Disintegration of Be^8 *

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VARIOUS investigators[1-3] have concluded that the nucleus Be^8 disintegrates into two alpha-particles. Wheeler[4] has examined critically the results of these experiments and concludes that Be^8 is unstable by about 125 kev. The present experiment is a more precise measurement of the disintegration energy than has been reported to date.

A proportional counter of 5-cm inside diameter and 10.5-cm active length, with a wire of 0.25-mm diameter, had a copper liner on which was evaporated a thin layer of beryllium. The beryllium covered two-thirds of the cylindrical surface; a patch bounded by elements of the cylinder, of one-third of the total area, was left bare. The counter filling was helium; the pressure was adjusted so that the observed particles were surely stopped in the counter and the counter voltage was adjusted accordingly. A strong monoenergetic gamma-ray source was placed near the beryllium patch, and the pulse distribution in the counter was observed with a 10-channel pulse discriminator. To test whether the measured pulses were heavy particles or gamma-pile-ups, a similar count was made with the source near the center of the bare patch. The difference of the two counting rates was used in each measurement.

The Be^9 nucleus photo-disintegrates into Be^8 and a neutron, which particles move in opposite directions. The Be^8 then disintegrates into two alpha-particles; these obviously have opposite directions in the center of gravity system, but in the laboratory system they may have many orientations with respect to the direction of Be^8 recoil; in any event there is some chance that both alphas will enter the counter and the largest pulse observed will be the sum of the energies resulting from Be^8 recoil and Be^8 disintegration. After measurement of a pulse distribution in this manner, the counter was placed in the beam of $Li(p,n)$ neutrons from an electrostatic generator, and the pulse distribution of He^4 recoils in the counter was observed. Since the energy of the machine is known, several such observations may be used to establish an energy scale corresponding to maximum pulse heights. During these measurements of He^4 recoils the gamma-source was left in its usual position near the counter; the alpha-counting rate caused by it was negligible, and one could be sure that space charge conditions in the counter were not changed. After the counter calibration another run was made using the gamma-source to assure that no changes in sensitivity had occurred.

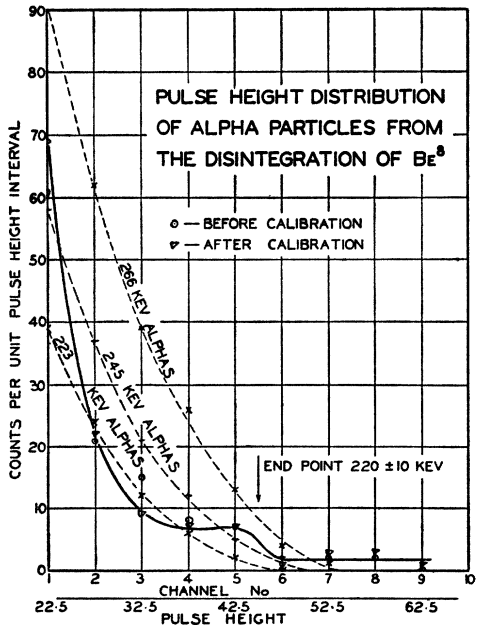

FIG. 1.

The best data were obtained using a gamma-source of 0.5 curie of mesothorium, which has a 2.62-Mev gamma-ray. The counting rates were small, and counts of 10-hours duration were required. To minimize the effects of gamma-pile-ups a 0.4-microsecond delay line clipper[5] was used at the pulse amplifier input. The results are shown in Fig. 1. Taking the value 1.68 Mev for the $Be^9(n,\gamma)$ threshold, we get 116 ± 10 kev for the disintegration energy of Be^8.

Similar measurements were attempted using Sb^{123} (1.70-Mev gamma-ray). The source strength was about 0.1 curie. Here the pulses sought for were much smaller, and the gamma-effects all but masked them. The results have much greater errors than, but are in essential agreement with, the MsTh measurement.

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[1] F. Kirchner, O. Laaff, and H. Neuert, Naturwiss. **39**, 794 (1937).
[2] O. Laaff, Ann. d. Physik **32**, 760 (1938).
[3] K. Fink, Ann. d. Physik **34**, 717 (1939).
[4] J. A. Wheeler, Phys. Rev. **59**, 27 (1941).
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A Note on Quantized Space

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THE infinitesimal elements of the group under which the quadratic form

$$-\eta^2=\eta_0^2-\eta_1^2-\eta_2^2-\eta_3^2-\eta_4^2 \tag{1}$$

is invariant consists of at least 15 in number instead of the 10 as used by Snyder.[1] It may be readily verified that

$$\begin{aligned} B_0&=ib\left(\eta\frac{\partial}{\partial\eta_0}+\eta_0/\eta\eta_\alpha\frac{\partial}{\partial\eta_\alpha}\right), \quad \alpha=0,1\cdots4,\\ B_j&=ib\left(\eta\frac{\partial}{\partial\eta_j}-\eta_j/\eta\eta_\alpha\frac{\partial}{\partial\eta_\alpha}\right), \quad j=1,2,3,4, \end{aligned} \tag{2}$$

are elements under which (1) is invariant. Furthermore, the ten possible commutators of the B's generate the elements used by Snyder except for a numerical factor. The commu-