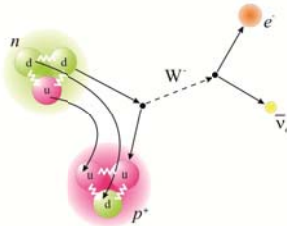


Diploma / Master thesis

Time variation of natural constants? Testing of and with PERKEO III detector *Electron energy spectroscopy for a measurement of correlation coefficients in neutron β -decay with PERC*



With the PERC (Proton Electron Radiation Channel) [1] project, we focus on novel experiments in neutron β -decay to study the structure and nature of the Standard Model (SM) and physics beyond. We think that for a unification of all fundamental forces and for aspects of cosmology, new symmetry concepts must be found. This is the intention of our project: Precise measurements of angular correlations

involving the neutron spin and electron, neutrino, and proton momenta will be used to search for possible extensions of the SM as well as to search for new symmetry concepts like SUSY (supersymmetry). PERC will be built in collaboration with the Universities of Heidelberg and Mainz, the Munich University of Technology, and the Institut Laue-Langevin in Grenoble. Here at the Institute of Atomic and Subatomic Physics, we focus on the design and the construction of the joint project, especially of different and specialized detectors for the analysis of the extracted electrons and protons.

The decay electrons are guided by a strong magnetic field to, e.g., a scintillation detector with photomultiplier readout [2]. The advantage of scintillation detectors is a short readout time with time resolution of 1 ns, which is needed for high count rate spectroscopy in PERC.

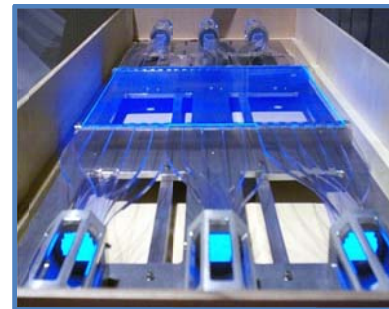
While we deal with electron energy spectroscopy, we try also to find answers on: “Do we have time-varying decay-rates? Does the solar activity affect natural constants?” [3]

We are looking for interested students who want to improve their knowledge in neutron and detector physics.

Linux and C++ programming skills are required.

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[1] D. Dubbers *et al.*, *A clean, bright, and versatile source of neutron decay products*, NIM A 596, 238-247 (2008), arXiv:0709.4440

[2] B. Märkisch *et al.*, *The new neutron decay spectrometer Perkeo III*, NIM A 611, 216-218 (2009)

[3] E. Fischbach *et al.*, *Time-Dependent Nuclear Decay Parameters: New Evidence for New Forces?*, Space Sci Rev (2009) 145:285-335