LOW-EXCITED 1^+ STATES IN ^{90}Nb, ^{120}Sb AND ^{208}Bi FROM (^{3}He,t) CHARGE EXCHANGE AT $E_{^3He}$ = 200 MeV

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The investigation of the (^{3}He,t) charge-exchange reaction with the IUCF K600 magnetic spectrometer at $\Theta = 0°$ has led to the observation of numerous isobaric analog states and giant resonances.[1] In addition, transitions to low-excited states were observed which have distinct $L = 0$ characteristics. The ray-tracing capability of the focal-plane detection system permits the identification of maxima in the cross section at 0°. This provides a unique signature for $L = 0$ transitions.

Figure 1 displays triton energy spectra measured near $\Theta = 0°$ for the regions of low excitation energies in ^{90}Nb, ^{120}Sb and ^{208}Bi. Apparently, only a very small number of the many states in the odd-odd final nuclei are selectively excited. Most of these are 1^+ spinflip Gamow-Teller transitions which are indicated in the spectra and listed in Table 1.

Table 1. Cross sections $d\sigma/d\Omega$ at 0° for (^{3}He,t) transitions to low-excited (mostly 1^+) states.

Target Nucleus	Final Nucleus	E_x (MeV)	$J\pi$	$d\sigma/d\Omega$ (mb/sr)
^{90}Zr	^{90}Nb	0.382	1+	0.314±0.023
		0.651	3+	0.258±0.021
		0.854	(2+)	0.234±0.020
		2.126	1+	1.05 ±0.04
^{120}Sn	^{120}Sb	0.000	1+	0.639±0.033
		0.94	1+	0.19 ±0.02
		1.26	1+	0.47 ±0.05
		1.49	1+	0.39 ±0.04
^{208}Pb	^{208}Bi	1.803	1+	0.302±0.015
		3.174	1+	0.204±0.014
		3.863	1+	0.194±0.013
		4.043	1+	0.173±0.013
		4.621	1+	0.350±0.018
		~ 5.6	1+ (broad)	

Such states are usually difficult to identify in (p,n) charge-exchange reactions due to the lower energy resolution. For example, low excited Gamow-Teller states were observed in ^{208}Pb (p,n)^{208}Bi at 134 MeV.[2] The present (^{3}He,t) work provides a better identification of these states. Furthermore, energies assigned in the (p,n) work to resonances from E_x = 7 to 12 MeV to describe the observed continuum do not appear to have counterparts in the (^{3}He,t) spectrum. The advantage of charged-particle spectroscopy is evident, but the extraction of Gamow-Teller strength from (^{3}He,t) cross sections even at 0° may be more involved because of the presence of the tensor interaction.

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1. J. Jänecke *et al.*, Nucl. Phys. **A526**, 1 (1991).
2. B.S. Flanders *et al.*, Phys. Rev. **C40**, 1985 (1989).

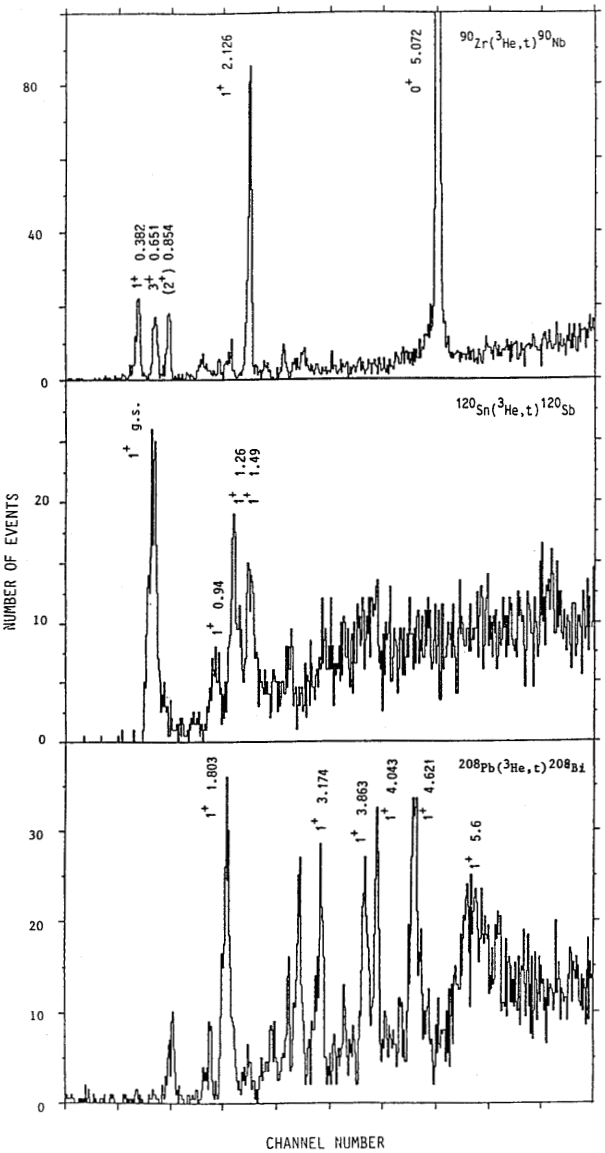

Figure 1. Triton energy spectra from the (^{3}He,t) charge exchange reactions for $E_{^3He}$= 200 MeV and $\Theta = 0°$ on targets of ^{90}Zr, ^{120}Sn and ^{208}Pb for transitions to excitation energies up to 6 MeV.