HK 39: Invited Talks II

Time: Thursday 11:00–12:30 Location: Kurt-Alder HS Chemie

Invited Talk HK 39.1 Thu 11:00 Kurt-Alder HS Chemie
Upgrade programme for the ALICE experiment at the LHC — •Andrea Dainese — INFN Padova, Italy

The main goal of the ALICE experiment is to determine the properties of the quark-gluon plasma (QGP), the deconfined state of strongly-interacting matter, and to discern how they arise from the underlying QCD interactions. During the second long shutdown of the LHC (LS2), the experiment has undergone a major upgrade, and a smaller-scale upgrade is in preparation for LS3 (upgrade of the inner tracking layers ITS3 and addition of a forward calorimeter FoCal).

The Collaboration has proposed a new apparatus, ALICE 3, for the LHC Runs 5-6. The detector consists of a large-acceptance pixel-based tracker, complemented by systems for hadron and lepton identification. ALICE 3 will enable novel QGP studies and open up important opportunities in other areas of QCD. The main new studies in the QGP sector focus on beauty hadrons, multi-charm baryons and charm-charm correlations, as well as on precise multi-differential measurements of dielectron emission to probe the mechanism of chiral-symmetry restoration and the time-evolution of the QGP temperature. ALICE 3 can uniquely contribute to hadronic physics, with femtoscopic studies of the interaction potentials between charm mesons and searches for nuclei with charm, and to fundamental physics, with tests of the Low theorem for ultra-soft photon emission.

The presentation covers the detector concept, the physics performance, and the status of R&D, for the LS3 upgrades and, more extensively, for ALICE 3.

Invited Talk HK 39.2 Thu 11:30 Kurt-Alder HS Chemie
Antiproton production measurement for indirect Dark Matter search at the AMBER experiment at CERN — •Davide Giordano — Torino Section of INFN, 10125 Turin, Italy

One of the indirect detection method of dark matter (DM) is based on the search of the products of DM annihilation or decay. They should appear as distortions in the gamma rays spectra and in the rare Cosmic Ray (CR) components, like antiprotons, positrons and antideuterons. In particular, the antiprotons in the Galaxy are mainly of secondary origin, produced by the scattering of cosmic proton and helium nuclei off the hydrogen and helium in the interstellar medium (ISM). In order to obtain a significant sensitivity to DM signals, accurate measurements of the antiproton production cross section in p-p and p-He collisions are crucial. The AMBER experiment at CERN collected in 2023 the first data ever in p+He collisions at a center of mass energies from 10 to 21 GeV. In addition, another poorly understood antiproton production method is the contribution from antineutrons decays, which remains experimentally unexplored. Unlike antiprotons, the yield of antineutrons in collisions is typically inferred based on theoretical principles, primarily relying on isospin symmetry. In 2024, the AMBER data collection was expanded to include p+H and p+D collisions to indirectly measure with unprecedented precision the possible antiproton production asymmetry in in p+n collisions.

Invited Talk HK 39.3 Thu 12:00 Kurt-Alder HS Chemie
New Constraints on the Nuclear Equation of State — •Melissa Mendes — Technische Universität Darmstadt, Department of Physics — ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung GmbH — Max-Planck-Institut für Kernphysik, Heidelberg

Investigating the behavior of the nuclear equation of state (EOS) is an exciting interdisciplinary research area. In this endeavor, the exploration of neutron stars has been fruitful to probe the EOS against their predictions for neutron star properties, such as mass, radius and tidal deformability and test the high-density EOS behavior. Over the past years, substantial progress has been achieved on EOS calculations at nuclear densities based on chiral effective field theory interactions with reliable many-body techniques. In this talk, I will present new constraints on the neutron star EOS and mass-radius range based on new chiral EFT results for matter in beta equilibrium up to next-to-next-to-next-to-leading order as well as recent NICER observations and LIGO/VIRGO gravitational wave events.

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