

# JUSTIPEN Exit Report

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The purpose of my visit to Japan was to determine if the breakup of  ${}^6\text{Li}$  plays any role in extracting the ANC of the  ${}^6\text{Li}({}^{13}\text{C}, d){}^{17}\text{O}(\frac{1}{2}^+, 6.356 \text{ MeV})$  reaction. This check was performed by making Continuum Discretized Coupled Channels (CDCC) calculations and comparing the cross section obtained with the cross section obtained through a Distorted Wave Born Approximation (DWBA) calculation.

The CDCC calculation was performed by Dr. Kazuyuki Ogata of Kyushu University. The number of nodes used in the  ${}^{13}\text{C} + \alpha$  wave function was 2 since that is the number of forbidden states based on the orthogonal condition model (OCM). Also in both the DWBA and CDCC calculations performed by Dr. Ogata the transfer reaction zero-range approximation was used for  $V_{13\text{C}+\alpha}$  and the remnant term for the transition operator was neglected. This was not the case for the DWBA calculation performed at FSU.

Even with these differences in the potentials the effects of the breakup of  ${}^6\text{Li}$  was found to be very minimal. The values of  $S_\alpha$  obtained by DWBA and CDCC were 0.86 and 0.90, respectively. This shows that the breakup effects of  ${}^6\text{Li}$  on the ANC is approximately 5% and well within the error which we reported in PRL 97. Also, I would like to point out that it is the opinion of Dr. Ogata that we should be suspicious of any estimation of the  ${}^6\text{Li}$  breakup effects by CDCC using a narrow model-space, i.e., a small number of bin states, or a small maximum excitation energy between  $d$  and  $\alpha$  as this will have a large effect on the final result.

I also visited RIKEN while in Japan. During my stay there I participated in a workshop on the cluster structure of nuclei. This was relevant for me because I have spent the last 18 months doing an R-Matrix analysis of the elastic scattering of  ${}^{14}\text{C}$  on  $\alpha$ -particles. I was able to have several discussions with cluster model experts from RIKEN about the analysis I was performing, and hopefully those discussions will be continued in the future after I finish my work.

I would like to thank everyone at ORNL and RIKEN for making this trip possible, and I would especially like to thank Dr. Ogata for inviting me to Kyushu.