HK 52: Structure and Dynamics of Nuclei X

Time: Wednesday 17:30–19:00 Location: HBR 19: C 5a

HK 52.1 Wed 17:30 HBR 19: C 5a

Absolute photon flux determination for nuclear resonance fluorescence experiments above the neutron separation threshold — •K. Prifti[1], J. Kleemann[1], U. Friman-Gayer[2,3,4], J. Isaak[1], N. Pietralla[1], V. Werner[1], A. D. Ayangeakaa[2,5], T. Beck[1,6], M. L. Cortes[1], S. W. Finch[2,3], M. Fulghieri[2,5], D. Gribble[2,5], K. E. Ide[1], X. James[2,5], R. V. F. Janssens[2,5], S. R. Johnson[2,5], P. Koseoglou[1], FNU Krishichayan[2,3], O. Papst[1], D. Savran[7], and W. Tornow[2,3] — [1]IKP, TU Darmstadt — [2]TUNL, Durham, NC, USA — [3]Duke University, Durham, NC, USA — [4]ESS, Lund, SE — [5]UNC, Chapel Hill, NC, USA — [6]FRIB, East Lansing, MI, USA — [7]GSI, Darmstadt

The giant dipole resonance (GDR) is a fundamental nuclear excitation that dominates the dipole response of all nuclei. The present work aims at quantifying the branching ratio of the decay of the GDR of ^{154}Sm and ^{140}Ce, via emission of γ-rays or neutrons as a function of excitation energy. An activation measurement has been performed simultaneously to a nuclear resonance fluorescence (NRF) measurement in the energy range from 11.22 MeV to 17.5 MeV at the HIγS facility. Natural samples of Sm, Ce and Au were used as targets in the activation measurements. By determining their activation after irradiation and then comparing it to the GDR-NRF events that are observed, the γ- to neutron-decay branching ratio was determined.

Supported by the State of Hesse within Cluster project ELEMENTS and the LOEWE project, DFG Project-ID 499256822-GRK 2891 and U.S. DOE grant Nos DE-FG02-97ER41041 and DE-FG02-97ER41033.

HK 52.2 Wed 17:45 HBR 19: C 5a

Investigation of the Pygmy Dipole Resonance near the magic $N = 82$ shell closure — •Florian Kluwig[1], Miriam Müscher[1], Deniz Savran[2], Ronald Schwengner[3], Tanja Schüttler[1], and Andreas Zilges[1] — [1]University of Cologne, Institute for Nuclear Physics, Germany — [2]GSI, Darmstadt, Germany — [3]Helmholtz-Zentrum Dresden-Rossendorf, Germany

The Pygmy Dipole Resonance (PDR) is part of the electric dipole response in atomic nuclei. However, despite being a subject of significant interest in both theoretical and experimental domains over recent decades [1-3], several questions regarding its structure and origin remain open. Systematic studies are therefore crucial for enhancing our understanding of this excitation mode. Such studies have been performed on isotopes near the magic $N = 82$ shell closure, e.g., ^{144,146}Nd and ^{142}Ce, using real-photon scattering experiments, commonly denoted as Nuclear Resonance Fluorescence (NRF). Photons are a well-suited probe for the investigation of the PDR since they only transfer small angular momenta [4]. In this contribution, the results of NRF experiments on ^{144}Nd and comparisons with other experiments on neighbouring isotopes and isotones will be presented.

This work is partly supported by the BMBF (05P21PKEN9).

[1] D. Savran *et al.*, Prog. Part. Nucl. Phys. **70** (2013) 210.
[2] A. Bracco *et al.*, Prog. Part. Nucl. Phys. **106** (2019) 360.
[3] E.G. Lanza *et al.*, Prog. Part. Nucl. Phys. **129** (2023) 104006.
[4] A. Zilges *et al.*, Prog. Part. Nucl. Phys. **122** (2022) 103903.

HK 52.3 Wed 18:00 HBR 19: C 5a

γ-decay Behavior of the Giant Dipole Resonances of ^{154}Sm and ^{140}Ce — •J. Kleemann[1], U. Friman-Gayer[2,3,4], J. Isaak[1], O. Papst[1], N. Pietralla[1], V. Werner[1], A. D. Ayangeakaa[2,5], T. Beck[1,6], M. L. Cortés[1], S. W. Finch[2,3], M. Fulghieri[2,5], D. Gribble[2,5], K. E. Ide[1], X. James[2,5], R. V. F. Janssens[2,5], S. R. Johnson[2,5], P. Koseoglou[1], FNU Krishichayan[2,3], D. Savran[7], and W. Tornow[2,3] — [1]IKP, TU Darmstadt — [2]TUNL, Durham, NC, USA — [3]Duke University, Durham, NC, USA — [4]ESS, Lund, SE — [5]UNC, Chapel Hill, NC, USA — [6]FRIB, MSU, East Lansing, MI, USA — [7]GSI, Darmstadt

The giant dipole resonance (GDR) is one of the most fundamental nuclear excitations and dominates the dipole response of all nuclei. Geometrically it is pictured as an isovector oscillation of the proton against the neutron body. Recently, novel data on the γ-decay of the GDR of the well-deformed nuclide ^{154}Sm and the spherical nuclide ^{140}Ce were obtained through photonuclear experiments at the HIγS facility. Individual regions of the GDR were selectively excited by HIγS's intense, linearly-polarized and quasi-monochromatic γ-ray beam. The obtained data allow for a novel close experimental assessment of the geometrical model of the GDR, in particular for ^{154}Sm with its double-humped GDR and respective K-quantum-number assignments.

Supported by the BMBF under grant No. 05P21RDEN9, by the DFG under GRK 2891, Project-ID 499256822 and the U.S. DOE under grant Nos. DE-FG02-97ER41041 and DE-FG02-97ER41033.

HK 52.4 Wed 18:15 HBR 19: C 5a

Studying the internal conversion decay of the ^{229}Th isomer in the bulk of VUV-sensitive SiPMs — •Lilli Löbell[1], Daniel Moritz[1], Georg Holthoff[1], Mahmood Hussain[1], Sandro Kraemer[1], Tamila Rozibakieva[1], Kevin Scharl[1], Benedict Seiferle[1], Lars von der Wense[2], Markus Wiesinger[1], and Peter G. Thirolf[1] — [1]Ludwig-Maximilians-Universität München — [2]Johannes-Gutenberg-Universität Mainz

^{229}Th has a nuclear isomer with an exceptionally low excitation energy of only 8.338 ± 0.024 eV ($\lambda = 148.71 \pm 0.42$ nm). This makes ^{229m}Th the so far only candidate for a nuclear clock, which has potential applications ranging from dark matter research and searching for a time dependence of fundamental constants to improving geodesy and satellite-based navigational systems. For the decay of the thorium isomer to the ground state, the dominant decay channel in neutral ^{229m}Th atoms is internal conversion (IC). The half-life of the IC decay measured on a metallic surface was found to be 7 ± 1 μs, but there are indications of a dependence on the electronic environment surrounding the thorium atom. We are currently investigating the IC lifetime of ^{229m}Th within a solid state environment by implanting ^{229m}Th atoms into the depletion region of VUV-sensitive silicon photomultipliers, where the IC electrons can be detected. In case of a significantly longer IC lifetime, this could be an approach for a solid-state nuclear clock based on internal conversion. The talk presents the current status of this project. This work was supported by the European Research Council (ERC): ERC Synergy Grant 'ThoriumNuclearClock'.

HK 52.5 Wed 18:30 HBR 19: C 5a

Preparations and first results using fast-timing lifetime analysis within the nu-Ball2 fission campaign — •Julia Fischer[1], Andrey Blazhev[1], Corentin Hiver[2], Jan Jolie[1], Andi Messingschlager[3], Sorin Pascu[4], Martin von Tresckow[3], Nigel Warr[1], and Jonathan Wilson[2] for the nu-Ball2 N-SI-120-Collaboration — [1]IKP Cologne — [2]IJCLab Orsay — [3]TU Darmstadt — [4]U Surrey

Nuclei beyond the band of stability are crucial to our understanding of the atomic nucleus and nuclear forces. Over the years, neutron-rich krypton isotopes have been studied as part of various campaigns [1,2]. Recently, high-resolution and fast-timing measurements were performed at the IJCLab Orsay as part of the nu-Ball2 fission campaign. The novel hybrid γ-spectrometer nu-Ball2 consists of HPGe and $LaBr_3$(Ce) detectors which provide excellent energy and timing information, respectively. The nuclei of interest were produced with a fast-neutron-induced fission reaction ^{238}U(n,f). Before new results can be reliably extracted, the time-walk of the $LaBr_3$(Ce) detectors had to calibrated and the performance of the setup to be validated using the known lifetimes of excited states. The calibration and validation of the nu-Ball2 fast-timing analysis, as well as some preliminary results will be presented. *Supported by BMBF under Verbundprojekt 05P2021 (ErUM-FSP T07) grant 05P21PKFN1.

[1] R.-B. Gerst et al., PRC 102, 064323 (2020).
[2] R.-B. Gerst et al., PRC 105, 024302 (2022).

HK 52.6 Wed 18:45 HBR 19: C 5a

Lifetime measurement of excited states in ^{150}Gd — •Felix Dunkel, Arwin Esmaylzadeh, Christoph Fransen, Jan Jolie, Casper-David Lakenbrink, Richard Novak, and Franziskus Spee — Institut für Kernphysik, Köln, Deutschland

To investigate the evolution of deformation along the Z = 64 (Gd) subshell closure between N = 82 and N = 90 lifetimes of low-lying excited states in ^{150}Gd were measured utilizing the Recoil Distance Doppler-Shift (RDDS) method. The excited states were populated using the ^{142}Ce(^{12}C,4n)^{150}Gd fusion-evaporation reaction at the FN Tandem accelerator at the IKP Cologne. Measured γ-γ coincidence data were analyzed with the differential decay-curve method (DDCM). It was

possible to determine the lifetimes of the 2^+_1,4^+_1,3^-_1 states. In this contribution we will present the results, discuss the evolution of collectivity along the isotopic chain and compare the results with theoretical calculations. Work supported by BMBF under grant 05P21PKFN1.