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PHYSICS III COMMITTEE

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LETTER OF INTENTION CONCERNING MONO-KINETIC NEUTRON BEAM

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At the Physics III meeting of 15th September, 1970, 30 main user shifts were approved for experiment SC 22 in 1971. It was stipulated that these shifts should be devoted to the measurement of the n+p total cross-section and allocation of further shifts for the study of other targets (D, He, etc.) was to be dependent on the results obtained in this first series of runs. Since then a group working at the Princeton Pennsylvania Accelerator has measured the total cross-section of neutrons on protons, deuterium and a set of heavier elements¹⁾. Although the PPA n-D cross-sections are not consistent with the values expected from the p-D cross-sections of the Cambridge-Rutherford group²⁾ and charge independence, and although the PPA group has not measured the n-He total cross-section, we must concede that the interest of our proposed experiment is very much reduced by the publication of ref. 1).

We do not believe, however, that the setting-up of a mono-kinetic neutron beam and the early measurement of its characteristics (peak position, peak width and spectrum in the tail region) has not lost any of its interest; any systematic attack on the

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problem of nucleon-nucleon scattering must contain a measurement of the n-p forward elastic differential cross-section with a considerably better accuracy than the 15% to 20% published by Kazarimov et al.³⁾ in the 5°-15° lab. angle region. In such an experiment the exact shape of the incoming neutron spectrum is much more important than in a simple total cross-section measurement; the early knowledge of the peak width, in particular, is necessary to the planning of the experiment if any set-up is used where the TOF of the forward-emitted neutron is measured. The shape of the tail must be known to make the necessary corrections.

Studies of neutron-beams obtained by proton bombardment of deuterium have been performed at incident proton energies of 150 MeV⁴⁾ and 710 MeV⁵⁾. The latter measurement, which could serve as a guide for energies of around 600 MeV, appears to us dubious and we, therefore, propose to measure the neutron spectra obtained from the D (p,n) 2p reaction at a range of energies between 600 and 400 MeV.

We therefore ask that the condition that the 30 allocated shifts be devoted to a measurement of σ_{tot} (n+p) should be lifted, and that we be allowed to use these shifts for the study of the neutron beam spectrum. For this we could use the spectrometer of the Oxford-Göteborg group, after that group has finished their measurement (i.e. starting approximately June, 1971).

REFERENCES

- 1) R. E. Mischke et al., P.P.L. 25, (1970) 1724.
- 2) D. V. Bugg et al., Phys. Rev. 146, (1966) 980.
- 3) Yu. M. Kazarimov et al., Dubna Preprint P.1207, (1963)
- 4) D. F. Measday, Nucl. Instr. Meth., 40 (1966) 213-220.
- 5) R. R. Larsen, UCRL 9292, (1960).