T 27: Suche nach Physik jenseits des Standardmodels II

Zeit: Dienstag 16:30–19:00 Raum: Philo-HS4

T 27.1 Di 16:30 Philo-HS4

Triggerlose Analyse mit dem Level-1 topologischen Prozessor bei ATLAS — Sebastian Artz, Volker Büscher, •Johannes Frederic Damp und Christian Schmitt — Johannes Gutenberg-Universität Mainz

Viele Erweiterungen des Standardmodells sagen neue Teilchen mit hadronischen Endzuständen voraus, die zu Dijet-Ereignissen führen, zum Beispiel ein Z'-Modell für dunkle Materie. Aktuelle Analysen von ATLAS und CMS konzentrieren sich auf schwere Teilchen über 1 TeV, da die Region unter 1 TeV statistisch limitiert ist durch das Vorhandensein von hohen Triggerprescales: Aufgrund der begrenzten Bandbreite, die inklusiven Single-Jet-Triggern zugewiesen wird, muss ein großer Teil der Ereignisse mit Jet-Impulsen unter etwa 400 GeV verworfen werden. Es gibt verschiedene Lösungsansätze für dieses Problem, zum Beispiel eine Trigger-Level-Analyse mit High-Level-Trigger Jets welche invarianten Dijetmassen bis zu ~ 450 GeV erreicht.

In diesem Vortrag wird ein neuer Ansatz zur Analyse von Regionen mit noch geringerer Masse vorgestellt, der den topologischen Prozessor der ersten Triggerstufe (L1Topo) von ATLAS nutzt. Durch das Ausführen der Analyse und Erzeugen von invarianten Massenhistogrammen direkt auf dem ersten Triggerlevel wird die eigentlich notwendige Triggerselektion vermieden. Dies ermöglicht im Gegensatz zur Offline-Analyse eine Analyse des gesamten Spektrums mit voller Statistik. Dieser Vortrag gibt einen Überblick über das allgemeine Konzept der Firmware-Implementierung, das Design der Auslesesoftware sowie den aktuellen Status der Offline-Analyse.

T 27.2 Di 16:45 Philo-HS4

Search for invisible particles produced in association with a single hadronically decaying top quark at $\sqrt{s} = 13$ TeV with the ATLAS detector — •Tobias Kupfer, Johannes Erdmann, and Kevin Kröninger — TU Dortmund, Lehrstuhl für Experimentelle Physik IV, Otto-Hahn-Straße 4 a, 44227 Dortmund

The large center of mass energies available in proton-proton collisions at the LHC provide the opportunity to search for new physics phenomena beyond the Standard Model (SM). A vector-like top partner (VLT), which is predicted by many extensions to the SM, as well as resonant and non-resonant production of Dark Matter (DM) particles can lead to a final state including the top quark in addition to particles interacting scarcely or not at all with the detector. This specific signature, referred to as mono-top, is detected by the ATLAS experiment as a single reconstructed top quark in combination with large missing transverse momentum.
An analysis is presented designed to search for singly produced VLT resulting in a hadronically decaying top quark and a Z boson decaying into two neutrinos, which leads to the mono-top signature. The search is performed in a phase-space region optimized on the expected signal sensitivity and limits are set on the predicted mass and coupling of the VLT and of DM particles.

T 27.3 Di 17:00 Philo-HS4

Search for light resonances in b-quark jet pairs in association with a jet from initial state radiation using boosted topologies with the ATLAS detector — •Merve Sahinsoy and Oleg Brandt — KIRCHHOFF INSTITUTE FOR PHYSICS, HEIDELBERG

Many models of new physics predict new particles with significant couplings to b quarks, including resonances which also couple to dark matter particles. The resulting hadronic final states at low resonance masses represent a particular experimental challenge due to the large cross-section of standard model backgrounds and the resulting bandwidth limitations. This challenge can be overcome by searching for b quark pairs from the resonance decay reconstructed as a single large-radius jet which recoils against a jet from initial state radiation. This approach is also sensitive to standard model Higgs boson production at high transverse momenta. In this talk, the analysis strategy will be presented together with the recent optimisation studies on the identification of Higgs boson decays to a b-quark pair in the boosted regime using large-radius jets.

T 27.4 Di 17:15 Philo-HS4

Search for excited leptons decaying via contact-interaction with CMS — •Christoph Schuler, Jonas Roemer, Kerstin Hoepfner, and Thomas Hebbeker — RWTH Aachen University

The CMS experiment at CERN has recorded proton-proton collisions at a center-of-mass energy of 13 TeV in 2016. These data allow to search for physics beyond the Standard Model. One possibility is the existence of excited leptons. These excited leptons could be produced via contact interaction with an additional lepton of the same flavour, and subsequently decay via contact interaction.

We searched for the existence of excited electrons and muons with the full 2016 CMS dataset.

T 27.5 Di 17:30 Philo-HS4

Uncertainties on multijet background for searches with jets and missing transverse energy with the ATLAS detector — •Vincent Kitali, Christian Sander, and Krisztian Peters — DESY, Hamburg, Deutschland

The Higgs-Boson might be a portal to new physics. It may for example couple to massive particles not visible to the ATLAS detector, which are dark matter candidates. The Vector Boson Fusion (VBF) channel offers a clean final state with two jets and missing transverse energy.

One background are QCD events, in which missing transverse energy is reconstructed due to the imperfect reconstruction of the jet. The uncertainties on this background are large and need to be understood. To quantify, how many events with jets in the final state are misidentified as signal, jets are smeared using simulated jet transverse momentum response distributions. The main topic of this talk is the test of these simulations for their viability.

T 27.6 Di 17:45 Philo-HS4

Search for heavy charged long-lived particles with the ATLAS detector in a dataset of 36.1 fb^{-1} **p-p collisions** — •Michael Adersberger and Sascha Mehlhase — LMU, Munich, Germany

Heavy charged long-lived particles are an important target for searches at the LHC, as they are predicted in a large variety of theories beyond the Standard Model. A model-independent approach will be presented, where heavy charged long-lived particles are detector stable or reach at least the ATLAS hadronic calorimeters, from now on referred to as Stable Massive Particles (SMP).
The main observables to identify SMPs are time-of-flight and specific ionisation energy-loss measurements. Their velocity is significantly lower then the speed-of-light due to their high mass and the moderate kinetic energies available. They are expected to have a significantly higher specific ionisation energy-loss than Standard Model particles produced at the LHC. The main backgrounds are of instrumental nature and due to mis-measurements of various observables.
This search targets Chargino and Stau SMP models with two charged tracks in the final state and R-hadron SMP models (gluino, sbottom, stop) which have a significant fraction uncharged tracks after hadronisation or undergo a change of charge due to hadronic interactions with the detector material. Most recent public results will be presented.

T 27.7 Di 18:00 Philo-HS4

Analysis of changes in the ATLAS reconstruction algorithm for slow, muon-like particles — •Martin Habedank and Sascha Mehlhase — Ludwig-Maximilians Universität München

Many extensions of the Standard Model (SM) predict heavy, long-lived charged particles in reach of the LHC. These are called stable massive particles (SMPs) if they traverse large parts of the detector before decaying. Due to their long lifetime and little interaction with the calorimeters, they would leave tracks comparable to that of a muon in the ATLAS particle detector. In contrast to Standard Model muons, a velocity significantly lower than the speed of light is expected for SMPs. Their velocity β can be reconstructed by dE/dx and time-of-flight measurements and grants therefore a model-independent approach for the search for beyond the Standard Model (BSM) particles.

In the last few years, there has been a complete revision of the ATLAS reconstruction algorithm for these slow, muon-like particles. The changes in this revision are analysed, differences and similarities regarding reconstruction techniques and efficiencies in dependence of the various particle kinematics are pointed out and the impact for the search for SMPs is evaluated.

T 27.8 Di 18:15 Philo-HS4

Track Reconstruction Performance for Semi-stable Charged Particles at CMS — Samuel Bein, Viktor Kutzner, Peter Schleper, Georg Steinbrueck, •Alexandra Tews, and Benedikt Vormwald — Institut für Experimentalphysik, Universität Hamburg

A variety of extensions of the standard model predict charged particles with lifetimes of the order of nanoseconds, allowing them to leave short tracks inside the tracking system of a particle detector before decaying.
Studies on the track reconstruction performance are a crucial part of analyses with such semi-stable charged particles at CMS.
Key parameters assessing the tracking performance are the efficiency of the tracking algorithm to find and reconstruct such tracks, as well as the probability that a given track is a "fake", and thus does not correspond to one single true particle. The tracking efficiency is associated with important systematic uncertainties while the fake rate is important for estimating the background in such searches.
A study on the track reconstruction performance is done using proton-proton collision data collected with the CMS experiment at $\sqrt{s}$ = 13 TeV making use of both, real and simulated data, with the particularity that a data-driven method is employed to measure the tracking efficiency.

T 27.9 Di 18:30 Philo-HS4

Search for disappearing tracks with the CMS experiment at $\sqrt{s}$ = 13 TeV — •Viktor Kutzner, Benedikt Vormwald, Peter Schleper, Samuel Bein, Georg Steinbrück, and Alexandra Tews — Institut für Experimentalphysik, Universität Hamburg

The status of the search for long-lived charged BSM particles, which decay in the CMS detector and produce disappearing track signatures, is presented. This signature is characterized by missing hits in the outer layers of the tracker with little or no energy deposited in the calorimeter. The findings are interpreted in the anomaly-mediated supersymmetry breaking model, which predicts a small mass splitting between the two lightest SUSY particles, typically being a chargino and a neutralino. This results in longlived charginos, which decay into soft non-reconstructed leptons or hadrons and a lightest supersymmetric particle.

The search aims to include short disappearing tracks with less tracker hits with respect to earlier analyses. Multivariate analysis methods are investigated for different categories of the disappearing track selection and results are presented using proton-proton collision data with $\sqrt{s}$ = 13 TeV collected with the CMS experiment in 2016 and 2017.

T 27.10 Di 18:45 Philo-HS4

Search for heavy Majorana neutrinos in rare semileptonic B meson decays at the LHCb experiment — •Meriem Boubdir, Eluned Smith, and Stefan Schael — I. Physikalisches Institut B, RWTH Aachen

It is an open question of particles physics whether neutrinos are Dirac or Majorana fermions. Neutrinos of Majorana-nature (meaning they are their own antiparticles) would induce lepton number violating (LNV) processes. An example would be B meson decays with two same-sign leptons and a (pseudo-)scalar meson in the final state. The LHCb experiment is an ideal environment for the search for these striking signatures due to the large number of $b\bar{b}$ pairs produced in the detector acceptance. This talk presents updated results on a search for the LNV decay $B^- \to \mu^-\mu^-\pi^+$ using data collected by the LHCb experiment during the LHC Run 1 and 2. In addition, The analysis is extended to include a search for the related decay $B_c^- \to \mu^-\mu^-\pi^+$, which allows neutrino masses to be probed up to ~ 6 GeV. The selection of the signal modes and the suppression of potential backgrounds will be discussed. Moreover, revised limits on the branching fractions of the signal decays, and of the heavy-to-light mixing angle $V_{\mu 4}$, will be introduced.