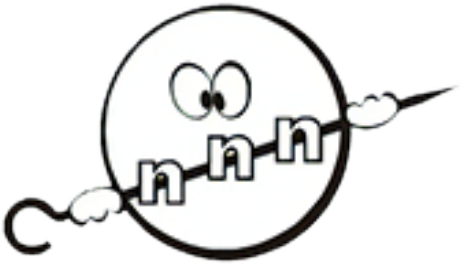

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Experimental Study on Differential Cross Section of 14N(n, p)14C Reaction

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The report briefly outlines the significance and background of this experimental study, the experimental setup, and the preliminary results. The 14N(n,p)14C reaction is the most significant poisoning reaction in the s-process nucleosynthesis. The measurement of its differential cross-section is crucial for producing 19F, determining neutron dose in boron neutron capture therapy (BNCT), estimating spin-parity of nuclear energy levels, and testing some nuclear models. Currently, there are discrepancies between existing experimental data and evaluated data, and there is a lack of differential cross-section data across the entire energy range. This experiment was conducted at CSNS Back-n, aiming to provide a scientifically robust supplement to the controversies and gaps in the nuclear data of this reaction. The result obtained in this experiment represent the first differential cross-section result in this energy region. During the experiment, neutron beams irradiated targets such as aluminum-backed C3H3N6 and aluminum-backed 6LiF, with signals detected by silicon detectors and data acquired by waveform digitizing electronics. The report provides a detailed description and explanation of the data analysis process and experimental results. After data processing and R-matrix fitting, the differential cross-section measurements were found to be consistent with the JENDL-5.0 evaluation within the error margins. The fitting results were consistent with the measurements and showed a distinct angular distribution in the 2.2˜5.5 MeV range. Additionally, resonance parameters for approximately 40 14N+n resonances in the 0.1˜6 MeV range were obtained from the fitting results, including the spin-parity of the 15N compound nucleus excited states and the reaction widths of the 14N+n, 14C+p, 15N+γ, and 11B+α reaction channels.

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