DREB2022 - Direct Reactions with Exotic Beams



Contribution ID: 239

Type: Poster

Measurement of the single-particle strength along the calcium isotopic chain using quasi-free scattering reactions

Tuesday 28 June 2022 16:30 (5 minutes)

Several properties of atomic nuclei are known to be sensitive to the neutron-to-proton (isospin) asymmetry. Isotopic chains that extend from the valley of beta-stability towards the drip lines have now become accessible with the advent of radioactive-ion beam facilities. In particular, the evolution of the single-particle strength as a function of isospin has been the subject of experimental and theoretical debate.

Quasi-free scattering reaction is an established method to probe the structure of atomic nuclei. Employing this reaction in inverse kinematics using radioactive-ion beams at relativistic energies is proving an effective tool to study very exotic nuclei with high luminosity. Recent studies [1, 2] reported on the evolution of the proton single-particle strength with isospin asymmetry using (p,2p) quasi-free reactions along the Oxygen isotopic chain and found a weak or no dependence of the single-particle strength with isospin. This contrasts with nucleon-removal reactions [3, 4] where they report a reduction factor that is strongly correlated with isospin. The reduction of the single-particle strength has been attributed to nucleon-nucleon correlations and a recent phenomenological study [5] has attempted to quantify the long and short-range part of these correlations and their dependency with isospin.

To shed light on this puzzle, we performed a systematic study of (p,2p) cross sections along the calcium isotopic chain (from ³⁸Ca to ⁵¹Ca) at 500 MeV/nucleon. The experiment was performed with the R3B setup at GSI-FAIR.

Preliminary results of the analysis will be discussed in this contribution.

[1] L. Atar et al., Phys. Rev. Lett. 120, 52501 (2018).

[2] Shoichiro Kawase et al., Prog. Theor. Exp. Phys. 2018, 021D01.

[3] A. Gade et al., Phys. Rev. C 77, 044306 (2008).

- [4] J. A. Tostevin and A. Gade, Phys. Rev. C 90, 057602 (2014).
- [5] S. Paschalis, M. Petri, A. O. Macchiavelli, O. Hen, E. Piasetzky, Phys. Lett. B 800, 135110 (2020).

Topic

Experiment

Authors: TANIUCHI, Ryo (Department of Physics, University of York); PASCHALIS, Stefanos (University of York (GB)); PETRI, Marina (Department of Physics, University of York); FOR THE R3B COLLABORATION

Presenter: TANIUCHI, Ryo (Department of Physics, University of York)

Session Classification: Poster session