Gamow-Teller resonance in ^{14}Be(p, n) reaction

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A charge-change (p, n) experiment, SAMURAI30, on ^{14}Be and ^{11}Li nuclei was performed on the SAMURAI spectrometer.[1,2] In this report, we present the status of the analysis of ^{14}Be$(p, n)^{14}$B* channel.

We used inverse kinematics with a secondary beam of ^{14}Be at 198.4 MeV/nucleon and a 10 mm thick liquid hydrogen target, rotated by 45°.[3,4] The low-energy neutron detector setup, consisted of PANDORA[5] and WINDS scintillator arrays, covered the laboratory angular range of 47.8° to 133.9° and were employed to detect the recoil neutrons. Signals from those detectors were recorded by a digital data acquisition system, which was operated in parallel with the standard SAMURAI DAQ system by sharing the same trigger signal.[6] The neutron time-of-flight was measured to reconstruct the missing mass spectra.

Figure 1 shows the laboratory angle vs. laboratory energy spectrum of the detected neutrons when ^{13}B is selected in the HODF24 hodoscope, three curves (in 0–5 MeV, 5–10 MeV, and 15–20 MeV of excitation energies) evidently appeared. The left and right wings of the scintilator array are drawn seperately. The colored solid lines indicate the excitation energy of ^{14}B. The dotted lines indicate the corresponding center-of-mass angles. The signal-to-noise ratio is expected to be improved by the neutron-gamma discrimination analysis.[7]

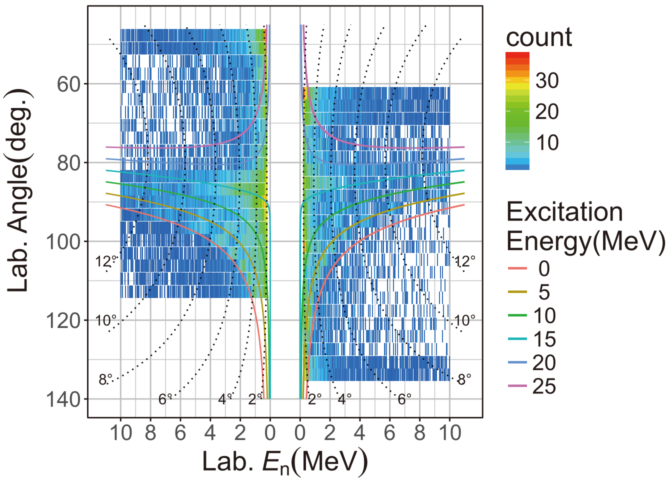

Fig. 1. Kinematic correlation of neutron angle and energy when ^{13}B is detected downstream of SAMURAI.

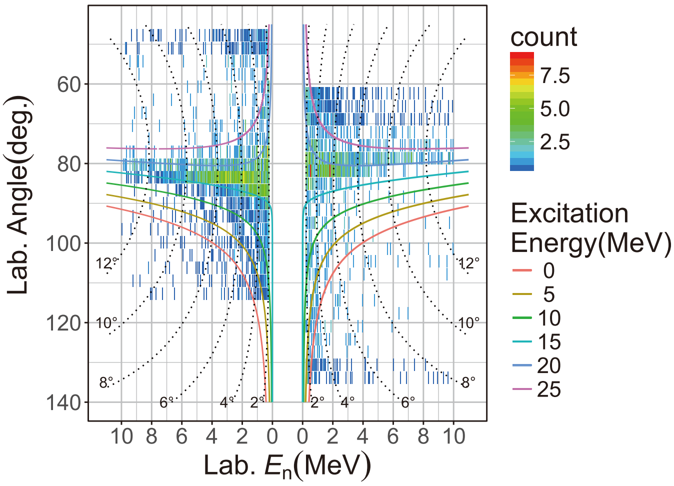

Fig. 2. Kinematic correlation of neutron angle and energy when ^{12}Be and deuteron are detected downstream of SAMURAI.

Figure 2 shows the laboratory angle vs. laboratory energy spectrum of neutrons when both ^{12}Be and deuteron are selected in the HODF24 hodoscope.

These curves show that the ^{14}B excitation energy can be derived from the missing mass sprctrum of neutrons, thereby implying that our experiment was successfully performed. In the future, we will tag the other decay channels of excited ^{14}B and finally derive the Gamow-Teller strength.

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