

## HK 11: Invited Talks II

Time: Tuesday 11:00–12:30

Location: H-HS X

**Invited Talk** HK 11.1 Tue 11:00 H-HS X  
**Experimental Nuclear Astrophysics Underground: The LUNA and LUNA-MV experiments** — ●ROSANNA DEPALO for the LUNA-Collaboration — Università degli Studi di Padova and INFN Padova

The cross sections of nuclear reactions relevant for astrophysics are crucial ingredients to understand the energy generation inside stars and the synthesis of the elements. In stars, nuclear reactions take place at energies well below the Coulomb barrier. As a result, their cross sections are often too small to be measured in laboratories on the Earth's surface, where the signal would be overwhelmed by the cosmic-ray induced background. An effective way to suppress the cosmic-ray induced background is to perform experiments in underground laboratories. LUNA is a unique facility located at Gran Sasso National Laboratories (Italy) and devoted to Nuclear Astrophysics. The extremely low background achieved at LUNA allows to measure nuclear cross sections directly at the energies of astrophysical interest.

Over the years, many crucial reactions involved in stellar hydrogen burning as well as Big Bang Nucleosynthesis have been measured at LUNA. The presentation will provide an overview on underground Nuclear Astrophysics and discuss the latest results and future perspectives of the LUNA experiment.

**Invited Talk** HK 11.2 Tue 11:30 H-HS X  
**Ten years after: Highlights from ALICE and future perspectives** — ●HARALD APPELSHÄUSER for the ALICE-Collaboration — Goethe-Universität Frankfurt

After ten years of operation at the CERN-LHC, ALICE has accumulated an impressive amount of experimental results from collisions of protons and heavy ions at the energy frontier. They help understanding the QCD phase transition at vanishing net baryon density, and elucidate the properties of the Quark-Gluon Plasma, a state of matter where the confinement of quarks and gluons is lifted and chiral symmetry is restored. Moreover, ALICE results contribute in a unique way

to the understanding of extreme matter at high baryonic densities, such as neutron stars, and other related subjects including hyperonic interactions and the properties of hypernuclei.

During the present LHC Long Shutdown 2, ALICE undergoes a substantial detector upgrade to cope with a significant increase of the interaction rate in Pb-Pb to 50 kHz, expected at the LHC in 2021 and beyond. In this presentation, recent highlights from ALICE are presented and the physics perspectives for running with an upgraded ALICE detector in the next decade are discussed.

**Invited Talk** HK 11.3 Tue 12:00 H-HS X  
**Constraining the nuclear equation of state from nuclear forces and neutron star observations** — ●SVENJA GREIF — Institut für Kernphysik, Technische Universität Darmstadt — ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung GmbH

Understanding dense matter and the nuclear equation of state beyond nuclear saturation density is a challenging open problem. We use a general equation of state framework based on chiral effective field theory constraints combined with extensions using piecewise polytopes and a new speed of sound parametrization [1], including also constraints from Fermi liquid theory. In addition, we require that the general equation of state reaches the observed heavy neutron star masses. In this talk, we present first applications provided by the first mass-radius determination obtained by NASA's NICER mission [2,3] and constraints inferred from the gravitational wave event GW170817. Complementary to the determination of the radius is the prospect of a moment of inertia measurement, which we explore for the most likely source PSR J0737 – 3039A.

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- [1] Greif *et al.*, MNRAS 485, 5363 (2019)
- [2] Raaijmakers *et al.*, ApJL 887, L22 (2019)
- [3] Raaijmakers *et al.*, arXiv:1912.11031 (2019)