Microscopic DWBA Calculations of the ^{120}Sn$(p,t)^{118}$Sn Reaction.

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As a complement of the experimental work concerning the study of the ^{120}Sn$(p,t)^{118}$Sn reaction, in addition to shell model investigation of ^{118}Sn [1], we have performed microscopic calculations of the (p,t) transfer with the reaction code TWOFNR [2], in order to determine whether the shell-model eigenstates of ^{120}Sn and ^{118}Sn are consistent with the measured differential cross sections. In ref. [3] we described the two-neutron transfer process microscopically. Because this theory uses a collective interaction between the proton and the transferred neutrons, rather than a realistic interaction between the proton and the individual neutrons, it is difficult to express the results in terms of absolute differential cross-sections. However, the relative differential cross-sections at different outgoing triton angles, and between different final states of the residual nucleus, should be adequately described by the theory. Therefore, in the presentation of the results of the calculation, we have normalized the calculated differential cross-section with a single multiplicative factor, chosen to give the best visual fit to the measured ground-state (0_1^+) angular distribution. This single multiplicative factor was used for all final states.

Figure 1 summarizes the comparison between calculated and predicted differential cross-sections for 0^+, 2^+, 4^+, 5^-, 6^+, and 7^- final states. Note that the version of two-neutron-transfer theory that we use, in which the transferred neutrons have zero total spin and zero relative orbital angular momentum, predicts that only natural parity states will be populated.

The most striking feature of the observed (p,t) spectrum is the dominance of the ground-state transition. For example, at 30° the ground-state transition is stronger than the 2_1^+ transition by a factor of 8, and stronger than any other transition by more than a factor of 35. This ground-state dominance is also exhibited by the results of the microscopic calculations, where the ground-state transition has about 4 times the strength of the 2_1^+ transition, and about 50 times the strength of any other transition.

It is seen from Fig. 1 that the microscopic theory overpredicts the strength of the 2_1^+ transition, relative to the ground-state transition, by a factor of about 2. This may imply that the real 2_1^+ level has greater complexity than is afforded by the shell model configurations we have included. If this more complex component of the real 2_1^+ level cannot be reached from the ^{120}Sn ground-state by the (p,t), then the observed cross-section would be lower than we would calculate on the basis of simple shell model configurations.

The orders-of-magnitude of the strengths of the transitions to the odd-parity states are reasonably well accounted for, although we cannot claim level-by-level agreement.

References

[1] A. Covello *et al.* Annual report 2007, p. 10.
[2] M. Igarashi, Computer code TWOFNR, (1977).
[3] P. Guazzoni *et al.*, Phys. Rev. **C74** (2006) 054605

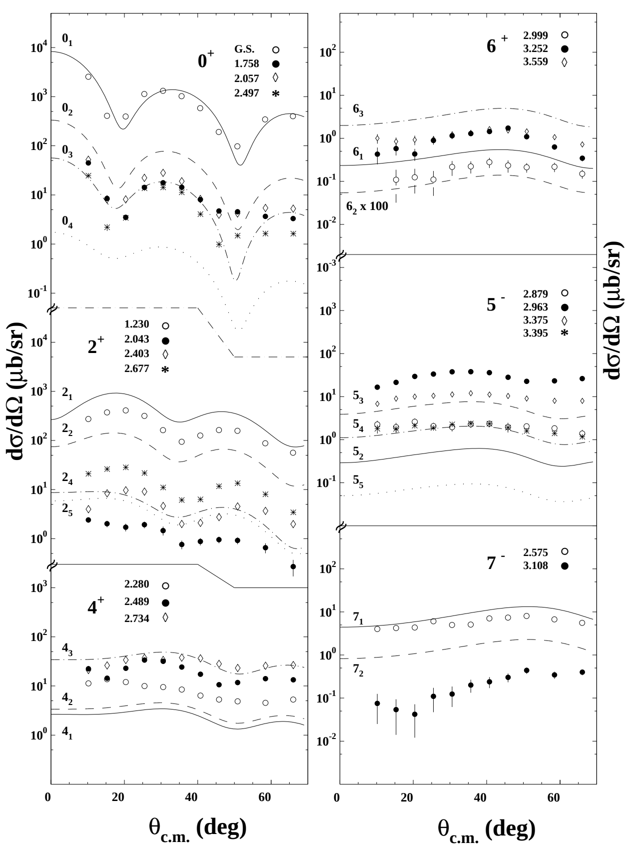

Fig. 1: Comparison between experimental and predicted differential cross sections for $0^+, 2^+, 4^+, 6^+, 5^-, 7^-$, final states. The lines represent results of the microscopic calculations. The subscripts 1,2,3,4 associated with the lines indicate the calculated energy ranking of the corresponding states, with 1 representing the lowest state of a given J^π.