HK 53: Hadron Structure and Spectroscopy X

Time: Wednesday 16:00–17:30 Location: HK-H9

Group Report HK 53.1 Wed 16:00 HK-H9

The BGOOD Experiment at ELSA - Exotic Structures in the *uds* Sector? — •Johannes Gross for the BGOOD-Collaboration — Physikalisches Institut Bonn

The discoveries of the X-, Y-, Z-states in the hidden charm meson sector by Belle and the P_c baryon states by LHCb shed a new light on our understanding of hadronic structure formation: Multi-quark states beside the conventional $q\bar{q}$ and qqq states now have unambiguously been realised. Such states could manifest themselves as single color-bound objects or, contrary, as molecular-like meson-meson or meson-baryon formations. Intriguingly, similar effects to those in the charm sector may be evidenced in the light *uds* sector. In order to study this, access to extreme forward angles and low transverse momentum kinematics is mandatory. To realise this, the BGOOD experiment at ELSA combines a central calorimeter for neutral meson identification with a forward spectrometer for charged particle identification. First results of the BGOOD experiment that support the possibility of such exotic structures are presented, e.g. cross section measurements of $\gamma p \rightarrow K^+\Lambda(1405)$, $\gamma p \rightarrow K^+\Sigma^0$ and $\gamma n \rightarrow K^0\Sigma^0$ that show pronounced structures in the proximity of production thresholds.

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HK 53.2 Wed 16:30 HK-H9

Search of the exotic nuclear two-photon emission decay in isochronous heavy ion storage rings — •David Freire[1,2,3,4], F. Çağla Akinci[5], Klaus Blaum[1,2], Wolfram Korten[3], Yuri A. Litvinov[2,4], Shahab Sanjari[4,6], and the E143 Collaboration[4] — [1]Max Planck Institute for Nuclear Physics, D-69117 Heidelberg, Germany — [2]Heidelberg University, D-69117 Heidelberg, Germany — [3]IRFU, CEA, Université Paris-Saclay, F-91191 Gif-sur-Yvette, France — [4]GSI Helmholtz Center, D-64291 Darmstadt, Germany — [5]Istanbul University, T-34452 Istanbul, Turkey — [6]Aachen University of Applied Sciences, D-52005 Aachen, Germany

The nuclear two-photon (2γ) decay is a rare decay mode in atomic nuclei whereby a nucleus in an excited state emits two gamma rays simultaneously. First order processes usually dominate the decay, however two-photon emission may become significant when first order processes are forbidden or strongly retarded, which can be achieved at the experimental storage ring ESR (GSI/FAIR). Within this work we will present the implemented methodology and the obtained results of two beam times performed in 2021, when for the first time the isochronous mode of ESR alongside non-destructive Schottky detectors were operated for the study of short-lived isomer production yields and lifetimes. We investigated specifically the isotope ^{72}Ge, as it is the most easily accessible nucleus having a first excited 0^+ state below the pair creation threshold paramount for the study of 2γ decay without competition of first order decays. In addition, the nuclei ^{70}Se and ^{72}Br were studied, as their isomeric states play a major role in nuclear astrophysics.

HK 53.3 Wed 16:45 HK-H9

Lifetime Measurement in ^{206}Rn and ^{202}Pb via γ-γ Fast-Timing Spectroscopy — •Mario Ley, Arwin Esmaylzadeh, Lukas Knafla, Jean-Marc Régis, and Jan Jolie — Institut für Kernphysik, Universität zu Köln

Lifetimes of the first excited 2^+, 4^+, 6^+, 8^+ states in ^{206}Rn and the 2^+ and 4^+ states in ^{202}Pb were measured using the γ-γ fast-timing technique with a detector array consisting of $LaBr_3$(Ce) and HPGe detectors. The experiment was performed at the FN-Tandem accelerator of the Institute for Nuclear Physics at the University of Cologne. The well established Generalized Centroid Difference (GCD) method [1], which is suitable for the determination of lifetimes in the pico- to nanosecond regime, was used to determine the lifetimes.

The derived reduced transition probabilities are discussed with regard to the onset of collective structures for low-lying excited states in ^{206}Rn and the results are compared with shell-model calculations based on the Nucleon Pair Approximation [2].

[1] J.-M. Régis et al., Nucl. Instrum. Methods Phys. Res. A 726 (2013)
[2] Z. Y. Xu, Y. Lei, Y. Zhao, A. Arima, et al., Phys. Rev. C, 79:054315, (2009)

HK 53.4 Wed 17:00 HK-H9

Preliminary results of Lifetime Measurements in ^{208}Rn via γ-γ Fast-Timing Spectroscopy — •Jan Garbe, Dennis Bittner, Arwin Esmaylzadeh, Guillaume Häfner, Vasil Karayonchev, Jean-Marc Regis, and Jan Jolie — Institut für Kernphysik, Universität zu Köln

Lifetimes of low-lying excited states in ^{208}Rn were measured using the γ-γ fast-timing technique with a detector array consisting of 12 $LaBr_3$(Ce) and 8 HPGe detectors. The experiment was performed at the 10 MV FN-Tandem accelerator of the Institute for Nuclear Physics at the University of Cologne. The sub-nanosecond lifetimes were determined by means of relative centroid shift measurements.
These results were then compared to shell-model calculations.

HK 53.5 Wed 17:15 HK-H9

Lifetime measurements in the ground-state band in ^{104}Pd — •Maximilian Droste[1], Andrey Blazhev[1], Peter Reiter[1], Nigel Warr[1], Konrad Arnswald[1], Marcel Beckers[1], Robert Hetzenegger[1], Rouven Hirsch[1], Levent Kaya[1], Lukas Knafla[1], Lars Lewandwoski[1], Claus Müller-Gatermann[1], Pavel Petkov[2,1], Dawid Rosiak[1], Burkhard Siebeck[1], Andreas Vogt[1], and Kai Wolf[1] — [1]Institut für Kernphysik, Universität zu Köln — [2]Horia Hulubei National Institute for Physics and Nuclear Engineering, Romania

Direct lifetime measurements in ^{104}Pd were motivated to close a gap along the Pd isotope chain. Excited states were populated via the fusion evaporation reaction ^{96}Zr(^{12}C,4n)^{104}Pd at 55 MeV. Lifetime values and reduced transition probabilities were determined in the ground-state band up to the 12^+ state in ^{104}Pd employing the Recoil Distance Doppler-Shift method. The new B(E2; $2^+ \rightarrow 0^+$) value deviates from the evaluated values, which were determined using Coulomb excitation. The transition strengths of higher lying states were obtained for the first time. Recent investigations in other medium weight even-even Pd isotopes question the vibrational character of these Pd isotopes. The experimental results are compared to Large Scale Shell-Model calculations (LSSM) employing the Sr88MHJM interaction. LSSM along the $^{96-106}$Pd isotope chain were performed allowing detailed comparison of level schemes and reduced transition strength values.