaying into a tau lepton pair play a crucial role not only in understanding the standard model of particle physics (SM) but also in searching for physics beyond the SM. Since the tau leptons couple directly to the Higgs boson, the measurement of the coupling strength of the Higgs boson to tau leptons helps to prove the generation of fermion masses and to understand if the observed Higgs boson is the SM Higgs boson.

The $H \to \tau\tau$ process was first observed in combination of the CMS and ATLAS experiments with 5 fb^{-1} data collected in 2011 at $\sqrt{s}$ =7 TeV and 20 fb^{-1} data collected in 2012 at $\sqrt{s}$ =8 TeV. The first significant observation only by the CMS experiment was achieved after inclusion of the 2016 data, corresponding to an integrated luminosity of 35.9 fb^{-1} at a centre-of-mass energy of 13 TeV. The analysis strategies have been improved during Run 2 data-taking for example by estimating most of the background processes from data, by moving to a new tau identification method using deep neural networks and alternatively by using a new method based on neural networks classification to differentiate the individual signal and background processes.

In this talk, these improvements will be discussed and the results for the full Run 2 data corresponding an integrated luminosity of 137 fb^{-1} collected at a centre-of-mass energy of 13 TeV will be presented.

Invited Topical Talk T 69.3 Thu 15:00 H-HS X

Searches for electroweak supersymmetry: highlights, coverage and limitations — •Jeanette Lorenz — LMU Munich, Germany

Supersymmetry is an appealing extension beyond the Standard Model, which could provide e.g. a particle candidate for Dark Matter. Both the ATLAS and the CMS experiments at the Large Hadron Collider (LHC), CERN, carry out a comprehensive search program, addressing several complementary signatures of supersymmetric particles. Searches for the supersymmetric partners of the electroweak gauge bosons (charginos and neutralinos) and leptons (sleptons) are particularly challenging due to low cross sections and possibly low-energetic decay products. The increasing data statistics as well as improvements in the technical methods allow some of these searches to be done for the first time at the LHC. Recent highlights of these searches will be presented along with the assumptions made in the interpretation of the results. Although these searches have not resulted in a discovery yet, there are several ways how supersymmetry could hide, which guide us to new directions in future searches.

Invited Topical Talk T 69.4 Thu 15:30 H-HS X

To the top and beyond: top quarks as a probe of new interactions at the LHC — •Katharina Behr — DESY

As the heaviest known elementary particle with a close to unity Yukawa coupling to the Higgs field, the top quark plays a special role in the Standard Model and in searches for new particles and interactions, which are often predicted to couple preferentially to the third quark generation. Searches targeting the complex detector signatures of single or multiple top quarks aim, for example, to shed light on dark matter or probe the existence of additional Higgs bosons.

I will review the strategies of searches involving top quarks or hypothetical top partner on the latest LHC data from proton-proton collisions at $\sqrt{s} = 13$ TeV, highlighting new analysis and reconstruction techniques.