HK 61: Fundamental Symmetries and Astroparticle Physics

Zeit: Freitag 14:00–15:45 Raum: HS 18

Gruppenbericht HK 61.1 Fr 14:00 HS 18

Probing charged lepton flavor violation with the Mu2e experiment — •Stefan E. Müller and Anna Ferrari for the Mu2e-Collaboration — Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

The Mu2e experiment, currently under construction at the Fermi National Accelerator Laboratory near Chicago, will search for the neutrinoless conversion of muons to electrons in the field of an aluminum nucleus. In the Standard Model, this process, which violates charged lepton flavor, is highly suppressed and therefore undetectable. However, scenarios for physics beyond the Standard Model predict small but observable rates. The Mu2e experiment aims at a sensitivity four orders of magnitude better than existing experiments. This is achieved by a rigorous control of all backgrounds that could mimic the monoenergetic conversion electron.

At HZDR, we use the ELBE radiation facility to study radiation hardness and performance of components for the Mu2e calorimeter and contribute with Monte Carlo simulations to the understanding of the optimal configuration for the detector that will monitor the rate of stopped muons in the aluminum target. Additional simulations are performed for both the pion production target and the muon stopping target.

In the presentation, the design and status of the Mu2e experiment will be presented, and results from the ELBE beamtimes and the simulation studies will be given.

Gruppenbericht HK 61.2 Fr 14:30 HS 18

CONUS: Towards the detection of coherent elastic neutrino nucleus scattering — •Janina Hakenmüller for the CONUS-Collaboration — Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg, Germany

The CONUS experiment is located at the nuclear power plant of Brokdorf, Germany, at 17 m distance from the reactor core. Four high-purity point contact Germanium detectors with a noise threshold in the range of 300 eV have been deployed in an elaborate shield and are used to look for the elusive coherent elastic neutrino nucleus scattering. The experiment has been set up in 2018. The analysis of the first data set based on 1 month of reactor off time and 6 months of reactor on time will be presented.

Before the setup of the experiment, the location, especially the potential neutron-induced background, has been characterized thoroughly. It will be shown in the talk that inside the detector chamber no reactor thermal power correlated background is expected.

An outlook on planned upgrades and feasible physics goals with the CONUS setup will be given.

HK 61.3 Fr 15:00 HS 18

Light sterile neutrino search with KATRIN — •Fotios Megas for the KATRIN-Collaboration — Technische Universität München, München, Deutschland — Max-Planck-Institut für Physik, München, Deutschland

The KATRIN experiment aims to measure the effective electron antineutrino mass, with an unprecedented sensitivity of 0.2 eV/c^2. Being sensitive in this mass range means that KATRIN can also be used to resolve another puzzling phenomenon:

Anomalies observed in short baseline and reactor experiments may be resolved by the existence of light sterile neutrinos. KATRIN has the potential to shed light onto these anomalies.

This talk will present the sensitivity of KATRIN to light sterile neutrinos. Focus will be put on the effect of background, systematic uncertainties and different measurement schemes. Finally, the analysis method will be applied to the first tritium data acquired in summer 2018, as a test study.

HK 61.4 Fr 15:15 HS 18

Simulation of Cosmic-Ray Antimatter Fluxes — •Laura Serksnyte, Laura Fabbietti, Martin J. Losekamm, Stephan Paul, and Thomas Pöschl — Technische Universität München, München, Deutschland

Measuring antimatter in space probes various astrophysical processes. The abundancies and energy spectra of antiparticles reveal details of the creation and propagation of cosmic-ray particles in the universe. Abnormalities in their spectra can reveal exotic sources or inaccuracies in our understanding of the involved processes. Especially the search for cosmic antideuterons and antihelium may reveal exotic production processes—such as dark-matter annihilation—as the background production rate through inelastic scattering of cosmic-ray protons is very low. However, these particles are strongly influenced by the magnetic fields of the Sun and Earth, modifying the expected particle flux for experiments near Earth. We discuss the production of secondary antiions in Earth's atmosphere as an additional background production mechanism. We simulate the propagation and interaction of the particles in Earth's proximity to extract the location-dependent antiparticle flux and to evaluate the suitability of different locations in space for experiments that search for low-energy cosmic-ray anti-ions.

HK 61.5 Fr 15:30 HS 18

Fluorescence measurements of optical active materials in response to liquid argon scintillation — •Ekaterina Rukhadze[1,2], Patrick Krause[1], Laszlo Papp[1], Stefan Schönert[1], and Mario Schwarz[1] — [1]Technische Universität München, Garching, Germany — [2]Institute of Experimental and Applied Physics, CTU in Prague, Prague, Czech Republic

The next generation of large volume liquid argon (LAr) detectors requires an understanding and optimization of the collection of light created by scintillation. Since most photodetectors are not sensitive for the emission wavelength of LAr, wavelength sifter (WLS) materials are needed. Measurements of the fluorescence yield of WLS materials in LAr should be performed in order to characterize the light collection of these detectors. For this purpose a new triggered LAr light source and detection system has been developed. An overview of the setup as well as first measurements using different WLS will be presented. This work is supported in part by the German Federal Ministry for Education and Research (BMBF) Verbundforschung 05A17W02, the German Research Foundation (DFG) via the SFB1258, the European Structural and Investment Fund, grant cz.02.2.69/0.0/0.0/16_027/0008465 and the Ministry of Industry and Trade of the Czech Republic via the FV30231.