

CONF-870413--16

PANIC '87

CONF-870413--16

DE88 001470

XI INTERNATIONAL CONFERENCE

ON

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KYOTO, APRIL 20-24, 1987

FG05-86 ER 40285

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SUPERRATIO FOR INELASTIC PION SCATTERING FROM  $^3\text{H}$  AND  $^3\text{He}$

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Charge symmetry requires that  $d\sigma(\pi^+\text{H}) = d\sigma(\pi^+\text{He})$  and  $d\sigma(\pi^-\text{H}) = d\sigma(\pi^-\text{He})$  at each incident pion energy and scattering angle. Consequently, the ratios  $r_1 = d\sigma(\pi^+\text{H})/d\sigma(\pi^+\text{He})$  and  $r_2 = d\sigma(\pi^-\text{H})/d\sigma(\pi^-\text{He})$  are equal to unity, and therefore that the superratio  $R = r_1 r_2$  also is equal to unity. Measurement of  $R$  is particularly advantageous because the experimental results do not depend upon knowledge either of the pion beam normalizations or of the pion detector efficiency, since these experimental quantities cancel in the superratio. A great deal of attention has been given to the determination of  $R$ , and its deviation from unity, for elastic scattering.<sup>1,2</sup> Here we report results from the first measurement of  $R$  for inelastic scattering.

We have measured all four of the above cross sections for pion energies of 142, 180, and 220 MeV at laboratory angles of  $40^\circ$ ,  $60^\circ$ , and  $80^\circ$ ; for energies of 142 and 180 MeV at  $110^\circ$ ; and for 142 MeV at  $90^\circ$ . The measurements were carried out at the EPICS facility at the Los Alamos Meson Physics Facility. Inelastic-scattering data were obtained from 6.3 MeV for  $^3\text{H}$  and 5.5 MeV for  $^3\text{He}$  to 10 MeV above these thresholds. The main systematic uncertainty in the earlier results<sup>1</sup> arose from reliance upon measurements of the pressure of the gas-filled target cells to determine the number of atoms in the samples. We used new target cells for the present measurements which have permitted us to use much larger samples (3 moles each); and, in

addition to the pressure, volume, and temperature, we measured the sample masses by direct weighing both before and after the experiment.

An example of our new results, the spectrum of 142-MeV positive pions scattered from  $^3\text{H}$  at  $110^\circ$ , is shown in Fig. 1. These data are being analyzed currently. The cross sections, simple ratios, and superratios, as well as their systematic trends will be presented and discussed at the conference.

\*This work was supported in part by the US Department of Energy under grant number DE-FG05-B6ER402B5 and contracts number DE-AS03-B1ER40021 and DE-AS05-B1ER40036 and the National Science Foundation under grant number NSF-PHY-B604524.

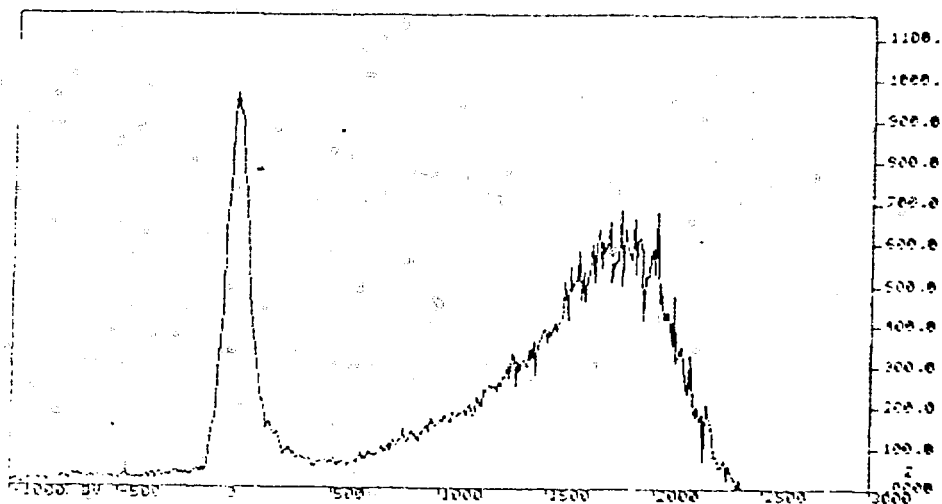


Fig. 1. Measured spectrum for  $\pi^+$   $^3\text{H}$  scattering at 142 MeV and  $110^\circ$ .

#### References

1. B.M.K. Nefkens, W.J. Briscoe, A.D. Eichon, D.H. Fitzgerald, J.A. Holt, A. Mokhtari, J.A. Wightman, M.E. Sadler, R.L. Boudrie, and C.L. Morris, Phys. Rev. Lett. 52, 735 (1984).
2. C. Pillai, D.B. Barlow, B.L. Berman, W.J. Briscoe, A. Mokhtari, B.M.K. Nefkens, A.M. Petrov, and M.E. Sadler, submitted to Phys. Rev. Lett.