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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

PROGRESS REPORT FOR THE PERIOD 1985/86

J.R. Morales Peña
Cyclotron Laboratory
University of Chile
Santiago, Chile

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SUMMARY

During the period the Laboratory has improved the conditions to perform both, basic and applied research.

The selection of the fields have been modulated by the technical limitations of the accelerator, equipment, staff and funds.

The 22" isochronous cyclotron is now in condition to provide deuteron external beams of 3.3. MeV and 1.0 μA, for fast neutron production with a Ti-T target. Proton beams of less intensity are being used in elemental analyses.

Donations from IAEA, through the Interregional Program INT/1/018, the UNDP, 1983-1986, Project PNUD-UNESCO CHI/84/005 and funds from the University of Chile allowed implementation of experiments and operation costs.

Training in experimental nuclear physics, have consumed great part of our activity. This activity has focussed in undergraduate upper division courses, graduate courses and M.Sc. theses.

Following is a summary of activities related to INDC interests.

TOTAL NEUTRON CROSS SECTION MEASUREMENTS ON C, Al, Mg, Cu, Ge AND Pb AT 17.5 AND 19.6 MeV

J.R. Morales, L.O. Figueroa, J.L. Romero#, R.L. Vallejos, and P. Martens*
Departamento de Fisica, Facultad de Ciencias, Universidad de Chile, Santiago, Chile
Crocker Nuclear Laboratory and Department of Physics, University of California, Davis, California
* Departamento de Fisica, Facultad de Ciencias Fisicas y Matematicas, Universidad de Chile, Santiago, Chile

A 3.3 MeV deuteron beam provided by the 22" isochronous cyclotron of the University of Chile has been used to produce fast neutrons through the $^{3}H(d,n)^{4}He$ reaction. A thin Ti-T target was used. The neutron facility and tritium target setup has been described elsewhere [1,2]. Briefly, a neutron collimator made of iron, 35 cm long and with a 1x1 cm^2 square aperture, is located close to the Ti-T target chamber. The collimator, the target and the neutron detectors are affixed to a movable arm, which can rotate in the horizontal plane with respect to the Ti-T target. From 2-body kinematics, the energy of the neutron beam can be varied by properly choosing the angle of the arm. The neutron detector and monitor each consisted of a 2x4 cm^2, 0.8 mm thick NE102 scintillating sheet viewed by a fast photomultiplier. 1 mm sheet of paraffin $(C_{25}H_{52})_n$ placed close acted as convertor. Discrimination between neutrons and gamma rays at the detectors was done by time of flight.

Cross sections were determined by measuring the number of neutrons detected by both detectors with and without target. Preliminary results are listed in Table I. An overall error of 5 % is estimated for these measurements, mainly given by the statistics. Table I also shows a comparison with some global optical models such as Ohio [3], Watson, Singh and Segel [4], Becchetti and Greenless [5] and Patterson et al [6]. We have indicated with asterisc (*) those ratios where the nuclei or energy falls outside the range of the intended parameters search in the corresponding optical model. In general, the parameters of Ohio seems to agree better with the data.

TABLE I

Element	Energy [MeV]	sigma [mb]	sigma exp/sigma opt Ohio	WSS	BG	PDG
C	17.5	1410	0.91*	0.91	1.12*	1.13*
	19.6	1370	0.90*	1.06	0.88*	0.87*
Mg	17.5	1740	0.96	1.26	0.95*	0.97*
	19.6	1660	0.92	1.19	0.91*	0.92*
Al	17.5	1810	0.98	1.29	0.96*	0.98*
	19.6	1720	0.93	1.22	0.91*	0.92*
Cu	17.5	2840	1.02	1.17*	0.99	0.96
	19.6	2700	1.01	1.19*	0.99	0.96
Ge	17.5	3060	1.00	1.11*	0.98	0.91
	19.6	2870	0.99	1.14*	0.96	0.90
Pb	17.5	5500	0.97	1.33*	0.97	0.97
	19.6	6150	1.08	1.43*	1.09	1.08

References

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