HK 58: Structure and Dynamics of Nuclei XI

Zeit: Donnerstag 16:30–18:15 Raum: S1/01 A03

Gruppenbericht HK 58.1 Do 16:30 S1/01 A03

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

At the radioisotope beam factory (RIBF) at the RIKEN Nishina Center, an experiment on properties of nuclei in the region of ^{100}Sn has been performed regarding the Gamow-Teller transition strength and the search for new isotopes as well as isomers. For decay spectroscopy, we used the detector arrays EURICA and WAS^{3}ABi 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 uncertainties of half-lives, close to the proton dripline southwest of ^{100}Sn, are significantly improved. The region around ^{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 presentation gives an overview of the dedicated high efficiency setup and the experimental program. Results of the Q_β-value analysis of ^{100}Sn using a Monte Carlo simulation, lifetime analysis and γ-spectroscopy of nuclei in this region as well as the nuclear structure are discussed. This project is supported by the DFG Cluster of Excellence: „Origin and Structure of the Universe“ and Hanns-Seidel-Stiftung.

HK 58.2 Do 17:00 S1/01 A03

Study of multiple isomeric states in ^{95}Ag via electron and gamma-ray spectroscopy — •Kevin Moschner[1], Andrey Blazhev[1], Plamen Boutachkov[2], Paul Davies[3], Magda Górska[2], Hubert Grawe[2], Robert Wadsworth[3], and Nigel Warr[1] — [1]Institut für Kernphysik - Universität zu Köln — [2]GSI Darmstadt — [3]Department of Physics, University of York

Recently, we studied isomeric decays of ^{95}Ag at the RIKEN Nishina Center using a fragmentation reaction of ^{124}Xe on a ^{9}Be target. The separated and identified reaction products were implanted in the modified SIMBA Silicon calorimeter, which was surrounded by the EURICA Germanium array, to measure the isomer and particle decays. The half-lives of all three isomeric states previously identified by Döring [Phys. Rev. C 68, 034306 (2003)] were measured from the analysis of the gamma-ray and conversion-electron (CE) data. Analysis of coincident gamma-rays and CE-gamma-ray data was used to verify the published level scheme. We have performed new shell-model calculations in a larger model space $pn(f_{5/2}, p_{3/2}, p_{1/2}, g_{9/2})$ using a modified interaction. These calculations provide an improved description of the isomers and the reduced transition rates extracted from the experimental half-lives. While for the isomeric states $(1/2^-)$ and $(23/2^+)$ the choice of E3 for the depopulating transitions is appropriate, the comparison of the shell-model to the experimental results is used as a basis to suggest a change of the spin and parity assignment of the high-spin isomer in with the former assignment of $(37/2^+)$.

HK 58.3 Do 17:15 S1/01 A03

B(E2) massurement of ^{112}Sn with NRF — •Marcel Schilling, Tobias Beck, Udo Gayer, Laura Mertes, Haridas Pai, Norbert Pietralla, Philipp C. Ries, Christopher Romig, Volker Werner, and Markus Zweidinger — Institut für Kernphysik, Technische Universität Darmstadt, 64289 Darmstadt, Deutschland

Significant differences in B(E2) values in the Sn isotopic chain exist in literature. Namely, the methods of Coulomb excitation and Doppler shift attenuation yield non-consistent B(E2) excitation strengths. Within this work, the method of nuclear resonance fluorescence (NRF) was used, in order to derive a new $B(E2; 2_1^+ \to 0_1^+)$ value for ^{112}Sn. The high precision experiment at the superconducting Darmstadt electron linear accelerator S-DALINAC yields a new value in a model-independent way. A sample of 4428.5 mg of highly enriched ^{112}Sn (99.995%) was irradiated with a bremsstrahlung photon beam at an endpoint energy of 2.5 MeV. Known level widths from the calibration standards ^{27}Al and ^{59}Co were used for photon-flux calibration. The extended target and the finite opening angles were taken into account. First results of the measurements and the evaluation will be presented and discussed.

HK 58.4 Do 17:30 S1/01 A03

Lifetime measurement in neutron-rich A $\sim$ 100 nuclei — •Saba Ansari, Jan Jolie, Jean-Marc Régis, Nima Saed-Samii, and Nigel Warr for the EXILL-FATIMA-Collaboration — Institute for Nuclear Physics, University of Cologne, Cologne, Germany

Rapid shape changes are observed in the region of neutron rich nuclei with a mass around A=100. Precise lifetime measurements are a key ingredient in the systematic study of the evolution of nuclear deformation and the degree of collectivity in this region. Nuclear lifetimes of excited states can be obtained using the fast-timing technique with $LaBr_3$(Ce)-scintillators.

We used neutron induced fission of ^{241}Pu in order to study lifetimes of excited states of fission fragments in the A $\sim$ 100 region. The EXILL-FATIMA array located at the PF1B cold neutron beam line at the Institut Laue-Langevin comprises of 8 BGO-shielded EXOGAM clover detectors and 16 very fast $LaBr_3$(Ce)-scintillator detectors, which were installed around the fission target. We have studied the lifetimes of low lying states for the nuclei ^{98}Zr, ^{100}Zr and ^{102}Zr by applying the generalized centroid difference method. In this contribution we will report on the used fast-timing setup and present preliminary results for the studied isotopes.

HK 58.5 Do 17:45 S1/01 A03

High resolution electron scattering off ^{96}Zr — •Christoph Kremer, Simela Aslanidou, Sergej Bassauer, Andreas Krugmann, Norbert Pietralla, Vladimir Ponomarev, Maxim Singer, Gerhart Steinhilber, Peter von Neumann-Cosel, and Markus Zweidinger — Institut für Kernphysik TU Darmstadt

The mass region $A \approx 100$ displays several intriguing nuclear structure phenomena. Of particular interest is the nucleus ^{96}Zr which exhibits features of a subdouble shell closure at $Z = 40$ and $N = 56$. Its strong octupole correlations lead to a large electric octupole transition strength $[B(E3; 3_1^+ \to 0_1^+) = 57(4)\ W.u.]$. Even though ^{96}Zr is a good testing ground for theoretical investigations [1] some basic low-energy observables are known with insufficient precision. Especially the transition strenghts of low-lying 2^+ states, that are important signatures for nuclear structure, have large uncertainties. Electron scattering at low momentum transfer is capable of obtaining these $B(E2)$ values with high precision [2]. A ^{96}Zr(e,e') experiment has been performed at the superconducting electron linear accelerator S-DALINAC at Darmstadt using the high-resolution LINTOTT spectrometer. The $B(E2; 2_2^+ \to 0_1^+)$ value has been directly measured for the first time. An interpretation in terms of type II shell evolution [3] is discussed.

[1] K. Sieja *et al.*, Phys. Rev. C **79**, 064310 (2009)
[2] A. Scheikh Obeid *et al.*, Phys. Rev. C **87**, 014337 (2013), Phys. Rev. C **89**, 037301 (2014)
[3] Y. Tsunoda *et al.*, Phys. Rev. C **89**, 031301(R) (2014)
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HK 58.6 Do 18:00 S1/01 A03

First application of the *Spectral Difference Method* for lifetime measurements of *Doppler* attenuated line shapes — Hannah Duckwitz[1] and •Pavel Petkov[2] — [1]Institut für Kernphysik, Zülpicher Str. 77, 50937 Köln — [2]Bulgarian Academy of Sciences, Institute for Nuclear Research and Nuclear Energy, 1784 Sofia, Bulgaria

In this new approach to lifetime measurements via *Doppler* attenuated line shapes, the spectra of a feeding f and a deexciting transition d of the level of interest are used to determine the lifetime without any lineshape analysis of the feeding transition (direct or indirect). Similarly to the DDC method, the decay function $\lambda_d n_d(t)$ of the deexciting transition is determined.

The feeding of the level is included via the spectral difference of the two successive decays. Consequently, the determined lifetime is the real lifetime. After transforming both transitions into the same energy region, their spectral difference $D(v_\theta) = S_d(v_\theta) - S_f(v_\theta) = \int_0^\infty \frac{\partial P_\theta(t,v_\theta)}{\partial t} n_d(t)dt$, is solved for $n_d(t)$. Dividing $n_d(t)$ by the decay function $\lambda_d n_d(t)$ should yield a constant τ value for the level lifetime as a function of the time t.

After the development and test of the procedure in 2015 [1], it is now applied for the first time. Two level lifetimes are determined in ^{86}Sr for the 2_2^+ and the 2_3^+ levels.

[1] P. Petkov *et al.*, NIM A 783 (2015), 6-11