For an evaluation of the Al data in terms of an optical model it will be important to know the depth of the minima which now are undoubtedly too shallow because of the poor angular resolution. The measurements will be repeated using a proportional counter-NaI telescope to distinguish between the protons and the alpha particles. This will permit the use of better angular resolution because of the gain in statistical accuracy achieved by eliminating the subtraction procedure employed.

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Elastic Scattering of 40-Mev Alpha Particles from Al†

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RECENT experiments have investigated the angular distributions for the elastic scattering of alpha particles from heavy elements at 22 Mev and 40 Mev.[1,2] At small angles the cross sections are found to agree with the Coulomb cross section. In the region of some critical angle, the cross sections rise slightly and then drop monotonically with increasing angle to values less than 1/1000 of the Coulomb cross section.

This letter is to report that the elastic scattering of 40-Mev alpha particles from Al shows a pronounced diffraction pattern, in qualitative distinction from the heavy element case. Similar results for the elastic scattering of 18-Mev alpha particles from Al were recently reported by Bleuler and Tendam.[3]

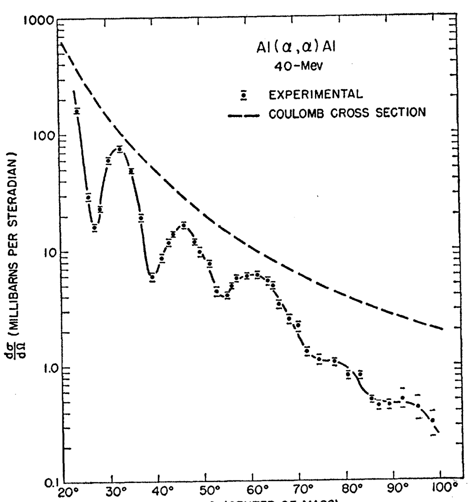

FIG. 1. Angular distribution for the elastic scattering of 40-Mev α particles from aluminum.

Figure 1 shows the angular distribution for the elastic scattering of 40-Mev alpha particles from Al. The energy in the center-of-mass system is 34.8 Mev. The abscissa is center-of-mass scattering angle, and the ordinate is absolute differential cross section in the center-of-mass system. The dashed curve gives the computed Coulomb cross section. Scattered alpha particles were detected in a thin NaI scintillation counter. The experimental techniques are similar to those described in a previous paper,[2] except that in this experiment absolute cross sections were measured. The energy resolution of the detector was 4 percent, and the angular resolution was ± 1.0 degree. The errors indicated for each point are due to counting statistics. In addition, 10 percent uncertainty in the scale factor of the ordinate is introduced by the error in determining the absolute cross section.

The magnitude of the (α,n) cross section for heavy elements indicates that heavy nuclei are opaque to 40-Mev alpha particles.[2] Consequently, it is reasonable to analyze the Al angular distribution in terms of scattering from an opaque disk. From the separation of the maxima in the diffraction pattern, this analysis leads to a value of 13.8 for kR. If k is set equal to the free-space center-of-mass wave number, then R is equal to 5.4×10^{-13} cm. This is consistent with current ideas of the size of the nucleus and the size of the alpha particle.

† Work performed under the auspices of U. S. Atomic Energy Commission.
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Electronic Detection of Heavy Mesons*

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AN experiment has been carried out to detect the decay of heavy mesons produced by cosmic rays, by means of scintillation and Čerenkov counters and fast electronic circuitry. This experiment was performed at Echo Lake, Colorado, at an altitude of 3300 meters.

The disposition of the counters is shown in Fig. 1. The apparatus is designed to detect events in which a heavy meson is produced in an interaction in the lead roof, the particles from the interaction triggering some of the Geiger counters and producing a pulse in the scintillators. If the heavy meson then stops in the region of the Čerenkov detectors and the secondary from its decay passes through the Čerenkovs in an upward direction, a delayed pulse is produced. Čerenkov