HK 2: Hauptvorträge I

Zeit: Montag 11:15–13:00 Raum: Plenarsaal

Hauptvortrag HK 2.1 Mo 11:15 Plenarsaal

Search for dark matter and other rare/exotic processes with XENON1T/nT — •Christian Weinheimer — Institut für Kernphysik, University of Münster, Münster, Germany

Cosmological observations at very different scales provide evidence for dark matter, which neither can consist of baryonic matter nor can be normal neutrinos. Several candidates for this dark matter are proposed: Weakly interacting Massive Particles (WIMPs) arise naturally in many models beyond the Standard Model and solve at the same time the hierarchy problem. Other candidates are axions solving additionally the CP-problem of QCD or sterile neutrinos with keV masses.

The XENON experiments searching directly for WIMPs at the Italian underground laboratory LNGS use dual-phase xenon TPCs with ultralow background and very low threshold. XENON1T has just been finished after collecting an exposure of 1 t yr. It is giving the most stringent limits on the spin-independent WIMP-nucleon and WIMP-pion cross sections. The WIMP search will go on with XENONnT possessing a xenon mass of 8 t at an even lower background.

After an introduction, the current results of XENON1T and the status of XENONnT will be presented in this talk. Special emphasis will be given on different possible interactions of WIMPs with the nucleus and how they can be distinguished in the case of a WIMP discovery. The XENON detectors with their large mass and their low background rates can also look for other exotic or rare processes. The current status of the search for double electron capture of Xe-124 and for neutrinoless double beta decay of Xe-136 will be given.

Hauptvortrag HK 2.2 Mo 11:50 Plenarsaal

Dark Sector searches at MESA — •Luca Doria[1,2], Patrick Achenbach[1,2,3], Mirco Christmann[1,2,3], and Achim Denig[1,2,3] — [1]Institut fuer Kernphysik, Johannes Gutenberg-Universitaet Mainz, Johann-Joachim-Becher-Weg 45 D 55128 Mainz — [2]PRISMA Cluster of Excellence — [3]Helmholtz Institute Mainz, Germany

The Mainz Energy Recovery Superconducting Accelerator (MESA) at the Institute for Nuclear Physics of the Johannes-Gutenberg University in Mainz will provide intense electron beams for a wide subatomic physics program. The MESA 155 MeV energy, 100% duty cycle beam will be delivered to three different experiments. One experiment is called MAGIX: a flexible two-spectrometer setup taking advantage of the high beam current available together with an internal gas-jet target. The second is a beam-dump experiment explicitly designed for dark matter searches. The third experiment P2 is devoted to the high-precision measurement of the electroweak mixing angle. In this talk I will focus in particular on the dark matter program at MESA, describing the experiments involved and their expected performance.

Hauptvortrag HK 2.3 Mo 12:25 Plenarsaal

Recent results on direct mass measurements of the heaviest elements with SHIPTRAP — •Francesca Giacoppo for the SHIPTRAP-Collaboration — GSI Darmstadt — HIM Mainz

During summer 2018 direct mass measurements of transfermium isotopes such as ^{251}No (Z=102), ^{254}Lr (Z=103) as well as the first superheavy element ^{257}Rf (Z=104) have been successfully achieved, for the first time, with the SHIPTRAP mass spectrometer. Moreover, exploiting the enhanced resolving power of the Phase-Imaging Ion-Cyclotron-Resonance technique, it was also possible to directly resolve, for the first time, the low-lying isomeric states ^{251m}No and ^{254m,255m}Lr and the K^{π}=8^{-} isomer ^{254m}No with a Penning-trap system. These results will shed light on the nuclear shell effects that determine regions of enhanced shell stabilization as for instance nearby the deformed neutron shell at N=152 and are closely linked to the existence of such heavy nuclei as bound systems. Furthermore, such investigations will enable a better understanding of the nature of the underlying strong interaction at the upper limit of the nuclear chart and will help to constrain predictions for the next spherical shell closures, expected by different models around Z=114, N=184, the so-called island of stability.

Such challenging experiments face the problem of very low production rates, down to few ions per hour(s) which demand a very efficient ion preparation and manipulation, coupled with a high-detection sensitivity and resolving power. In this talk an overview of the latest optimization and enhanced performances of the SHIPTRAP setup will be presented together with the recent experimental results.