

PHYSICS III COMMITTEE

A PROPOSAL TO MEASURE THE π^+ AND π^- TOTAL CROSS-SECTIONS
FOR SEVERAL NUCLEI IN THE ENERGY RANGE 110-300 MeV

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We propose to undertake a survey type measurement of the total cross-section for π^+ and π^- in the region of the 3-3 resonance for the elements ${}^6\text{Li}$, ${}^7\text{Li}$, ${}^9\text{Be}$, ${}^{10}\text{B}$, ${}^{12}\text{C}$, ${}^{16}\text{O}$, ${}^{27}\text{Al}$, ${}^{40}\text{Ca}$, Fe, Sn. Recently several authors have demonstrated that calculations made on the basis of the Glauber multiple scattering model are in remarkably good agreement with the available scattering data for pions of energies 120 - 280 MeV. In order to obtain further data before the SC shutdown for the improvement programme, we propose to measure the total cross-sections for pions by the classical transmission technique. The experimental set-up will be essentially identical to that used in the recent proton total cross-section measurements (S.C. 26) so that we should be able to begin data-taking within the next two months. The preliminary testing of the apparatus can be done by parasiting on the present π -d experiment (S.C. 39). The running time estimates shown below are based on total cross-sections from the available C^{12} data using a $A^{0.7}$ scaling factor, and the measured π fluxes for the present Oxford-Göteborg beam line. The π flux at which the data will actually be taken will differ somewhat from these estimates depending upon the duty cycle of the extracted beam (in order to keep random coincidences sufficiently small); this in turn will depend upon the requirements imposed by the group with which we are "sharing". The data-taking shifts have been computed for 0.5% statistics for π^+ and 1.0% statistics for π^- ; we have assumed targets giving 10% absorption.

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Estimated Shifts Required

0.5% π^+ 120, 140, 160, 180, 200, 220, 240, 260, 280, 300

Data-taking only: 8 shifts; Beam Set-up: 20 shifts

π^- at same energies

1.0% Data-taking only: 10 shifts; Beam Set-up: 20 shifts

Total shared shifts: 58 shifts.