T 27: Searches II

Time: Tuesday 17:00–18:30 Location: HSZ/0403

T 27.1 Tue 17:00 HSZ/0403

CMS Dijet Anomaly Search with Substructure — Gregor Kasieczka, •Louis Moureaux, Tobias Quadfasel, and Manuel Sommerhalder — Institut für Experimentalphysik, Universität Hamburg

The extensive searches for physics beyond the Standard Model carried out at the LHC have so far yielded no positive result, despite the very large number of models that have been tested. This motivates the use of techniques based on machine learning that, unlike common search strategies, are capable of dynamically adjusting the event selection to the observed data. These "anomaly detection" methods are expected to feature broad coverage of potential new physics signatures and can thus fill the gaps between searches dedicated to specific models.

We present the application of such an anomaly detection method, CATHODE, in a search for resonant dijet events using substructure observables with the CMS experiment. CATHODE combines density estimation and weak supervision techniques to detect anomalous events in a signal region, interpolating the background from sidebands to achieve nearly optimal classification performance.

T 27.2 Tue 17:15 HSZ/0403

The LHC as Lepton–Proton Collider: Searches for Resonant Production of Leptoquarks — •Daniel Buchin, Michael Holzbock, and Hubert Kroha — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München

Searches for leptoquarks constitute an essential part of the physics programme at the ATLAS detector. These hypothetical particles couple to a lepton and a quark and are predicted by many extensions of the Standard Model such as Grand Unified Theories. The existing leptoquark searches at the LHC currently only consider production modes via quark and/or gluon interactions. The small but non-zero lepton content of the proton, however, allows also for the so far unexplored resonant leptoquark production.

This production mode gives rise to lepton-plus-jet signatures. Thus, leptoquarks would emerge as peaks over the smoothly falling Standard Model background in the invariant mass spectrum of the lepton-plus-jet system. The talk will introduce the search strategy and present the current status of the analysis, focusing on final states with fermions of the first and second generation.

T 27.3 Tue 17:30 HSZ/0403

Development of a new trigger for exotic particle searches with IceCube — •Timo Stürwald for the IceCube-Collaboration — Bergische Universität, Wuppertal, Deutschland

The IceCube Neutrino Observatory is a cubic kilometer scale Cherenkov light detector that also searches for signatures of particles beyond the standard model. The upcoming IceCube Upgrade and IceCube-Gen2 extension will improve the sensitivity for these searches due to an increased and partly denser instrumented sensitive volume. The better sensitivity allows for the detection of signatures of exotic particles including fractionally charged particles, which directly and indirectly produce light.
The development of a new trigger for faint signatures of exotic particles with the focus on fractionally charged particles is presented. The new trigger includes the analysis of isolated single hits that so far are not included in any IceCube trigger, because a large fraction of them originates from well understood noise sources. For simulated faint exotic signatures the isolated single hits become the dominant hit type. The improvement in signal efficiency and the estimated trigger rate for different trigger configurations will be presented. Furthermore, the results of running the new trigger at the IceCube test DAQ will be presented.
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T 27.4 Tue 17:45 HSZ/0403

Axion-Like-Particle (ALP) search using ATLAS central and ATLAS Forward Proton (AFP) detectors — •Ondrej Matousek and Andre Sopczak — CTU in Prague

The latest results of the ALP search with the AFP detector are presented.

T 27.5 Tue 18:00 HSZ/0403

A TES for ALPS II - Status and Prospects — •José Alejandro Rubiera Gimeno for the ALPS-Collaboration — Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany

The Any Light Particle Search II (ALPS II) is a Light-Shining-through-a-Wall experiment operating at DESY, Hamburg. Its goal is to probe the existence of Axions and Axion Like Particles (ALPs), possible candidates for dark matter. In the ALPS II region of interest, a rate of photons reconverting from Axions/ALPs on the order of 10^{-5} cps is expected. This requires a sensor capable of measuring low-energy photons (1.165 eV) with high efficiency and a low dark count rate. We investigate a tungsten Transition Edge Sensor (TES) system as a photon-counting detector that promises to meet these requirements and is foreseen for a later science run of ALPS II. This detector exploits the drastic change in its resistance caused by the absorption of a single photon when operated in its superconducting transition region at millikelvin temperatures. In order to achieve the required sensitivity, the implementation of the TES into the ALPS II experiment needs to be carefully optimized. In this work, we present the progress on measurements for the characterization of dark noise, energy resolution, background rejection, efficiency and linearity of our sensor.

T 27.6 Tue 18:15 HSZ/0403

LUXE-NPOD background estimation — Torben Ferber, Alexander Heidelbach, Markus Klute, •Raquel Quishpe, and Nicolo Trevisani — Karlsruhe Institute of Technology, Karlsruhe, Germany

The proposed LUXE experiment at the European XFEL at DESY will produce high-intensity electron-laser interactions to study QED in the non-perturbative regime. These interactions have as a secondary product a large flux of photons with energy up to a few GeV. The photons are then directed onto a physical dump allowing the production of axion-like particles (ALPs) in a region of parameters never probed before. The ALPs produced will decay into pairs of photons detected by an electromagnetic calorimeter. One of the challenges for ALPs searches at LUXE is to reduce the background of neutrons and non-resonant photons reaching the calorimeter. We present a systematic simulation study with different dump materials and depths we carried out in the quest of the best balance between signal acceptance and background suppression.