1) A. Bohr and B. Mottelson, Nuclear Structure (Benjamin, New York, 1969), Vol 1, p. 345, 349, 411.

2) W.G. Love, A. Scott, F. Todd Baker, W.P. Jones and J.D. Wiggins, Jr., Phys. Lett. 73B, 277 (1978).

3) W.G. Love, in The (p,n) Reaction and the Nucleon-Nucleon Force, ed. by C.D. Goodman, S.M. Austin, S.D. Bloom, J. Rapaport and G.R. Satchler, (Plenum, N.Y., 1980) p.23.

4) G. Bertsch, J. Borysowicz, H. McManus and W.G. Love, Nucl. Phys. A284, 399 (1977).

5) F. Ajzenberg-Selove and T. Lauritsen, Nucl. Phys. A227, 1 (1974); F. Ajzenberg-Selove, Nucl. Phys. A248, 1 (1975); Nucl. Phys. A268, 1 (1976).

6) P.M. Endt and C. van der Leun, Nucl. Phys. A310, 1 (1978).

7) F. Petrovich, W.G. Love and R.J. McCarthy, Phys. Rev. C (in press).

GAMOW-TELLER RESONANCES OBSERVED IN ^{90,92,94}Zr(p,n) at 120 and 160 MeV

W. Sterrenburg, S.M. Austin, and A. Galonsky
Michigan State University, East Lansing, Michigan 48823

D.E. Bainum and J. Rapaport
Ohio University, Athens, Ohio 45701

C.C. Foster
Indiana University Cyclotron Facility, Bloomington, Indiana 47405

C.D. Goodman and D.J. Horen
Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830

C.A. Goulding and M.B. Greenfield
Florida A&M University, Tallahassee, Florida 32307

E. Sugarbaker
University of Colorado, Boulder, Colorado 80309

Because the β-decay and nucleon charge exchange operators are identical in the spin isospin space of the target (decaying) nucleus, strong Gamow-Teller transitions should be seen strongly in charge exchange reactions. Searches with the (p,n) reaction at E_p= 45 MeV indicate that Gamow-Teller strength is concentrated just above the isobaric analog state (IAS).[1] But the enhancement in the continuum is relatively weak, making quantitative conclusions uncertain. The situation at E_p= 120 MeV is much less ambiguous because of the dominance of the spin-flip part of the effective two-nucleon interaction above 100 MeV.[2]

The ^{90,92,94}Zr(p,n) spectra shown in Fig. 1 were obtained with the beam swinger time of flight system at Indiana University. The IAS (0^+, T=5) and the states labelled 1^+ all have strongly forward peaked angular distributions characteristic of L=0. Since the transition to the IAS exhausts the non-spin-flip L=0 strength, the 1^+ identification follows. The stronger 1^+ state is assigned T=4 and the weaker T=5 based on intensity ratios expected from the isospin geometry. Finally, the state labelled 1^- has been so assigned because of its L=1 angular distribution.

Two qualitative conclusions follow immediately from this data. First, a substantial fraction of the Gamow-Teller strength has been seen. The relative areas of the 1^+ and IAS states, combined with a knowledge of the ratio of spin-flip to non-spin-flip strengths for the effective interaction leads to the conclusion that the Gamow-Teller matrix element for the 1^+ transition is comparable to the Fermi matrix element for the IAS transition. And second, the Gamow-Teller strength moves toward the IAS as N increases. The width of the 1^+ strength remains about constant at ∿ 4.5 MeV

FWHM.

Preliminary data at E_p= 160 MeV appears to indicate that the ratio of spin-flip to non-spin-flip strength is larger than at 120 MeV, but the resolution is sufficiently worse that the interpretation is less clear cut.

1) R.R. Doering, A. Galonsky, D.M. Patterson, and G.F. Bertsch, Phys. Rev. Lett. 35, 1691 (1975).

2) C.D. Goodman, Telluride Conference, March 29-31, 1979.

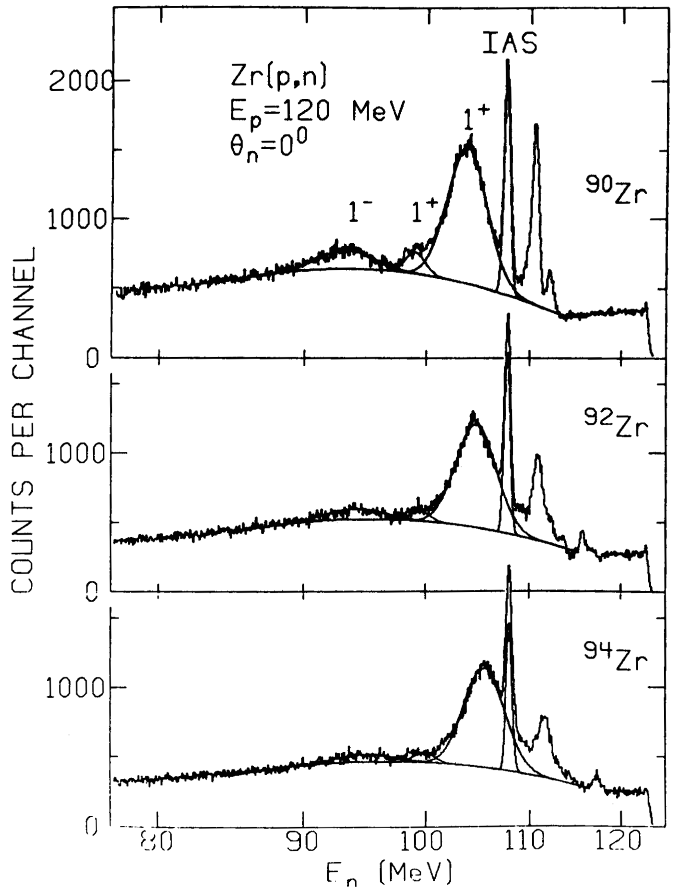

Figure 1. Neutron spectra including fits to peak shapes for the $^{90,92,94}Zr(p,n)$ reactions at 120 MeV proton bombarding energy.

NEUTRON MATTER DISTRIBUTIONS FROM QUASI-ELASTIC (p,n) REACTIONS

D. Bainum
Emporia State University, Emporia, Kansas 66801

C.C. Foster and C.D. Goodman
Indiana University Cyclotron Facility, Bloomington, Indiana 47405

D.A. Lind, C.D. Zafiratos, R.S. Raymond, T.G. Masterson, and E. Sugarbaker
University of Colorado, Boulder, Colorado 80309

J. Rapaport
Ohio University, Athens, Ohio 45701

S.D. Schery
New Mexico A&M University, Socorro, New Mexico 87801

Runs made early in the year on Zr, Sn and Pb to look at (p,n) neutron spectra at angles much larger than 15° indicated that the general background, mainly cosmic ray neutron and muon events, was so large that it was not possible to take angular distributions on large A targets at angles beyond 20°. The two features currently of interest are gound state IAS transition strengths and the giant resonance strengths. For both problems improved signal-to-background was needed.

In the past year very substantial improvements in the chopped beam current at the TOF targets has occurred. The other improvement made was the installation of large