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PHYSICS III COMMITTEE

PROPOSAL TO STUDY NUCLEON-NUCLEON TOTAL AND DIFFERENTIAL CROSS-SECTIONS.

by

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In the letter of intention PH III-68/4 submitted to the previous meeting of the Physics III Committee, we gave details of a proposed experiment to study the neutron-proton total and differential cross-sections. We now request that this experiment be accepted. We would expect to need machine time towards the end of this year (1968).

When preparing the letter of intention we placed the emphasis of the proposed work on the measurement of the neutron-proton cross-sections, where the lack of reliable data was most manifest. Since then new results on proton-proton scattering have been published by Bugg et al.¹⁾, whose data on the proton-proton total cross-section above 510 MeV disagree with the earlier values found by Dzhelepov et al.²⁾ Table 1 gives a summary of the data available at present.

Table 1

Proton-proton total cross-sections

Proton Energy (MeV)	σ_T (Bugg) (mb)	σ_T (Dzhelepov) interpolated (mb)
510	$34.03^{+0.17}$	$30.4^{+0.5}$
650	$43.23^{+0.11}$	$40.6^{+0.6}$

It is clearly of interest to repeat these measurements and if possible to remove the uncertainty of the present data, especially in the energy region below 510 MeV, which was not investigated by Bugg et al.

It would also be interesting to compare proton-deuteron and neutron-deuteron total cross-sections as a check on charge symmetry at high energies. Present results show that the n-d and p-d total cross-sections are the same to within 6%; an improvement on this precision will not be difficult, and we would expect to achieve a comparison which would be accurate to 2%. We therefore propose to measure proton-proton and proton-deuteron total cross-sections from 300 to 600 MeV in addition to the work outlined in the letter of intention. These extra measurements will require no modifications to the apparatus originally proposed. Furthermore we hope to be able to carry out these additional measurements in the scattered-out proton beam and so no extra time will be requested.

References

1. D.V. Bugg et al. Phys. Rev. 146, 980 (1966).
2. V.P. Dzhelepov et al. Dokl. Akad. Nauk. SSSR 104, 380 (1955).