HK 58: Poster - Astroteilchenphysik

Zeit: Mittwoch 16:45–16:45 Raum: HSZ 4.OG

HK 58.1 Mi 16:45 HSZ 4.OG

Distillation Column for XENON1T Dark Matter Project — •Michael Murra[1], Ethan Brown[1], Stephan Rosendahl[1], Ion Cristescu[2], Christian Huhmann[1], Alex Fieguth[1], and Christian Weinheimer[1] — [1]Institut für Kernphysik, Universität Münster — [2]Karlsruhe Institute of Technology

The XENON1T experiment is the next generation experiment for the direct detection of dark matter in the form of Weakly Interacting Massive Particles (WIMPS). While current limits set by XENON100 and other experiments constrain the WIMP-nucleon cross section to $\sigma < 2.0 \times 10^{-45}$ cm^2, XENON1T will achieve an increased sensitivity by two orders of magnitude by utilizing about 2.6 tons of liquid xenon. A key requirement to reach this sensitivity is the reduction of radioactive backgrounds. One dominant radioactive contamination at this level is ^{85}Kr, which has a beta-decay with an endpoint energy of 687keV. To reach the final sensitivity, the xenon has to be purified to a concentration of $<$ 0.5 ppt (parts per trillion) natural krypton in xenon. Because of different boiling points of Kr and Xe a cryogenic distillation column is used to achieve the required purity. For XENON1T, a rectification column, which operates with partial reflux, is being constructed and characterized to purify $\approx$ 3 tons of xenon. The key features of this column will be presented, along with a status of the construction.

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

HK 58.2 Mi 16:45 HSZ 4.OG

^{83m}Kr tracer method to determine the separation factor of a cryogenic distillation column for the XENON1T experiment — •Alexander Fieguth, Ethan Brown, Volker Hannen, Stephan Rosendahl, and Christian Weinheimer for the XENON collaboration — Institut für Kernphysik, Universität Münster

A promising approach to look for dark matter in form of Weakly Interacting Massive Particles (WIMPs) is the use of liquid noble detectors to detect the signals produced when a WIMP scatters off of a target nucleus. The XENON project, using a xenon target for such a detector, has achieved the best sensitivity to the WIMP-nucleon cross section with the XENON100 experiment, placing the most stringent limits to date of$\sigma < 2.0 \times 10^{-45}$ cm^2. The next stage XENON1T aims to achieve an increased sensitivity by using more liquid Xenon and enhanced background suppression. One important background is ^{85}Kr. To reach the necessary level, natural krypton has to be removed to a level <0.5 ppt. Here the technique of cryogenic distillation is used, and a column is under construction to achieve a separation factor of 10^5. To characterize the column, and to quantify the separation factor, a doping method has been developed using ^{83m}Kr, which is no contamination to the system due to its short half-life of 1.83h. ^{83m}Kr detectors have been build, which measure the scintillation light produced in xenon with a PMT at different points in the column which allows characterization and determination of the separation factor. The project is funded by DFG and Helmholtz Allianz for Astroparticle Physics HAP.

HK 58.3 Mi 16:45 HSZ 4.OG

Das COBRA-Experiment — •Jan Timm für die COBRA-Kollaboration — Institut für Experimentalphysik, Hamburg

In den letzten Jahren wurde eine neuartige Eigenschaft der Neutrinos, die Neutrinooszillation, entdeckt. Ein Neutrino, das sein eigenes Antiteilchen wäre, könnte helfen weitere Fragen bezüglich der Neutrinomassen oder der Baryogenese zu beanworten. Der neutrinolose Doppel-Beta Zerfall bietet zur Zeit die einzige Möglichkeit, diesen hypothetischen Majorana-Teilchenkarakter der Neutrinos zu verifizieren. Das COBRA-Experiment sucht diesen Zerfall mit Hilfe von Raumtemperatur-Halbleiterdetektoren aus Cadmium, Zink und Tellur mit insgesamt 9 Doppel-Beta zerfallenden Isotopen. Cd-116 hat einen, im Vergleich zum natürlichen radioaktivem Gamma-Untergrund, relativ hohen Q-Wert von etwa 2,8 MeV und somit eine gute Ausgangslage diesen seltenen hypothetischen Zerfall zu untersuchen. Das Poster stellt die Detektor- und Abschirmungskonzepte des COBRA-Experiments vor.