kev, in agreement with our earlier interpretation. It appears, however, that the line width is too large to allow a significant differentiation between these two cases; it has been pointed out already[2,4] that this line width arises principally from variations about the average number of ion pairs produced by the β-rays in the initial ionization process, and it is unlikely that the uncertainty will be resolved by relatively slight increases in the accuracy of measurement.

We should like to take this opportunity of thanking Professor P. I. Dee for his advice throughout the work and we are indebted to Dr. W. B. Lewis for a number of helpful comments and suggestions.

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On Positive Excess of Meson Component near Sea Level

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THE scarcity of experimental data concerning the distribution of positive excess in the meson spectrum and the common opinion that the positive excess is closely related to the meson production by the N component, lead us to perform an experiment at sea level, in which positive and negative mesons are separated by means of a magnetic field of 14,000 gauss in air. The experimental apparatus is shown in Fig. 1.

The upper telescope consists of five channels of double coincidences $1-1$, $2-2\cdots5-5$, which limits a not strictly convergent beam of cosmic rays traversing the central region of magnetic field. The field focuses particles of $pc=2\ 2\cdot10^8$ ev which are revealed by counters CDE; $C'D'E'$.

Putting in S 4.7 cm of lead, fivefold coincidences register only mesons, the fourfold, besides mesons, protons and electrons. The absorber T has the object of degradating the energies of incident particles. Experimental results and their probable errors are reported in Table I.

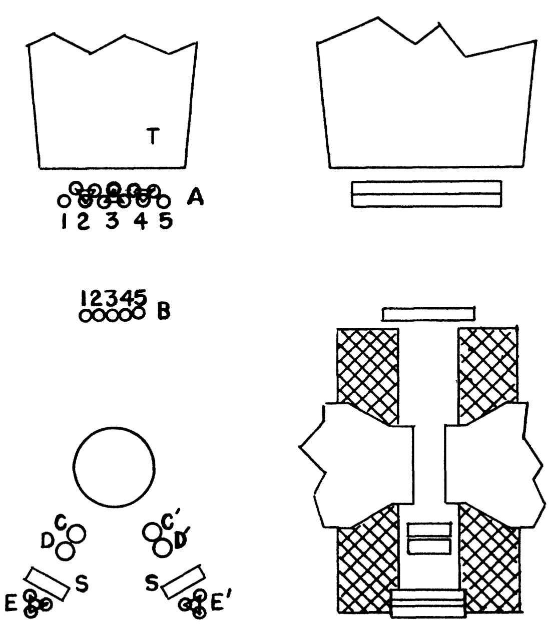

Fig. 1. Counter arrangement.

Table I. Experimental results for coincidence rates.

Absorber thickness (g/cm² Pb)	Counts per hour	δ	[IV–V]$^-$	[IV–V]$^+$
290 g/cm²	1.18±0.06	0.16±0.10	0.13±0.03	0.04±0.02
540 g/cm²	1.36±0.06	0.22±0.12	0.10±0.06	0.02±0.04
1150 g/cm²	1.14±0.05	0.25±0.07	0.20±0.04	0.04±0.05

In the second column counts per hour are shown, they agree with the Wilson spectrum. In the third column, the excess as commonly defined by

$$\delta=2\frac{N_+-N_-}{N_++N_-}$$

is indicated.

The first two plots are in a good agreement with the previous data by Nereson[1] and Conversi, Pancini, and Piccioni;[2] the value of the excess in the third plot, on the contrary, is remarkably high, and indicates that, at least for energies up to 2 Bev, the excess does not decrease. This is in agreement with a recent isolated result by Brode[3] who finds an excess about 0.3 for energies from 1.4 to 2 Bev. The fourth column indicates the number of negative particles per meson whose energies are about 2.2×10^8 ev and which do not penetrate 4.7 cm of lead. They should in the first line be interpreted as knock-on electrons. The fifth column is concerned with positive particles that we may explain as protons, but the last data are less significant because of large errors.

The present results may be explained in terms of multiple meson production with the existence of two sources distributed in the atmosphere, of which the first formed by mesons created in the first collision by primary protons is substantially responsible for the excess A detailed paper will be submitted for publication in *Nuovo Cimento*.

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Heat Flow in Metals below 1°K and a New Method for Magnetic Cooling

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MEASUREMENTS have been made of the thermal conductivities of tin and tantalum both in the superconducting and normal states in the temperature range 0.2° to 1°K and experiments have been carried out on the question of thermal contact by heat flow through superconductors in this temperature range. The preliminary results of these experiments may be of interest in connection with two stage magnetic cooling methods, such as have been proposed for the study of nuclear paramagnetism[1] and consequently are reported herewith. In addition the experiments have led to a convenient method for adiabatic magnetic cooling.

The general experimental arrangements consisted of two chromium potassium alum ellipsoids (one approximately five times the volume of the other) separated from one another by a distance of about 10 cm and connected thermally by the superconducting metal specimen under investigation. The salt-metal connection was made by high pressure molding of the salt powder. The salt ellipsoids were differentially cooled to low temperatures by the magnetic method,[2] and the thermal conductivity of the metal link between them calculated from observations of the rate