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THE ^{39}K(p,n)^{39}Ca REACTION

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The ^{39}K(g.s.) is predominantly ($\pi 1d^{-1}$). The transition to the ^{39}Ca(g.s.) carries essentially all of the $(d^{-1}_{3/2}) \rightarrow (d^{-1}_{3/2})$ strength. The $(\nu d^{-1}_{5/2})$ strength seen in ^{40}Ca(p,d)^{39}Ca and ^{40}Ca(d,t)^{39}Ca reactions is distributed in several states between 5 and 10 MeV of excitation. In the data from our March, 1983 measurements of the ^{39}K(p,n)^{39}Ca reaction at 135 MeV, we observe the excitation of ~20 known states between 4.5 and 10.5 MeV of excitation energy. Ten of these states have $\Delta\ell = 0$ angular distributions (peaked at 0°. The other states have $\Delta\ell \geq 1$ angular distributions. Every state identified as $(\nu d^{-1}_{5/2})$ in the 40-MeV ^{40}Ca(p,d)^{39}Ca work of Martin et al.[1] has a $\Delta\ell = 0$ angular distribution in the ^{39}K(p,n) reaction; however, several states identified as $(\nu d^{-1}_{5/2})$ in the 52-MeV ^{40}Ca(d,t)^{39}Ca work of Doll et al.,[2] clearly do not have $\Delta\ell = 0$ angular distributions in the ^{39}K(p,n)^{39}Ca reaction. Thus, the (p,n) reaction provides a valuable cross check on the spectroscopy of ^{39}Ca.

When we add up the strength seen in the (p,n) reaction for the 10 $(\nu d^{-1}_{5/2})$ states we identify between 5 and 10 MeV of excitation and compare this with the Gamow-Teller strength for the (p,n) reaction to the ^{39}Ca(g.s.), we obtain a ratio:

$$\frac{(\nu d^{-1}_{5/2})}{(\nu d^{-1}_{5/2})} \sim 2.71$$

This can be compared with the extreme single-particle value:

$$\frac{|\langle d_{5/2}|||\vec{\sigma}\cdot\vec{\tau}|||d_{3/2}\rangle|^2}{|\langle d_{1/2}|||\vec{\sigma}\cdot\vec{\tau}|||d_{3/2}\rangle|^2} = 4$$

With the effective s-d shell matrix elements of Brown and Wildenthal[3] this ratio is reduced to 3.78.

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THE $^{51}V(p,n)^{51}Cr$ REACTION AT E_p = 160 MeV

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The $^{51}V(p,n)^{51}Cr$ reaction has been studied at E_p = 160 MeV using the IUCF beam swinger facility. Data have been obtained at several angles up to θ_L = 20°. The zero degree spectrum (Fig. 1) is used to obtain a $\Delta L = 0$ response function from which Gamow-Teller strength is derived. This is presented integrated in 1 MeV bins in the shaded area of Fig. 2. A shell model calculation of the GT strength distribution is also shown in Fig. 2 and is in excellent agreement with the data. The integrated experimental GT strength of 12.6 ± 2.5 is (63 ± 13)% of the total theoretical strength of 20.14.

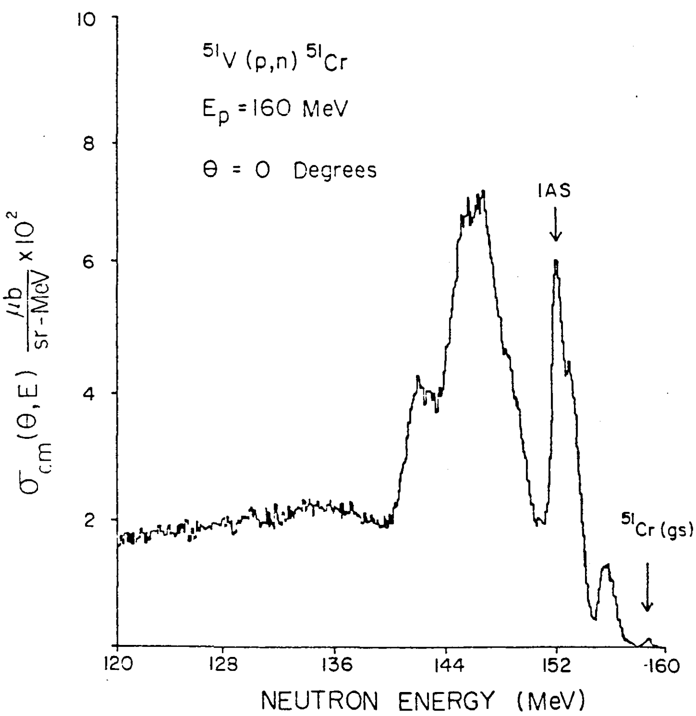

Figure 1. Zero-degree spectrum measured for the $^{51}V(p,n)^{51}Cr$ reaction.