T 105: Suche nach neuen Teilchen 6

Zeit: Donnerstag 16:45–19:00 Raum: JUR 5

T 105.1 Do 16:45 JUR 5

Energy loss calibration for a search for heavy, (meta-)stable, charged particles at CMS — •Paul Asmuss, Tobias Kramer, Viktor Kutzner, Peter Schleper, and Benedikt Vormwald — Universität Hamburg

Many theories beyond the Standard Model predict new, long-lived particles. CMS performs a search for these kind of heavy, (meta-)stable, charged particles. Their momentum to mass ratio is often small, leading to enhanced energy loss in material. One of the main observables in this search is the measured dE/dx in the silicon tracker. In this talk, a calibration scheme for the more than 80000 read-out chips is presented which allows to use both tracker subsystems, the pixel and the strip detector, for discriminating between new heavy particles and Standard Model background. First results using data collected during LHC Run-2 at a center of mass energy of $\sqrt{s} = 13\,\text{TeV}$ will be shown.

T 105.2 Do 17:00 JUR 5

Calibration of the ATLAS Tile Calorimeter and the implications for the search for heavy charged long-lived particles — •Michael Adersberger and Sascha Mehlhase — Ludwig-Maximilians Universität München

Heavy charged long-lived particles are a promising but challenging type of particles predicted in many extensions of the Standard Model (SM). The high mass together with the long lifetime lead to a distinct signature in the detector. In this search only lifetimes allowing for a direct interaction with at least the hadronic tile calorimeter are considered, called Stable Massive Particles (SMPs). SMPs are expected to have a velocity significantly lower than the speed-of-light. The main observables for SMPs are long time-of-flight and high specific energy loss measurements together with a high momentum, as no particles in the SM are produced at the Large Hadron Collider (LHC) able to traverse the full (or at least a large fraction) detector with low velocities. The main background for this analysis is therefore detector mis-measurements. Hence it is essential to have a deep understanding of the measurements of the main observables in the corresponding detector components. A detailed description of the time-of-flight calibration of the ATLAS Tile Calorimeter together with the search for SMPs with the ATLAS detector at a center-of-mass energy of 13 TeV will be presented in this talk.

T 105.3 Do 17:15 JUR 5

Calibration of the ATLAS Muon Spectrometer for time-of-flight measurements targeting searches for long-lived particles — •Jochen Jens Heinrich and Sascha Mehlhase — Ludwig-Maximilians-Universität, München, Deutschland

Many theories beyond the Standard Model predict the existence of new long-lived heavy charged particles that can be produced in LHC proton–proton collisions at $\sqrt{s} = 13$ TeV. If their lifetimes are large enough to enable them to traverse large parts of the detector before decaying, we speak of stable massive particles (SMPs). SMPs do not form extensive showers in the calorimeters and therefore present the signature of a muon-like particle that propagates with velocities much slower than the speed of light. A direct search for SMPs can be conducted, where the signature is largely model independent with only a small instrumental background. It also expands coverage in new-particle searches, as it is an orthogonal approach to generic missing-energy based searches for new physics. SMPs are identified by determining their velocity via measurement of their anomalous ionisation energy losses in the inner tracker and time-of-flight measurements carried out in the calorimeter and muon system. All involved subsystems require extensive calibration. The status of a search effort for stable supersymmetric particles in the dataset collected in 2015 and 2016 corresponding to 36.5fb^{-1} is presented. Special emphasis is given to the timing calibration process of the Muon Spectrometer, which involves a series of dedicated corrections that account for time-dependent effects as well as disparities between individual detector components.

T 105.4 Do 17:30 JUR 5

Improved mass reconstruction of large-radius jets with the ATLAS detector using tracker and calorimeter information — •Fabrizio Napolitano and Oleg Brandt — Kirchhoff-Institut für Physik (KIP), Heidelberg, Germany

The invariant mass of large-radius jets is a powerful observable to identify hadronic decays of top quarks, W, Z, and Higgs bosons at very high transverse momenta of about 0.5 TeV and above; these decays are an important aspect of the physics potential of the ATLAS detector at the LHC. The track-assisted subjet mass belongs to a series of novel techniques developed to increase the precision of large-radius jet mass reconstruction by improving its resolution at very high transverse momenta. The information from the calorimeter and the tracker is combined on a subjet-by-subjet basis, resulting in an improved performance. The performance of this variable is presented and compared to the traditional calorimeter-based jet mass definition and other observables.

T 105.5 Do 17:45 JUR 5

Dedicated Energy Calibration of Trigger Jets for the Dijet Trigger Level Analysis with the ATLAS Detector — •Hanno Meyer zu Theenhausen — Universität Heidelberg

In the search for particles, which could mediate between the standard model sector and the dark matter sector, a large unexcluded parameter space is represented by small mediator masses, both from the cosmological as well as the particle physics point of view. In ATLAS and CMS at the Large Hadron Collider the sensitivity to mediators at small masses is limited by the data-archiving rate. As a result, their limits obtained from searches for low-mass resonances in the dijet mass spectrum are not competitive with those determined at the Tevatron and SPS. To circumvent this limitation, the dijet trigger level analysis (TLA) at ATLAS uses only the jet information from the trigger system, which can be recorded at higher event rates. The challenge of using trigger-based jet information is to achieve a similar performance of jet calibration as in the offline reconstruction, despite the lack of information e.g. from the tracking detectors. This talk reports on a dedicated derivation of a calorimeter based global sequential calibration scheme to be applied to the trigger-based jets, which improves jet energy resolution and reduces jet energy scale uncertainties.

T 105.6 Do 18:00 JUR 5

Triggerlose Suche nach neuer Physik in Dijet-Ereignissen mit dem topologischen Prozessor des ATLAS Level-1 Triggers — •Sebastian Artz, Volker Büscher, Christian Schmitt, Frank Fiedler und Johannes Damp — Johannes Gutenberg-Universität, Mainz

Im Large Hadron Collider am CERN werden Protonen bei einer Schwerpunktsenergie von 13 GeV zur Kollision gebracht. Entstehen dabei neue Teilchen, welche als Resonanz direkt produziert werden, zerfallen diese in Jets und sind somit als Erhöhung im Spektrum der invarianten Masse der Jets sichtbar.

For Massen unterhalb ≈ 1 TeV werden Jet-Trigger benötigt, die mit hohen Raten feuern und deshalb nur mit hohen Prescale-Faktoren betrieben werden können, wodurch hier ein erheblicher Sensitivitätsverlust entsteht. Auf den FPGAs des topologischen Prozessors, welcher Teil der ersten Triggerstufe des ATLAS-Detektors ist, können jedoch die invarianten Massen aller Kollisionsereignisse ohne Einsatz eines Triggers betrachtet werden. So ist es im Gegensatz zur Offlineanalyse möglich das gesamte Spektrum mit voller Statistik zu analysieren. Inhalt dieses Vortrages ist sowohl die Analyse des Dijetspektrums als auch die Entwicklung der erforderlichen Firmware.

T 105.7 Do 18:15 JUR 5

Search for new physics in events with one lepton and high missing transverse energy with the ATLAS detector — •Holger Herr and Stefan Tapprogge — Johannes Gutenberg Universität Mainz

Extensions of the Standard Model (SM) predict new massive charged spin-1 gauge bosons decaying amongst others into a lepton and a neutrino. The existence of such a particle would lead to an excess of data in the tail of the transverse mass distribution. In 2015 and 2016 the LHC collided protons at a center of mass energy of 13 TeV. Data corresponding to an integrated luminosity of 36.5 /fb has been recorded by the ATLAS experiment and is analysed searching for such a new heavy gauge boson. Results of this search will be presented.

T 105.8 Do 18:30 JUR 5

Search for new heavy vector bosons in the e+MET final state — •Sebastian Wiedenbeck, Thomas Hebbeker, Kerstin Hoepfner, Klaas Padeken, Fabian Bispinck, and Marcel Materok — III. Physikalisches Institut A, RWTH Aachen University

Many BSM models predict new heavy vector bosons. CMS has been searching for such bosons taking guidance from the sequential standard model (SSM). Using the full CMS data set of the 2016 runs at $\sqrt{s} = 13$ TeV, the signature consisting of a high p_T electron + missing transverse energy (MET) due to a neutrino was investigated. The reconstruction of high p_T objects is challenging because of their low statistics. The strategy and results of this analysis are presented in the context of the SSM along with other interpretations.

T 105.9 Do 18:45 JUR 5

Search for new heavy vector bosons in the τ + MET final state — •Marcel Materok, Thomas Hebbeker, Kerstin Hoepfner, and Swagata Mukherjee — III. Physikalisches Insitut A, RWTH Aachen University

A search for new physics in the τ + missing transverse energy (MET) channel is presented based on proton-proton collisions measured with the CMS detector at the LHC, using the full 2016 CMS data set recorded at a center of mass energy of $\sqrt{s} = 13$ TeV. The tau channel is of theoretical interest in particular for models with enhanced couplings or larger branching fraction to fermions of the third generation. The analysis strategy is discussed and the results are interpreted in the context of a new heavy charged vector boson, W', described by the Sequential Standard Model (SSM) and other models with non-universal couplings.