HK 18: Kernphysik / Spektroskopie

Zeit: Dienstag 17:00–19:00 Raum: D

HK 18.1 Di 17:00 D

Studies of the (^{3}He,t) reaction on ^{32}S and ^{48}Ca. — •J. H. Thies, H. Dohmann, E.-W. Grewe, and D. Frekers — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, 48149 Münster

We have performed a ^{32}S(^{3}He,t) experiment to probe the GT$^-$ distribution in ^{32}Cl. The measurement was performed at RCNP in Osaka (Japan) using the 420 MeV ^{3}He-beam and the high resolution WS Course beam line. An energy resolution of 70 keV was achieved. The character of the transition was identified by means of its angular distribution up to θ_{lab}=2.5^o. The (^{3}He,t) reaction is an alternative to the (p,n) reaction and therefore should give identical results. The ^{48}Ca(^{3}He,t)^{48}Sc was earlier performed at RCNP in 2005.

The extracted GT$^-$ distribution in ^{32}Cl and ^{48}Ti were then compared to (p,n) measurements, performed by Anderson *et al.* at IUCF in 1985. The extracted GT$^-$ strength shows, that both reactions give identical results near q = 0.

HK 18.2 Di 17:15 D

The 10$^+$ Isomer in ^{54}Ni: Proton Emission and $A = 54$ Mirror Symmetry — •Robert Hoischen[1,2] and Dirk Rudolph[1] for the RISING-Collaboration — [1]Department of Physics, Lund University, S-221100 Lund, Sweden — [2]Gesellschaft für Schwerionenforschung mbH, D-64291 Darmstadt, Germany

Within the first RISING Stopped-Beam Campaign, exotic nuclei were produced using relativistic projectile fragmentation of a 550 MeV/u beam of ^{58}Ni provided by the SIS synchrotron at GSI. The fragments were separated and identified event-by-event using the FRagment Separator (FRS), and their decay was observed by the high-efficiency, high-granularity RISING γ-ray spectrometer in a compact configuration.

Time-correlated γ decays from individually identified nuclear species have been measured, allowing a clean identification of isomeric decays in a range of exotic nuclei along the proton drip-line. The presentation concentrates on the study of isospin symmetry in the $T_z = \pm 1$ system $^{54}_{28}Ni_{26} - ^{54}_{26}Fe_{28}$. This includes the first observation of isomeric proton radioactivity produced in fragmentation reactions, which competes with γ-ray emission from the newly established 10$^+$ isomeric state in ^{54}Ni. This state represents the mirror state to a well-known 10$^+$ isomer in ^{54}Fe. The impact of these results is discussed based on large-scale shell-model calculations.

HK 18.3 Di 17:30 D

New spin assignments in the N=Z nucleus ^{42}Sc from angular correlation measurements — •Clemens Scholl[1], Pavel Petkov[1,2], Volker Werner[1,3], Andreas Linnemann[1], Christoph Fransen[1], Tatsuya Adachi[4], Peter von Brentano[1], Alfred Dewald[1], Andreas Fitzler[1], Yoshitaka Fujita[4], Dennis Mücher[1], Jan Jolie[1], Alexander Lisetskiy[5,7], Karlheinz Langanke[5], Gabriel Martinez Pinedo[5], Nico Orce[6], Norbert Pietralla[1], Nigel Warr[1], and Karl-Oskar Zell[1] — [1]IKP Universität Köln, Germany — [2]Bulgarian Academy of Sciences, Sofia, Bulgaria — [3]WNSL, Yale University, New Haven CT, USA — [4]Physics Department, Osaka University, Japan — [5]GSI GmbH, Darmstadt, Germany — [6]Physics Department, University of Kentucky, Lexington KY, USA — [7]Physics Department, University of Arizona, Tucson AZ, USA

Using the ^{40}Ca(^{3}He,p) reaction at $E_{^3He}$ = 9 MeV and the multidetector array HORUS, angular correlations of coincident γ transitions in ^{42}Sc were measured at the FN tandem Van de Graaf accelerator at Cologne University. Nine new spins could be assigned and a series of new multipole mixing ratios determined. In particular, spin and parity of the 5$^+$ and 7$^+$ levels belonging to the lowest T=0 $f^2_{7/2}$ multiplet have been determined. Thus all T=1 states up to an excitation energy of 3.2 MeV now have known spins as well as the lowest T=0 quadruplet and many other T=0 states of unknown structure. The comparison with shell model calculations reveals that a breaking of the ^{40}Ca core has to be invoked in order to describe the level structure of ^{42}Sc.

HK 18.4 Di 17:45 D

Neutron transfer reactions in Fe Isotopes* — •Mahmoud Mahgoub[1], Andreas Bergmaier[1], Dorel Bucurescu[3], Thomas Faestermann[1], Roman Gernhäuser[1], Ralf Hertenberger[2], Thorsten Kröll[1], Reiner Krücken[1], Alexander Lisetskiy[4], and Hans Wirth[1] — [1]Physik-Department, TU -München — [2]Sektion Physik, LMU München — [3]NIPNE, Bucharest, Romania — [4]GSI

We report on new results from the reaction ^{54}Fe(d,p)^{55}Fe using the Munich Q3D spectrograph. 13 new states have been observed, for 10 states spin values could be established for the first time and spectroscopic factors were determined for 51 states. The results are compared with large scale shell-model calculations using up to 6 particle-hole excitation of the ^{56}Ni core. Consequences for the N = 28 shell stability will be discussed.

In a second experiment the same reaction was performed in inverse kinematics at a beam energy of 2.5 MeV/u. the aim of the experiment was to compare spectroscopic factors obtained in such an experiment with those from normal kinematics experiments. This is relevant in order to establish the reliability of spectroscopic factors in transfer reactions using radioactive ion beams.

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HK 18.5 Di 18:00 D

Messung der Spallationsreaktion ^{56}Fe + p in inverser Kinematik — •Michael Böhmer — TU München, Physik Department E12, James-Franck-Strasse 1, 85748 Garching

Im Rahmen des Spaladin-Experiments wurde die Spallationsreaktion ^{56}Fe + p in inverser Kinematik in Hinblick auf die vollständige Identifikation der schweren Fragmente untersucht.

Bei der Durchführung des Experiments an der GSI in Darmstadt wurde ein ringabbildender Čerenkov-Zähler zur Geschwindigkeitsmessung eingesetzt. Zur Integration in die Datenaufnahme wurde eine neue schnelle Auslese-Elektronik entwickelt und im Experiment erfolgreich eingesetzt. Die Impulsmessung erfolgte über das ALADiN-Spektrometer.

Es wurden in einer Spektrometereinstellung massenaufgelöst Wirkungsquerschnitte und Geschwindigkeitsverteilungen für über 100 Isotope gleichzeitig gemessen. Ein Vergleich der Ergebnisse mit empirischen Modellen und anderen Experimenten wurde durchgeführt. Weitere Analysen der Daten erlauben einen detaillierten Einblick in die Reaktionsmechanismen der Spallation.

HK 18.6 Di 18:15 D

Nuclear moments and isotope shifts of neutron-rich $^{64,66-70}$Cu studied with collinear laserspectroscopy — K. Flanagan[1], •M. Kowalska[2], K. Blaum[2,3], B. Cheal[4], D. Forest[4], Ch. Geppert[3,5], P. Lievens[6], R. Neugart[2], G. Neyens[1], W. Noertershaeuser[3,5], and D. Yordanov[1] — [1]Instituut voor Kernen Stralingsfysica, K.U. Leuven, Belgium — [2]Institut für Physik, Universität Mainz, Germany — [3]GSI, Darmstadt, Germany — [4]Schuster Laboratory, University of Manchester, UK — [5]Institut für Kernchemie, Universität Mainz, Germany — [6]Laboratorium voor Vaste-Stoffysica en Magnetisme, K.U. Leuven, Belgium

Among other observables, ground state properties of nuclei, such as spins/parities, nuclear moments and charge radii, contribute widely to our understanding of the nuclear structure, particularly in the context of shell closures and magic numbers, also far from stability.

In 2006 we started an experimental programme on neutron-rich Cu isotopes, where single-particle level migration and magicity of $N = 50$ are of high interest. In the first part, we investigated isotopes closer to stability, i.e. ^{64,66,67,68g,68m,69,70g}Cu, whose hyperfine structure was recorded with our collinear laser spectroscopy setup located at ISOLDE/CERN. Based on this we could confirm, and in some cases improve, the values and signs of their magnetic moments, as well as determine for the first time their quadrupole moments and changes in their mean square charge radii. In the talk we will present the physics motivation, the experimental technique, the results and their interpretation.

HK 18.7 Di 18:30 D

Spin- and Parity-Resolved Level Densities from High-Resolution Hadron and Electron Scattering Studies of Giant Resonances* — •Yaroslav Kalmykov[1], Karlheinz Langanke[2,1], Patricio Leboeuf[3], Gabriel Martínez-Pinedo[2], Peter von Neumann-Cosel[1], Iryna Poltoratska[1], Vladimir Ponomarev[1], Achim Richter[1], and Jochen Wambach[1] — [1]Institut für Kernphysik, Technische Universität Darmstadt, 64289 Darmstadt, Ger-

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Modern experiments allow to unravel the fine structure of giant resonances even in heavy nuclei. High energy resolution along with excellent selectivity achieved by a proper choice of the kinematics give a possibility to extract spin- and parity-separated level densities by means of an autocorrelation analysis. A novel method [1] using the discrete wavelet transform provides a nearly model-independent determination of the non-resonant background which is crucial for the applicability of this technique. Results for 1^+ states in ^{58}Cu and ^{90}Nb, 2^- and 2^+ states in ^{58}Ni and ^{90}Zr as well as 2^+ states in a broad range of nuclei are presented in comparison with the predictions of state-of-the-art theoretical models applied in astrophysical network calculations. An emphasis is placed on a possible parity dependence and shell effects in nuclear level densities.

[1] Y. Kalmykov et al., Phys. Rev. Lett. **96**, 012502 (2006).

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HK 18.8 Di 18:45 D

Termschemata quadrupol-oktupol-deformierter (ug)-Kerne mit Paritätsaufspaltung — •Michael Strecker[1] und Nikolay Minkov[2] — [1]Institut für Theoretische Physik der Justus-Liebig-Universität, Heinrich-Buff-Ring 16, D-35392 Giessen, Germany — [2]Institute of Nuclear Research and Nuclear Energy, 72 Tzarigrad Road, 1784 Sofia, Bulgaria

Ein kollektiver Hamiltonoperator für axiale quadrupol- und oktupoldeformierte Kerngestalten wird benutzt, um die Spektren von Aktiniden-(ug)-Kernen zu beschreiben. Diese Kerne zeigen charakteristische Paritätsaufspaltungen der Banden. Der Hamiltonoperator verfügt über einen Coriolisterm, der die Kopplung des ungepaarten Nukleons mit dem (gg)-Kern vermittelt. Mit einem analytischen Ausdruck für die Energien, der von Fitparametern abhängt, werden die Spektren der ungeraden Isotope von Aktiniden-Kernen beschrieben. Auch lassen sich experimentelle elektromagnetische Übergangswahrscheinlichkeiten reproduzieren.

Es wird eben untersucht, ob sich das Modell durch die explizite Berücksichtigung von Einteilchen-Zuständen im Rahmen eines Woods-Saxon-Potentials optimieren lässt.