HK 26: Astroparticle Physics I

Zeit: Dienstag 16:30–18:30 Raum: HZO 100

Gruppenbericht HK 26.1 Di 16:30 HZO 100

The XENON1T Dark Matter Search — •Daniel Coderre — University of Freiburg, Freiburg, Germany

XENON1T is a dual phase time projection chamber operated at the Gran Sasso underground national laboratory. Over 3 tons of ultra-pure liquid xenon are used as a target to measure WIMP-nucleon interactions. The detector was commissioned in 2016 and operated through 2017 and has collected the largest exposure of any detector of its type, giving unprecedented sensitivity to potential dark matter interactions. An in situ upgrade to triple the target mass, XENONnT, is in the development stages and will start construction later in 2018, opening up even more parameter space in the search for WIMPs.

This talk will give an overview of the experiment and present the latest results.

Gruppenbericht HK 26.2 Di 17:00 HZO 100

Everything you want to know about new Borexino results — •Zara Bagdasarian for the Borexino-Collaboration — IKP-2 Forschungszentrum Jülich

Borexino is located at the Laboratori Nazionali del Gran Sasso (LNGS) in Italy with the primary goal of detecting solar neutrinos, particularly those below 2 MeV, with unprecedentedly high sensitivity. The ultra-low radioactive background, Borexino's technical distinctive feature, is the basis of the outstanding achievements obtained so far. During Phase I (2007-2010), Borexino first detected and then precisely measured the flux of the Be7 solar neutrinos, ruled out any significant day-night asymmetry of their interaction rate, made the first direct observation of the pep neutrinos, and set the best available upper limit on the flux of solar neutrinos produced in the CNO cycle (carbon, nitrogen, oxygen). This talk will cover the most recent and precise solar neutrino measurements, along with a limit on neutrino magnetic moment and search for correlations with gravitational waves and gamma-ray bursts.

Gruppenbericht HK 26.3 Di 17:30 HZO 100

The Jiangmen Underground Neutrino Observatory — •Florian Kiel for the JUNO-Collaboration — III. Physikalisches Institut B, RWTH Aachen University

The Jiangmen Underground Neutrino Observatory (JUNO) is a next-generation neutrino experiment currently under construction in southern China, close to Kaiping. Below an overburden of 1900 m.w.e., the liquid scintillator detector with a target volume of 20kT will be used to measure reactor antineutrinos from two power plants at a distance of 53 km. The primary goal is the determination of the neutrino mass hierarchy from the reactor neutrino energy spectrum with better that 3σ significance. It is therefore necessary to reach an unprecedented energy resolution of 3% @ 1 MeV. Furthermore, JUNO can improve the precision on solar oscillation parameters to below 1% and allows the measurement of geo-neutrinos, supernova-neutrinos and atmospheric neutrinos. The start of data taking is planed for 2020. This talk will review the status of the project and physics potential.

HK 26.4 Di 18:00 HZO 100

Removal of noble gases from xenon by cryogenic distillation — •Michael Murra — Institut für Kernphysik, Münster

The operating XENON1T experiment, located in the Laborati Nazionali del Gran Sasso (LNGS), utilizes about 3.3 tons of liquid xenon for the direct detection of dark matter in the form of Weakly Interacting Massive Particles (WIMPS).

A key requirement to reach the desired sensitivity is the removal of intrinsic radioactive backgrounds such as Kr-85 and Rn-222, which create WIMP-like signals within the innermost of the detector.

By employing the differences in vapor pressure between krypton and radon with respect to xenon, a cryogenic distillation column is used to reduce such noble gas impurities.

This talk will present an overview of the performed distillation campaigns at XENON1T and will discuss possible improvements for the future XENONnT experiment.

Different aspects of this project have been funded by DFG Großgeräte, BMBF and Helmholtz-Alliance for Astroparticle Physics (HAP).

HK 26.5 Di 18:15 HZO 100

Studies of the nucleosynthesis $^{12}C(\alpha,\gamma)^{16}O$ in inverse kinematic for the MAGIX experiment on MESA — •Stefan Lunkenheimer — Institut für Kernphysik der Universiät Mainz

MAGIX is a versatile fixed-target experiment and will be built on the new accelerator MESA (Mainz Energy-Recovering Superconducting Accelerator) in Mainz. The accelerator will deliver polarized electron beams with currents up to 1 mA and energy up to 105 MeV. Using its internal gas-target, MAGIX will reach a luminosity of $O(10^{35}\,\mathrm{cm^{-2}s^{-1}})$. This allows to study processes with very low cross section at small momentum transfer in a rich physical program.

We will present the planned measurements of the inverse kinematic of the nucleosynthesis process $^{12}C(\alpha,\gamma)^{16}O$ to determine its S-factor. In the experiment we will scatter electrons on oxygen atoms and we will detect the scattered electrons in coincidence with the produced α-particles. With this measurement we will determine the cross section as a function of the outgoing center of mass energy of the carbon-α-system to calculate the S-factor. Hereby we will present the results of the first simulations which can be used to understand the parameter range that MAGIX will be able to explore.