lengths below 10 cm, where such an elaboration becomes less necessary because of the very small field penetration, the extrapolated permeability values are found to approach closely the measurements on iron wires by Arkadiew and others.[5]

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[3] J. H. E. Griffiths, Nature 158, 670 (1946).
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On the Lateral Extension of Auger Showers

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A SHOWER experiment has been carried out by Skobeltzyn, Zatsepin, and Miller[1] in which they measured the coincidence rate between two sets of counter trays as a function of their separation. They conclude that their experimental results give a much higher coincidence rate at large counter separations than the curve calculated on the basis of a primary electron shower model. Possible reasons for this discrepancy have recently been examined by Cocconi.[2] He points out that good agreement can be reached between theory and experiment if one takes into account the effect of showers incident at large zenith angles. Particularly for large tray separations, this effect cannot be neglected; for a shower whose axis is at zenith angle θ in the vertical plane joining the counter trays, the effective separation between the trays is reduced by a factor $\cos\theta$, thereby increasing the probability for the shower to be detected. It is the purpose of this note (a) to extend Cocconi's argument, and (b) to report on an experimental confirmation.

(a) A shower striking the experimental arrangement at an angle θ not only sees a smaller separation but—depending on the geometry of the counter tray—a smaller area as well. This decrease in area reduces the sensitivity of the equipment to low density showers, and thereby lowers the counting rate. The net effect is an increase in counting rate smaller than calculated in reference 2.

(b) To check this point, the following experiment, suggested by Professor J. A. Wheeler, was carried out at Silver Spring, Maryland (altitude 120 meters). The coincidence rate of two Geiger counters was measured. The counters were 29.2 cm long and 2.4 cm in diameter; their separation in the horizontal plane was 40 meters. In arrangement A, the counter axes were parallel to each other and perpendicular to their line of separation. In arrangement B (see Fig. 1), the counters were rotated through 90° about a vertical axis so that their axes were along their line of separation. Evidently, arrangement B is subject to the effect discussed in (a) to a much greater degree than arrangement A. This is borne out by the result of the experiment: the counting rate under arrangement A was greater than the corresponding rate for arrangement B by 32 percent$\pm$13 percent.

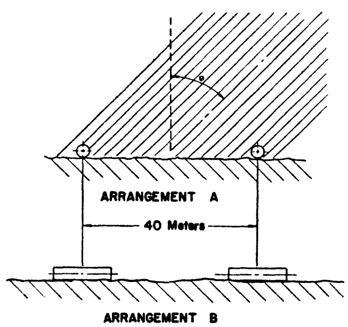

FIG. 1.

The experiment was repeated with the separation reduced from 40 meters to 20 meters. Within the statistics of the experiment (10 percent) there was no difference in counting rate between arrangements A and B.

From the experimental results, it appears reasonable to conclude (i) that non-vertical showers contribute greatly to the coincidence rate of arrangement A for large counter separations; (ii) arrangement B has a lower counting rate than arrangement A since it does not record many non-vertical showers of low particle density because of the decrease of counter area discussed above.

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The Specific Charge of the Positron

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SEVERAL considerations regarding the properties of elementary particles[1] seem to suggest that the mass of an elementary particle is composed of intrinsic mass and mass-defect. The positron as a free particle has a positive intrinsic mass equal to the intrinsic mass of the electron, i.e., to m_0, whereas its mass-defect $-0.00177m_0$ has equal size but opposite sign. Accordingly, the mass of the positron would be with 0.354 percent less than the mass of the electron, entailing the consequence that the specific charge of the positron would be higher by the same amount.

Spees and Zahn[2] report measurements in which they compared the specific charge of electron and positron. A close scrutiny of the position of the peaks upon the curves seems to indicate that the specific charge of the positron slightly exceeds that of the electron. Unfortunately, the accuracy of the measurement does not permit a determination with greater accuracy than one percent. It would seem to be worth while to investigate this point with an improved method of greater accuracy.

A further consequence of this mass difference is that the g value of the positron will slightly differ from that of the electron:

$$g_p=1.99636, \quad \text{while} \quad g_e=2.00343.^3$$

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[3] J. Barnóthy, Phys. Rev. 73, 113 (1948).