HK 25: Instrumentation VI

Zeit: Dienstag 14:00–15:30 Raum: F 072

Gruppenbericht HK 25.1 Di 14:00 F 072

Status of the R3B experimental setup — •Dominic Rossi for the R3B-Collaboration — Technische Universität Darmstadt, Darmstadt, Germany — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

The versatile R^3B experimental setup has been designed for kinematically complete measurements of various types of nuclear reactions involving exotic secondary beams at relativistic energies. Currently located at GSI, the setup is in use at the existing facility while being completed with new or upgraded detector systems. Once the future FAIR facility is operational, the entire setup will be moved to a new location downstream of the Super-FRS, where it will take advantage of enhanced beam rates and energies.

The experimental setup and scope will be presented briefly, followed by the current status of the various detector subsystems, including for instance the superconducting dipole magnet GLAD, the neutron detector NeuLAND and the photon detector CALIFA.

This work is supported in part by the BMBF under contract number 05P15RDFN1 and by the GSI-TU Darmstadt cooperation agreement.

HK 25.2 Di 14:30 F 072

Upgrade und Inbetriebnahme des Lund-York-Cologne CAlorimeters

— •B. Fu[1], K. Wolf[1], P. Reiter[1], C. Goergen[1], S. Thiel[1], M.A. Bentley[2], S. Fox[2], D. Rudolph[3], P. Golubev[3], C. Lorenz[3], P. Coleman-Smith[4] und I. Lazarus[4] — [1]IKP, Universität zu Köln — [2]University of York — [3]Lund University — [4]Daresbury Laboratory

Nach dem erfolgreichen ersten Einsatz des Lund-York-Cologne CAlorimeters (LYCCA) während der NUSTAR-PreSPEC-Kampagne bei der GSI wurde ein Upgrade der Elektronik und des DAQ-Systems am Daresbury Laboratory durchgeführt. Hochintegrierte AIDA Front-End-Elektronik Module mit Application-Specific Integrated Circuits (ASICs) werden eingesetzt, um die Signale von mehr als tausend DSSSD-Kanälen zu verstärken, und zu verarbeiten. Das Multi-Instance-Data-Acquisition-System (MIDAS) ermöglicht Hardware-Einstellungen, Experiment-Kontrolle, Daten-Merging und Daten-Speicherung. Nach der Testphase in Daresbury wurde der LYCCA Detektor mit der neuen Elektronik am Tandembeschleuniger des IKP in Köln aufgebaut. Nach Messungen mit einer Tripel-Alpha-Quelle wurden In-beam-Experimente zur elastischen Streuung von schweren Ionen durchgeführt um die Spezifikationen des Detektors nach dem Upgrade zu überprüfen. Die erzielten Ergebnisse erlauben wichtige Rückschlüsse auf Energieauflösung und Effizienz des Kalorimeters bei niedrigen Energien für zukünftige NUSTAR-Experimente. Supported by the German BMBF (05P12PKFNE TP5) and GSI F&E KREITE 1416

HK 25.3 Di 14:45 F 072

Detector Response of the CALIFA Endcap — Roman Gernhäuser, •Benjamin Heiss, Philipp Klenze, Patrick Remmels, Felix Stark, and Max Winkel for the R3B-Collaboration — Technische Universität München

The 4π-calorimeter CALIFA is one of the major detectors of the R^3B-experiment at the upcoming Facility for Antiproton and Ion Research (FAIR) in Darmstadt. This calorimeter with 2464 CsI(Tl) crystals and 96 Phoswich detectors provides a high efficiency, good energy resolution of about 5 % at 662 keV γ energies and a large dynamic range, allowing a simultaneous measurement of γ rays at $E > 100$ keV and scattered protons up to $E < 700$ MeV. Especially in the forward section of CALIFA, the Endcap, the highest particle rates and energies paired with highly doppler shifted γ rays are expected. This talk will show a full simulation of the detector response in a (p,2p) reaction in direct kinematics at 500 MeV. A special focus is on the coincident measurement of light charged particles and γ rays. We will present results particle reconstruction efficiencies, background suppression, and energy resolution of the total reconstructed energy. Supported by BMBF Project 05P15WOFNA.

HK 25.4 Di 15:00 F 072

Characterisation of the CALIFA petal response to γ-rays up to 9 MeV — Han-Bum Rhee, •Alexander Ignatov, and Thorsten Kröll for the R3B-Collaboration — Institut für Kernphysik,TU Darmstadt, Germany

CALIFA is a calorimeter and spectrometer that aims to detect γ-rays and light charged particles. It is a part of the R3B experiment at GSI and the future FAIR facility. CALIFA is divided into a cylindrical barrel[1] and a forward end-cap[2]. The CALIFA barrel consist of CsI(Tl) scintillating crystals, which are individually read out with Avalanche Photodiodes(APDs). The functional units for the CALIFA demonstrator are called petals containing 64 crystals each. The petals are built using the same construction procedures, materials and elements as for CALIFA. In this contribution, we investigated the response of one CALIFA petal to high-energy γ-rays from an AmBe source and from the neutron capture process with the Ni target. The results are compared to the R3BRoot simulation, which is based on the FairRoot. This work is supported by German BMBF(05P12RDFN8,05P15DFN1), HIC for FAIR and GSI-TU Darmstadt cooperation contract.

[1] R3B Collaboration,Technical Design Report for the CALIFA Barrel, November 2011

[2] R3B Collaboration,Technical Design Report for the CALIFA Endcap, August 2015

HK 25.5 Di 15:15 F 072

NeuLAND: Simulating the venture into uncharted territory — •Jan Mayer[1], Konstanze Boretzky[2], Michael Heil[2], Dmytro Kresan[2], Simon G. Pickstone[1], Mark Spieker[1], and Andreas Zilges[1] for the R3B-Collaboration — [1]Institute for Nuclear Physics, University of Cologne — [2]GSI Gesellschaft für Schwerionenforschung GmbH, Darmstadt

Located at the existing RIB facility GSI Helmholtzzentrum für Schwerionenforschung in Darmstadt, the Facility for Antiproton and Ion Research (FAIR) is currently under construction. One major setup is the R^3B (Reactions with Relativistic Radioactive Beams) experiment, exploring the properties of exotic nuclei.

NeuLAND (new Large-Area Neutron Detector) is a next generation neutron detector, featuring both high detection efficiency and high resolution for fast neutrons. The full detector will be composed of 3000 scintillator bars, providing an active volume of almost 19 m^3.

Data analysis and simulations are both performed with R3BRoot, the FAIRRoot based data analysis software for R3B. Embracing object oriented concepts of `C++11`, I/O, physics business logic, and configuration can be separated into individual tasks and classes.

Simulations have been performed to predict the detector performance in different scenarios. Different neutron event reconstruction algorithms and comparisons with experiments performed at GSI and RIKEN (Japan) will be presented.

Supported by the BMBF (05P2015PKFNA). J.M. is supported by the Bonn-Cologne Graduate School of Physics and Astronomy.