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Proposal for an experiment using 4-8 GeV/c anti-protons in emulsion.

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At several energies and with many different particles the optical model gives a rather good description of scattering phenomena. Especially the small angle scattering can be described in this way. Information can be obtained on the imaginary and the real part of the nuclear potential and on the dimension of the nucleus. The sign of the real potential will follow from the interference with the coulomb potential which is important in the very small angle region.

We propose to measure the small angle scattering of 6 GeV/c anti-protons on emulsion nuclei for momentum transfer between 30 and 230 MeV/c. We have measured the small angle scattering of 5.7 GeV/c pions and 12 GeV/c protons, while measurements with 24 GeV/c protons are in progress. We are using the special apparatus for small angle scattering developed in our laboratory.

Blob counting is a feasible method to distinguish anti-protons from pions if the momentum is between 4.2 and 8.0 GeV/c. We intend to use an automatic blob counting apparatus which is in development in our laboratory at the moment. If the background is less than 10% blob counting is not necessary if the percentages of muons and pions are known. In this case we are able to correct the angular distribution. Still we wish to have a momentum higher than 4 GeV/c to avoid a large value of the multiple coulomb scattering which will shorten the mean pathlength of a particle in one plate. The divergence of the beam in one direction should be small so that long tracks are obtained and the following procedure is facilitated.

The total number of anti-protons has to be about 25 000 over a cross section larger than 2 cm^2. We prefer plates above pellicles in order to minimize the effects of distortion. The size of the plates will be about 10 x 15 cm^2, the number of plates depends on the dimensions of the beam.

If the intensity is 120 $\bar{p}$/pulse as assumed in CERN report 62/15, an exposure of about half an hour would be necessary. This will provide us with roughly 1 km followable track, which will be amply sufficient to determine the existence of an interference effect between coulomb and nuclear potential.

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