HK 61: Structure and Dynamics of Nuclei X

Time: Thursday 14:00–15:30 Location: HK-H6

Group Report HK 61.1 Thu 14:00 HK-H6

DSAM lifetime measurements using particle-γ coincidences at SONIC@HORUS — •Sarah Prill, Anna Bohn, Christina Deke, Felix Heim, Michael Weinert, and Andreas Zilges — University of Cologne, Institute for Nuclear Physics, 50937 Cologne, Germany

In recent years, the (p,p'γ) Doppler-shift attenuation method (DSAM) has been successfully applied to determine lifetimes of excited low-spin states in the sub-picosecond range [1,2]. The use of particle-γ coincidence data taken at the SONIC@HORUS spectrometer in Cologne [3] gives complete knowledge of the reaction kinematics and enables the direct selection of levels via their excitation energy, thus greatly reducing background and eliminating feeding from levels of higher energies. This contribution will present the DSA method and recent results obtained from experiments on Ru, Sn [2] and Te isotopes will be shown. Additionally, a complementary approach to the conventional DSA technique will be presented which aims to extract lifetimes from weak transitions and excited states with low statistics that cannot be analysed with the established method.

Supported by the DFG (ZI-510/9-1).

[1] A. Hennig *et al.*, Nucl. Instr. and Meth. A **794** (2015) 171.
[2] M. Spieker *et al.*, Phys. Rev. C **97** (2018) 054319
[3] S. G. Pickstone *et al.*, Nucl. Instr. and Meth. A **875** (2017) 104.

HK 61.2 Thu 14:30 HK-H6

Lifetime measurement of the 2_1^+ state of ^{170}W — •K.E. Ide[1], V. Werner[1], A. Goasduff[2,3], J. Wiederhold[1], P.R. John[1], D. Bazzacco[3], M. Beckers[4], J. Benito[5], M. Berger[1], D. Brugnara[2,3], M.L. Cortés[1], L.M. Fraile[5], C. Fransen[4], A. Gozzelino[3], E.T. Gregor[3], A. Illana[3], J. Jolie[4], L. Knafla[4], R. Menegazzo[3], D. Mengoni[2,3], C. Müller-Gatermann[4,6], O. Papst[1], G. Pasqualato[7], C.M. Petrache[8], N. Pietralla[1], F. Recchia[2,3], D. Testov[2,7], J.J. Valiente-Dobón[3], and I. Zanon[2,3,9] — [1]IKP, TU Darmstadt — [2]Uni Padova, Italy — [3]INFN, LNL, Italy — [4]IKP, Uni Köln — [5]Uni Madrid, Spain — [6]ANL, USA — [7]INFN, Padova, Italy — [8]Uni Paris-Saclay, France — [9]Uni Ferrara, Italy

Recent measurements of the mean lifetimes of the first 2^+ states in the region of the Hf and W isotopic chains pointed out a change of the previously measured mean lifetimes by enhanced experimental techniques. This results in an increased value of the $E2$ transition probability from $N = 114$ down to $N = 98$ with an unexpected sudden drop in the transition probability at $N = 96$, i.e. ^{170}W. The experiment to remeasure the mean lifetime of the 2_1^+ state of ^{170}W with the RDDS method was carried out at the Laboratori Nazionali di Legnaro (LNL). The GALILEO array, comprised of 24 HPGe detectors placed in 5 rings, was used in conjunction with the LNL plunger device. Experimental results are compared to predictions of the CBS model.

*Supported by the BMBF under Grant Nos. 05P18RDFN9 and 05P21RDFN9.

HK 61.3 Thu 14:45 HK-H6

In-beam gamma-ray spectroscopy of neutron rich scandium isotopes — •Radostina Zidarova[1], Martha Liliana Cortés[1], Volker Werner[1], Pavlos Koseoglou[1], Norbert Pietralla[1], Pieter Doornenbal[2], and Alexandre Obertelli[1] — [1]TU Darmstadt, Germany — [2]RIKEN-RIBF, Japan

Experimental data have shown that far from the valley of stability new magic numbers can emerge and the traditional ones can disappear. In particular, two new magic numbers at N=32 and N=34 have been suggested in the vicinity of Z=20 based on spectroscopy and mass measurements. The N=34 sub-shell closure is observed in Ca and Ar isotopes, but vanishes in the Ti isotopes. To get a complete picture of the shell evolution in this region, it is also necessary to study the neighbouring Sc isotopes with only one valence proton above Z=20 and determine their structural evolution towards the possible harmonic oscillator magic number N=40 . Investigation of exotic nuclei in this region was the goal of the third SEASTAR (Shell Evolution And Search for Two-plus energies At RIBF) campaign at RIKEN-RIBF. Neutron-rich isotopes in the vicinity of ^{53}K were produced by fragmentation of a primary ^{70}Zn beam on a ^{9}Be target. The γ rays of ^{55}Sc isotope were observed and γ rays from ^{57,59}Sc were identified for the first time. Observed γ spectra from ^{55,57,59}Sc will be presented together with preliminary level schemes. They will be discussed in the framework of the tensor force driven shell evolution.

Supported by BMBF under Grant Nos. 05P19RDFN1, 05P21RDFN1.

HK 61.4 Thu 15:00 HK-H6

Lifetime measurement of excited states in ^{120}Te — •Franziskus v. Spee[1], Alfred Dewald[1], Claus Müller-Gatermann[1,2], Marcel Beckers[1], Felix Dunkel[1], Lisa Kornwebel[1], Casper-David Lakenbrink[1], Jan Jolie[1], Nigel Warr[1], and Andrey Blazhev[1] — [1]Institut für Kernphysik, Cologne, Germany — [2]Argonne National Laboratory, Illinois, USA

The nuclear structure of tellurium isotopes at Z=52 and the evolution of collectivity are of special interest due to the close proximity of the closed shell at Z=50 in the even-even neighbor Sn. A recoil distance Doppler-shift (RDDS) experiment was performed to investigate absolute transition probabilities in ^{120}Te. Excited states in ^{120}Te were populated using the ^{110}Pd(^{13}C,3n)^{120}Te reaction at the FN-Tandem accelerator facility located at the IKP of Cologne. The $\gamma - \gamma$ coincidence data were analysed with the differential decay-curve method (DDCM) eliminating problems related to feeding and absolute distances. Lifetimes of excited states in the yrast band up to the 8^+ state were measured and the corresponding B(E2) values were calculated. In this contribution we will present the results and compare these with known data from Coulomb excitation experiments and IBM1-Calculations. This work was supported by the Deutsche Forschungsgemeinschaft (DFG) under contract numbers FR 3276/2-1 and DE 1516/5-1.

HK 61.5 Thu 15:15 HK-H6

Extension of the level scheme of ^{104}Ru and lifetime determination using the Doppler-shift attenuation method — •Anna Bohn, Christina Deke, Felix Heim, Sarah Prill, Michael Weinert, and Andreas Zilges — University of Cologne, Institute for Nuclear Physics, 50937 Cologne, Germany

The (p,p'γ) Doppler-shift attenuation method (DSAM) is a powerful tool to determine nuclear level lifetimes in the sub-picosecond range and was well established at the Institute for Nuclear Physics at the University of Cologne in recent years [1,2]. The combined particle-γ detector array SONIC@HORUS [3] enables the measurement of p-γ and p-γ-γ coincidences. Hence, knowledge of the complete reaction kinematics is provided and feeding contributions from energetically higher lying states can be eliminated.

In this contribution, results from a ^{104}Ru(p,p'γ) DSAM experiment will be presented. More than two dozen nuclear level lifetimes as well as over 50 previously unknown levels and decay transitions could be identified via the analysis of p-γ-γ coincidence data.

Supported by the DFG (ZI-510/9-1).

[1] A. Hennig *et al.*, NIM A **794** (2015) 171
[2] M. Spieker *et al.*, Phys. Rev. C **97** (2018) 054319
[3] S. G. Pickstone *et al.*, NIM A **875** (2017) 104