Thesis Project Offer

Joint Research and Education Programme “Palestinian-German Science Bridge PGSB”
Forschungszentrum Jülich GmbH & Palestine Academy for Science and Technology

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**Thesis type**

- ☐ BSc
- ☐ MSc
- ☒ PhD

Intended starting date (approx.): flexible

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**Contact details of supervisor/responsible host at Forschungszentrum Jülich**

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<th>Title*</th>
<th>Degree First name*</th>
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<tr>
<td>Mr.</td>
<td>Degree Prof. Dr.</td>
<td>Hans</td>
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Phone*                              E-mail*

+49246161-4408                      h.stroeher@fz-juelich.de

**Function**

- Head of institute

Institute and homepage of institute*

IKP-2: Experimental Hadron Dynamics

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**University affiliation in Germany**

- University of Cologne

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**Co-Supervisor at Palestinian university (if applicable)**

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**Project description**

**Project for PhD thesis:**
Preparation for the Time Reversal Invariance experiment at COSY (TRIC)

TRIC is a complex precision experiment which requires coherent work of various systems available at several installations of COSY. Within this project the PhD candidate will be involved in the preparation of all the necessary equipment for the realization of the TRIC experiment and commissioning of the openable storage cell and horizontal holding field systems. In addition, he/she will be involved in the software development for the slow control of various installation and its integration into the common system for experiment status monitoring.

Introduction to TRIC project

The world around us consists of matter – only insignificant amounts of antimatter are observed in Nature. Why this is so constitutes a fundamental puzzle and the motivation for many ongoing projects to elucidate its cause. The Standard Model (SM) of elementary particles, although very successful in the description of Nature, postulates that in the initial moment matter and antimatter were produced in equal amounts. Thus, the SM, despite its general success, cannot explain our very existence in the Universe.
One possible explanation for the dominance of matter in the Universe would require a new source of violation of Time-reversal symmetry to be found in addition to effects already detected in systems of mesons and implemented in the SM. This project aims to improve the upper limit for T-symmetry violation by at least one order of magnitude. A genuine T-violating null observable will be studied by conducting a new precision experiment, using the COSY facility at Jülich as accelerator, storage ring, ideal zero-degree spectrometer, and detector. The total cross section for double-polarised proton-deuteron interactions will be extracted from the measurement of the lifetime of the coasting COSY beam using the new high precision beam current measurement system. An internal polarised deuterium gas target which consist of polarised Atomic Beam Source, storage cell and holding field system will be used for this experiment.

T-symmetry violation has never been observed in a system of baryons. The discovery of such an effect would give strong indications for physics beyond the Standard Model and help in providing an explanation for the predominance of matter in the Universe.

Date*  Signature*
11.07.2016

* required field

Prof. Dr. H. Ströher
Forschungszentrum Jülich GmbH
–Institut für Kernphysik–
Briefpost: 52425 Jülich
Fracht/Paketpost: 52428 Jülich