HK 42: Hauptvorträge

Zeit: Freitag 8:30–10:30 Raum: 1B/C

Hauptvortrag HK 42.1 Fr 8:30 1B/C

Exploring the nuclear landscape with laser-spectroscopy at ISOLDE — •Magdalena Kowalska[1], Klaus Blaum[2,3], Dana Borremans[4], Kieran Flanagan[4], Christopher Geppert[2], Jörg Krämer[2], Peter Lievens[4], Rainer Neugart[2], Gerda Neyens[4], Wilfried Nörtershäuser[2], Nele Vermeulen[4], and Deyan Yordanov[2,4] — [1]CERN — [2]Universität Mainz — [3]GSI — [4]Katholieke Universiteit Leuven

Ground-state properties of nuclei - spins, magnetic dipole and electric quadrupole moments, and charge radii - provide crucial information on nuclear single-particle and collective behaviour, and are particularly valuable in the context of shell closures and halo effects. They have been studied successfully for many exotic nuclei with the COLLAPS setup located at ISOLDE/CERN, which uses optical excitation or pumping of atoms/ions with laser light together with the hyperfine interaction of the nucleus with the shell electrons, external magnetic fields or electric crystal fields. Recent studies concentrated on light- and medium-mass regions: the quadrupole moment of halo ^{11}Li; spins and magnetic moments of neutron-deficient ^{21}Mg around $Z = N$ line and neutron-rich ^{31,33}Mg inside the 'island of inversion'; and spins, magnetic and quadrupole moments, and charge radii of neutron-rich Cu isotopes including $^{68-72}$Cu. I will present the technique and setup, the physics motivation for the above measurements, as well as the experimental results and their interpretation.

Hauptvortrag HK 42.2 Fr 9:00 1B/C

Dipolanregung exotischer Kerne als Zugang zur Dichteabhängigkeit der nuklearen Symmetrieenergie* — •Konstanze Boretzky — GSI, D-64291 Darmstadt

Riesenresonanzen in Kernen sind kollektive Anregungen, die durch fundamentale Eigenschaften der Kerne sowie der Kernmaterie bestimmt sind. Hochenergetische Strahlen kurzlebiger Kerne erlauben die Untersuchung kollektiver Effekte in isospin-asymmetrischen Kernen [1] und geben Zugang zu den Eigenschaften asymmetrischer Kerne und Kernmaterie. Die LAND Kollaboration hat in Experimenten bei der GSI die Dipolstärkeverteilung neutronenreicher Kerne um ^{132}Sn untersucht [2] und dabei das Auftreten einer resonanzartigen Struktur bei niedrigen Anregungsenergien gefunden, die bei stabilen Kernen in diesem Ausmaß nicht beobachtet wird [3]. Mikroskopische Rechnungen zeigen, dass es sich dabei um eine kollektive Anregung der schwächer gebundenen Neutronen gegen den Restkern handelt. Die experimentellen Ergebnisse werden vorgestellt sowie eine Methode diskutiert, wie aus den Eigenschaften der beobachteten Stärke mit Hilfe von theoretischen Rechnungen Rückschlüsse auf die Zustandsgleichung asymmetrischer Kernmaterie gezogen werden können. Eine Korrelation zwischen der Dicke von Kernneutronenhäuten und Eigenschaften von Neutronsternen, wie in der Literatur diskutiert, wird kurz vorgestellt.

[1] T. Aumann, Eur. Phys. Journal **A 26**, 441, (2005)
[2] P.Adrich *et al.*, Phys. Ref. Lett. **95**, 132501 and A. Kliemkiewicz, N. Paar et. al., subm. to Phys Rev. **C**, rapid comm. , (2007)
[3] U. Kneissl, N.Pietralla and A. Zilges, J. Phys. **G 32**, R217, (2006)

Hauptvortrag HK 42.3 Fr 9:30 1B/C

Frontiers in the physics of nuclei — •Achim Schwenk — TRIUMF, 4004 Wesbrook Mall, Vancouver, BC, V6T 2A3, Canada

Nuclear physics has entered an exciting era, in which substantial progress can be expected on fundamental problems. This is due to advances on many fronts, including the development of effective field theory and the renormalization group in nuclear physics, the advances in ab-initio methods for nuclear structure, the effort to develop a universal density functional based on microscopic nuclear interactions, and the application of large-scale computing resources. I will discuss the current frontiers in understanding and predicting the structure of strongly-interacting matter in laboratory nuclei and in the cosmos.

Hauptvortrag HK 42.4 Fr 10:00 1B/C

Development of a cryogenically cooled liquid beam internal target for FAIR — •Robert Grisenti[1,2], Nikos Petridis[1], Reinhard Dörner[1] und Thomas Stöhlker[2] — [1]Institut für Kernphysik, J. W. Goethe-Universität, Frankfurt am Main, Germany — [2]GSI, Darmstadt, Germany

Most of the internal-target experiments planned at the future FAIR facility at GSI require a high-density, low-spread low-Z target to achieve the highest efficiency in terms of the luminosity. State-of-the-art internal targets realized by expanding a gas through a nozzle into vacuum provide low target densities in the interaction region and a target spatial extension that spreads out over several millimeters. These features make thus gas-jet internal targets not suitable for future storage ring experiments at FAIR. Larger target densities and smaller interaction lengths can be achieved by further cooling the gas to temperatures down into the liquid regime, below 20 K for hydrogen and below 4 K for helium. Producing liquid beams of helium and hydrogen, however, is not straightforward. For instance, in order to make these beams entirely compatible with the high-vacuum conditions in a storage ring the use of sub-10-micrometer diameter nozzles is mandatory. We will discuss the recent advances on the production of micrometer-sized liquid beams and their application in storage-ring experiments. We will also report on the design and development of a prototype cryogenic liquid beam source at the internal-target station at the ESR at GSI.