OBSERVATION OF GIANT PARTICLE-HOLE RESONANCES IN $^{90}Zr(p,n)^{90}Nb$

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

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

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

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

Data obtained with the beam swinger facility indicate that Gamow-Teller (GT) resonances show up much more prominently at energies above 100 MeV than at lower energies. Figure 1 shows a comparison of 0° spectra for $^{90}Zr(p,n)^{90}Nb$ at 45, 120 and 160 MeV.

Using the procedures described in another contribution to this report, we have extracted GT matrix elements from the 120 MeV data for ^{90}Zr. The peak fitting is shown in Fig. 2 and a summary of the findings are given in Table I. We are able to locate approximately 38% of the total possible GT strength.

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

TABLE I. Information extracted from peaks identified in Fig. 2.

Peak	E_x	FWHM (MeV)	0° Cross Section $(mb/sr)_{cm}$+	Deduced $\langle GT \rangle^2$
a	1.0 ± .2	0.66*	0.8 ± 19%	0.3
b	2.3 ± .2	0.66*	5.0 ± 5%	1.8
c	3.0 ± .3	0.66*	0.9 ± 18%	
d (IAS)	5.1 ± .2	0.66*	6.0 ± 5%	10 (Fermi matrix element)
e (Giant GT)	8.7 ± .3	4.4 ± .2	23 ± 6%	8.3
f	13.4 ± .4	3.1 ± .3	3 ± 12%	1.0
g	17.9 ± .6	7.8 ± .7	7.9 ± 10%	

*Instrumental resolution.

+The quoted errors are the relative uncertainties in the peak fitting. An additional 10% should be added in quadrature to obtain uncertainties in the absolute cross sections.

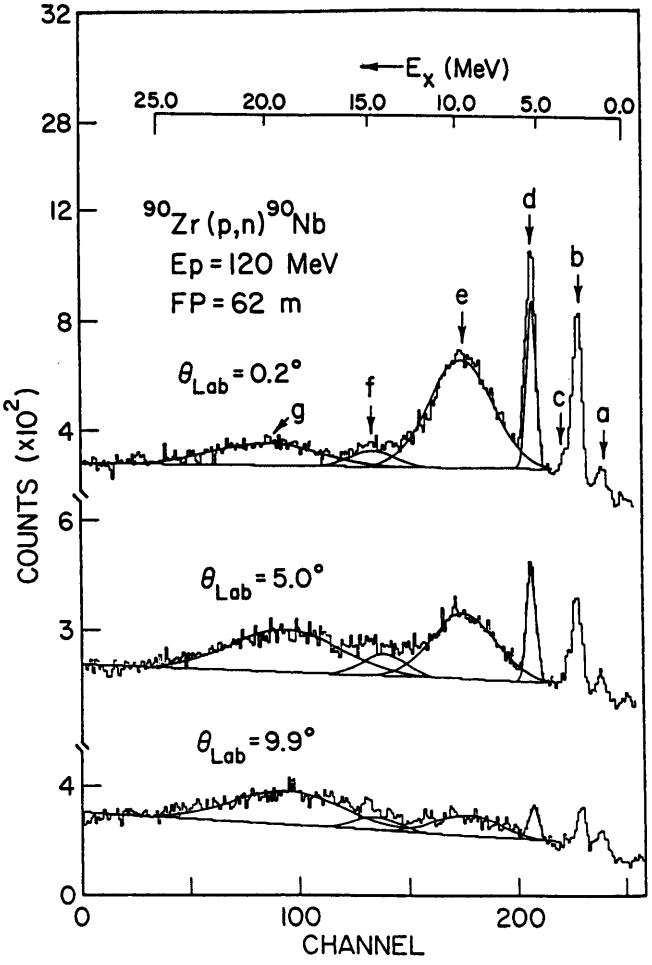

Figure 1. Comparison of 0° spectra from $^{90}Zr(p,n)^{90}Nb$ at 45, 120, and 160 MeV. The 45 MeV spectrum is from Ref. 1. The 120 and 160 MeV spectra are IUCF data.

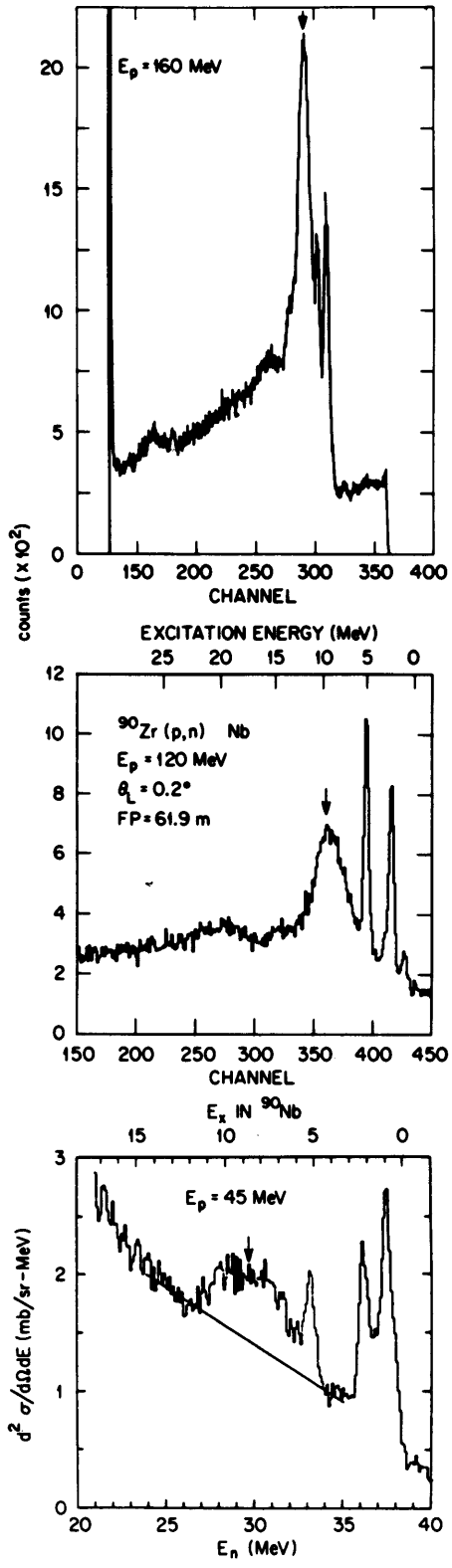

Figure 2. Time-of-flight neutron spectra for $^{90}Zr(p,n)^{90}Nb$ at θ=0°,5°, and 10° lab angles. The peak labeled "e" is assumed to be a giant GT resonance. The curves show the background and individual gaussian peaks derived from a fitting program. The detector efficiency is essentially flat over the energy region shown.