Letters to the Editor

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Showers of Penetrating Particles at Altitude of 26,000 Feet

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February 17, 1947

THE variation of the frequency of showers of penetrating particles with atmospheric depth was observed during three recent flights in an airplane at altitudes of 22,000 and 26,000 feet. The arrangement and the results are indicated in Fig. 1, where also the results of previous measurements are reported.[1] (Circles indicate measurements made in recent flights, X refers to measurements made in 1944 in the mountains, at 24.2 inches Hg of mean pressure and in 1946 in an airplane at 13.4 inches Hg.) The improved arrangement with 8 counters of 200 cm² of area permitted the observation of a greater number of fourfold coincidences: 157 in 35 min. at the highest altitude (11 inches Hg), 145 in 67 min. at the altitude corresponding to 13 inches Hg. We used a coincidence set with a multivibrator, following the method of Sousa Santos. The resolving time was $\sim 2\times 10^{-6}$ sec. The efficiency was better than . . . 98 percent. The observed variation with altitude is in agreement with the assumption of an exponential absorption law for the shower producing primary radiation. One obtains cross sections per nucleus of O or $N \sim 2.5\times 10^{-25}$ cm² (or $\sim 1.6\times 10^{-26}$ per nucleon). The intensity falls by a factor e in ~ 101 g/cm² of air. This value agrees with the values indicated by Janossy and based on the transition effect in Pb. The author acknowledges the valuable cooperation of the Brazilian Air Force and expresses his special thanks to the Minister of Air, Major-Brigadeiro A. F. Trompowsky, Brigadeiro Eduardo Gomes, and to all persons who helped him in these experiments.

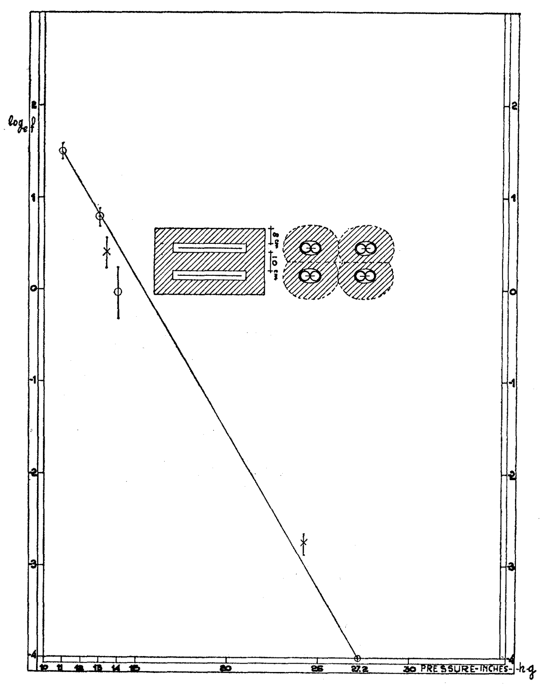

FIG. 1.

[1] O. Sala and G. Wataghin, Phys. Rev. 70, 430 (1946).

The Total Disintegration Energy of Na^{24}*

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March 1, 1947

COINCIDENCE measurements[1-5] have shown that the two γ-rays of Na^{24} are probably emitted in cascade. They have energies of 2.76 and 1.38 Mev. Sachs[6] has pointed out that if they are in cascade, the disintegration energy of Na^{24} may be higher than would be expected according to the considerations of Barkas.[7] The following is the result of a different kind of experiment which bears directly on the same question. This was a measurement for Na^{24} analogous to that which was made for RaB and RaC by L. H. Gray.[8] In this type of experiment, the source is placed in a large block of aluminum, and distribution measurement of the γ-energy absorbed in the aluminum are made with small ionization chambers. Integration gives the total energy emitted per second from the source, and a determination of the β-strength gives the average γ-energy emitted per β-particle. In the case of Na^{24} the β-decay is simple, and the result is interpretable as the γ-energy accompanying each disintegration.

Measurements with two separate sources gave the γ-energy per disintegration as 4.15 Mev and 4.19 Mev, respectively, assuming 32.5 ev as the energy required to produce an ion pair. Adding the beta-disintegration energy of 1.39 Mev, one obtains 5.56 Mev for the total disintegration energy of Na^{24}.

* This document is based on work performed under Contract No. W-35-058-eng-71 for the Manhattan Project and the information covered therein will appear in Division IV of the Manhattan Project Technical Series, as part of the contribution of the Clinton Laboratories.

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