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A Precision Test of Charge Independence*

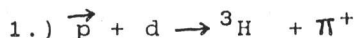
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There is renewed interest in the study of charge-independence and charge-symmetry (isospin conservation) in strong interactions because it is believed that at the quark level they are related to the (accidental?) near-equality of the masses of the up- and the down- quarks.¹⁾ Unfortunately, despite numerous experiments for which claims of higher sensitivity are made, neither CI nor CS have been verified in nuclear experiments at a level better than about 5% to 10%. Certain specific aspects of CI/CS violation, e.g., the spin-orbit part of the two-body isospin-violating interaction, have not been investigated even at this level.²⁾

The main problem with experiments in this domain is that one is usually required to compare two different measurements which must be done under two very different experimental conditions. Different beams, different targets, and different particle-detectors are generally involved, leading to uncontrolled systematic errors.

In order to avoid the experimental problems mentioned above, and to investigate specifically the spin-orbit part of the isospin-violating interaction, we have studied the two reactions:



with the detection of the recoil particles, ${}^3\text{H}$ and ${}^3\text{He}$.

The experiment was done at the HRS facility at LAMPF. A 733 MeV beam of transverse polarized protons was incident on a liquid deuterium target. ${}^3\text{H}$ and ${}^3\text{He}$ were identified and momentum analyzed in the HRS spectrometer system. The spectrometer was cycled between ${}^3\text{H}$ and ${}^3\text{He}$ acceptance every few hours. The primary goal of the experiment was to make precision measurements of $A_{\text{vo}}(12^\circ)$ for the two reactions and to obtain the difference between them, $\Delta A_{\text{vo}} = A_{\text{vo}}({}^3\text{H}) - A_{\text{vo}}({}^3\text{He})$ at a level better than ~1%. The comparison of the differential cross sections (at the level of a few %) was a secondary objective.

Preliminary results of the experiment will be presented.

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1) S. Weinberg, Proc. VII ICOHEPANS, Zurich 1977,p.339.

2) E. M. Henley, in Isospin in Nuclear Physics, ed. D. H. Wilkinson, pub. North Holland (Amsterdam),p. 1572.