T 18: Niederenergie-Neutrinophysik 1

Zeit: Montag 11:00–12:30 Raum: P106

T 18.1 Mo 11:00 P106

Pulse shape studies with ultra high purity point contact detectors — •Alexander Hegai — Eberhard Karls Universität Tübingen

For the search of the neutrinoless double beta decay the Majorana collaboration, with funding support from DOE Office of Nuclear Physics and NSF Particle Astrophysics, is constructing the Demonstrator, an array consisting of 40 kg of p-type point-contact high-purity germanium (HPGe) detectors, of which ∼30 kg will be enriched to 87% in ^{76}Ge. The enriched detectors are produced by ORTEC and are made out of ultra pure material which gives the advantage of a low depletion voltage but influences the pulse shape properties. In this talk detailed pulse shape studies of the new type of germanium detectors will be presented.

T 18.2 Mo 11:15 P106

Pulse-shape discrimination of lateral surface events for the COBRA experiment — •Jan Tebrügge for the COBRA-Collaboration — Exp.Phys.IV, TU Dortmund

The aim of the Cadmium Zinc Telluride 0-Neutrino Double Beta Decay Research Apparatus (COBRA) experiment is to prove the existence of neutrinoless double beta decay by investigating the decay of the isotope 116Cd, with a sum energy of both electrons of 2.814 MeV. The experiment employs CdZnTe semiconductor detectors of the coplanar grid design. A DAQ system records complete signal forms, so that pulse shape analysis is possible. Events near the cathode and anode surfaces of a coplanar grid CdZnTedetector are identifiable by means of the interaction depth information encoded in the signal amplitudes. However, the amplitudes cannot be used to identify events near the lateral surfaces. In this talk a method is described to identify lateral surface events by means of their pulse shapes. Such identification is important for discriminating surface alpha particle interactions from more penetrating forms of radiation. The effectiveness of the presented technique is demonstrated using COBRA data as well as a dedicated setup with alpha and gamma sources.

T 18.3 Mo 11:30 P106

Single-site and Multi-site Event Discrimination for the COBRA Experiment — •Stefan Zatschler for the COBRA-Collaboration — IKTP, TU Dresden, Germany

The aim of the COBRA experiment is to prove the existence of neutrinoless double beta decay for several isotopes intrinsically abundant in the detector material. Currently a demonstrator setup built of 64 coplanar grid detectors collects high quality low background physics data at the underground laboratory LNGS (Italy). The detectors are made of cadmium zinc telluride, which is a commercially available room temperature semiconductor material.
One of the key instruments to further reduce background is to identify so called multi-site events (MSE) via pulse shape analysis. MSEs are typically caused by multiply-scattered highly energetic photons. Since the energy deposition of a $0\nu\beta\beta$ event is expected to be almost always single-site, all events of the same energy clearly identified as MSEs can be rejected.
In this talk a lab experiment is presented that makes use of Compton scattering to verify the signal efficiency of the newly developed SSE/MSE cuts. Furthermore, the application of the algorithms is tested on physics data to identify the contribution of multi-site events to the total background of the COBRA experiment.

T 18.4 Mo 11:45 P106

Background Estimation for a large scale COBRA Experiment — •Nadine Heidrich for the COBRA-Collaboration — Institut für Experimentalphysik, Universität Hamburg, D

The aim of the COBRA experiment is to measure the neutrinoless double beta decay ($0\nu\beta\beta$) by using cadmium zinc telluride (CdZnTe) semiconductor detectors.
The concept for a large scale set–up consists of an array of CdZnTe detectors with a total mass of 420 kg enriched in ^{116}Cd up to 90 %. With a background rate in the order of 10^{-3} counts/keV/kg/year, the experiment would be sensitive to a half–life $T_{1/2}$ larger than 10^{26} years, corresponding to a Majorana mass term $m_{\beta\beta}$ smaller than 50 meV.
To achieve this background level, an appropriate shield was developed based on Monte-Carlo simulations. As a next step, various background sources in different parts of the set–up were simulated and their contribution to the background rate calculated. In the talk the current status of the Monte–Carlo survey is presented and discussed.

T 18.5 Mo 12:00 P106

COBRA als Neutronenspektrometer? — •Jan Timm für die COBRA-Kollaboration — Universität Hamburg

Der neutrinolose Doppel-Betazerfall bietet zur Zeit die einzige Möglichkeit, den hypothetischen Majorana-Teilchencharakter der Neutrinos zu überprüfen, in diesem Fall wären die Neutrinos ihre eigenen Antiteilchen. Mit Hilfe von Raumtemperatur-Halbleiterdetektoren aus Cadmium, Zink und Tellur sucht das COBRA-Experiment diesen Zerfall vornehmlich in Cd-116.
Da Cd-113 einen hohen Einfangwirkungsquerschnitt für thermische Neutronen hat, aber auch schnelle Neutronen einen Beitrag zum Untergrund leisten, ist das Verständis dieses Neutronen-Untergrunds von besonderer Bedeutung. Dieser Vortrag bietet einen Überblick über Analyse-Methoden mit dem COBRA-Detektor eine energieabhängige Neutronenüberwachung zu ermöglichen.

T 18.6 Mo 12:15 P106

Feasibility study of muon-induced neutrons measurement in shallow underground labs and a first measurement attempt above ground. — •Matteo Palermo for the GeDet-Collaboration — Max-Planck-Institut für Physik,München

In the field of low background experiments, the expected event rate is especially small: background identification and reduction becomes essential in order to obtain an acceptable signal to background ratio. One of the three main sources of background for such experiments comes from the interactions of remaining cosmic muons with the experiment infrastructure as well as with the surrounding rock. From these interactions, many different particles can arise. Among them, the most dangerous component is the neutral one, i.e. neutrons. They require particular attention, since neutrons cannot be easily vetoed and therefore are a limiting factor for such experiments. Given the presence of a high cosmogenic neutron-flux above ground, which represents the main background source for such a measurement above ground, the optimal location for such a measurement would be a shallow underground lab. A simulation study comparing two possible setup geometries to measure muon-induced neutrons is presented. Furthermore, the results of a non-optimized above ground experimental setup, by means of an eXtended Range germanium detector (XtRa), are presented.