

HK 21: Invited Talks - IV

Time: Thursday 11:00–12:30

Location: H1

Invited Talk HK 21.1 Thu 11:00 H1
Charming bound states of the strong interaction — ●FRANK NERLING — Helmholtz Forschungsakademie Hessen für FAIR (HFHF), Frankfurt, Germany

Quantum chromodynamics, the quantum field theory of the strong interaction, allows for and predicts exotic bound states beyond the simple quark model. Even though experimental searches are performed since decades, most of them were not conclusive — the reported candidates are heavily disputed in the community. The discovery of the first so-called charmonium-like (exotic) XYZ states at the beginning of the millennium, however, has initiated a new era. With the observation of tetraquark candidates, the BESIII experiment has discovered manifestly exotic states in the meson sector. Other facilities such as the upcoming PANDA experiment at FAIR offer unique possibilities to finally clarify the nature of e.g. one of the first and most famous XYZ states that still 15 years after the observation is not yet understood.

Invited Talk HK 21.2 Thu 11:30 H1
Baryon Spectroscopy with the CBELSA/TAPS experiment at ELSA — ●ANNIKA THIEL — Helmholtz-Institut für Strahlen- und Kernphysik, Universität Bonn

The dynamics of the quarks and gluons inside the nucleon are a long-standing question in hadron physics. To shed more light on this topic, the excitation spectrum of the nucleons needs to be measured and compared to theoretical models like constituent quark models or lattice QCD calculations.

The extraction of the resonance spectrum is a recent research project by several different experiments. One of them is the CBELSA/TAPS experiment, which is located at the ELSA accelerator in Bonn. The CBELSA/TAPS experiment features a detector system with nearly full 4π angular coverage and a high detection efficiency for photons, which makes it the ideal tool for the measurement of final states comprising neutral mesons. One of its special features is the use of linearly or circularly polarized photon beams impinging on a longitudinally or

transversely polarized butanol target. This allows for the measurement of single or double polarization observables, which are of major importance in the identification of small resonance contributions.

In this presentation, an overview of the recent status in baryon spectroscopy at the CBELSA/TAPS experiment will be given. This includes measurements of different polarization observables, as well as a review of their impact on the excitation spectra of the nucleons. Supported by the DFG (SFB/TR16).

Invited Talk HK 21.3 Thu 12:00 H1
Mass measurements of the most exotic nuclei and their relevance for nuclear structure — ●TIMO DICKEL^{1,2}, FRS ION CATCHER COLLABORATION^{1,2}, and TITAN COLLABORATION³ — ¹GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt — ²Justus-Liebig-Universität Giessen, Giessen — ³TRIUMF, Vancouver, Canada

High-performance multiple-reflection time-of-flight mass spectrometers (MR-TOF-MS) developed at Justus Liebig University Gießen have been used for nuclear physics experiments using the FRS Ion Catcher experiment at the in-flight fragment separator FRS at GSI and the TITAN experiment at the ISOL facility ISAC at TRIUMF, Canada. The unprecedented sensitivity and mass resolving powers of these MR-TOF-MS allows to study the nuclear structure and astrophysics at the extremes of the nuclear chart. A wide range of cases will be presented, from investigations of the astrophysical scenario of the r-process to nuclear structure effects like the island of inversion or the shell structure at the outskirts of the nuclear chart.

In addition, the use of these MR-TOF-MS goes even beyond precision mass measurements, e.g., they can be employed to unambiguously identify and analyze ions independent of their decay properties. This enables novel and universal approaches to measure reaction cross-sections, fission yields, half-lives, and branching ratios. Recent highlights and outlook for both experiments at GSI and TRIUMF will be presented.