T 4: Suche nach Physik jenseits des Standardmodels

Zeit: Montag 16:00–18:30 Raum: Philo-HS4

T 4.1 Mo 16:00 Philo-HS4

New physics results based on data and software preservation — •Andrii Verbytskyi, Siegfried Bethke, and Stefan Kluth — Max-Planck-Institut für Physik, Föhringer Ring 6, 80805 München

The speaker will present recent results on jet physics and precision determinations of the strong coupling constant, and explain how such results are enabled by the consistent preservation of data and software of experiments which have stopped data taking.

T 4.2 Mo 16:15 Philo-HS4

Hadron Production in Photon-Photon Processes at the ILC and new Physics signatures with small mass differences — •Kollassery Swathi Sasikumar[1,2], Carl Mikael Berggren[1], and Jenny List[1] — [1]DESY,Notkesstrasse 85, Hamburg — [2]Dept.of Physics, Universität Hamburg, Hamburg

Being an e^+e^- collider ILC has the prospect of providing very clean physics environment for making high precision measurements. In addition to the desired e^+e^- collisions, parasitic collisions of real and virtual photons radiated off the e^+e^- beams occur at the rates depending on the center-of-mass energy (ranging from 250 GeV to 1 TeV) and other beam parameters e.g at a centre of mass energy 500 GeV the expectation value is about 1.05 $\gamma\gamma$ events per bunch crossing. It is important to estimate the impact of these backgrounds which pile-up on each e^+e^- event. In the studies of BSM processes with small mass differences, where the visible decay products have low transverse momenta, the removal of these backgrounds is very challenging due to their similar natures. For example, here we discuss a specific case of light higgsinos with sub-GeV mass splittings, where the standard methods to remove this background remains inadequate. In this context we discuss an algorithm developed using the concept of displaced vertices to identify and cluster the tracks from same origin and its application on the low ΔM higssino analysis.

T 4.3 Mo 16:30 Philo-HS4

Search for dark matter in events with a Z boson and missing transverse energy at CMS — •Andreas Albert, Thomas Hebbeker, and Arnd Meyer — III. Physikalisches Institut A, RWTH Aachen University, Aachen

Understanding the origin of dark matter (DM) is one of the most pressing tasks in physics today. As ample astrophysical evidence has shown, DM occupies a significant fraction of the cosmological energy budget, for which the standard model of particle physics cannot account. If DM consists of particles, it may be produced in particle collisions. A search for DM particles in proton-proton collision events with a center-of-mass energy of 13 TeV at the CERN LHC is presented. The analysis is based on a dataset corresponding to an integrated luminosity of approximately 36/fb collected in the CMS experiment in 2016. Since hypothetical DM particles would not be directly detectable in CMS, events with large missing transverse energy (MET) are selected. Additionally, a muon or electron pair compatible with the decay of a Z boson from initial state radiation is required in order to select a well-defined topology. A shape analysis of the MET spectrum then allows to search for a signal.

Following an introduction to the analysis concepts, recent developments in the used experimental techniques and results of the analysis are presented. A special focus is put on interpretations of the beyond the most simplistic cases of DM production.

T 4.4 Mo 16:45 Philo-HS4

Large Extra Dimension Searches with the CMS Experiment — •Markus Radziej, Thomas Hebbeker, Arnd Meyer, and Tobias Pook — RWTH Aachen, III. Phys. Inst. A

With the Higgs Boson discovery at a mass of 125 GeV, the hierarchy problem becomes a pressing issue. One of the most prominent, potential solutions is the addition of extra spatial dimensions. A particularly interesting model has been suggested by Arkani-Hamed, Dimopoulos and Dvali, allowing for non-resonant excesses in the dilepton mass spectra at high energies.

Topic of the presented analysis is the dimuon final state. The results are based on the data recorded by the CMS experiment during 2016 at a center-of-mass energy of $\sqrt{s} = 13\,\text{TeV}$.

T 4.5 Mo 17:00 Philo-HS4

Measurement of the muon flux in a SPS test beam for the SHiP experiment — •Stefan Bieschke, Caren Hagner, Daniel Bick, Joachim Ebert, and Walter Schmidt-Parzefall — Universität Hamburg, Institut für Experimentalphysik, Luruper Chaussee 149, 22761 Hamburg

The SHiP experiment is a proposed beam dump experiment at CERN, dedicated to the Search for Hidden Particles. A high intensity, 400 GeV proton spill from the SPS delivered to a beam dump produces a large number of muons that need to be diverted from the detector. Knowledge of both the flux and the spectrum of the muons is crucial in order to design and optimize a magnetic muon shield for the hidden sector detector. Therefore, in a mid 2018 SPS test beam experiment, a replica of the proposed SHiP target will be used as beam dump and after a hadron stop, drift tubes will be placed as muon tracker and spectrometer.

T 4.6 Mo 17:15 Philo-HS4

Search for HNL $\to \rho\mu$ decays in SHiP using the Surrounding Background Tagger — •Sandra Gerlach — Humboldt-Universität zu Berlin

The SHiP (Search for Hidden Particles) experiment is a proposed fixed-target experiment at the CERN SPS. It aims to explore the domain of hidden particles at the $\mathcal{O}$(GeV) mass scale, such as heavy neutral leptons (HNLs).

Protons of 400 GeV momentum are dumped on a tungsten-molybdenum target, where HNLs can be produced from heavy-flavour meson decays. The HNLs may decay in a 50 m long vacuum decay vessel enclosed by the Surrounding Background Tagger (SBT), whose purpose is the suppression of background, in particular, from neutrino and muon interactions in the decay vessel walls.

This talk discusses the reconstruction of the decay HNL $\to \rho\mu$ in the SHiP detector and the role of a liquid-scintillator based SBT in not only suppressing of background but also in extending the signal acceptance for this specific decay.

T 4.7 Mo 17:30 Philo-HS4

Estimation of muon DIS (Deep Inelasctic scattering) background for the SHiP Experiment — •Plamenna Venkova for the SHiP LScin SBT-Collaboration — Humboldt University, Berlin, Germany

SHiP is a general-purpose fixed-target facility, proposed to be constructed at the CERN SPS accelerator complex. Dumping 2×10^{20} protons with momentum of 400 GeV on a molybdenum-tungsten target over a time of five years allows probing a wide variety of models containing light long-lived exotic particles with masses below $O(10)$ GeV such as Heavy Neutral Leptons (HNLs).

After stopping hadrons and filtering out muons, the HNLs can decay in the decay vessel, which is enclosed by a surrounding background tagger (SBT). The decay products of the HNLs are detected in a subsequent spectrometer.

One of the main background to the hidden particle decay signals originates from deep inelastic scattering of muons in the vicinity of the decay vessel producing V^0 particles. Their decay modes can mimic the topology of the signal events.

In this talk, an estimation of this background is presented and the role of the SBT to suppress the background in the offline analysis is discussed.

T 4.8 Mo 17:45 Philo-HS4

Search for low relativistic magnetic monopoles utilizing luminescence light with the IceCube detector* — •Frederik Lauber for the IceCube-Collaboration — Bergische Universität Wuppertal, Deutschland

Magnetic monopoles are hypothetical particles predicted by many Beyond the Standard Model theories. They are carriers of single elementary magnetic charge. This work considers intermediate mass monopoles which have been created shortly after the Big Bang.

There is no recent search for the low relativistic range $(0.1\,c - 0.5\,c)$. This is due to the predominant usage of Cherenkov light as a detection mechanism and the usage of detection media with a Cherenkov threshold above the aforementioned velocity range in current experiments.

However, highly ionizing particles such as magnetic monopoles produce luminescence light in water and ice. While the light yield of this process is much lower in comparison to Cherenkov light, simulations show that IceCube should be capable to detect this light. IceCube also has a large effective detection volume which is needed to detect magnetic monopoles due to the previous flux limits.

An update on the ongoing search in the low relativistic range, utilizing luminescence light as a detection method with IceCube for the first time, is presented. Signal simulation is compared to data, which has been taken with the new monopole filter of IceCube, and background simulation on different cut levels will be shown as well as a set of neural networks to separate background from signal. * *Gefördert durch die BMBF-Verbundforschung Astroteilchenphysik*

T 4.9 Mo 18:00 Philo-HS4

Model Unspecific Search in CMS - 2016 Results — •Tobias Pook, Deborah Duchardt, Saranya Ghosh, Thomas Hebbeker, Jonas Lieb, Arnd Meyer, and Jonas Roemer — III. Physikalisches Institut A, RWTH Aachen University

The CMS Detector recorded a dataset of about $36 fb^{-1}$ during 2016 at a center of mass energy of 13 TeV. This dataset presents a unique opportunity to find new phenomena beyond the Standard Model.

The majority of searches for new physics are optimized for an established signal hypothesis in one or few decay channels. These searches cover only a fraction of all observed final states with model dependent analysis strategies. The Model Unspecific Search in CMS (MUSiC) provides a unique procedure to search for new physics at CMS in several hundred final states that are not all covered by dedicated analyses. This talk extends the previous introductory talk and presents results from an automated search for deviations in significant parts of the complete 2016 dataset.

The observed distribution of deviations is compared to a standard model only expectation estimated from pseudo experiments. The overall agreement between current CMS data and simulations is evaluated and most significant deviations are discussed.

T 4.10 Mo 18:15 Philo-HS4

Model Unspecific Search in CMS - 2016 Introduction — •Saranya Ghosh, Tobias Pook, Deborah Duchardt, Thomas Hebbeker, Jonas Lieb, Arnd Meyer, and Jonas Roemer — III. Physikalisches Institut A, RWTH Aachen University

In 2016, the CMS experiment recorded an integrated luminosity of 35.9fb^{-1} of proton-proton collision data at a center of mass energy of $\sqrt{s}$ =13 TeV. This increase in energy and luminosity compared to the $\sqrt{s}$ =7, 8 TeV dataset collected during Run I of the LHC presents a unique opportunity in the search for new physics beyond the standard model.

The Model Unspecific Search in CMS (MUSiC) searches for physics beyond the standard model independent of theoretical models. Using an automated method, kinematic distributions of the data are compared with the standard model expectation in several different final states. Therefore, MUSiC reduces the chance of overlooking new physics, since even final states not covered by dedicated analyses are investigated.

This talk presents the motivation, concept and methods used for the MUSiC analysis of the 2016 dataset collected by CMS and gives an introduction to the interpretation of a global comparison of simulation and data that will be presented in a following talk.