

Tests of fundamental symmetries of nature are performed all over the world using different systems and employing various experimental techniques. Three symmetries of the nature: time (T-invariance), charge (C-conjugation), and parity (P-invariance), are linked via the CPT theorem. Whereas there are no indications of any CPT violation, the amount of CP violation observed in different meson systems can be nicely incorporated into the standard model of particle physics. But the strength of CP violation, observed up to now only in meson systems, is not sufficient to explain the baryon asymmetry of the Universe. Time-reversal T invariance is one of a basic symmetries which is linked to CP symmetry via the CPT theorem.

Using the Cooler-Synchrotron COSY-Jülich at the Institut für Kernphysik of Forschungszentrum Jülich we plan to perform a null-test of time-reversal invariance in proton-deuteron scattering (TRIC). In this experiment COSY will serve as an accelerator, detector and ideal zero degree spectrometer. The experiment will be performed using the PAX target and detector systems. Especially crucial for this experiment is a high precision beam current measurement system which must be calibrated, fully tested in the laboratory and implemented in to the COSY ring. In order to study performance of different beam current measurement devices a test bench is setup in the laboratory.

Within preparation for this experiment the following projects are available for a master thesis:

- 1) A novel method for the measurement of double-polarized cross sections by studying the beam current in a storage ring,
- 2) Development and preparation of a high precision beam current measurement system for the TRIC experiment.

The PAX collaboration is developing and maintaining a C++ analysis code for processing the experimental data. Candidates should have an interest in the field of particle physics, be prepared to modify and write parts of the analysis codes necessary for the project, work in the laboratory and participate in the experimental beam times. The position could be further extended into a PhD project upon mutual agreement.

Contact:

Institut für Kernphysik
Forschungszentrum Jülich
52425 Jülich
Helmholtz-Institut für Strahlen- und Kernphysik
Nussallee 14-16
53115 Bonn

Dr. Yury Valdau
Tel.: (02461)-61-5675
E-Mail: y.valdau@fz-juelich.de

or

Dr. Paul-Dieter Eversheim
Tel.: (0228)-73-5299
E-Mail: evershei@hiskp.uni-bonn.de

http://www.fz-juelich.de/SharedDocs/Stellenangebote/_common/dipldok/d099-2013-ikp.html