

Project offers / Expressions of Interest from Jülich

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

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Initial contacts at Palestinian university/universities (if available)

Salman M Salman Faculty of Science and Technology, Al-Quds University, Abu Dis, Jerusalem, Palestine

Thesis candidate(s) (if available)

yes

Project description*

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.

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Project for Master thesis:

Systematic study of a beam current sensors at the laboratory test stand
 (candidate: R. Al-Faqeh, AQU; co-supervisor: Salman M. Salman)

Precision of the test of Time Reversal Invariance at COSY (TRIC experiment) depend on the accuracy of the beam current measurement. To study parameters of the beam current sensors installed at COSY a test station where beam current is simulated using a conductive wire, has been built in the laboratory. Within this master project systematic studies of the beam current sensors response on various parameters of the simulated beam will be studied.

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 in to the common system for experiment status monitoring.

Analysis of the experimental data from the test of Time Reversal Invariance at COSY (TRIC)

Experimental data from the TRIC experiment will be collected using data acquisition system common for all the experiments at COSY which will readout all the systems used in the experiment. A dedicated ROOT based software package needs to be developed for the data analysis. Within this project he/she will be involved in the software development for the readout, online and offline analysis, as well as in the analysis of the experimental data from the TRIC experiment.

Date*	Signature*
11.07.2016	

* required field

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