HK 20: Structure and Dynamics of Nuclei V

Zeit: Dienstag 14:00–15:30 Raum: S1/01 A03

Gruppenbericht HK 20.1 Di 14:00 S1/01 A03

Studying the γ-decay behaviour of the Pygmy Dipole Resonance — •Simon G. Pickstone, Vera Derya, Andreas Hennig, Mark Spieker, Michael Weinert, Julius Wilhelmy, and Andreas Zilges — Institute for Nuclear Physics, University of Cologne

The Pygmy Dipole Resonance (PDR) has been studied extensively in the past decade [1,2]. However, one important property, the γ-decay branching ratio to excited states, is still not known systematically. To access this observable, the particle-γ coincidence method is used at the dedicated SONIC@HORUS setup. It consists of up to twelve silicon detectors for particle identification and ejectile energy determination and the 14 HPGe detector array HORUS for high-resolution γ-ray spectroscopy. Due to the good energy resolution of the silicon detectors, a narrow gate on a specific excitation energy can be set, which allows for a sensitive and straightforward state to state determination of branching ratios.

Branching ratios for 1^- states in ^{92}Mo and ^{94}Mo from (p,p'γ) experiments and the decay pattern of 1^- states in ^{120}Sn from a (d,pγ) experiment will be shown, as well as possible theoretical interpretations. Together with γ-decay studies from the γ^3 setup at HIγS, these experiments allow for a systematic study of the PDR decay pattern to better understand the underlying structure of low-lying E1 strength.

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[1] D. Savran, T. Aumann, and A. Zilges, PPNP **70** (2013) 210
[2] A. Bracco, F.C.L. Crespi, and E.G. Lanza, EPJ A **52** (2015) 99

HK 20.2 Di 14:30 S1/01 A03

Probing the Pygmy Dipole Resonance in ^{140}Ce by means of the (p,p'γ) reaction at intermediate energy — •V. Derya[1], S. Bagchi[2], J. Endres[1], E. Fiori[3], M.N. Harakeh[2,4], N. Kalantar-Nayestanaki[2], M.A. Najafi[2], S. Pascu[1], S.G. Pickstone[1], N. Pietralla[5], C. Rigollet[2], C. Romig[5], D. Savran[3], M. Spieker[1], H.J. Wörtche[2], and A. Zilges[1] — [1]Institute for Nuclear Physics, University of Cologne, Germany — [2]KVI-CART, University of Groningen, the Netherlands — [3]GSI, Darmstadt, Germany — [4]GANIL, CEA/DSM-CNRS/IN2P3, Caen, France — [5]TU Darmstadt, Germany

The Pygmy Dipole Resonance (PDR) has been studied using various experimental methods [1], including systematic (α,α'γ) and (γ,γ') experiments [1] as well as (^{17}O,^{17}O'γ) experiments [2]. Protons at 80 MeV were used as a complementary hadronic probe in a (p,p'γ) coincidence experiment on ^{140}Ce. The experiment was performed at KVI in Groningen, the Netherlands. Due to a higher energy per nucleon compared to the previously used α particles of 34 MeV/u, the proton-induced reaction is more sensitive to the inner parts of the dipole transition density. Results of this experiment including DWBA calculations will be presented and discussed.

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[1] D. Savran, T. Aumann, and A. Zilges, PPNP **70** (2013) 210
[2] A. Bracco, F.C.L. Crespi, and E.G. Lanza, EPJ A **51** (2015) 99

HK 20.3 Di 14:45 S1/01 A03

Selective excitation and γ-decay studies of the Pygmy Dipole Resonance in ^{120}Sn with SONIC@HORUS — •Michael Weinert, Vera Derya, Andreas Hennig, Simon G. Pickstone, Mark Spieker, Julius Wilhelmy, and Andreas Zilges — Institute for Nuclear Physics, University of Cologne.

The excitation of states belonging to the Pygmy Dipole Resonance (PDR) in ^{120}Sn was observed in a ^{119}Sn(d,pγ) experiment, using the SONIC@HORUS setup at the 10 MV Tandem accelerator in Cologne. The setup, consisting of 6 ΔE-E silicon and 14 HPGe detectors, allows a selection of reaction, excitation, and deexcitation channels in an offline analysis, due to complete kinematics. Several excited states were identified as $J^\pi = 1^{(-)}$ states by comparison with results from a nuclear resonance fluorescence experiment [1], establishing the (d,p) reaction as an additional tool to study the PDR. Preliminary analysis shows that a γ-decay branching to the first 2^+ state is observed and branching ratios can be determined. The contribution will present the experiment and principles of the data analysis needed to select transitions from $J^\pi = 1^-$ states. Furthermore, the latest status of the analysis will be presented, including branching ratios and branching-corrected B(E1) values, which will allow a more stringent comparison with recent inelastic proton scattering data [2].

Supported by DFG (ZI 510/7-1). S.G.P., M.S., and J.W. are supported by the Bonn-Cologne Graduate School of Physics and Astronomy.

[1] B. Özel *et al.*, Phys. Rev. C **90** (2014) 024304
[2] A.M. Krumbholz *et al.*, Phys. Lett. B **744** (2015) 7-12

HK 20.4 Di 15:00 S1/01 A03

Low-lying dipole strengths of ^{50,54}Cr* — •H Pai[1], P C Ries[1], T Beck[1], J Beller[1], R Beyer[2], M Bhike[3,4], V Derya[5], U Gayer[1], J Isaak[6,7], Fnu Krishichayan[3,4], B Löher[6], V O Nesterenko[8], N Pietralla[1], G Martinez-Pinedo[1], L Mertes[1], V Yu Ponomarev[1], C Romig[1], D Savran[6,7], R Schwengner[2], W Tornow[3,4], V Werner[1], J Wilhelmy[5], A Zilges[5], and M Zweidinger[1] — [1]Technische Universität Darmstadt, Germany — [2]Helmholtz-Zentrum Dresden-Rossendorf, Germany — [3]Duke University, Durham, USA — [4]TUNL, Durham, USA — [5]IKP, Universität zu Köln, Germany — [6]EMMI and GSI, Darmstadt, Germany — [7]FIAS, Frankfurt am Main, Germany — [8]JINR, Dubna, Russia

Low-lying electric and magnetic dipole strengths (E1 and M1, respectively), particularly the Pygmy Dipole Resonance (PDR), low-energy orbital M1 mode, and Spin-flip M1 excitations, of atomic nuclei have drawn considerable attention in the last decade. The low-lying dipole strengths of ^{54}Cr and ^{50}Cr were studied with the method of nuclear resonance fluorescence up to 9.7 MeV, using bremsstrahlung provided by the superconducting Darmstadt electron linear accelerator S-DALINAC. 33 and 52 spin-1 states were observed in ^{50}Cr and ^{54}Cr, respectively. Parity quantum numbers were determined with a polarized photon scattering at the HIγS, TUNL in Durham, USA. Microscopic calculations within the QPM, QRPA, and Shell Model were performed to interpret the dipole strengths distributions of ^{50,54}Cr.

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HK 20.5 Di 15:15 S1/01 A03

Pygmy-dipol resonance in nerutron-rich Sn-isotopes — •Joachim Tscheuschner and Thomas Aumann for the DALI-LaBr RIBF-Collaboration-Collaboration — TU Darmstadt, Darmstadt, Germany

To investigate the pygmy-dipole resonance (PDR) in the unstable Sn-128 and Sn-132 isotopes, an alpha-scattering experiment was performed at RIKEN, Japan. The photons of the excited states are measured with a high efficiency detector-array consisting of NaI crystals (DALI2) and in forward-directions large volume LaBr crystals (HECTOR). With alpha-scattering mainly the isoscalar modes are excited, through comparison with Coulomb-excitation it is possible to disentangle the isovector and the isoscalar part of the PDR. The aim of the experiments is to study the the development of the PDR as a function of the neutron-excess. In this contribution the experiments and first results of the ongoing analysis are presented. This project is supported by HIC for FAIR.