MAX-PLANCK-INSTITUT FÜR PHYSIK

The Max Planck Institute for Physics (MPP) invites applications for

Postdoctoral position(s)

focused on R&D in connection with the LEGEND experiment, a next generation large scale neutrinoless double beta (0νββ) decay experiment based on HPGe detectors. Germanium based 0νββ decay experiments are designed to investigate the nature of the neutrino and to test Lepton number conservation by searching for 0νββ decay of ^{76}Ge. The goal is to either establish Lepton number violation and the Majorana nature of the neutrino or to push the relevant exclusion limits to the neutrino mass scale indicated by neutrino oscillations. The first phase of the experiment, LEGEND-200, is currently being operated at the Gran Sasso Underground Laboratory. Further upgrades to LEGEND-200 are pending, and planning for the next phase, LEGEND-1000, is in progress.

Within the LEGEND collaboration, the Max Planck Institute for Physics is involved in the simulation and characterization of high-purity germanium (HPGe) detectors, the development and deployment of polyethylene naphthalate (PEN) as a low-background self-vetoing material, and the LEGEND data analysis.

Within this area of expertise, postdoctoral positions may cover one or two of the following topics:

- **HPGe detector simulation and characterization**: The Germanium detector laboratory at MPP offers a variety of experimental setups, including a novel Compton scanner, to study the bulk and surface behaviour of current and novel HPGe detector designs. We also maintain the Julia-based software SolidStateDetectors.jl to simulate the fields and charge drift in detectors. Input from such measurements and simulations is important to improve the understanding of the behaviour of current and future LEGEND detectors and form a basis for both detector production and the development of DSP-based background-suppression algorithms.

  We are looking for candidates interested in further improving our simulation software, utilize and improve our measurement capabilities, and apply the results with respect to the needs of the LEGEND experiment. Candidates will need to possess expertise with semiconductor detectors (ideally cryogenic detectors), advanced programming skills, solid laboratory skills, as well as experience with handling and improving complex measurement setups. The candidate will be expected to work closely with the LEGEND groups at the Technical University Munich (TUM) and at the Max Planck Institute for Nuclear Physics (MPIK).

- **PEN production and development:** MPP has played a major role in establishing polyethylene naphthalate (PEN) as a structural, low-background, cryo-compatible self-vetoing scintillating material and producing the PEN detector holders currently in use in LEGEND-200. Our laboratory is equipped to characterise the optical properties and scintillation response of PEN and we work closely with the Leibniz Institute of Polymer Research in Dresden on injection moulding and machining radiopure PEN as well as synthesising ultra-clean PEN material.

  We aim to continue this success story and are looking for a candidate who will make significant contributions to the further development and characterization of PEN as structural material, as well as producing and characterizing PEN material and parts for the LEGEND experiment.

  The candidate will be expected to work closely with the LEGEND groups at TUM, at the Leibniz Institute of Polymer Research and at Oak Ridge National Laboratory (ORNL).

- **LEGEND data analysis:** The LEGEND collaboration performs data analysis using two independent software stacks in Python and Julia. The Julia software stack is used to ensure independently verified results and to explore cutting-edge software technology for LEGEND-1000. MPP plays a major role in the development of the LEGEND Julia algorithms and their application in an end-to-end (raw data to physics analysis) scenario.

  We are looking for a candidate who is passionate about data analysis and modern software techniques to join this effort. Advanced programming experience will be required, as well experience with data processing and statistical analysis. DSP and Julia skills are a plus, an interest to acquire them is required. The candidate will be expected to work closely with the LEGEND groups at TUM and MPIK, as well as other groups within the LEGEND collaboration.

Assignment of postdoctoral candidates to topics will depend on their research interests and area of expertise. We are looking for self-motivated scientists who excel both in independent research and as integral members of a team and an international collaboration.

The primary working language of the MPP LEGEND group is English.

A formal requirement for the positions is a PhD in experimental physics. The candidate should have a background in (astro-)particle and/or detector physics. Experience in scintillator and HPGe detector development, polymer properties, low background physics and good programming skills are an advantage or requirement (depending on the topic).

Salary and benefits are commensurate with public service organizations (TVöD Bund). The contract is initially limited to 2 years with the possibility of an extension.

The Max Planck Society strives for gender equality and diversity. The Max Planck Society is committed to increasing the number of individuals with disabilities in its workforce and therefore encourages applications from such qualified individuals. Furthermore, the Max Planck Society seeks to increase the number of women in those areas where they are underrepresented and therefore explicitly encourages women to apply.

Further information can be obtained from Dr. Oliver Schulz (EMail: oschulz@mpp.mpg.de) and Dr. Béla Majorovits (EMail: bela@mpp.mpg.de). Interested scientists should submit an application letter, a statement of research interests, a curriculum vitae, a list of publications exclusively via our online application portal. Please provide three names and contact details of persons who will be providing reference letters upon our request. We are looking forward to your online application.

Selection of applicants for interviews will begin in December 2024, though the application process will be open until the available positions are filled.

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