T 4: Searches I

Time: Monday 16:30–18:00

Location: HSZ/0403

T 4.1 Mon 16:30 HSZ/0403
Search for long-lived particles decaying into displaced jets using a trackless and delayed jet tagger — •Lisa Benato and Gregor Kasieczka — Institute of Experimental Physics, Hamburg University

A search for long-lived particles decaying in the outer regions of the CMS silicon tracker or in the calorimeters is presented. A novel technique, using trackless and delayed jet information combined in a deep neural network discriminator, is employed to identify decays of long-lived particles. The results are interpreted in a simplified model of chargino-neutralino production, where the neutralino is the next-to-lightest supersymmetric particle, is long-lived, and decays to a gravitino and either a Higgs or Z boson. This search is most sensitive to neutralino proper decay lengths of ∼1 m, for which neutralino masses from up to 1180 GeV are excluded at 95% confidence level.

T 4.2 Mon 16:45 HSZ/0403
Search for resonant lepton+jet production with the ATLAS experiment — •Jiyoung Kim, Adrian Fernandez, and Stefan Tapprogge — Institute for Physics, Johannes Gutenberg University, Mainz

The leptoquark (LQ) is a hypothetical particle, which carries both lepton and quark quantum numbers. Its existence could point to extended theories beyond the Standard Model. If such particles were to exist, their decays might be observable in high-energy pp collisions using the ATLAS detector at the LHC. In this contribution, the specific interest is single LQ production leading to a resonant structure in the lepton-jet invariant mass. The search strategy about the existence of the LQs will be presented, including optimization of the selection cuts and comparison with the run 2 data set from ATLAS (with an integrated luminosity of 139fb^{-1} at $\sqrt{s} = 13\text{TeV}$).

T 4.3 Mon 17:00 HSZ/0403
Search for Dark Matter in association with a single top quark at the CMS experiment - leptonic analysis and combination — •Sebastian Wieland, Ulrich Husemann, and Michael Wassmer — Institute of Experimental Particle Physics (ETP), Karlsruhe Institute of Technology (KIT)

A promising production mechanism of Dark Matter at the Large Hadron Collider (LHC) is the associated production with a single top quark. Since the Dark Matter particles are not directly detected by the CMS detector the final state consists of a single top quark and missing transverse momentum, referred to as mono-top signature. The focus of this talk is the leptonic decay channel of the top quark, where the transverse W boson mass is utilized to discriminate between the mono-top signal and the standard-model backgrounds. In addition, the combination with the analysis targeting the hadronic decay of the top quark is presented. The analysis utilizes the full Run-2 dataset collected by the CMS experiment at the LHC. All results of this search are interpreted in the context of a simplified model introducing a flavor-changing neutral current at tree level by a spin-1 mediator and a Dirac Dark Matter particle.

T 4.4 Mon 17:15 HSZ/0403
Search for long-lived particles in the CMS muon system — •Joerg Schindler, Lisa Benato, Karim El Morabit, and Gregor Kasieczka — Universität Hamburg

Traditionally, searches for new physics at the LHC focused on already established objects, like photons, leptons, jets or missing energy. A different approach is to look for signatures in the detector which up until now were not considered. One example are long-lived particles, which can have a long lifetime leading to macroscopic flight distances ranging from a few micrometers up to several kilometers. In this talk, a search for long lived particles decaying in the CMS muon system is presented. The resulting signature is a large hadronic shower in the muon system with no inner detector activity, which can be observed with close to no background, but requires the development of new reconstruction and analysis tools. The status of the current searches for LLPs with decays in the muon system is shown, using data collected by the CMS detector in Run 2.

T 4.5 Mon 17:30 HSZ/0403
Substructure tagging with mass and p_T dependent variable-R jet clustering and a soft drop veto — •Anna Benecke[1], Anna Albrecht[2], and Roman Kogler[3] — [1]UCLouvain, Belgium — [2]Universität Hamburg, Germany — [3]DESY, Germany

The Heavy Object Tagger with Variable R (HOTVR) is an algorithm for the clustering and identification of boosted, hadronically decaying, heavy particles. The central feature of the HOTVR algorithm is a vetoed jet clustering with variable distance parameter R, that decreases with increasing transverse momentum of the jet. In this talk, we present improvements to the HOTVR algorithm, replacing the mass jump with a soft drop veto in the clustering. We study the performance of jet substructure tagging with HOTVR and ungroomed variable R jets, where we use machine learning techniques and energy flow polynomials to analyse the information loss from the soft drop veto. In addition, we show preliminary results of a distance parameter that changes with the jet mass and the transverse momentum, allowing to achieve an optimal value of R for W, Z, H bosons and top quarks simultaneously.

T 4.6 Mon 17:45 HSZ/0403
Search for Heavy Majorana Neutrinos in same-sign W Boson Scattering with the ATLAS experiment — •Jonas Neundorf for the ATLAS-Collaboration — Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, 22607 Hamburg

Among the open question of particle physics is the origin of neutrino masses. While they are predicted to be zero by the Standard Model, oscillation measurements have shown that at least two of the three neutrino flavours observed in nature are massive. These masses can be explained by the "Seesaw Mechanism", which introduces Majorana neutrinos with a mass on the TeV scale. This talk will discuss the design and statistical evaluation of an ATLAS search for Heavy Majorana Neutrinos produced via same-sign W boson scattering.