HK 60: Structure and Dynamics of Nuclei XII

Time: Thursday 14:00–15:30 Location: SCH/A215

HK 60.1 Thu 14:00 SCH/A215

Electron scattering off ^{10}B under 180° — •M. Spall, M. Singer, J. Birkhan, I. Brandherm, M. L. Cortés, F. Gaffron, K. E. Ide, J. Isaak, I. Jurosevic, P. von Neumann-Cosel, F. Niederschuh, N. Pietralla, G. Steinhilber, and T. Stetz — Institut für Kernphysik, Technische Universität Darmstadt

Electron scattering experiments under 180° are an excellent tool to study transversal form factors of magnetic excitations due to the suppression of longitudinal excitations by several order of magnitudes with respect to the transversal excitations and the associated radiative tail background from elastic scattering at this angle. A measurement was performed with the 180° system [1] at the S-DALINAC, in order to investigate the M3 transition of the 3^+ ground state to the excited 0^+ state at 1.74 MeV in ^{10}B which is the analogue to the second-forbidden beta-decay of ^{10}Be. The measurement will extend existing data towards lower momentum transfer allowing to improve the precision of the determined transition strength. The combined information from electron scattering and beta-decay will serve as a precision test of the unified description of electroweak observables in ab-initio models. First results of the new ^{10}B(e,e') data will be presented.

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[1] C. Lüttge et al., Nucl. Instrum. Meth. A 366, 325-331 (1995).

HK 60.2 Thu 14:15 SCH/A215

^{16}O(n,α_0)^{13}C Cross Section Normalization based on a new Time-of-Flight measurement using a Frisch Grid Ionisation Chamber — Sebastian Urlass[1], •Arnd Junghans[1], Roland Beyer[1], and Arjan Plompen[2] — [1]Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Bautzner Landstraße 400, 01328 Dresden, Germany — [2]European Commission, Joint Research Center (JRC), Retieseweg 111 2440 Geel, Belgium

The ^{16}O(n,α)^{13}C reaction plays an important role in nuclear technology. Oxygen is a major component of the fuel and in the water coolant of nuclear power reactors. This reaction influences criticality through the removal of neutrons and produces helium in the fuel which may lead to swelling. A new reaction cross section measurement was carried out at the time-of-flight facility GELINA using a Frisch-gridded ionization chamber. Between the reaction threshold and a neutron energy of 9 MeV, ^{16}O(n,α_0)^{13}C events on the CO_2 admixture in the counting gas could be well identified. The cross sections were determined relative to relative to the neutron-induced fission cross section standard of ^{235}U using the H19 fission chamber of PTB and compared to recent evaluations. Special care was taken to quantify all sources of systematic uncertainties based on measurements. The integral over the data from 4 to 5.3 MeV allows the normalization of evaluated ^{16}O(n,α_0)^{13}C reaction cross sections and data in the literature to about 6% uncertainty. The new cross section normalization is compared with results deduced from thin target measurements of the inverse reaction ^{13}C(α,n)^{16}O and thick target yields.

HK 60.3 Thu 14:30 SCH/A215

Energy-dependence of the γ-decay branching ratio of the Giant Dipole Resonances of ^{154}Sm and ^{140}Ce — •K. Prifti[1], J. Kleemann[1], V. Werner[1], N. Pietralla[1], P. Koseoglou[1], M. Beuschlein[1], U. Friman-Gayer[1,2,4], S. W Finch[2,3], T. Beck[1], K. Ide[1], J. Isaak[1], O. Papst[1], M.L. Cortes[1], D. Gribble[2,3], D. Savran[5], and W. Tornow[2,4] — [1]IKP, TU Darmstadt — [2]TUNL, Durham, NC, USA — [3]UNC, Chapel Hill, USA — [4]Duke University, Durham, NC, USA — [5]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. Simultaneously to a nuclear resonance fluorescence (NRF) measurements an activation measurement has been performed at the HIγS facility. The targets used for the activation measurements were comprised of natural samarium, natural cerium and gold foils. By determining the activation of these targets and then comparing to the GDR-NRF events that are observed, we will determine the γ- to neutron-decay branching ratio. The data, their analysis and first results will be presented and discussed.

This work is supported by the LOEWE program under grant *Nuclear Photonics* and within the Hessian cluster project *ELEMENTS*.

HK 60.4 Thu 14:45 SCH/A215

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], 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], 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, 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. 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' intense, linearly-polarized and quasi-monochromatic γ-ray beam. The regions were chosen to highlight distinct features of the double-humped GDR of ^{154}Sm. The obtained data allow for a first experimental test of the commonly accepted K-quantum-number assignments to the GDR of ^{154}Sm. First results of the analysis will be presented and discussed with respect to the textbook interpretation of the GDR in deformed nuclei.

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HK 60.5 Thu 15:00 SCH/A215

Status report on the progress on the analysis of the NewSUBARU data — •Nikolina Lalic[1], Thomas Aumann[1,2], Takashi Ariizumi[3], Martin Baumann[1], Patrick van Beek[1], Ioana Gheorghe[4], Heiko Scheit[1], Dmytro Symochko[1], and Hiroaki Utsunomiya[3] for the NewSUBARU-Collaboration — [1]Technische Unitversität Darmstadt, Germany — [2]GSI Helmholtzzentrum, Germany — [3]Department of Physics, Konan University, Japan — [4]"Horia Hulubei" National Institute for R & D in Physics and Nuclear Engineering (IFIN HH), Romania

The photoneutron cross sections of ^{112}Sn, ^{116}Sn, ^{120}Sn and ^{124}Sn were measured in (γ, xn) reactions, where $x \in [1, 4]$, using a quasi-monochromatic laser Compton-scattering γ-ray beam at the NewSUBARU facility. The goal of the experiment is to resolve the long-standing discrepancy of the total and partial cross sections measured by the Livermore and the Saclay groups. Measurements were done with γ energies from 8 MeV to 38 MeV. As a neutron counter a detector with a flat efficiency was used to take advantage of the direct neutron-multiplicity sorting technique. The (γ, xn) cross sections $x \in [1, 4]$ will be determined as well as the total photo absorption cross sections.
In this report the experiment and the current state of the ongoing analysis will be presented.

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HK 60.6 Thu 15:15 SCH/A215

Systematic investigation of the low-energy electric dipole response in ^{116,118}Sn using the $(d, p\gamma)$ reaction — •Markus Müllenmeister, Michael Weinert, Florian Kluwig, Miriam Müscher, and Andreas Zilges — University of Cologne, Institute for Nuclear Physics

The so-called Pygmy Dipole Resonance (PDR) has been a research topic of great interest in recent decades. While the general properties of this excitation is well known [1], there are still questions about its structure. For the study of this underlying structure, experiments sensitive to different aspects of the nucleus are vital [2]. The $(d, p\gamma)$ reaction has been shown to be a selective probe for the microscopic character of certain states. The tin isotopic chain in particular is an interesting subject for this kind of investigation, as its magic proton number ($Z = 50$) provides several isotopes accessible for this reaction. As the $(d, p\gamma)$ reaction was already studied in depth for ^{119}Sn$(d, p\gamma)^{120}$Sn [3],

similar experiments were performed at the SONIC@HORUS setup [4] in Cologne on the other two available isotopes ^{115,117}Sn to study excitations in ^{116,118}Sn. The results of these experiments will be shown. Supported by the DFG (ZI 510/10-1).

[1] A. Bracco *et al.*, Prog. Part. Nucl. Phys. **106** (2019) 360
[2] D. Savran *et al.*, Phys. Lett. B **786** (2018) 16
[3] M. Weinert *et al.*, Phys. Rev. Lett. **127** (2021) 242501
[4] S. G. Pickstone *et al.*, Nucl. Instr. and Meth. **875** (2017) 104