Contribution ID: **57** Type: **Oral presentation**

Gamow-Teller Giant Resonance in ^{11}Li

Tuesday, 25 June 2024 14:00 (20 minutes)

The Gamow-Teller Giant Resonance in ^{11}Li was measured via the ^{11}Li(p,n)^{11}Be charge-exchange reaction at 182 MeV/u in inverse kinematics at the RIKEN Radioactive Isotope Beam Factory. There is no available data for isovector spin-flip giant resonances in nuclei with large isospin asymmetry factors, where (N−Z)/A > 0.25 [1]. Our work aims to investigate this unexplored region, with ^{11}Li ((N−Z)/A = 0.45).
The (p,n) charge-exchange reactions in inverse kinematics, coupled with the missing-mass technique, serve as powerful tools for investigating the Gamow-Teller Giant Resonance in radioactive isotopes across a broad excitation energy range (up to 50 MeV), without being constrained by the Q-value limitations of β decay [1]. In our previous work on ^{132}Sn [2], we demonstrated that accurate information about giant resonances can be obtained for unstable nuclei by using this probe. The combined setup [3] of the PANDORA low-energy neutron spectrometer [4] and SAMURAI large-acceptance magnetic spectrometer [5], together with a thick liquid hydrogen target, allowed us to perform the experiment with high luminosity. Recoil neutrons with kinetic energy of 0.1–10 MeV were identified with PANDORA, while SAMURAI was used for tagging the decay channels of the reaction residues.
The β decay of ^{11}Li is complex. The ^{11}Li β-decay involves the largest number of decay channels ever detected [6], and experimental results have been reported for cases where the daughter breaks into fragments, and emission of one, two, and three neutrons, α particles and ^{6}He, tritons, and deuterons have been observed in several β-decay studies [8,9]. However, the B(GT) values were not clearly deduced as these studies were affected by the Q value.
In this talk, the results of our completed analysis will be presented. Deduced double differential cross-section up to about 40 MeV, including the Gamow-Teller (GT) Giant Resonance region in ^{11}Li, will be reported. A comparison of the deduced B(GT) values with those from β-decay studies reveals significant differences, emphasizing the limitations imposed by Q values in the latter. We will also discuss the nature of seven newly identified decay channels of ^{11}Be. Our observation that the GT peak occurs below the Isobaric Analog State in ^{11}Li will be discussed in connection with the variation of residual spin-isospin interaction in exotic nuclei.

[1] K. Nakayama, et al., Phys. Lett. B 114, 217 (1982).
[2] M. Sasano et al., Phys. Rev. Lett. 107, 202501 (2011).
[3] J. Yasuda et al., Phys. Rev. Lett. 121, 132501 (2018).
[4] L. Stuhl et al., Nucl. Instr. Meth. B 463, 189 (2020).
[5] L. Stuhl et al., Nucl. Instr. Meth. A 866, 164 (2017).
[6] T. Kobayashi, et al., Nucl. Instr. Meth. B 317, 294 (2013).
[7] M. Madurga et al., Nucl. Phys. A 810, 1 (2008).
[8] M.J.G. Borge et al., Nucl. Phys. A 613 199 (1997).
[9] R. Raabe et al., Phys. Rev. Lett. 101, 212501 (2008).

Collaboration

Primary authors: STUHL, Laszlo (Center for Exotic Nuclear Studies, Institute for Basic Science); SASANO, Masaki (RIKEN Nishina Center); FOR SAMURAI30 COLLABORATION

Presenter: STUHL, Laszlo (Center for Exotic Nuclear Studies, Institute for Basic Science)

Session Classification: Tuesday afternoon 1