Contribution ID: **73** Type: **Oral presentation**

Relativistic Coulomb excitation cross section in 124-134Sn for the study of density-dependence of the symmetry energy

Thursday, 27 June 2024 09:00 (20 minutes)

Relativistic Coulomb excitation in inverse kinematics can be utilized to study the electric dipole response of projectile neutron-rich nuclei. In such conditions, collective excitations arise where neutron and proton densities of the excited nucleus are displaced with respect to each other. Additionally, access to greater isospin asymmetries on the neutron-rich side of the nuclide chart provide a suitable environment to probe the symmetry energy, a crucial yet still fairly unknown ingredient of the nuclear equation of state.

In Ref. [1] a novel approach to constrain the slope of the symmetry energy L, i.e. the linear coefficient in the expansion of the symmetry energy around saturation density, is explored for the first time by measuring the Coulomb-excitation cross section σ_C of neutron-rich nuclei at relativistic energies. This particular cross section correlates with the dipole polarizability α_D, and through the established correlation between α_D and L, enables constraining the symmetry energy by measuring σ_C. The advantage of using σ_C instead of α_D lies in simpler measurement and analysis procedure.

This approach was further examined in the experiment carried out using the large acceptance spectrometer R^3B-GLAD at the GSI accelerator facility as a part of the FAIR Phase-0 campaign [2]. Tin isotopes in the mass range 124-134 were produced as a secondary beam in the fragmentation and fission reactions at energies close to 1 GeV/u and impinged onto the lead target which provided a Lorentz-contracted field to induce Coulomb excitations. De-excitation followed through the emission of gammas and neutrons, which were detected using the CALIFA gamma calorimeter [3] and the NeuLAND neutron detector [4]. The remaining fragment nuclei were detected by tracking detectors located before and after the GLAD magnet, altogether providing a kinematically complete measurement.

[1] A. Horvat, Doctoral thesis, Technische Universität Darmstadt (2019).

[2] R^3B Collaboration, https://www.r3b-nustar.de/.

[3] H. Alvarez-Pol, et al., Nucl. Instrum. Meth. A, 767, 453-466 (2014).

[4] K. Boretzky, et al., Nucl. Instrum. Meth. A, 1014, 165701 (2021).

Collaboration

R3B

Primary authors: LIHTAR, Ivana (Institut Ruder Boškovic(IRB)); Ms KUDAIBERGENOVA, Eleonora (TU Darmstadt); FEIJOO-FONTAN, Martina (IGFAE, Universidad de Santiago de Compostela); GASPARIC, Igor (Rudjer Boskovic Institute (RBI)); HORVAT, Andrea (RBI); AUMANN, Thomas (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Dr ROSSI, Dominic Michel (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); PANIN, Valerii (GSI Helmholtzzentrum für Schwerionenforschung GmbH(GSI)); Dr RODRIGUEZ SANCHEZ, Jose Luis (University of Coruña)

Presenter: LIHTAR, Ivana (Institut Ruder Boškovic(IRB))

Session Classification: Thursday morning 1