Letters to the Editor

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On the Positive Excess of the Penetrating Component at 17,000 Feet

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RECENT experiments by Jánossy,[1] Rossi,[2] and others[3] indicate that mesons are produced considerably even at low height. These experiments moreover yield a rough value of the absorption coefficient of the meson producing primary radiation (about 150 g/cm²). These results, together with the usual assumption that the primary radiation is protonic, point out that the proton component might be noticeable even at not very great heights. Consequently, the positive excess would be expected to increase with the height.

However, an opposite result (i.e., a decrease of the positive excess with height) would be expected if the assumption[4] is made that a great fraction of low mesons is produced even at low heights (about 17,000 feet) by a neutral radiation.

Because of the interest of these problems, we have carried out some experiments on the positive excess of the penetrating component in substratosphere.

Our experimental arrangement (Fig. 1) similar to that described by the Rome group[5] consists of three G.-M. counters 52×4 cm², the charged particles being deflected by two magnetic lenses. The apparatus was placed in a Baltimore Martin and the following counting rates were simultaneously recorded photographically: (1) twofold coincidences (AB) for $E \geqslant 2.3 \cdot 10^8$ ev, (2) twofold coincidences (BC) for $E \geqslant 4.6 \cdot 10^8$ ev, (3) threefold coincidences (ABC) for $E \geqslant 4.6 \cdot 10^8$ ev. Here, for each type of event recorded, the minimum meson energy required to penetrate the iron plates, is indicated.

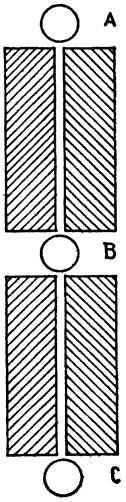

FIG. 1. Counter arrangement.

TABLE I. Positive excess of the penetrating component at 17,000 feet with control data taken before and after each flight.

Height (feet)	(AB) N^+*	(AB) N^-*	(BC) N^+	(BC) N^-	(ABC) N^+	(ABC) N^-
17,000	54.60±0.84	48.20±0.76	43.20±0.60	38.92±0.60	15.84±0.52	13.04±0.48
300	15.84±0.16	15.40±0.12	14.64±0.12	14.28±0.12	5.68±0.08	5.28±0.08

* N^+, N^- indicate coincidences per minute of positive and negative particles when the casual rate is subtracted.

TABLE II. Values of $\delta = 2(N^+ - N^-)/(N^+ + N^-)$ and the corrected value η of the positive excess.

Height (feet)	(AB) δ	η*	(BC) δ	η	(ABC) δ	η
17,000	0.124±0.024	0.30	0.104±0.025	0.45	0.193±0.048	0.32
300	0.028±0.013	0.14	0.025±0.011	0.12	0.073±0.013	0.15

* We estimate that the accuracy of our values of η is of the order of 40 percent.

The signs of the various fields were so arranged as to focus either positive or negative particles. During each flight the sign of the particles recorded was alternately changed. The results of the first eight flights (four hours at 17,000 feet) are summarized in Table I, together with the control data recorded before and after each flight.

It should be noticed that there is no complete exclusion for particles of the "unwanted" sign. Consequently, the measured effect $\delta = 2(N^+ - N^-)/(N^+ + N^-)$ must be corrected, according to the calculations of Bernardini and others.[5] In Table II the values of δ and of *the corrected value η of the positive excess* are given for the three types of coincidences recorded.

The experiments are being continued at different heights in order to get more detailed information. Although the present results are still preliminary, the evidence of an increase in the positive excess with height is certain.

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