# HK 40: Structure and Dynamics of Nuclei X

Time: Thursday 14:00–15:30 Location: HS 2 Physik

**Group Report** HK 40.1 Thu 14:00 HS 2 Physik

**Lifetime measurement in $N=50$ isotones to investigate seniority conservation in the $\pi g_{9/2}$ orbital** — •Mario Ley[1], Jan Jolie[1], Piet Van Isacker[2], Andrey Blazhev[1], Arwin Esmaylzadeh[1], Christoph Fransen[1], Lukas Knafla[1], Aaron Pfeil[1], and Jean-Marc Régis[1] — [1]Universität zu Köln, Institut für Kernphysik — [2]Grand Accélérateur National d'Ions Lourds, Caen, France

Excited states in the $N=50$ semi-magic nuclei $^{92}$Mo, $^{93}$Tc, $^{94}$Ru and $^{95}$Rh were populated using fusion-evaporation reactions at the Cologne FN Tandem accelerator, and their lifetimes were measured with a hybrid setup of HPGe and LaBr detectors using the fast-timing method. The lifetime of the $4_1^+$ state in $^{92}$Mo was measured with high precision to derive state-dependent effective charges from the $B(E2)$ values of the yrast band [1]. In $^{94}$Ru the lifetime of the $4_1^+$ state was measured with high statistics [2]. The results were compared with theoretical predictions from semiempirical calculations in the single-$j$ orbital for the protons and shell-model calculations using the SR88MHJM interaction in the $\pi(1p_{1/2}, 0g_{9/2})$ model space [2]. Preliminary results of lifetime measurements in $^{95}$Rh will be presented.

Work supported by DFG Grant JO391/18-2
[1] Phys. Rev. C 108, 064313 (2023)
[2] Phys. Rev. C 110, 034320 (2024)

HK 40.2 Thu 14:30 HS 2 Physik

**Probing a sudden drop of collectivity at $^{170,172}$W** — •K. E. Ide[1], V. Werner[1], R. Abels[2], U. Ahmed[1], D. Bittner[2], T. Biesenbach[2], A. Blazhev[2], A. Esmaylzadeh[2], C. Fransen[2], J. Jolie[2], H. Kleis[2], C. -D. Lakenbrink[2], M. Ley[2], H. Mayr[1], M. Müllenmeister[2], C. M. Nickel[1], R. Novak[2], A. Pfeil[2], N. Pietralla[1], J. Roob[2], F. von Spee[2], T. Stetz[1], T. Sültenfuss[2], and R. Zidarova[1] — [1]IKP, TU Darmstadt — [2]IKP, Uni Köln

Nuclear quadrupole collectivity is identified from enhanced $E2$ decay rates. The $E2$ decay strength of a state is inversely proportional to its lifetime. A sudden increase of the $E2$ strength of the $2_1^+ \rightarrow 0_1^+$ transition from $N$=96 ($^{170}$W) to $N$=98 ($^{172}$W) in the W isotopic chain is unexpected compared to the neighboring Hf isotopic chain. This discrepancy was previously investigated by lifetime measurements of yrast states of $^{170}$W [1]. Therefore, in this work we investigate yrast $B(E2)$ values in $^{172}$W to learn about the structural evolution of the yrast band in comparison to $^{170}$W. The experiment was performed at the Cologne 10 MV FN-tandem accelerator facility and used the new CATHEDRAL spectrometer and a plunger device. The fast-timing method and the recoil distance Doppler-shift (RDDS) method are used complementary to determine the lifetimes of yrast states. First results will be presented and discussed together with the previous results on $^{170}$W and will be compared to the confined $\beta$-soft (CBS) rotor model.

[1] K. E. Ide *et al.*, LNL report 2019 (2020).

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HK 40.3 Thu 14:45 HS 2 Physik

**Lifetime measurements in $^{198}$Pt and $^{200}$Pt** — •Arwin Esmaylzadeh[1], Franziskus von Spee[1], Mario Ley[1], Christoph Fransen[1], Andrey Blazhev[1], Senuri Dantanarayana[1], Maximilian Droste[1], Julia Fischer[1], Jan Jolie[1], Lukas Knafla[1], Casper-David Lakenbrink[1], Richard Novak[1], Aaron Pfeil[1], and Kosuke Nomura[2,3] — [1]Universität zu Köln, Institut für Kernphysik — [2]Department of Physics, Hokkaido University, Sapporo 060-0810, Japan — [3]Nuclear Reaction Data Center, Hokkaido University, Sapporo 060-0810, Japan

Eight lifetimes of low-lying states in $^{198}$Pt and $^{200}$Pt were determined using the fast-timing and the recoil distance Doppler shift methods at the Cologne CATHEDRAL spectrometer. Low-lying states were populated in the $^{198}$Pt($^{18}$O, $^{18}$O)$^{198}$Pt* inelastic scattering and in the $^{198}$Pt($^{18}$O, $^{16}$O)$^{200}$Pt two-neutron transfer reaction,respectively. The beam was provided by the Cologne FN Tandem accelerator. In addition, four new candidates for states, five new transitions in $^{198}$Pt and one new potential transition in $^{200}$Pt could be observed and placed in the level scheme. The newly obtained results will be discussed in the context of the tungsten-osmium-platinum region around mass A≈ 190. This region is known to exhibit different phenomena like a prolate-to-oblate phase transitions, but also characteristics of $\gamma$-soft nuclei. The results will be compared to mapped interacting boson model with input from the microscopic self-consistent mean-field calculation using a Gogny interaction [1].

[1] K. Nomura et al., Phys. Rev. C 84, 054316 (2011)

HK 40.4 Thu 15:00 HS 2 Physik

**Coulomb excitation in $^{185g,m}$Hg** — •Hannah Kleis[1], Peter Reiter[1], Liam Gaffney[2], Janne Pakarinen[3], and Katarzyna Wrzosek-Lipska[4] for the IS699-Collaboration — [1]IKP, University of Cologne, Germany — [2]University of Liverpool, UK — [3]University of Jyväskylä, Finland — [4]HIL, University of Warsaw, Poland

Shape coexistence in the neutron-deficient lead region around N≈104 has been discovered in different nuclei especially in the mercury isotopes, where a staggering effect was found between even- and odd-mass nuclei using charge radii measurements [1,2]. In addition the study of the even-even $^{182,184,186,188}$Hg isotopes showed a mixing of weakly deformed oblate and more deformed prolate configurations which coexists at low excitation energies [3]. To investigate collective behavior of low-lying states on top of the $(1/2^-)$ ground-state in $^{185g}$Hg and the $(13/2^+)$ isomeric state in $^{185m}$Hg, a Coulomb excitation experiment was performed at HIE-ISOLDE. The $^{185g,m}$Hg beams were accelerated onto $^{120}$Sn and $^{48}$Ti targets with an energy of 4 MeV/u. The emitted $\gamma$ rays were detected utilizing the Miniball array in coincident to the scattered particles measured in the DSSSD detector. First results yield the discovery of the signature partner band of the ground-state band which was observed up to spin values of $25/2^-$. Supported by BMBF Projects 05P21KCI1, 05P24KCI1. This project has received funding from the European Union's Horizon Research and Innovation programme under Grant Agreement No. 101057511. [1] B. Marsh et al., Nature Physics 14, 1163 (2018) [2] J. Bonn et al., Z Phys A 276(3), 203 (1976) [3] K. Wrzosek-Lipska et al., EPJ A 55:130 (2019)

HK 40.5 Thu 15:15 HS 2 Physik

**Lifetime measurements in $^{208}$Po using the ORANGE-spectrometer and $LaBr_3$(Ce) detectors** — •Dania Al Daas, Andrey Andrey, Jean-Marc Regis, Nigel Warr, and Jan Jolie — IKP, University of Cologne, Germany

The iron-free high-efficiency electron-spectrometer ORANGE at the IKP University of Cologne was updated recently [1]. Using the 10 MV FN-tandem accelerator, 208Po was produced with the reaction $^{209}$Bi(p, 2n$\gamma$) to measure the lifetimes of the $2_1^+$, $4_1^+$ and $6_1^+$ states using $e^-$-$\gamma$ and $\gamma$-$\gamma$ coincidence measurements. The resulting lifetimes were compared to known values to ascertain the state of the updated spectrometer. For the mono-energetic electrons, the magnetic field of the ORANGE was varied to select different electron energies for detection by a plastic scintillator counter. The $\gamma$-rays were measured by a HPGe and four $LaBr_3$(Ce) detectors, the latter having a fast electronic response that allows for a precise determination of the lifetime of excited states. The resulting lifetimes of all three states have a higher precision than the known lifetimes, while agreeing within the error margin [2,3].

[1] A. Harter et al., Physical Review C, 106:024326, (2022) ;
[2] D. Kalaydjieva et al., Physical Review C, 104:024311, (2021) ;
[3] V. Rahkonen et al., Z. Phys. A 322, 333-348, (1985) .