STUDY OF RESONANCES USING A THICK TARGET TECHNIQUE AND RIB'S

A. Galindo-Uribarri, J. Gomez del Campo, J. R. Beene, C. J. Gross[1], F. Liang[1], J. W. McConnell, D. Shapira, S. D. Paul[1], R. Varner, E. Chavez[2], M. E. Ortiz[2] and D. Khatamian[3]

We have measured resonant states in $^{17}O + ^{1}H$ in inverse kinematics using a thick target technique in preparation for an experiment to study the resonances in $^{17}F + ^{1}H$ expected at excitation energy around 4.5 MeV in ^{18}Ne. The resulting excitation function agree very well with calculations done with the code MULTI [4] and previous experimental results [5] (Figure 1). The excitation function shown in Figure 1 (open circles) was measured with a 20 μm polypropylene foil and a beam intensity of only about $5x10^6$ ^{17}O/s at a bombarding energy of 20 MeV. Recoil protons were detected with a double sided silicon strip detector (DSSD) with 256 pixels. This large area (25 cm^2) detector subtended a solid angle of 189 msr and covered the scattering angles from 0 to 16°. The data shown in Figure 1 represents only 300 mins of beam time and a solid angle of 5 msr. Thicker foils of ZrH target with a high concentration of H were also tested with beam. Targets with optimal thickness will be prepared for use in future experiments.

Modifications were made to the Enge spectrometer scattering chamber to accommodate the experimental apparatus. Work included installing multipin feedthroughs, designing a detector support structure, construction of two 16-channel preamplifier modules, and adaptation of the gain matching control program for the shapers. The DSSD preamplifier and shaper is based on a design from Washington University. The shaped signals were digitized with CAMAC peak sensing ADCs.

Data analysis and comparison with simulations has clearly demonstrated the technique and the feasibility of doing experiments with low intensity RIB's. This technique can be especially valuable at the initial stages of development of RIB's (i.e., when high beam intensities are not available). It can also be extended to other reactions such as (p,α) and (p,γ) and to the study of other light systems using RIB's such as ^{18}F, ^{15}O, and ^{11}C. Indeed, Figure 1 Bottom) shows an α particle energy spectra in the c.m. frame obtained in a short test run from the reaction ^{17}O(p,α).

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[1]Oak Ridge Institute for Science and Education, Oak Ridge, TN 37831.
[2]Universidad Nacional Autonoma de Mexico, 04510 Mexico, D.F., Mexico.
[3]AECL, Chalk River, Ontario, K0J 1J0, Canada.
[4]R. O. Nelson, E. G. Bilpuch, G. E. Mitchell, Nucl. Instr. and Meth. A **236** (1985) 128.
[5]J. C. Sens et al., Nucl. Phys. A **199** (1973) 232.

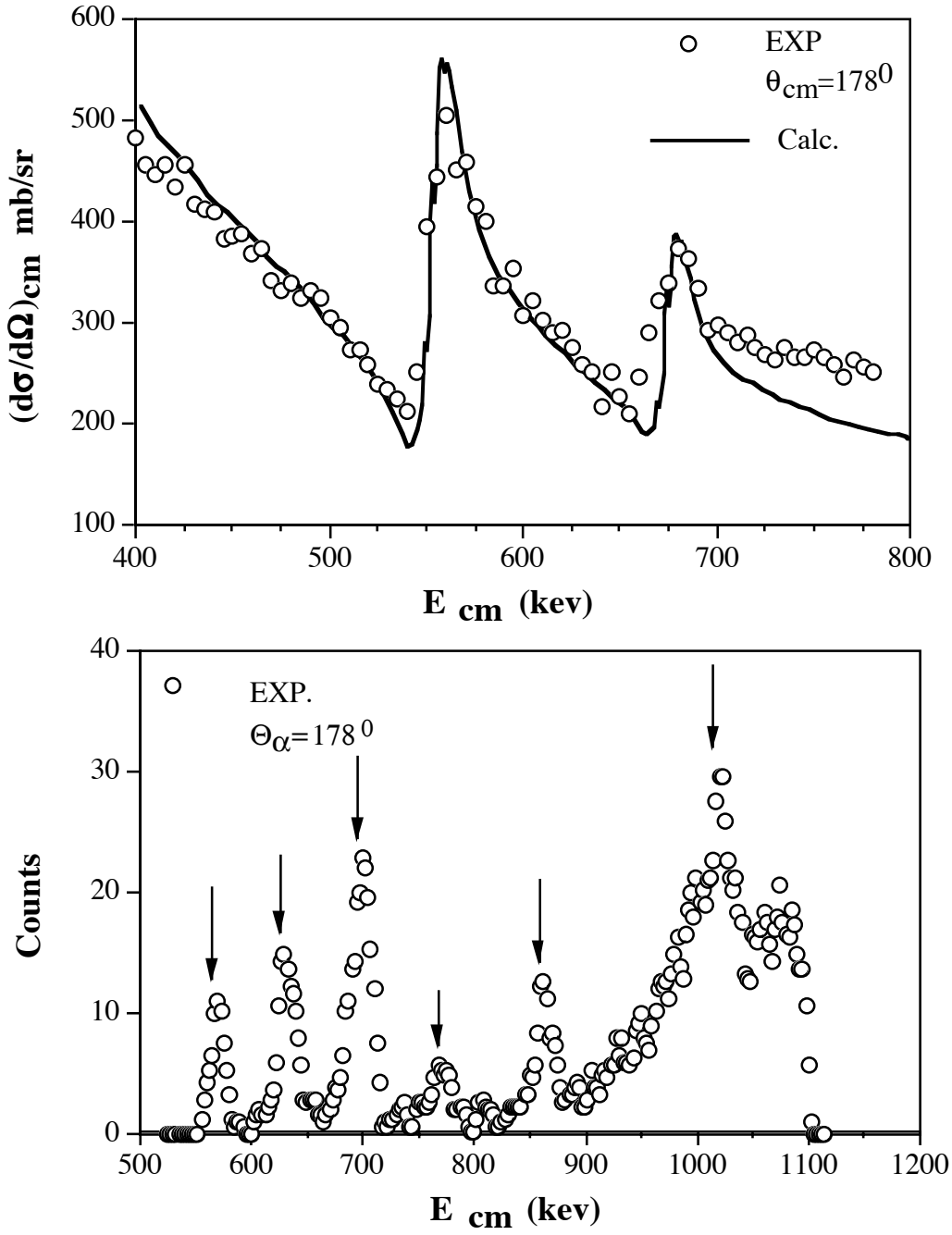

Figure 1: Top) Resonant states for $^{17}O(p,p)$. This run was obtained at a beam intensity of only 10^7 ^{17}O/s at 20 MeV incident on a CH_2 target (20 μm thick). The position of the beam spot was varied during the run. The total length of the run was of only 300 mins. Bottom) Results for $^{17}O(p,\alpha)$ using a thick target technique. The arrows indicate known resonances.