

Decay of  $\text{Rb}^{86}\dagger$ 

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The gamma-ray spectrum of  $\text{Rb}^{86}$  has been examined with a NaI(Tl) gamma-ray spectrometer. Only the gamma ray of energy 1.08 Mev has been found; the fraction of decay proceeding through the transition is  $0.089 \pm 0.005$ .

**R**UBIDIUM-86 (19.5 day) has been reported as a negatron emitter having two beta groups with maximum energies of 1.82 and 0.72 Mev.<sup>1</sup> The presence of a 1.08-Mev gamma ray in coincidence with the 0.72-Mev beta has also been previously noted. The fraction of the total decay occurring through the 1.08-Mev gamma ray has been quite uncertain, however, with values reported ranging from 20 percent<sup>2</sup> to 12 percent.<sup>3</sup> It was therefore thought of interest to measure accurately the branching ratio of  $\text{Rb}^{86}$  by finding the fractional decay through the 1.08-Mev gamma ray.

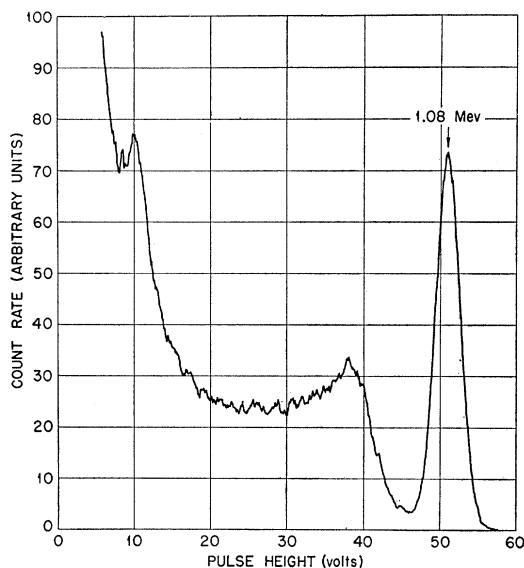


FIG. 1. Gamma-ray spectrum of  $\text{Rb}^{86}$ .

† Based on work performed under contract to U. S. Atomic Energy Commission.

<sup>1</sup> Hollander, Perlman, and Seaborg, *Revs. Modern Phys.* **25**, 469 (1953).

<sup>2</sup> Zaffarano, Kern, and Mitchell, *Phys. Rev.* **74**, 682 (1948).

<sup>3</sup> C. E. Mandeville and E. Shapiro, *Phys. Rev.* **77**, 439 (1950).

Chemically pure  $\text{Rb}_2\text{CO}_3$  was irradiated in the Oak Ridge National Laboratory graphite reactor, removed, dissolved, and processed through an ion-exchange separation—similar to that described below—by the Operations Division, Oak Ridge National Laboratory. The gamma spectrum of this processed material showed only one gamma ray of energy 1.08 Mev. A portion of this solution was further purified, however, by making it 0.1*N* in HCl and passing it through an ion-exchange column containing IR-100 resin. A portion of the center cut of the main activity fraction (Rb) was used for the measurements. The only other activity observed from the ion exchange separation was a small amount of  $\text{Cs}^{134}$  which was removed, assayed, and found to correspond to 0.03 percent of the original Rb activity.

Aliquots of the repurified center-cut Rb solution were assayed by absolute beta counting,  $4\pi$  counting, and  $4\pi$  coincidence counting. Agreement between the three methods was excellent.

Aliquots were then measured by means of calibrated NaI(Tl) gamma-ray spectrometer.<sup>4</sup> Figure 1 is a typical spectrum obtained. The area beneath the 1.08-Mev photoelectron peak was obtained by integration; this area when divided by the efficiency of the counter for 1.08-Mev gamma rays yielded the number of 1.08-Mev gamma-ray transitions. The number of gamma-ray transitions divided by the absolute beta disintegration rate yielded the gamma branching ratio. In addition, aliquots of the  $\text{Rb}^{86}$  solution were read on a calibrated high-pressure ionization chamber,<sup>5</sup> and the number of gamma disintegrations calculated. This value was also used to calculate the gamma branching ratio. Agreement between the two methods was within experimental error. The average value for the gamma branching in  $\text{Rb}^{86}$  was thus found to be  $(8.9 \pm 0.5)$  percent.

<sup>4</sup> B. Kahn and W. S. Lyon, *Nucleonics* **11**, No. 11, 61 (1953).

<sup>5</sup> J. W. Jones and R. T. Overman, U. S. Atomic Energy Commission Report 2367, March 20, 1948 (unpublished).