HK 54: Invited Talks IV

Time: Friday 9:00–10:30 Location: H-HS X

Invited Talk HK 54.1 Fri 9:00 H-HS X

The Compressed Baryonic Matter experiment at FAIR — •Alberica Toia for the CBM-Collaboration — GSI — Goethe University of Frankfurt

The study of QCD matter in extreme conditions of temperature and density such as those existing shortly after the Big Bang or in the core of neutron stars brings many insights into the innermost structure of the matter and the forces between its building blocks.

While gravitational wave events revealed a glimpse of QCD matter at extreme conditions, the future Facility for Antiproton and Ion Research (FAIR) will directly create and investigate its properties in the laboratory. Nucleus-nucleus collisions at SIS100 beam energies produce very high net-baryon densities, where phenomena such as a first order phase transition between hadronic and partonic matter or even exotic phases, are expected.

The Compressed Baryonic Matter (CBM) is a dedicated heavy-ion experiment designed to explicitly access rare observables sensitive to the medium. For high-statistics measurements of rare probes, event rates of up to 10 MHz are needed. To meet these demands, the CBM experiment uses fast and radiation hard detectors, self-triggered detector front-ends and a free-streaming readout architecture.

Several of the CBM detector systems, the data read-out chain and event reconstruction are commissioned and already used in experiments during the FAIR phase 0, and also within a full-system setup at GSI SIS18. In this presentation the physics program of CBM will be reviewed and the current status of the experiment will be reported.

Invited Talk HK 54.2 Fri 9:30 H-HS X

Short-Ramge-Correlations in neutron-rich nuclei — •Meytal Duer for the CLAS-Collaboration — Technische Universität Darmstadt

Analysis of high-energy scattering experiments shows that some nucleons (protons and neutrons) in the nuclear ground state form temporarily close-proximity neutron-proton pairs with large relative momentum and small center-of-mass momentum, relative to the Fermi momentum of the nucleus. These pairs are referred to as Short-Range Correlated (SRC) pairs. However, how excess neutrons in neutron-rich nuclei form such pairs remains unclear.

Using data from CLAS detector at Jefferson Laboratory, we measure protons and, for the first time, neutrons knocked out by high-energy electrons. We show that the fraction of high-energy protons increases markedly with the neutron excess in the nucleus, whereas that of neutrons decreases slightly. This effect is surprising because in the classical nuclear shell model, protons and neutrons obey the Fermi statistics, have little correlation and mostly fill independent energy shells. These nucleons are important for understanding of neutron-rich systems such as neutron stars, the internal structure of bound nucleons, and more.

So far SRC measurements were done in direct kinematics off stable nuclei ($N/Z<1.5$). We will also present the next generation of proposed studies at GSI and the future FAIR facilities, using radioactive beams. This will allow a fully exclusive measurement of SRC pairs in very asymmetric nuclei ($N/Z>1.5$).

Invited Talk HK 54.3 Fri 10:00 H-HS X

Das Physikprogramm des MESA-Beschleunigers — •Harald Merkel für die MAGIX-Kollaboration — Institut für Kenrphysik, Johannes Gutenberg-Universität Mainz,

In Mainz wird zur Zeit der Mainz Energy Recovery Superconductiong Accelerator (MESA) aufgebaut. Das besondere an diesem Elektronen-Beschleuniger ist die Möglichkeit zur Energierückgewinnung, d.h. nach Durchlaufen der Wechselwirkungszone wird die im Strahl enthaltene Energie wieder in die Beschleunigungskavitäten zurückgeführt. Auf diese Weise lassen sich Ströme von bis zu 10mA erzeugen. Da bei diesem Prinzip ein großer Teil der Strahlintensität ohne Beeinträchtigung der Strahlqualität für Experimente entnommen werden kann, können hohe Luminositäten erreicht werden. Das Physikprogramm an diesem Beschleuniger konzentriert sich entsprechend auf Präzisionsmessungen im Energiebereich bis 150 MeV, da durch den hohen Strahlstrom mit fensterlosen Targets und Rückstossdetektoren gearbeitet werden kann. In diesem Vortrag wird das Physikprogramm an MESA anhand einiger Beispiele, u.a. zur Suche nach dunkler Materie und zu Messung von astrophysikalischen S-Faktoren vorgestellt, die mit diesem neuen Beschleuingerkonzept möglich werden.