HK 31: Structure and Dynamics of Nuclei V

Time: Wednesday 14:00–15:30 Location: SCH/A118

Group Report HK 31.1 Wed 14:00 SCH/A118

Real photon-scattering experiments for the study of dipole excitations — •Miriam Müscher[1], Johann Isaak[2], Florian Kluwig[1], Deniz Savran[3], Tanja Schüttler[1], Ronald Schwengner[4], and Andreas Zilges[1] — [1]University of Cologne, Institute for Nuclear Physics — [2]TU Darmstadt, Institute for Nuclear Physics — [3]GSI, Darmstadt — [4]Helmholtz-Zentrum Dresden-Rossendorf

Absolute photoabsorption cross sections of atomic nuclei can have great impact on reaction rates in nucleosynthesis processes. Hence, they are crucial to understand the nuclear abundances in our universe. Real photon-scattering experiments are well suited to study the dipole response due to the small angular-momentum transfer of photons [1, 2]. Besides the determination of spin and parity quantum numbers of excited states in even-even nuclei, absolute and total photoabsorption cross sections can be extracted in a model-independent way by combining complementary (γ,γ') experiments. The most common photon sources are, on the one hand, energetically-continuous bremsstrahlung and, on the other hand, Laser-Compton Backscattering producing a linearly-polarized, quasimonoenergetic γ-ray beam.
In this contribution, the aforementioned complementary photon sources, examples for corresponding setups, and recent results will be presented.
This work is supported by the BMBF (05P21PKEN9).
[1] U. Kneissl *et al.*, Prog. Part. Nucl. Phys. **37** (1996) 349
[2] A. Zilges *et al.*, Prog. Part. Nucl. Phys. **122** (2022) 103903

Group Report HK 31.2 Wed 14:30 SCH/A118

Systematics of the dipole polarizability — •Isabelle Brandherm[1], Peter von Neumann-Cosel[1], Tobias Klaus[1], Hiroaki Matsubara[2], and Atsushi Tamii[2] — [1]Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany — [2]RCNP, Osaka, Japan

Inelastic proton scattering at extreme forward angles has been established as a tool to probe the electric dipole response in nuclei. From that the electric dipole polarizability can be obtained, which is a key observable to set constraints to the symmetry energy parameters of the equation of state and neutron skin thickness of nuclei. Over the last decade the electric dipole response in numerous nuclei has been measured at the Research Center for Nuclear Physics in Osaka, Japan. In this talk new result about the dipole response and dipole polarizability of ^{58}Ni and ^{90}Zr will be presented. Also the now available systematics of of the dipole polarizability will be discussed.

Supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) - Project-ID 279384907, SFB 1245.

HK 31.3 Wed 15:00 SCH/A118

Investigation of low-lying dipole excitations in ^{144}Nd via real photon-scattering experiments — •Florian Kluwig[1], Miriam Müscher[1], Ronald Schwengner[2], Tanja Schüttler[1], and Andreas Zilges[1] — [1]University of Cologne, Institute for Nuclear Physics — [2]Helmholtz-Zentrum Dresden-Rossendorf

Since photons only transfer small angular momenta, they are a well-suited probe to investigate dipole excitations in atomic nuclei [1]. Therefore, the (γ,γ') or also called Nuclear Resonance Fluorescence (NRF) technique is an established method to study among others the so-called Pygmy Dipole Resonance (PDR). The PDR occurs as a concentration of electric dipole strength around and below the neutron separation energy. For the last decades, this excitation mode has been a research topic of great interest [2,3] and further systematic studies are crucial. Due to its wide range of stable, even-even isotopes, the Nd isotopic chain is well suited for this purpose. Thus, two complementary (γ,γ') experiments on the rare-earth nucleus ^{144}Nd have been performed using a continuous bremsstrahlung beam at the γELBE facility [4] and utilizing quasi-monoenergetic γ rays at HIγS [5]. First results of these experiments will be presented in this contribution.
This work is partly supported by the BMBF (05P21PKEN9).
[1] A. Zilges *et al.*, Prog. Part. Nucl. Phys. **122** (2022) 103903
[2] D. Savran *et al.*, Prog. Part. Nucl. Phys. **70** (2013) 210
[3] A. Bracco *et al.*, Prog. Part. Nucl. Phys. **106** (2019) 360
[4] R. Schwengner *et al.*, Nucl. Instr. and Meth. A **555** (2005) 211
[5] H.R. Weller *et al.*, Prog. Part. Nucl. Phys. **62** (2009) 257

HK 31.4 Wed 15:15 SCH/A118

Photoexcitation of ^{76}Ge — Ronald Schwengner[1], Konrad Schmidt[1], Kai Zuber[2], •Hans F. R. Hoffmann[2], Marie Pichotta[2], and Steffen Turkat[2] — [1]Helmholtz-Zentrum Dresden-Rossendorf, 01328 Dresden, Germany — [2]Institute of nuclear and particle physics, TU Dresden, 01069 Dresden, Germany

The dipole strength of the nuclide ^{76}Ge was studied in photon-scattering experiments using bremsstrahlung produced with electron beams of energies of 7.8 and 12.3 MeV which were delivered by the electron linear accelerator of high brilliance and high brightness (ELBE). In total, 210 levels up to an excitation energy of 9.4 MeV were identified and a spin $J = 1$ was assigned to most of them. The quasi-continuum of unresolved transitions was included in the analysis of the spectra and the intensities of branching transitions were estimated on the basis of simulations of statistical γ-ray cascades. The photoabsorption cross section up to the neutron-separation energy was determined.
The experimental procedure and results will be discussed including some implication on ^{76}Ge $0\nu\beta\beta$ experiments.