T 130: Dark matter physics - an insight into various experiments (with AGjDPG)

Zeit: Donnerstag 16:45–18:15 Raum: HSZ-103

Hauptvortrag T 130.1 Do 16:45 HSZ-103

Physik unter Tage — •Kai Zuber — Technische Universität Dresden

Diverse physikalische Prozesse mit kleinen Zählraten und Wirkungsquerschnitten können auf der Erdoberfläche aufgrund der omnipräsenten kosmischen Strahlung praktisch nicht gemessen werden. Die einzige Möglichkeit besteht in der Benutzung von unterirdischen Laboren, seien es Minen oder Autobahntunnel. Besonders davon betroffen sind Experimente mit Neutrinos und die direkte Suche nach dunkler Materie. Hinzu kommen allerdings auch Experimente aus der Nuklearen Astrophysik und das Studium langer Halbwertszeiten von Kernzerfällen bzw. der Messung kleiner Aktivitäten.

In dem Vortrag werden die physikalische Motivation und generelle Gedanken zur Abschirmtiefe diskutiert. Dies soll mit diversen Beispielen auch aus dem Felsenkeller Labor Dresden abgerundet werden.

Hauptvortrag T 130.2 Do 17:15 HSZ-103

The PICASSO experiment - searching for cold dark matter — •Robert Filgas — Czech Technical University in Prague

The PICASSO experiment (Project In CAnada to Search for Supersymmetric Objects) specializes in searches for cold dark matter through the direct detection of Weakly Interacting Massive Particles (WIMPs). It uses the superheated droplet technique, which is based on the operation principle of the classic bubble chamber. In the case of PICASSO the active detector liquid is dispersed as droplets of a metastable superheated perfluorobutane, C4F10, and the detectors are operated in a temperature range such that nuclear recoils in the keV range induced by interactions with WIMPS could trigger bubble formation. These explosive evaporations are accompanied by acoustic signals, which are recorded by piezoelectric transducers. I will present details of the PICASSO experiment and the first results obtained by the detector located at the underground laboratory of the Sudbury Neutrino Observatory.

Hauptvortrag T 130.3 Do 17:45 HSZ-103

The XENON dark matter project — •Ethan Brown for the XENON-Collaboration — Institut für Kernphysik, Universität Münster

A large amount of evidence supports the theory that 25% of the universe is composed of cold dark matter. The XENON project has conducted several experiments using a liquid xenon target in a dual phase time projection chamber (TPC) in an attempt to detect dark matter in the form of Weakly Interacting Massive Particles (WIMPs). The XENON100 experiment has conducted a dark matter search based on 225 live days of data without evidence for a dark matter signal, placing the most stringent limits on the WIMP-nucleon cross section, of $\sigma < 2.0 \times 10^{-45}\,\mathrm{cm}^2$.

The next phase of the XENON project aims to increase the sensitivity by two orders of magnitude by scaling up the existing 100 kg detector to the ton scale. In order to achieve the sensitivity goal, detector performance must be similar to that of XENON100 while scaling up the detector size. Additionally, backgrounds must be substantially reduced by special material selection and purification techniques that are currently being developed.

The XENON100 results will be presented, along with an overview of the XENON1T experiment, including results from the development of several subsystems.

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