

## Diploma thesis

# PERC: the $\beta$ -decay of cold polarized neutrons

**- A determination of the coupling constants of the weak interaction,  
 a search new physics beyond the Standard Model of particle physics –**

PERC is a new project of the Neutron & Quantum Physics Group at the Atomic Institute of the Austrian Universities in collaboration with the University of Heidelberg, the Munich University of Technology and the Institut Laue-Langevin in Grenoble. The experiments are planned here at the Atomic Institute and carried out at the European Neutron Source at the Institute Laue-Langevin in Grenoble/ France.

## Motivation

Although the observed breaking of fundamental symmetries in particle physics has been built into the Standard Model, its origin has remained a mystery and constitutes a great challenge to theoretical physics. We will therefore build a new facility PERC, where count rates of neutron decay products are increased by a factor 100 compared to best experiments. Our new projects will test the Standard Model at a much higher level of sensitivity benefiting both, from the gain in statistical accuracy and from the redundancy of observables.

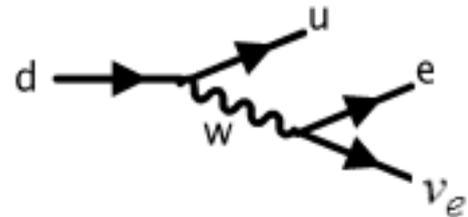


Fig.1: Neutron  $\beta$ -decay

## Future planning

The main goal within the next three years is the design and construction of the joint project PERC. A milestone for this  $\beta$ -decay project is its design (2009/2010). As a first step magnetic field calculations for strong magnetic fields (superconducting) must be performed. They are needed for both, particle transport and also suppression of backscattering and the determination of the effective solid angle for charged particle collection. At its exit PERC delivers a quasi beam of decay electrons and protons under well-defined and precisely variable conditions, which can well be separated from the cold neutron beam itself.

## Contact

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