

T 79: Searches III

Time: Wednesday 17:30–18:45

Location: HSZ/0403

T 79.1 Wed 17:30 HSZ/0403

A new algorithm for the identification of boosted $Z \rightarrow e^+e^-$ decays for heavy resonance searches with the ATLAS detector at the LHC — DUDA DOMINIK, ●KIWIT FLORIAN, KORTNER SANDRA, and KROHA HUBERT — Max-Planck-Institut für Physik

The identification of W , Z and Higgs bosons with large transverse momenta is crucial in many searches for new heavy resonances. Thus far, the development of algorithms for the tagging of boosted bosons focuses on the reconstruction and identification of hadronic boson decays, while no dedicated algorithm to identify boosted $Z \rightarrow e^+e^-$ decays exists. The performance of the standard electron reconstruction and identification algorithms degrades with decreasing angular separation between the e^+e^- pairs and will eventually vanish once the angular separation between the e^+e^- pairs is too small to construct individual clusters in the calorimeter. To improve the reconstruction and identification of such highly boosted $Z \rightarrow e^+e^-$ decays, a dedicated algorithm for $Z \rightarrow e^+e^-$ tagging is being developed using a deep neural network.

Finally, the $Z \rightarrow e^+e^-$ identification and reconstruction approach is tested in the search for a Z' boson based on Monte Carlo simulations of the data taken with the ATLAS detector during the LHC Run 2. Expected exclusion limits on the production cross section times branching ratio at 95% confidence level are presented.

T 79.2 Wed 17:45 HSZ/0403

Exploring extensions of MUSiC with Machine Learning techniques — ●ANA RITA ALVES ANDRADE, THOMAS HEBBEKER, YANNIK KAISER, ARND MEYER, and FELIPE TORRES DA SILVA DE ARAUJO — III. Physikalisches Institut A, RWTH Aachen University

MUSiC - Model Unspecific Search in CMS - is a model-independent search used in the CMS experiment, serving as a complementary approach to model-specific searches. Unlike the latter approach, MUSiC neither constrains the search phase-space nor is restricted to a specific final state. To this end, MUSiC employs, per set of final state multiplicity, an automated search for the most discrepant phase-space region, considering a defined p-value. We report results on exploring the implementation of the New Physics Learning from a Machine (NPLM) algorithm, a machine learning (ML) approach for new physics searches, applied to simulated MUSiC-like data as well as CMS data pre-processed by MUSiC. Sensitivities for the nominal MUSiC and the ML modified approach are discussed. Challenges to incorporate this or similar ML methods to the standard MUSiC procedure, are also considered.

T 79.3 Wed 18:00 HSZ/0403

Search for excited leptons in the contact interaction and Z decay channels with CMS — ●FABIAN NOWOTNY, THOMAS HEBBEKER, and KERSTIN HOEPFNER — III. Physikalisches Institut A, RWTH Aachen University

The Standard Model of particle physics does not provide a comprehensive explanation for the observed hierarchy of three generations

of fermions, for both leptons and quarks. A possible explanation is delivered by models postulating that quarks and leptons themselves are composite objects. Their constituents are bound by an asymptotically free gauge interaction below a characteristic scale Λ . Such models of compositeness predict the existence of excited lepton (l^*) and excited quark (q^*) states at the characteristic scale Λ of the new binding interaction. The theory allows the production of excited leptons via contact interactions in conjunction with a Standard Model lepton. Furthermore, the leptons can decay into several final states. This talk focuses on the contact interaction and Z-boson decay channels, both resulting in $l^* \rightarrow lq\bar{q}$ transitions where l represents e and μ . Preliminary results are presented on the Run 2 proton-proton dataset of CMS corresponding to a luminosity of 137.6 fb^{-1} at a center of mass energy of $\sqrt{s} = 13 \text{ TeV}$.

T 79.4 Wed 18:15 HSZ/0403

Search for high-mass resonances in dilepton final states with associated b-jets at the ATLAS experiment — FRANK ELLINGHAUS and ●ANNA VORLÄNDER for the ATLAS-Collaboration — Bergische Universität Wuppertal

A search for the Z' boson in high-mass dilepton (e,μ) final states in association with b -jets is presented. The considered Z' model is a candidate explanation for potential anomalies in B hadron decays and couples to b and s quarks in the production. The search is carried out using the dataset collected by the ATLAS detector in Run-2 of the LHC corresponding to an integrated luminosity of 139 fb^{-1} . Control, signal and validation regions are defined, and these regions are fitted in a profile-likelihood fit. Expected exclusion limits on the Z' mass are obtained based on the results of the fit.

T 79.5 Wed 18:30 HSZ/0403

Search for Dark Matter in association with a hadronically decaying top quark at the CMS experiment — ●MICHAEL WASSMER, ULRICH HUSEMANN, and SEBASTIAN WIELAND — Institute of Experimental Particle Physics (ETP), Karlsruhe Institute of Technology (KIT)

In this talk a search for the production of Dark Matter in association with a single highly-energetic top quark is presented. In the standard model such a final state can only be generated at loop level and is, in addition, CKM suppressed, making it a prime candidate to search for new physics. The search is based on the total Run-2 dataset collected by the CMS collaboration. The mono-top signature is characterized by large missing transverse momentum and the well-known top quark decay. This talk is focused on the hadronic decay of the top quark. Large-radius jets are used to reconstruct the decay products and multivariate methods are employed to distinguish these jets from purely QCD-initiated jets. The results of the 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.