HK 82: Nuclear Structure and Dynamics I

Time: Friday 11:00–12:45 Location: H-ZO 40

Group Report HK 82.1 Fr 11:00 H-ZO 40

Systematics of electric dipole strength in the stable even-mass Mo isotopes — •R. Schwengner[1], G. Rusev[1,2], F. Doenau[1], S. Frauendorf[1,3], S.Q. Zhang[1,4], R. Beyer[1], M. Erhard[1], E. Grosse[1], A.R. Junghans[1], K. Kosev[1], C. Nair[1], K.D. Schilling[1], and A. Wagner[1] — [1]Forschungszentrum Dresden-Rossendorf, 01314 Dresden — [2]Duke University, Durham, NC 27708, USA — [3]University of Notre Dame, IN 46556, USA — [4]Beijing University, Beijing 100871, China

Photoabsorption cross sections σ_γ up to the neutron-separation energy S_n were measured for the stable even-mass isotopes $^{92-100}$Mo in photon-scattering experiments at the ELBE accelerator. As a consequence of the high level density at excitation energies close to S_n a huge number of resolved transitions and in addition an even greater intensity portion in an unresolved continuum have been observed. Simulations of γ-ray cascades were performed to estimate the intensity distribution of inelastic transitions to low-lying levels and, hence, to deduce intensities and branching ratios of the ground-state transitions needed for the determination of σ_γ. The combination of the present data with (γ, n) data allows us to obtain σ_γ in the energy range from about 4 MeV up to the giant dipole resonance.

The experimental cross sections are compared with predictions of a new approach called Instantaneous Shape Sampling that calculates dipole strengths by means of QRPA for instantaneous shapes of the nucleus with probabilities obtained from IBA. The calculated σ_γ reproduce very well the experimental values around S_n.

HK 82.2 Fr 11:30 H-ZO 40

Decay of isoscalar giant resonances* — •Felix Siebenhühner[1], P. Butler[2], P. Dendooven[3], J. Endres[4], M.N. Harakeh[3], S. Harissopulos[5], J. Hasper[4], R.-D. Herzberg[2], R. Krücken[6], A. Lagoyannis[5], N. Pietralla[1], L. Popescu[7], D. Savran[1], M. Scheck[2], K. Sonnabend[1], V. Stoica[3], H.J. Wörtche[3], and A. Zilges[4] — [1]Institut für Kernphysik, TU Darmstadt — [2]Department of Physics, University of Liverpool, UK — [3]Kernfysisch Versneller Instituut, Rijksuniversiteit Groningen, Netherlands — [4]Institut für Kernphysik, Universität zu Köln, Germany — [5]I.N.P. NCSR Demokritos, Athens, Greece — [6]Physik-Department E12, TU München, Germany — [7]SCK-CEN, Mol, Belgium

At the KVI in Groningen, NL, several $\alpha - \gamma$ coincidence experiments [1] were performed. In these experiments the decay of the excited nucleus can be studied in great detail, using HPGe detectors for high resolution gamma spectroscopy. At excitation energies above the neutron separation threshold in the region of isoscalar giant resonances the degree of population of excited states in the daughter nucleus after particle emission can be studied as a function of the excitation energy. Preliminary results from the analysis of the experiments on ^{124}Sn and ^{140}Ce are presented and discussed. A strong dependance of the population of excited states on the excitation energy is observed.

*Supported by DFG under contract SFB 634 and by the EU under EURONS Contract no. RII3-CT-2005-506065

[1] D.Savran *et al.*: Nucl. Instr. Meth. Phys. Res. A564(2006) 267

HK 82.3 Fr 11:45 H-ZO 40

Dipole strengths in $^{235}U(\gamma,\gamma')$ - reaction up to 3.5 MeV * — •Olena Yevetska, Joachim Enders, Matthias Fritzsche, Peter von Neumann-Cosel, Norbert Pietralla, Achim Richter, Christopher Romig, Deniz Savran, and Kerstin Sonnabend — Institut für Kernphysik, Technische Universität Darmstadt, Germany

The $^{235}U(\gamma,\gamma')$ reaction was studied at 3.5 MeV endpoint energy of the incident bremsstrahlung spectrum at the superconducting Darmstadt electron linear accelerator S-DALINAC in November 2008. The aim of this experiment was to extend the data from recent experiment with endpoint energy 2.2 MeV [1] and search for the magnetic dipole scissors-mode in an odd-mass actinide.

First results will be presented.

[1] W. Bertozzi et al., Phys. Rev. **C85** (2008) 041601(R).

*Supported by the DFG through SFB 634.

HK 82.4 Fr 12:00 H-ZO 40

Investigation of the Pygmy Dipole Resonance in ^{60}Ni* — •Matthias Fritzsche[1], Norbert Pietralla[1], Christopher Romig[1], Gencho Rusev[2], Deniz Savran[1], Kerstin Sonnabend[1], Anton P. Tonchev[2], Werner Tornow[2], Henry R. Weller[2], and Andreas Zilges[3] — [1]Institut für Kernphysik, Technische Universität Darmstadt, Germany — [2]Triangle Universities Nuclear Laboratory, Duke University, Durham, NC, USA — [3]Institut für Kernphysik, Universität zu Köln, Germany

At the High Intensity Photon Setup (HIPS) at S-DALINAC in Darmstadt ^{60}Ni was investigated with unpolarized bremsstrahlung with energies up to 8.0 MeV and 9.9 MeV, respectively. Determination of spin and parity quantum numbers and absolute transition strengths was possible, using HPGe detectors placed under different angles. To assign also parity quantum numbers, the polarized photon beam of the High Intensity Gamma Source (HIγS) at Duke University was used. With the combined results, evidence of the Pygmy Dipole Resonance in ^{60}Ni was found.

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HK 82.5 Fr 12:15 H-ZO 40

Nuclear Resonance Fluorescence of ^{203,205}Tl — •Fabian Pfeifer[1], Mathias Fritzsche[1], Norbert Pietralla[1], Gencho Rusev[2], Deniz Savran[1], Anton P. Tonchev[2], Werner Tornow[2], Henry Weller[1], Andreas Zilges[3], and Markus Zweidinger[1] — [1]Institut für Kernphysik, Technische Universität Darmstadt, Germany — [2]Triangle Universities Nuclear Laboratory, Duke University Durham, USA — [3]Institut für Kernphysik, Universität zu Köln, Germany

In order to investigate the dipole strength distribution in Thalium isotopes we have studied Nuclear Resonance Fluorescence of a sample composed of natural Thalium (consisting of 30% ^{203}Tl and 70% ^{205}Tl). Unpolarized bremsstrahlung with photo energies up to 7.5 MeV was used at the High Intensity Photon Setup (HIPS) at S-DALINAC at the IKP Darmstadt. 24 fluorescent γ-ray transitions were observed, 19 of them for the first time. For the assignment of the polarity[1] of two prominent γ-ray transitions, one at 4.7 MeV and one at 4.9 MeV, the polarized photon beam of the High Intensity γ-ray Source (HIγS) at Duke University was used. The experiment at HIγS revealed the existence of a photo-excited state of ^{205}Tl at an excitation energy of 4.971 MeV that exhibits a transition to the first excited state at 203 keV. The data will be presented and discussed

[1] N. Pietralla et al., Phys. Rev. Lett. 88, 012502 (2002)

HK 82.6 Fr 12:30 H-ZO 40

Skyrme-RPA Description of Giant Resonances in Spherical and Deformed Nuclei — •Jan Kvasil[1], Valentin O. Nesterenko[2], Wolfgang Kleinig[2,3], Petr Vesely[1], and Paul G. Reinhard[4] — [1]IPNP, Charles University, CZ-18000, Prague, Czech Republic — [2]BLTF, Joint Institute for Nuclear research, Dubna, 141980 Russia — [3]Technical University, D-01062, Dresden, Germany — [4]University of Erlangen, D-91058, Erlangen, Germany

Ability of the time-dependent density functional theory (TDDFT) with Skyrme forces to describe electric and magnetic resonances (GR) is scrutinized within the separable RPA (SRPA) method recently developed by our group [1]. The method is fully self-consistent and does not need additional parameters. Due to the factorization of the residual interaction, the SRPA drastically reduces the computational effort while keeping the accuracy of involved RPA method. This feature becomes crucial for systematic study of collective dynamics in complex nuclei with their huge configuration space. Both spherical and axially deformed nuclei can be covered. The isovector E1(T=1) and M1 GR is analysed in detail in rare-earth, actinide and superheavy nuclei, including long isotopic chains approaching drip-lines [1]. A special attention is paid to the role of the time-odd current in the Skyrme functional and its influence on the GR properties [1]. We discuss relation of the current with the effective masses and propose a tentative classification of Skyrme forces, based on the description of isovector modes [1].

1. W. Kleinig, V.O. Nesterenko, J. Kvasil, P.-G. Reinhard and P. Vesely, Phys. Rev. C78, 044313 (2008)