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Study of the Spin-Memory Effect with Low-energy Gamma-rays in $^{177}\mathrm{Hf}(n,\gamma)^{178}\mathrm{Hf}$ Reaction Measurement

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The total angular momentum, J, of resonances is one of the important parameters to represent cross sections in low-energy nuclear reactions. Several methods have been proposed to estimate J of resonances from experiments [1]. One of the attractive methods was to compare the intensity ratios of appropriately chosen pairs of low-energy transitions in the gamma-ray spectrum of a resonance proposed by Wetzel and Thomas [2]. This method is based on the Spin-Memory Effect (SME) proposed by Huizenga and Vandenbosch [3]. SME means that the spin information of an initial resonance state remains, even if there are many intermediate excited levels in the cascade transitions. The strength of SME, which appears in the intensity ratio, can be quantitatively evaluated from the difference of the intensity ratios. The results of past measurements have suggested that SME is enhanced when the atomic number Z is near the magic number Z=50 [4]. In this study, neutron capture reaction measurements were performed at J-PARC/MLF/ANNRI using natural Hf (Z=72), which is the element away from Z=50. The strength of SME was determined from the intensity ratios of low-energy gamma-rays from resonances. It is found that SME observed in Hf (Z=72) was stronger than in Ta (Z=73) [5].

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