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EXPERIMENTS ON ELASTIC P-P SCATTERING IN THE ENERGY RANGE 120 TO 345 MEV

O. Chamberlain, E. Segrè and C. Wiegand

November 10, 1950

Berkeley, California

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O. Chamberlain, E. Segrè and C. Wiegand

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University of California, Berkeley, California

November 10, 1950

In a previous paper we have described some experiments on p-p scattering at 340 Mev made with gas proportional counters. We have now improved and extended the measurements by using stilbene scintillation counters in coincidence and by varying the energy of the beam by the use of lithium absorbers.

In view of the interest in these results shown in recent theoretical papers we have decided to publish the results to date. Details on the experiments and extension to smaller angles will follow later.

The results at 345 Mev are summarized in Figure 1 which gives the differential scattering cross section in the center of mass system, as a function of the angle in the center of mass system. The cross section is normalized in the usual way such that the total scattering cross section σ_s is given by

$$\sigma_s = \frac{1}{2} \int_{4\pi} \sigma(\phi) d\omega_\phi = \frac{1}{2} \int_0^\pi \sigma(\phi) \left[2\pi \sin \phi \, d\phi \right]$$

Table I gives the differential cross sections of $\sigma(\phi)$ (center of mass system) for incident proton energy E in the laboratory coordinate system, at angle ϕ (center of mass system) from the beam direction. The symmetry of the problem in the center of mass system guarantees that $\sigma(\phi) = \sigma(\pi-\phi)$.

The errors shown in Fig. 1, as well as those quoted in Table 1, are the standard deviations due only to the statistical counting errors. The

other errors, which must be superimposed on those shown, are for the most part systematic errors which affect all the cross sections equally. These errors do not alter the angular distribution very much. We believe the systematic errors amount to 5 percent (probable error) in the experiments at 345 Mev, and 10 percent in the experiments done at lower energy.

TABLE I

Differential scattering cross sections at reduced energies. Quoted errors are standard deviations from counting statistics only.

E (Mev)	ϕ (degrees)	$\sigma(\phi)$ (10^{-27} cm^2 sterad^{-1})
119	63	4.0 ± 0.4
119	78	4.2 ± 0.4
119	89	3.95 ± 0.12
164	61	4.1 ± 0.4
164	89	3.8 ± 0.3
249	48	3.5 ± 0.3
249	63	3.7 ± 0.2
249	78	3.69 ± 0.15
249	87	3.64 ± 0.11

This work was performed under the auspices of the Atomic Energy Commission.

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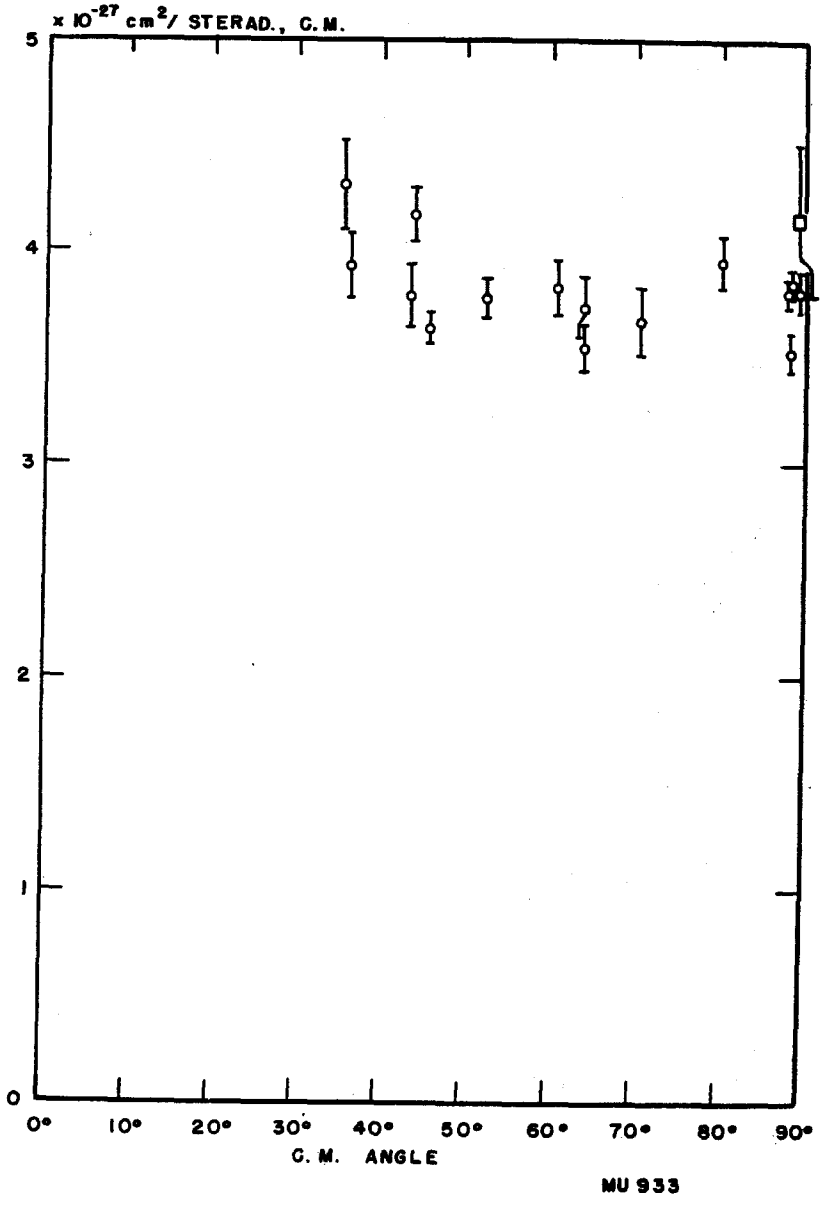
x 10^-27 cm^2/ STERAD., C.M.
5
4
3
2
1
0
0°
10°
20°
30°
40°
50°
60°
70°
80°
90°
C. M. ANGLE
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Figure 1