greater distance than, e.g., 10 meters so that the particles constituting the showers are unaffected by the additional layer of 10 cm of lead.

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[1] G. Cocconi and K. Greisen, Phys. Rev. **74**, 62 (1948).
[2] G. Sazepin and L. Eydus, J. Exper. Theor. Phys. **18**, 259 (1948).
[3] L. Jánossy and G. D. Rochester, Proc. Roy. Soc. **A183**, 181 (1944).
[4] H. A. Meyer, G. Schwachheim, and A. Wataghin, Phys. Rev. **74**, 846 (1948).
[5] Gleb Wataghin, Phys. Rev. **74**, 975 (1948).
[6] C. M. G. Lattes, G. P. S. Occhialini, and C. F. Powell, Nature **160**, 453 and 486 (1947).
[7] Camerini, Muirhead, Powell, and Ritson, Nature **162**, 433 (1948).

On the Beta-Particle Spectrum from the Decay of Tritium

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IN an earlier letter we presented[1] unreduced data relative to the beta-particle spectrum from the decay of tritium; these data, taken from tracks of the beta-particles in a cloud chamber, were in the form of a differential distribution of plane-projected track lengths. A reduction of these data has now been completed, with the following interesting results.

By numerical solution of the rather complicated relevant integral equation, a differential distribution of true track lengths was obtained; this, after consideration of the small effects of straggling, was converted to a differential energy-distribution; finally, this last distribution was compared in the standard way with the theory of Fermi.[2] Extrapolation of the linear portion of the Fermi plot indicated an end-point energy which is 1.222 times that shown by the initial distribution of projections; this extrapolation was based upon the statistically satisfactory portions of the data, so the extrapolated end-point can be determined by the energy-range relation of von Droste.[3] Thus the cloud-chamber data now lead to an extrapolated end-point energy of $14.0\times 1.222=17.0$ kev, which is in extremely good agreement with the 16.9 kev recently obtained[4] by Curran, Angus, and Cockcroft.

Figure 1 shows the distribution of energy in the decay of tritium, as determined by both experiments, on the assumption that both experiments indicate the same end-point energy. Although there are statistical limitations to the precision of the cloud-chamber data at energies near the end point, and observational limitations at very short ranges (both of which could be considerably reduced by obvious means), the agreement between the results of the two experiments, at energies between 6 and 13½ kev, is remarkably good. This agreement, incidentally, has a significant bearing upon the results reported recently[5] on

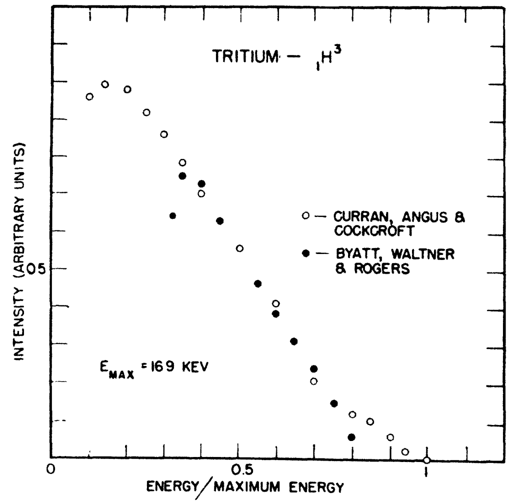

FIG. 1. Distribution of energies in the beta-decay of tritium.

the low energy portion of the beta-particle spectrum from the decay of RaE, for the RaE data were obtained with the same apparatus and the same detailed techniques, except that $Bi^{210*}(CH_3)_3$ was the molecule instead of tritiated water.

[1] W. J. Byatt, F. T. Rogers, Jr., and Arthur Waltner, Phys. Rev. **74**, 699 (1948). In this reference is an expression of the authors' indebtedness to the Carnegie Institution of Washington for the gift of tritiated water.
[2] See E. J. Konopinski, Rev. Mod. Phys. **15**, 209 (1943).
[3] Von Droste, Zeits. f. Physik **84**, 33 (1933).
[4] S. C. Curran, J. Angus, and A. L. Cockcroft, Nature **162**, 302 (1948).
[5] Arthur Waltner and F. T. Rogers, Jr., Phys. Rev. **74**, 699 (1948).

The Gamma-Rays Following Au^{198} β-Decay

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THE question whether the decay of Au^{198} is simple or complex has been pointed up by much recent work in the literature. Levy and Greuling,[1] from spectrometer measurements, have proposed a complex decay scheme wherein ~15 percent of the transitions emit a β of 0.605 Mev, and γ's of 0.157 and 0.208 Mev. DuMond, Lind, and Watson,[2] by absorption in Sn, found low energy γ's in ~15 percent ratio to the precisely measured 0.4112-Mev γ-ray. These low energy γ's could explain the γ-γ coincidences of many recent measurements.[3,4]

In a spectrometer measurement of the β-shape Saxon[5] found the spectrum allowed down to 0.2 Mev, but no systematic search for the low energy γ's was made. Wilkinson and Peacock[6] also report a simple spectrum, while Jurney and Keck[7] found no γ-γ coincidences.

In view of the above conflicting measurements, it was decided to rerun the Au spectrum, with particular care in looking for low energy internal conversion lines from the 0.157- and 0.208-Mev γ's. The same source material used previously[5] was reactivated in the Argonne heavy water