STUDIES OF THE $^{116}Sn(\vec{d},t)^{115}Sn$ AND $^{116}Sn(\vec{d},He)^{115}In$ REACTIONS AT 50 MeV.

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An earlier study[1)] of the reaction $^{116}Sn(d,t)^{115}Sn$ located approximately 45% of the deeply-bound hole state strengths ($2p_{1/2}$, $2p_{3/2}$, and $1g_{9/2}$) in ^{115}Sn. Two of the aims of the present experiment were to determine if additional strength could be located at higher excitation energy and whether a further decomposition of the strength into $2p_{1/2}$ and $2p_{3/2}$ components would be possible.

Vector polarized deuterons were accelerated by the IUCF cyclotrons to an energy of 50 MeV. Reaction products were detected in ΔE-E counter telescopes placed on opposite sides of the beam. The triton and ^{3}He spectra were separated by setting software windows in the E vs. ΔE arrays stored in the data acquisition computer. The bombarding energy of 50 MeV was chosen to facilitate comparison with the cross section measurements of ref. 1.

A triton spectrum for the $^{116}Sn(d,t)^{115}Sn$ reaction at 15° is shown in Figure 1. The present measurements extend to much higher excitation than those of ref. 1 and permit a better determination of the background underlying the gross structure peaks corresponding to "deep-hole" pickup. The use of region VI to determine the background leads to the extraction of additional strength in the excitation region V from 12 to 18 MeV in ^{115}Sn. The new component (thought to be part of the background in the earlier measurements) contains most likely $1f_{5/2}$ strength in addition to p strength. With the inclusion of the additional cross section the total sum rule strength for pick-up from the $1g_{9/2}$, $2p_{3/2}$, and $1f_{5/2}$ neutron subshells is observed.

The analyzing powers for the deeply bound hole states were found to be rather non-distinctive, indicating admixtures between the different subshells

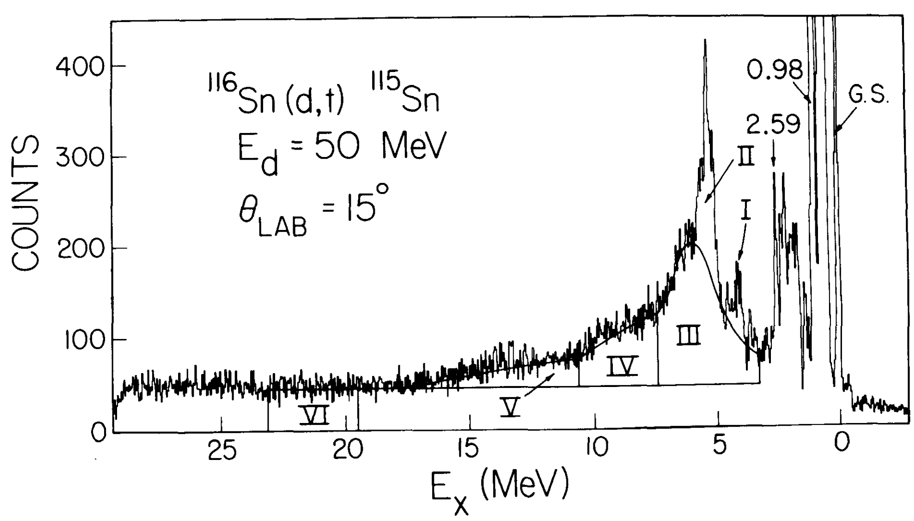

Figure 1. A triton spectrum from the $^{116}Sn(d,t)^{115}Sn$ reaction measured at 15°. The areas I through VI show the division of the gross structure described in the text.

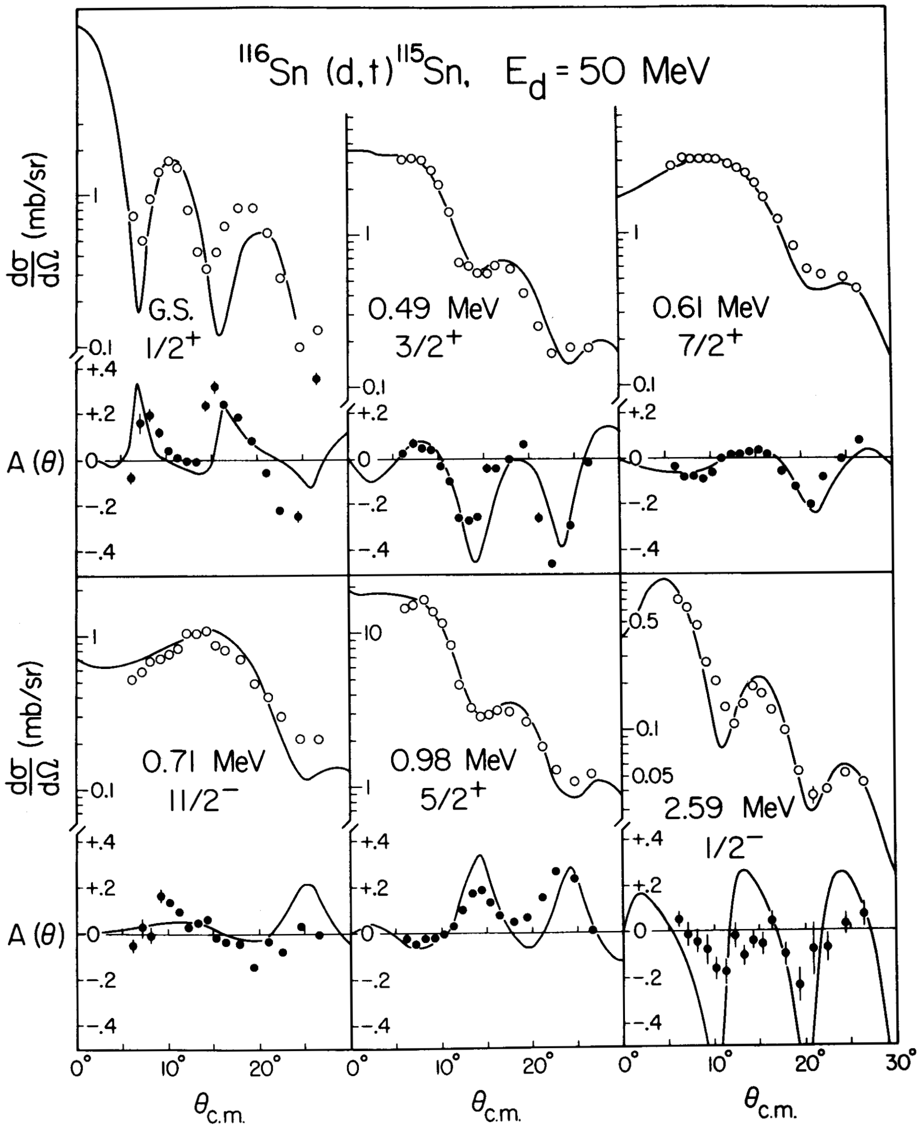

Figure 2. Cross section and analyzing power angular distributions for the low-lying state of ^{115}Sn observed in the $^{116}Sn(\vec{d},t)^{115}Sn$ reactions. The solid curves are the results of DWBA calculations using the parameters of ref. 1.

in the gross-structure peaks. Consequently, it was not possible to separate the $2p_{3/2}$ strength from the $2p_{1/2}$ strength.

In addition to the data for the deep-lying hole states in ^{115}Sn, transitions to low-lying states in ^{115}Sn and ^{115}In resulting from the pick-up of valence shell neutrons and protons, respectively, were studied via the $^{116}Sn(\vec{d},t)$ and $^{116}Sn(\vec{d},^3He)$ reaction. Figure 2 shows angular distributions and analyzing power measurements for a number of the low-lying states in ^{115}Sn.DWBA calculations with standard optical model parameters in general were found to give a good account of the analyzing powers for the pick-up of the valence shell nucleons. It will be possible to make spin assignments for a few excited states in ^{115}In on the basis of the present analyzing power measurements.

1) S.Y. van der Werf et al., Phys. Rev. Lett. 33, 712 (1974), and Nucl. Phys. A289, 141 (1977).