HK 45: Structure and Dynamics of Nuclei 9

Time: Wednesday 14:30–16:30 Location: T/HS2

Group Report HK 45.1 Wed 14:30 T/HS2

Low electric dipole response in ^{120}Sn — •Anna Maria Krumbholz[1], Peter von Neumann-Cosel[1], Atsushi Tamii[2], Vladimir Yu. Ponomarev[1], and Michael Mathy[1] for the EPPS0-Collaboration — [1]Institut für Kernphysik, TU Darmstadt — [2]Research Center for Nuclear Physics, University Osaka

A consistent and powerful method to measure electric and magnetic dipole modes over a broad excitation energy range including energies below and above the neutron separation energy is polarized proton scattering at small scattering angles including 0° [1]. Measurements of the ^{120}Sn($\vec{p}$,$\vec{p}'$) reaction have been performed at RCNP with a beam energy of 295 MeV and an energy resolution of about 25 keV. For the separation of electric and magnetic contributions two different independent methods are applied: a multipole decomposition of the angular distributions and the analysis of the polarization transfer. In the energy region between 5.5 and 6.5 MeV the extracted E1 strength is comparable to results of the (γ,γ') reaction [2]. Between 7 MeV and 9 MeV significant previously unknown E1 strength is found. The low energy E1 strength distribution shows a resonance-like structure peaking at 8.2 MeV. A comparison with B(E1) strength distributions from various microscopic models is shown. The electric dipole polarizability was determined from the data: It represents an important test of the poorly contrained isovector strength of modern mean field models.

[1] A. Tamii et al., Phys. Rev. Lett. 107, 062502 (2011).
[2] B. Özel-Tashenov et al., Phys. Rev. C 90 024304.
*Supported by DFG under contracts SFB 634 and NE 679/3-1.

Group Report HK 45.2 Wed 15:00 T/HS2

Axial asymmetry of excited heavy nuclei as essential feature for the prediction of compound nuclear cross sections and decay rates — •Eckart Grosse[1], Arnd R. Junghans[2], and Ralph Massarczyk[2,3] — [1]IKTP, Technische Universität Dresden — [2]ISP, Helmholtz-Zentrum Dresden-Rossendorf — [3]LANL, New Mexico, USA

Nuclear level densities ρ(Ex,J) are a very important input for the prediction of compound nuclear cross sections and decay rates. Different experimental data enter and theory based parameterizations are needed. Fermi energy and pairing gap fix the level density parameter â and the pair condensation energy, but in finite nuclei the energy backshift changes with surface and shell effects controlled by comparing mass formulae to data. A (surprisingly small) surface term added to â is used as the only free global fit parameter and, using a CTM at low Ex, we describe well neutron capture resonance spacings as observed for 146 even-even target nuclei with 51<A<253. This modelling of collectively enhanced level density avoids any ad hoc assumption about an axial symmetry of excited nuclei.

A combination of the photon strength from the global description of IVGDR shapes and their tails by the sum of three Lorentzians (TLO), summed up to obey the TRK sum rule, to the new parameterization for ρ(Ex,J) compares well to cross section data for radiative neutron capture - including Maxwellian averages. Photon scattering and other experiments show that additional minor dipole strength exists; it weakly increases capture cross sections.

HK 45.3 Wed 15:30 T/HS2

dipole response of ^{156}Gd below 7.1 MeV — •Esra Aciksoz[1,2], Tobias Beck[3], Jacob Beller[3], Udo Gayer[3], Laura Mertes[3], Haridas Pai[3], Norbert Pietralla[3], Philipp Ries[3], christopher Roming[3], Volker Werner[3], and Markus Zweidinger[3] — [1]Akdeniz University, Department of Physics, 07058 Antalya, Turkey — [2]Nuclear Science Application and Research Center, Akdeniz University, 07058 Antalya, Turkey — [3]Institut für Kernphysik, Technische Universität Darmstadt, 64289 Darmstadt

The $J^\pi = 1^+$ scissor mode was first observed in ^{156}Gd in high-resolution electron scattering experiments in 1984 and shortly after confirmed in Nuclear Resonance Fluorescence (NRF) experiments. An experiment was performed at the superconducting Darmstadt linear electron accelerator (S-DALINAC) using the NRF technique to study dipole-excitations of ^{156}Gd up to ~ 7 MeV. A monoenergetic electron beam of 7.1 Mev was used for the production of bremsstrahlung which allows for the investigation of dipole excitations of ^{156}Gd in the sensitive energy range from $\sim 3-7$ MeV. First results of the^{156}Gd $(\gamma,\gamma^{'})$ experiment will be presented and discussed.

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HK 45.4 Wed 15:45 T/HS2

Origin of low-lying enhanced $E1$ strength in rare-earth nuclei — •Mark Spieker[1], Sorin Pascu[1,2], and Andreas Zilges[1] — [1]Institute for Nuclear Physics, University of Cologne, Germany — [2]Horia Hulubei National Institute of Physics and Nuclear Engineering, Bucharest, Romania

Candidates for excited α-cluster states have been identified in many light nuclei being organized in rather simple quasimolecular configurations [1]. For heavier nuclei the existence of these states remains an open question, though different experimental observables have been discussed as possible signatures. The electric dipole response of atomic nuclei is intimately connected to the breaking of isospin symmetry in simplified macroscopic nuclear models. Here, an α cluster could oscillate against the remaining core, which would generate a dynamic electric dipole moment in the nucleus [2]. To study this possibility, we have adopted the *spdf* interacting boson model for the description of the $E1$ response below 4 MeV in the neodymium isotopes. In this contribution, we will show that the model successfully reproduces the main features of the $E1$ response and, thus, might establish α clusters as an important ingredient to describe the $E1$ strength distribution in heavier nuclei. Supported by the DFG (ZI-510/4-2).

[1] W. von Oertzen *et al.*, Phys. Rep. **432** (2006) 43
[2] F. Iachello, Phys. Lett. B **160** (1985) 1

HK 45.5 Wed 16:00 T/HS2

Deformation of ground and beta-bands: search for the $2^+_\beta \to 0^+_\beta$ decay in ^{158}Gd — •J. Stamm[1], V. Werner[1], M. Thürauf[1], N. Pietralla[1], C. Bernads[2], A. Blanc[3], R.B. Cakirli[7], R.F. Casten[2], N. Cooper[2], G. de France[8], M. Jentschel[3], J. Jolie[6], U. Köster[3], P. Mutti[3], R.B. Régis[6], M Scheck[5], G. Simpson[5], W. Urban[4], and D. Wilmsen[6] — [1]TU Darmstadt — [2]Yale University — [3]Institut Laue-Langevin — [4]University of Warsaw — [5]University of West Scotland — [6]Universität zu Köln — [7]University of Istanbul — [8]Grand Accélérateur National d'Ions Lourds

A crossing of the deformations of the ground state and the band head of the K=0 (β) band had been observed in the Gadolinium isotopic chain at N=90, where a phase transition from spherical to deformed shapes occurs. As a consequence past N=90 the first excited 0^+ state has a smaller β-deformation than the ground state. However, it has been predicted that the deformations of both states should become similar in the deformed limit. To test this prediction in ^{158}Gd, we performed an experiment within the EXILL (n, γ) campaign at the Institut Laue-Langevin in Grenoble. Excited states in ^{158}Gd were populated after neutron capture, and we searched for the 64 keV $2^+_3 \to 0^+_2$ γ-decay within the K=0 band. A weak signal of the transition of interest has been identified in the $\gamma\gamma$ coincidence matrix, which allows to constrain the shape of the 0^+_2 state.

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HK 45.6 Wed 16:15 T/HS2

Identification of the $\pi p_{3/2} \to \pi p_{1/2}$ spin-flip transition in ^{85}Br at PreSPEC-AGATA — •Christian Stahl[1], Michael Reese[1], Georgi Rainovski[2], and Norbert Pietralla[1] for the PreSPEC-Collaboration — [1]Institut für Kernphysik, Technische Universität Darmstadt — [2]Faculty of Physics, St. Kliment Ohridski University of Sofia, Bulgaria

We present an experiment performed at GSI's PreSPEC-AGATA setup aiming at the identification of the $\pi p_{3/2} \to \pi p_{1/2}$ spin-flip transition in radioactive ^{85}Br. A novel experimental technique was employed for the determination of the absolute B(M1) transition strength between the $\pi p_{3/2}$-dominated ground-state and its spin-orbit partner candidate at 1191 keV excitation energy. The technique is based on the comparison of E2 and M1 Coulomb-excitation cross sections at different beam energies by exploiting AGATA's superb position resolution and the fast beams from GSI's heavy ion synchrotron. This work was supported by the BMBF under grant No. 06P12RDFN8, the german-bulgarian exchange program under grants No. PPP 50751591 and DNTS/01/2/2011 and by HIC for FAIR.