a purely attractive force in the S state of isotopic spin $\frac{1}{2}$ and a strong repulsion at short distances surrounded by a somewhat longer-range attractive region for the S state of isotopic spin $\frac{3}{2}$. They should also serve as a guide to experiments in this energy region. In particular, the prediction of a small π^+ cross section which switches from backward to forward scattering around 20 Mev and a greatly enhanced π^- cross section for elastic (rather than charge-exchange) scattering around 5–10 Mev should now be taken rather seriously.

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Shower Structure in the Higher Shower Maxima

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IN an attempt to shed more light on the production of showers in connection with the second, third, and fourth maxima of the shower curve, the experimental arrangement as described previously[1] was slightly modified. In Fig. 1, Pb is the lead radiator of variable thickness, I and II are the two crossed counter trays which determine the apparent shower angle, and III is a counter tray that may be shifted between I and Pb. Fivefold coincidences (I, I, II, II, III) as well as anticoincidences (I, I, II, II, −III) were counted as a function of lead thickness Pb. The results, some of which are reproduced in Fig. 2, are clear cut though rather surprising. If tray III is arranged immediately beneath Pb ($a=82$ cm), the second and third maximum only appear in the anticoincidence curve. The inverse holds if III is lowered to practically $a=0$ cm. In intermediate positions of III the maxima are divided up between the two curves.

The simplest interpretation of these results is this: The particles emerging from the Pb are *neutral* ones; a considerable fraction of them decay before reaching tray I, thus giving rise to the charged showers or pairs recorded by trays I+II. So these neutral particles have at least some of the characteristics of neutral V particles.

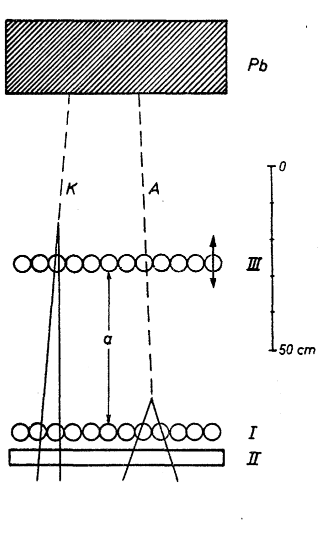

FIG. 1. Experimental arrangement. K: case of coincidence; A: case of anticoincidence.

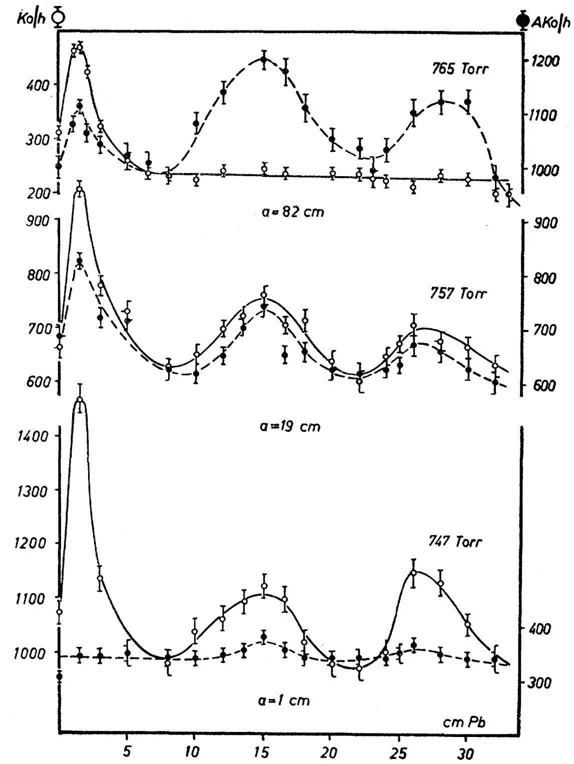

FIG. 2. Shower curves. Full curve: coincidence. Dashed curve: anticoincidence. (1 Torr = 1 mm mercury).

In the light of these results, a number of discrepancies that seemed to exist between the works of different authors now readily disappear. Since the apex of a shower does not lie in the lead layer but is more or less below, the real shower angle is considerably larger than supposed in our previous work. In fact Broussard and Graves[2] have observed in a cloud chamber that the second maximum occurs only for rather wide angle showers.

If a counter tray III is arranged beneath Pb and coincidences (I, I, III) or (I, I, II, II, III) are counted, the second and third maximum cannot appear. Likewise the higher maxima must be strongly suppressed, if trapezoidal counter arrangements are used fixing the shower apex within the lead layer. Investigations with both kinds of arrangements have been described and regarded as proof against the existence of higher shower maxima.

This counter work is being continued in combination with a cloud chamber.

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Perturbation Theory with Sommerfeld-Maue Wave Function

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IT has been implicitly assumed by a number of authors[1] that the matrix element in the differential cross section for a process is the same whether Sommerfeld-Maue wave functions or non-