SAMURAI acceptance for ^{9}Li + d decay channel in ^{11}Li(p, n) reaction

M. Sasano,[*1] L. Stuhl,[*1,*2,*3] J. Gao,[*1,*4] Y. Hirai,[*5] K. Yako,[*2] T. Wakasa,[*5] D. S. Ahn,[*1] H. Baba,[*1] A. I. Chilug,[*1,*6] S. Franchoo,[*7] Y. Fujino,[*8] J. Gibelin,[*9] I. S. Hahn,[*3,*10] Z. Halász,[*11] T. Harada,[*12] M. N. Harakeh,[*13,*14] D. Inomoto,[*5] T. Isobe,[*1] H. Kasahara,[*5] D. Kim,[*3,*15] G. G. Kiss,[*11] T. Kobayashi,[*16] Y. Kondo,[*17] Z. Korkulu,[*1,*3] S. Koyama,[*18] Y. Kubota,[*1] A. Kurihara,[*17] H. N. Liu,[*19] M. Matsumoto,[*17] S. Michimasa,[*2] H. Miki,[*17] M. Miwa,[*20] T. Motobayashi,[*1] T. Nakamura,[*17] M. Kurata-Nishimura,[*1] H. Otsu,[*1] V. Panin,[*1] S. Park,[*10] A. T. Saito,[*17] H. Sakai,[*1] H. Sato,[*1] T. Shimada,[*17] Y. Shimizu,[*1] S. Shimoura,[*2] A. Spiridon,[*6] I. C. Stefanescu,[*6] X. Sun,[*1,*4] Y. L. Sun,[*19] H. Suzuki,[*1] E. Takada,[*21] Y. Togano,[*8] T. Tomai,[*1,*17] L. Trache,[*6] D. Tudor,[*6,*3] T. Uesaka,[*1] H. Yamada,[*17] M. Yasuda,[*17] K. Yoneda,[*1] K. Yoshida,[*1] J. Zenihiro,[*1] and N. Zhang[*22,*2]

In the SAMURAI30 experiment, we studied the Gamow-Teller (GT) giant resonance in the drip-line nucleus ^{11}Li at 181 MeV/nucleon using the missing-mass technique.[1] The ^{11}Li nucleus is the showcase of a two-neutron halo system, with its very extended matter distribution related to the small energy necessary to remove the neutrons. The charge-exchange (p, n) reactions in inverse kinematics are efficient tools to extract the B(GT) strengths of unstable isotopes up to high excitation energies without the Q-value limitation.[2] In our previous study, we demonstrated that accurate information about isovector spin-flip giant resonances can be obtained for unstable nuclei using this probe.[3] The setup of the PANDORA low-energy neutron time-of-flight counter[4] and SAMURAI magnetic spectrometer[5] as well as a thick liquid hydrogen target facilitate the performance of measurements with high luminosity.

We observed 13 decay channels with particle emission. In certain cases, the fragments emitted from the daugther nucleus, such as neutrons, deuteron, α particles, and so on, are lost before being detected by the HODF24 hodoscope array at the exit of the SAMURAI spectrometer. To correct for this effect, we performed a GEANT4 simulation to evaluate acceptance of the SAMURAI spectrum by employing the simulation package smsimulator.[6] Corresponding to the strong transition at approximately 19 MeV in the excitation energy spectrum of ^{11}Be,[7] the acceptance was evaluated to be 80% for the ^{9}Li + d channel.

Figure 1 presents the comparison of the experimental and simulated data for this particular channel. The analyses for other decay channels are ongoing.

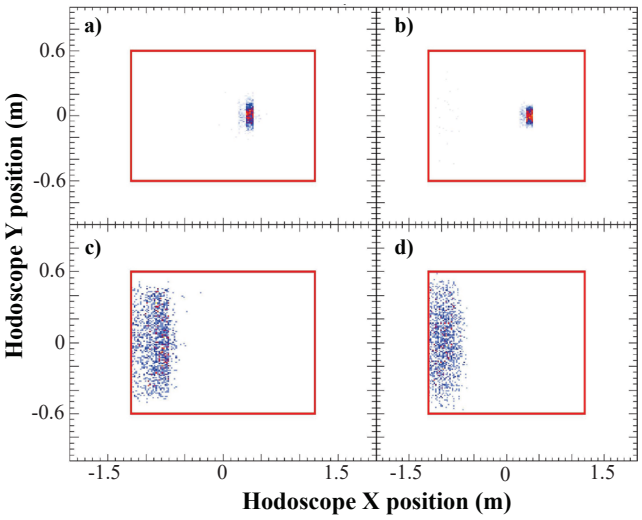

Fig. 1. Comparison of the experimental and simulated results for the HODF24 hodoscope hit pattern for the ^{9}Li + d decay channel. Panels (a) and (b) depict the experimentally measured and simulated distributions for the heavy residue (^{9}Li), respectively. Panels (c) and (d) represent the experimentally measured and simulated distributions for the deuteron decay particle, respectively. The red squares represent the physical size of the HODF24 detector.

*1 RIKEN Nishina Center
*2 Center for Nuclear Study, University of Tokyo
*3 Center for Exotic Nuclear Studies, Institute for Basic Science
*4 School of Physics, Peking University
*5 Department of Physics, Kyushu University
*6 Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering
*7 Institut de Physique Nucléaire, Université Paris-Saclay
*8 Department of Physics, Rikkyo University
*9 Nuclear Physics Laboratoy LPC CAEN
*10 Department of Physics, Ewha Womans University
*11 HUN-REN Institute for Nuclear Research (Atomki)
*12 Department of Physics, Toho University
*13 Department of Physics, University of Groningen
*14 GSI Helmholtzzentrum für Schwerionenforschung GmbH
*15 Department of Physics, Korea University
*16 Department of Physics, Tohoku University
*17 Department of Physics, Tokyo Institute of Technology
*18 Department of Physics, University of Tokyo
*19 Département Physique Nucléaire, CEA, Université Paris-Saclay
*20 Department of Physics, Saitama University
*21 National Institute of Radiological Sciences (NIRS)
*22 Institute of Modern Physics, Chinese Academy of Sciences

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