HK 2: Plenary II

Time: Monday 11:00–13:00 Location: Audi-Max

Invited Talk HK 2.1 Mo 11:00 Audi-Max

Overview on Physics with radioactive ion beams (exchanged with HK 78.1) — •Zsolt Podolyak — University of Surrey, Guildford, UK

The appearance of radioactive beam facilities can be viewed as a revolution in nuclear physics, in a similar way to how stable beam accelerators revolutionised the understanding of the atomic nucleus and led to applications in many different fields of science and everyday life. The importance of this step-change is recognised world-wide and the first generation of radioactive beam facilities is already in operation. A second generation, aimed at increasing the number of accelerated radioactive species, the range of energies and the beam intensities, is now in design, planning and construction.

The radioactive ion beam facilities address and will continue to address the fundamental questions of nuclear physics, such as:

- What are the limits of nuclear existence? What is the heaviest element we can make and where does the neutron-dripline lie?

- Do new forms of collective motion occur far from the valley of nuclear stability?

- Are there new forms of nuclear matter in very loosely bound nuclear systems?

- How does the ordering of quantum states, with all of its consequent implications for nuclear structure and reactions, alter in highly dilute or neutron-rich matter?

- How are the elements and isotopes found in the Universe formed?

An overview of the physics addressed with radioactive ion beams will be presented.

Invited Talk HK 2.2 Mo 11:30 Audi-Max

The structure of the nucleon from DIS experiments — •Franco Bradamante — Trieste University and INFN Section

An update is given of the QCD structure of the nucleon as it has been unveiled in DIS experiments. Emphasis will be given to the most recent results from the experiments which use polarized lepton beams and/or polarized targets, namely the HERMES experiment at DESY and the COMPASS experiment at CERN. In these experiments identification of the hadrons in the current jet has made tagging of the struck quark possible, thus allowing flavour separation of the parton distributions.

An important step forward in the understanding of the nucleon structure is the recent extraction of the transversity distributions. These distributions describe the correlations between the quark spin and the nucleon spin in a transversely polarized nucleon, and are believed to play a role in the various transverse spin effects which have been known since many years in hadron-hadron reactions and are still unexplained.

Invited Talk HK 2.3 Mo 12:00 Audi-Max

Moments of Exotic Nuclei — •Gerda Neyens — K.U. Leuven, Instituut voor Kern- en Stralingsfysica, Leuven, Belgium

Magnetic dipole moments and electric quadrupole moments are fundamental properties of nuclei. They reveal information about the nuclear structure and about the interaction that holds the nucleons together in the atomic nucleus. As the electrons in atoms, the nucleons (protons and neutrons) in the atomic nucleus can be described as moving in a mean field induced by the other nucleons. However, while the atomic electrons are interacting through the well-known electromagnetic interaction, the description of the nuclear forces is less understood and *effective* interactions are being used to model the nuclear properties. Not only do nuclear moments allow to test the validity of nuclear model predictions, these parameters can also serve as an input to improve on the parametrisation of the models.

In this talk, I will present recent experimental developments and results from moments measurements on exotic isotopes produced by projectile fragmentation and by the ISOL method.

Invited Talk HK 2.4 Mo 12:30 Audi-Max

Non-exponential electron capture decay of hydrogen-like ions — •Yuri Litvinov — GSI Helmholtzzentrum für Schwerionenforschung, 64291 Darmstadt, Germany

In this contribution we report on the observation of time-modulated orbital electron-capture decays of hydrogen-like 140Pr58+ and 142Pm60+ ions coasting in the ion storage-cooler ring ESR at GSI. By using non-destructive, time-resolved Schottky mass spectrometry of single ions it turned out that the expected exponential decay is periodically modulated in time with an oscillation period of about 7 seconds for both systems. By our special detection technique most of systematic errors, such as time-modulated detection efficiencies, can be excluded - at the expense of restricted counting statistics, however.

The interpretation of the observed effect is broadly disputed in literature. Some scenarios show that our observations can be attributed to the coherent creation of finite mass eigenstates of the electron neutrino in these two-body weak decays.

Electron capture decay of hydrogen-like 122I52+ has been studied very recently to investigate a possible scaling of the modulation frequency with the mass of the recoiling daughter nucleus. The data analysis is still in progress. The experiment and the preliminary results will be discussed.