HK 36: Structure and Dynamics of Nuclei 8

Time: Tuesday 17:00–19:00 Location: T/HS2

Group Report HK 36.1 Tue 17:00 T/HS2

Nucleon-nucleon scattering studies at small angles at COSY-ANKE — •Zara Bagdasarian for the ANKE-Collaboration — Forschungszentrum Jülich, Jülich, Germany — Tbilisi State University, Tbilisi, Georgia

The most accepted approach to describe nucleon-nucleon (NN) interaction is the partial wave analysis (PWA). The SAID database and analysis program comprise various experimental observables at different energies over the full angular range and express them in the partial waves. The goal of the experiments held at COSY-Jülich is to provide SAID with new valuable measurements. Scattering data was taken at small angles for six beam energies between 0.8 and 2.4 GeV with polarized proton beam incident on both proton and deuteron unpolarized targets using the ANKE spectrometer. First, the results of the proton-proton (pp) scattering analyzing power and cross section are presented. While pp data closes a very important gap at small angles in the database, proton-neutron (pn) data is a crucial contribution to the almost non-explored pn database above 800 MeV. Therefore, the talk will mainly concentrate on the proton-deuteron (pd) scattering studies, which includes the overview of the older COSY experiments with polarized deuteron beam, and the abovementioned new experiment with polarized proton beam and unpolarized deuteron target. The presentation will show the most recent results of the analyzing powers of pd elastic and pn scattering.

Group Report HK 36.2 Tue 17:30 T/HS2

Decay Spectroscopy with EURICA in the Region of ^{100}Sn — Thomas Faestermann, Roman Gernhäuser, •Daniel Lubos, and Konrad Steiger for the EURICA RIBF09-Collaboration — Technische Universität München, Germany

The most recent experiment on properties of nuclei in the region of ^{100}Sn has been performed at the radioisotope beam factory (RIBF) at the RIKEN Nishina Center. For the decay spectroscopy, we used the detector arrays EURICA and WASABI which consist of Ge- and LaBr- as well as Si-detectors, respectively. The experiment has revealed new nuclei along the N = Z - 2 line and an increase of statistics by a factor of ∼10 for N = Z - 1 nuclei and ^{100}Sn compared to previous experiments. The presentation gives an overview on the dedicated high efficiency setup and the experimental program. A status of the on-going analysis with regard to ^{100}Sn and selected results for several nuclei and isomers in this region will be discussed.

This project is supported by the DFG Cluster of Excellence: „Origin and Structure of the Universe“.

HK 36.3 Tue 18:00 T/HS2

Probing the O(6) character of ^{196}Pt with inelastic electron scattering — •Simela Aslanidou, Sergej Bassauer, Alexander Hufnagel, Christoph Kremer, Andreas Krugmann, Peter von Neumann-Cosel, Norbert Pietralla, and Maxim Singer — Institut für Kernphysik, Technische Universität Darmstadt

The Interacting-Boson-Model [1] provides an elegant tool to classify low-lying collective states in medium and heavy mass even-even nuclei. One of its dynamical symmetries is O(6) and a crucial test of this theory is to investigate the monopole transition to the band head of the K=0 , σ=N-2 band. A powerful tool to investigate monopole transitions is inelastic electron scattering. An experiment on ^{196}Pt -claimed to be a perfect O(6) nucleus [2]- has been performed at the superconducting electron linear accelerator S-DALINAC at Darmstadt using the high resolution LINTOTT spectrometer. The experiment and analysis results will be presented.

This work is supported by the DFG under contract SFB 634

[1] F. Iachello, Phys. Rev. Lett. **87**, 052502 (2001)
[2] J. Cizewski et al., Phys. Rev. Lett. **40**, 167 (1978)

HK 36.4 Tue 18:15 T/HS2

Study of ground and excited state decays in $N \approx Z$ Ag nuclei — •Kevin Moschner[1], Andrey Blazhev[1], Plamen Boutachkov[2], Paul Davies[3], Robert Wadsworth[3], and Nigel Warr[1] for the EURICA-RIBF83-Collaboration — [1]IKP, University of Cologne, Germany — [2]GSI Darmstadt, Germany — [3]University of York, UK

A decay spectroscopy experiment was performed within the EURICA campaign at RIKEN in 2012. It aimed at the isomer and particle spectroscopy of excited states and ground states in the mass region below the doubly magic ^{100}Sn.

Projectile fragmentation of a 345 MeV/u ^{124}Xe beam on a ^{9}Be target was used to create the nuclei of interest. The fragments were then separated and identified on an event-by-event basis in the BigRIPS spectrometer and transported to the EURICA array to perform decay spectroscopy after implantation in the active stopper SIMBA.

In ^{94}Ag a more precise value for the half-life of the ground state's superallowed Fermi transition was deduced. In addition the energy spectra of the mentioned decay could be reproduced through precise Geant4 simulations of the used active stopper SIMBA which enabled us to extract Q_β values from the measured data.

Additionally, newly determined half-life values of the $(37/2^+)$ and $(23/2^+)$ isomers in ^{95}Ag will be presented.

This work is supported by the German BMBF under contract Nos. 05P09PKCI5 and 05P12PKFNE.

HK 36.5 Tue 18:30 T/HS2

Isomerer β^+-Zerfall von protonenreichen Kernen in der Region um ^{100}Sn — •O. Müller[1], R. Gernhäuser[2], S. Ilieva[1], T. Kröll[1], R. Krücken[3], M. Lewitowicz[4] und S. Nishimura[5] für die EURICA RIBF09-Kollaboration — [1]IKP, TU Darmstadt, Germany — [2]E12, TU München, Germany — [3]TRIUMF, Canada — [4]GANIL, France — [5]RIKEN, Japan

Der radioaktive Kern ^{100}Sn ist von besonders großem Interesse für die Physik, denn er ist der schwerste gebundene “doppelt magische” N=Z Kern. Während für doppelt magische Kerne sehr große log(ft)-Werte erwartet werden, wurde für ^{100}Sn der kleinste, jemals gemessene log(ft)-Wert gefunden [1]. Am RIKEN wurde im Rahmen der EURICA-Kampagne RIBF09 der doppelt magische Kern ^{100}Sn und benachbarte Kerne der ^{100}Sn-Region untersucht. Im Rahmen dieses Experiments wurde ^{100}Sn in einer vorher noch nie zugänglichen Statistik (∼ 2000 Kerne) erzeugt. Die Nuklide wurden in den Teilchendetektor WAS3ABi implantiert und untersucht. Mit Hilfe des EURICA-Aufbaus konnte die Energie der γ-Quanten des Nuklids detektiert werden. Im Rahmen dieser Arbeit werden die Lebensdauern von isomeren Zuständen von Kernen in der Region von ^{100}Sn untersucht. Diese physikalischen Observablen helfen, theoretische Vorhersagen mit Hilfe des Schalenmodells zu verbessern und den r-Prozess näher zu untersuchen.

[1] *C. B. Hinke et al., Nature 486 (2012) 341*

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HK 36.6 Tue 18:45 T/HS2

Nuclear X-ray emission after fusion of heavy ions — •Christian Berner[1], Dennis Mücher[1], Roman Gernhäuser[1], Thomas Faestermann[1], Walter Henning[1,2], Kosuke Morita[3], Kouji Morimoto[3], and Daiya Kaji[3] — [1]Technische Universität München, Lehrstuhl E12 — [2]Argonne National Laboratory — [3]RIKEN, Research Group for Superheavy Elements

The goal is to establish in-beam K-X-ray spectroscopy as a sensitive tool to identify super heavy elements (SHEs) produced in fusion reactions via their proton number. SHEs, formed after cold or hot fusion, are usually identified via the alpha-decay products, which have to be connected to well-known elements. In case of hot fusion, the daughter nuclei quickly undergo spontaneous fission, so that the identification of the produced SHEs is difficult. Using the hot fusion approach in our first test experiments, the resultant products will be analysed by the gas-filled GARIS separator at the RILAC facility at RIKEN. As the X-ray detector is required to have superior energy and timing resolution to best identify the rare events at highest masses and to supress random coincidences as sufficient as possible, we chose a thin and planar geometry, which also reduces the damage caused by fast neutrons. We show first measurements using the MINIBALL Ge array at Munich. Additionally we report on our feasibility studies and on first tests using the new detector at high count rates together with a powerful DAQ system and transistor reset preamplifiers.

Supported by DFG Cluster of excellence: ”Origin and structure of the Universe”