HK 26: Invited Talks - V

Time: Friday 11:00–12:30 Location: H1

Invited Talk HK 26.1 Fri 11:00 H1

Studying the Universe from deep underground: the LUNA experiment — •Rosanna Depalo — Università degli Studi di Milano and INFN Milano

Nuclear cross sections are crucial ingredients to understand the production of energy 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 Earths surface, where the signal would be overwhelmed by the environmental background. An effective way to suppress the background is to perform experiments in underground laboratories. The Laboratory for Underground Nuclear Astrophysics (LUNA) is a unique facility located at Gran Sasso National Laboratories (Italy). 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 26.2 Fri 11:30 H1

Double parton scattering and double parton distributions — •Peter Plössl — Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

Double parton scattering (DPS) describes the situation when two individual hard scattering reactions occur in a single hadron-hadron collision. In some regions of phase space DPS may give sizeable contributions to the production of multi-particle final states and thus constitutes an important background to single parton scattering (SPS) in channels suitable for the search for physics beyond the standard model. Besides this DPS is also an interesting phenomena in its own right, as it gives insight into the correlations of partons inside of hadrons.

A theoretical description of DPS processes from first principles can be achieved by deriving factorisation theorems akin to the ones known from SPS, with a central building block being the double parton distributions (DPDs). However, these DPDs are presently basically unknown as experimental data is still lacking.

As a consequence one has to rely on physically motivated models for DPDs to be able to calculate DPS contributions to a given process. One important constraint for such models is given by number and momentum sum rules for DPDs in close analogy to the well known PDF sum rules. Another constraint can be obtained by observing that in the limit of small distances between the two partons DPDs can in fact be matched onto regular PDFs with perturbative matching kernels.

Invited Talk HK 26.3 Fri 12:00 H1

BSM physics in hadronic and nuclear beta decays: challenges and opportunities — •Chien Yeah Seng — Helmholtz-Institut für Strahlen- und Kernphysik and Bethe Center for Theoretical Physics, Universität Bonn, 53115 Bonn, Germany

In the past years, several significant anomalies have been observed in the beta decay of mesons, nucleon and nuclei, which make them promising avenues for the search of the physics beyond the Standard Model (BSM). However, the current significant level of the observed anomalies is not yet sufficient to declare a discovery, and the major limiting factor is the precision level of the Standard Model (SM) theory inputs instead of experiments. In this talk, I will describe the major theory improvements needed to increase the significance level of the existing beta decay anomalies to 5 standard deviations, assuming that BSM physics is the underlying reason. They include high-precision studies of radiative corrections, isospin-breaking corrections and nuclear structure corrections to various beta decay processes.