HK 22: Structure and Dynamics of Nuclei III

Zeit: Dienstag 14:00–16:15 Raum: F 2

Gruppenbericht HK 22.1 Di 14:00 F 2

Decay Spectroscopy of ^{100}Sn and Neighboring Nuclei — •D. Lubos, R. Gernhäuser, and T. Faestermann for the EURICA RIBF09-Collaboration — Technische Universität München

The region around the heaviest known doubly magic N = Z nucleus ^{100}Sn is a unique playground to study nuclear structure as well as fundamental interactions and it is important towards the understanding of the rp-process in astrophysics. The Gamow-Teller transition of ^{100}Sn is predicted to decay dominantly into the lowest 1^+-state of ^{100}In such that this decay allows for an accurate determination of its transition strength. At the radioactive isotope beam factory (RIBF) of the RIKEN Nishina Center, an experiment has been performed in order to investigate the properties of nuclei in the region of ^{100}Sn. The highly segmented Si-detector array WAS3ABi and the high resolution gamma-spectrometer EURICA, employing HPGe- and LaBr-detectors, have been utilized for the decay spectroscopy. A brief overview of the detector setup and the Geant4-simulation will be given within this presentation. The N = Z - 2 nuclei ^{96}In, ^{94}Cd, ^{92}Ag and ^{90}Pd have been newly identified, half-lives were determined with unprecedented precision throughout the region and the experimentally determined $\mathcal{B}_{\rm GT}$-value of ^{100}Sn can challenge theoretical models for the first time. Furthermore, the ordering of the lowest energy levels, which is affected by the Wigner-energy, of the neighboring odd-odd N = Z nucleus ^{98}In and its decay channels will be discussed in detail. This project is supported by the DFG Cluster of Excellence: Origin and Structure of the Universe and the Hanns-Seidel-Stiftung.

HK 22.2 Di 14:30 F 2

Isomer spectroscopy with the EURICA gamma-ray setup — •Pär-Anders Söderström[1,2,3], Pieter Doornenbal[3], Giuseppe Lorusso[3,4], Shunji Nishimura[3], Jin Wu[3,5], and Zhengyu Xu[6,7] — [1]GSI, Darmstadt, Germany — [2]TU Darmstadt, Darmstadt, Germany — [3]RIKEN, Wako, Japan — [4]NPL, Teddington, UK — [5]Peking University, Beijing, China — [6]University of Tokyo, Tokyo, Japan — [7]KU Leuven, Leuven, Belgium

Isomer-decay spectroscopy is a sensitive probe of nuclear structure, and is often the only techniques capable of providing data for exotic nuclei that are produced with very low rates. The EURICA project (EUROBALL RIKEN Cluster Array) has been operating between 2012 and 2016 with the goal of performing spectroscopy of very exotic nuclei. Several experimental campaigns have been successfully completed. This contribution will highlight some results obtained within the EURICA project, with special emphasis on isomeric states.

HK 22.3 Di 14:45 F 2

First evidence for shape coexistence in neutron-rich krypton isotopes* — •Kevin Moschner, Andrey Blazhev, and Rosa-Belle Gerst for the SEASTAR-Collaboration — Institut für Kernphysik, Universität zu Köln

Low lying excited states of the nuclei ^{94}Kr and ^{96}Kr were studied after nucleon removal reactions at intermediate beam energies at the RIKEN Radioactive Isotope Beam Factory. Previously unknown γ transitions could be observed for both nuclei. The established level schemes confirm the already observed smooth onset of collectivity which is contrary to the findings in the zirconium and strontium isotopic chains [1]. Additionally, the spectroscopic data show evidence for low-lying 0_2^+ and 2_2^+ states in ^{96}Kr. This indication of shape coexistence in the neutron rich krypton isotopes is in agreement with IBM-2 calculations based on the self-consistent beyond-mean-field approach using the Gogny D1S interaction [2].

[1] M. Albers *et al.*, Phys. Rev. Lett. 108, 62701 (2012)
[2] K. Nomura, N. Shimizu, and T. Otsuka, Phys. Rev. C 81, 44307 (2010)
*Supported by the DFG under Grant No. BL 1513/1-1

HK 22.4 Di 15:00 F 2

Shape coexistence in ^{70}Kr — •Tugba Arici[1], Kathrin Wimmer[2], Wolfram Korten[3], Juergen Gerl[1], and Pieter Doornenbal[4] — [1]GSI Helmholtzzentrum fur Schwerionenforschung, Darmstadt, Germany — [2]Department of Physics, University of Tokyo, Japan — [3]CEA Saclay, IRFU, SphN, France — [4]RIKEN Nishina Center, Saitama, Japan

Nuclei in the vicinity of the N = Z line around A = 70 exhibit very rapid shape changes due to the isospin symmetry breaking related to charge effects. This leads to differences in excitation energy between analogue states in isobaric multiplets. In this study we probed Coulomb energy differences in the T_z = -1 nucleus ^{70}Kr with respect to its mirror ^{70}Se. In ^{70}Kr, no spectroscopic information is available so far. We have performed a Coulomb excitation experiment of ^{70}Kr and ^{72}Kr isotopes to measure the B(E2) value. The experiment was performed at the Radioactive Isotope Beam Factory (RIBF). A ^{78}Kr primary beam at 345 MeV/nucleon was impinging on a Be target. The BigRIPS fragment separator was used in order to deliver the ^{70}Kr and ^{72}Kr isotopes at around 150 MeV/nucleon to the secondary target for Coulomb excitation and inelastic scattering measurements. The emitted gamma-rays of the reaction were detected by the DALI2 array and recoils were identified by the ZeroDegree Spectrometer. Results will allow to make a direct comparison with the mirror nucleus ^{70}Se and will give important new information about shape coexistence across the N = Z line.

HK 22.5 Di 15:15 F 2

In-flight and decay spectroscopy of ^{95}Kr* — •Rosa-Belle Gerst, Kevin Moschner, and Andrey Blazhev — Institut für Kernphysik, Universität zu Köln

Excited states in ^{95}Kr have been measured at the RIBF at the RIKEN Nishina Center for Accelerator-Based Science via a prompt-delayed correlation analysis of conjoined SEASTAR and EURICA data. Even-even Sr and Zr nuclei in the A = 100 region show a sudden onset of deformation at N = 60 while the lighter isotopes up to N = 58 are rather spherical. For the even Kr isotopes it could be shown that this onset of collectivity is fairly smooth [1]. The nuclei with N = 59 neutrons lie just at the border of these phenomena and are therefore of particular interest. In a study of fission fragments at the ILL an isomeric $(7/2^+)$ state in ^{95}Kr could be identified [2]. The analysis of prompt gamma-radiation observed in DALI2 in coincidence with isomeric transitions identified in the EURICA array provides new information on the nuclear structure above the known isomeric state in ^{95}Kr.

[1] M. Albers *et al.*, Phys. Rev. Lett. 108, 62701 (2012)
[2] J. Genevey *et al.*, Phys. Rev. C 73, 37308 (2006)
*Supported by the DFG under Grant No. BL 1513/1-1

HK 22.6 Di 15:30 F 2

Signatures of triaxiality in low-spin spectra of ^{86}Ge — •Marc Lettmann[1], Norbert Pietralla[1], Volker Werner[1], Pieter Doornenbal[2], Alexandre Obertelli[3], Tomás R. Rodríguez[4], and Kamila Sieja[5] for the SEASTAR-Collaboration — [1]TU Darmstadt — [2]RIKEN — [3]CEA Saclay — [4]Universidad Autónoma de Madrid — [5]Chargé de recherches CNRS Institut Pluridisciplinaire Hubert Curien

Low-spin states of neutron-rich ^{84,86,88}Ge isotopes were measured via in-beam γ-ray spectroscopy after nucleon removal on hydrogen at intermediate energies. The exotic radioactive beams are provided by the RIKEN-RIBF. Based on the spectroscopic information first level schemes of ^{86,88}Ge are derived. The behavior of the 2_1^+, 4_1^+, 2_2^+ level energies and the $R_{4/2}$ ratio were obtained up to N = 56. The data are compared to state of the art shell model and beyond-mean-flied calculations. Triaxial deformation in ^{86}Ge is discussed on the grounds of experimental observations and theoretical predictions. Supported by the BMBF under grant No. 05P15RDFN1 and NuSTAR DA under grant No. 05P12RDFN8

HK 22.7 Di 15:45 F 2

Isomer γ-ray decay spectroscopy of ^{92,94}Se — •Cesar Lizarazo[1,4], Volker Werner[1], Norbert Pietralla[1], P.-A. Söderström[2], Pieter Doornenbal[2], Alexandre Obertelli[3], Cristina Nita[5], and EURICA Collaboration[2] for the SEASTAR-Collaboration — [1]TU Darmstadt, Darmstadt, Germany — [2]RIKEN Nishina Center, Wako-Shi, Japan — [3]CEA, Saclay, Saclay, France — [4]GSI, Darmstadt, Germany — [5]IFIN-HH, Bucharest, Romania

Isomer γ-ray decay of neutron rich $^{92-94}$Se was experimentally studied using the EURICA detector array. The exotic nuclei were produced via the in-flight fission technique at the RIBF-RIKEN facility. They were identified via Z and A/Q determination using the ZeroDegree spectrometer and implanted in the AIDA silicon stopper placed at the center of the EURICA HPGe detector array. New transitions on all the nuclei studied were detected, allowing to extend the corresponding level schemes. The isomeric state of ^{94}Se has been observed for the first time. The origin of the observed isomeric states is discussed and the experimental results are compared to up-to-date calculations. Supported by NuSTAR DA unter grant No. 05P12RDFN8.

HK 22.8 Di 16:00 F 2

Sub-Shell Closure and Shape Coexistence in the transitional ^{98}Zr — •W. Witt[1], V. Werner[1], M. Albers[2], M. P. Carpenter[2], R. V. F. Janssens[2], T. Lauritsen[2], G. Savard[2], D. Seweryniak[2], S. Zhu[2], D. Cline[3], A. B. Hayes[3], C.-Y. Wu[4], O. Möller[1], N. Pietralla[1], G. Rainovski[5], R. Stegmann[1], B. Bucher[4], H. David[2], J. Smith[2], A. D. Ayangeakaa[2], and C. Hoffman[2] — [1]IKP, TU Darmstadt, Deutschland — [2]ANL, Argonne, USA — [3]Univ. of Rochester, USA — [4]LLNL, Livermore, USA — [5]Univ. of Sofia, Bulgaria

Sub-shell closures are of special interest for nuclear structure studies. With Z = 40 Zr nuclei show a closed $\pi 2p_{1/2}$ sub-shell and allow for interesting insight into nucleon interactions in the Zr isotopic chain [1]. ^{98}Zr is subject to coexistence of nuclear shapes between the mostly spherically shaped ^{96}Zr and the strongly deformed ^{100}Zr. The degree of mixing between different configurations is unclear as experimental constraints for model predictions are barely available. To study low-lying transitions in ^{98}Zr a Coulomb excitation experiment was conducted at the ATLAS-facility at ANL making use of the GRETINA and CHICO2 arrays for γ- and particle-detection. This talk reports on the firstly determined B(E2; $2^+_1 \to 0^+_1$) value of ^{98}Zr and its interpretation.

Supported by the BMBF under the grant 05P15RDFN9 within the collaboration 05P15 NuSTAR R&D.

[1] C. Kremer et al., Phys. Rev. Lett. 117, 172503 (2016)