a variable flux of the penetrating shower primaries. The maximum correction necessary was found to be about five percent, assuming the mean free path of the primaries in air to be 120 g cm^{-2}.[3]

We received valuable suggestions and encouragement from Doctor B. Rossi. Operation on Mt. Evans was made possible by the cooperation of the Inter-University High Altitude Laboratory.

* Assisted by the joint program of the ONR and the AEC.

[1] W. Walker, private communication.
[2] B. Rossi, Rev. Mod. Phys. 20, 537 (1948), Section 20.
[3] J. Tinlot, Phys. Rev. 73, 1476 (1948).

Correlation of Penetrating Showers with Air Showers*

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IN order to investigate the relationship between locally produced penetrating showers and air showers, an experiment was performed on Mt. Evans, Colorado, in conjunction with the one described in the previous letter. Two trays of counters, labeled F and G ("extension trays") were placed at distances of 1.0 m and 2.5 m, respectively, from the axis of the penetrating shower detector. Tray F contained eight counters connected to form four pairs and had a total effective area of 520 cm^2. An addition circuit permitted the detection of multiple coincidences between pairs of counters. Such coincidences will be referred to by the symbol F_α, where $\alpha=1$, 2, 3, or 4, signifying the simultaneous discharge of one or more, two or more, three or more, or all four pairs. Tray G contained four counters connected in parallel and having a total effective area of 260 cm^2.

The following events were recorded: γF_1, γF_2, γF_3, γF_4, and γG, where the symbol γ refers to the event described in the previous letter. The total number of counts for each of these events, and for the event γ, were recorded with different thicknesses of iron and lead absorber placed above the penetrating shower detector; these are reproduced in Table I.

The most striking fact evident from the data of Table I is the great rarity of events γ accompanied by discharges of the extension trays. Of a total of 2084 counts obtained with the two absorbers, there were only 17 cases of γF_1, and 3 cases of γF_2. The rate of γF_1 was three times and the rate of γF_2 twenty times the expected accidental rate, so that these can be considered as real events. The event γG, on the other hand, can be explained as entirely the result of accidental coincidences.

TABLE I. Rate of occurrence of air showers coincident with penetrating showers as defined by the event γ (see text).

Absorbing material	Thickness g cm^{-2}	Total counts γ	γF_1	γF_2	γF_3	γF_4	γG
	0	314	2	1	0	0	0
	115	444	5	0	0	0	1
Lead	445	264	2	1	0	0	0
	1100	85	0	0	0	0	0
	1760	103	1	0	0	0	0
	0	314	2	1	0	0	0
	315	262	3	0	0	0	1
Iron	475	179	1	0	0	0	0
	790	116	0	0	0	0	0
	1105	103	1	0	0	0	0

As described previously, the event γ can be attributed to a penetrating shower produced by a single ionizing particle interacting in the layer of lead between tray B and trays C and D in the detector system. Any group of penetrating particles from the air capable of discharging C and D is rejected.

The few events of the type γF_α that were detected may be explained by assuming that very rarely a particle capable of producing penetrating showers is accompanied by an air shower of small density (since in no case were more than two counters discharged in tray E). These showers could be produced, for instance, by a knock-on process in the air. It is also possible, however, that events γF_α are caused by secondary particles originating in the nuclear interactions and projected through the tray F.

In any case, the important result is that dense air showers do not contain single particles capable of producing penetrating showers. They may, however, contain groups of penetrating particles, some of which may interact to produce nuclear events. This type of air shower would be rejected by the penetrating shower detector, and therefore nothing can be said about this possibility on the basis of this experiment.

The facilities for operation on Mt. Evans were made available by the Inter-University High Altitude Laboratory.

* Assisted by the joint program of the ONR and the AEC.

Excited-State Bands of Atmospheric CO_2

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IN a recent note, McMath and Mohler[1] have reported the presence of two new band structures in the telluric spectrum at approximately 2.04μ and 2.08μ. The bands were found on high resolution tracings obtained with the McGregor spectrometer and Cashman PbS cell of the McMath-Hulbert Observatory. The band at 2.04μ has already been identified[2] as the positive branch of the 00_00-12_01 band[3] of the isotope molecule $C^{13}O_2^{16}$. Following suggestions by Professor D. M. Dennison of the University of Michigan and Dr. W. S. Benedict of the National Bureau of Standards, we have made a further study of the 2.08μ band, which indicates with considerable certainty that it is the negative branch of the CO_2 band resulting from the transition 01_10-05_11.

The first few lines at the high frequency end of the 2.08μ band are nearly uniformly spaced, the separations being about one-half those of the band lines originating from the ground state 00_00 of CO_2. In the direction of lower frequen-