

Possible direct evidence of tensor interaction in heavy nucleus studied via (p,d) reaction

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The tensor interaction which originates from the pion exchange is an essential interaction that provides the important two-body attraction in the nuclear forces. The importance of the tensor force has been demonstrated to reproduce the properties of nuclear matter as well as to explain the binding energies of the deuteron and alpha particles. In heavier nuclei, results from recent experiments with radioactive-isotope beams have hinted at a possible important role of the tensor forces in the changes of the magic numbers and the orders of single-particle orbitals in neutron-rich nuclei. However, the experiment evidences other than those from the deuteron are indirect. Hence, to search for direct evidence of the tensor interaction in heavier nuclei, we carried out (p,d) reaction measurements on ^{12}C and ^{16}O .

The tensor interaction is expected to give rise to high momentum components in nuclei. In this talk, we will report on an observation of enhancements of high momentum neutrons, which may indicate a direct evidence of tensor interaction.

The experiment was performed at the RCNP WS course using the Grand Raiden spectrometer. Proton beams at three energies: 198, 295 and 392 MeV, with intensities around 5 – 10 nA, were directed onto a natural carbon or an ice target placed in a scattering chamber before the GR spectrometer. The scattered deuterons were momentum analyzed and transported to the focal plane of the GR, where they were detected by two drift chambers and two 10-cm-thick plastic scintillators. For each proton beam energy, measurements were performed at several scattering angles between 5 – 30 degrees to obtain data for different momentum transfers at around 2 fm^{-1} where marked effect of the tensor interaction is expected.

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