

This weak radiation is probably caused by internal and external bremsstrahlung as well as excitation of characteristic lead x-rays by the fast beta-rays.

An upper limit for the number of photons for which we were searching was derived in the following way. Our Geiger counter had an average efficiency $\approx 10^{-3}$ for detecting photons of this energy region if they passed through it. A tungsten foil (46 mg/cm²) reduced the counting rate by 2.4 ± 1.5 counts per minute. If we assume that tungsten would absorb the x-rays with an absorption coefficient of 10 cm²/g, and allow for the absorption in the lead foil and in the copper and aluminum filters, we find that less than $(8 \pm 5)10^3$ photons per min. are emitted "in the direction" of the Geiger counter. Assuming a fluorescence yield close to unity we obtain the result that less than 3 percent of the beta-rays stopped in lead are captured into the K-shell. One can conclude from this experiment that beta-rays, at the end of their path, are identical with atomic electrons.

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¹ H. R. Crane, *Rev. Mod. Phys.* **20**, 278 (1948).

² C. T. Zahn and A. H. Spees, *Phys. Rev.* **53**, 365 (1938).

³ H. R. Crane, *Rev. Mod. Phys.* **20**, 279 (1948).

⁴ S. Ruben and M. D. Kamen, *Phys. Rev.* **59**, 349 (1941); P. W. Levy, *ibid.* **72**, 248 (1947); W. E. Stephens and Margaret N. Lewis, *ibid.* **72**, 526; G. L. Berggren and R. K. Osborne, *Bull. Am. Phys. Soc.* **23**, No. 3, 46 (1948).

An Excited State of Be⁹ by Inelastic Scattering of Protons

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THE spectrum of protons emitted in the reaction Be⁹(*p,p'*)Be⁹ has been studied in order to locate low lying excited states of Be⁹ in the region 0–5.2 Mev. Incident beams of 4.5 and 7.1 Mev were provided by the 27-inch Rochester cyclotron, and observations were made at an angle of 37° using 180-degree magnetic focusing and Eastman NTA photographic plates. The target was a thin evaporated foil of 99.9 percent purity. The resolution of the method, as measured by the energy width of elastically scattered protons, is about 0.15 Mev, and the background is such that a differential cross section 10^{-28} cm² leads to an observable yield.

The results, shown in Fig. 1, indicate no bound states above the ground state, a virtual state at 2.41 Mev (0.78 Mev above the dissociation energy), and no other states up to about 5.2 Mev. The possibility that the tracks were made by deuterons or alpha-particles from the reaction Be⁹(*p,d*)Be⁸ or Be⁹(*p,a*)Li⁶ was removed by observing that the count was not reduced when the plate was covered with a foil thick enough to stop the heavier particles. The cross section for excitation of the level is about 3×10^{-27} cm² at these energies. The experimental width is not significantly greater than the width of the elastic peak, suggesting an actual width less than 0.10 Mev.

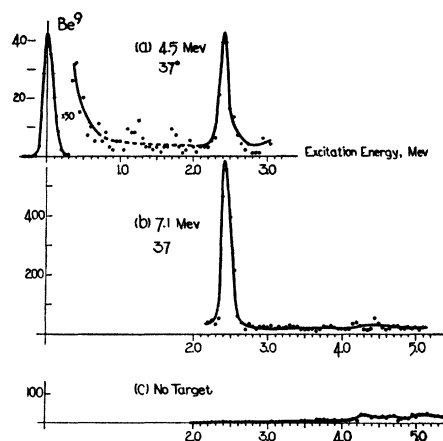


FIG. 1. Energy distribution of protons scattered by Be⁹, plotted as number of tracks per 50 kev interval.

Calculations based on the model for Be⁹ used by Caldirola¹ account for this state in a qualitative way, giving a value for the position which is in approximate agreement with experiment. However, the indicated width is too great by at least a factor of two. The absence of other states in the neighborhood is confirmed, but the model does not include the effect of the spin dependence of the forces. This model allows one to predict the excitation function and angular distribution for the scattering process; these calculations are being made and the corresponding experiments are under way.

¹ P. Caldirola, *Nuovo Cimento* **IV**, No. 1–2, 39 (1947).

The Effect of the Composition of the Gas Mixture in Self-Quenching Geiger-Müller Tubes on Their Plateau Characteristics

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THE effect of the composition of the gas mixture in self-quenching G-M counters on the properties of these counters has been described by a number of authors.^{1–4} Weisz² using ethyl-ether at room temperature and Rochester and McCusker⁴ using alcohol at 40°C found the interesting result that at a pressure of 6 cm of Hg of the quenching gas the plateau of a given tube vanishes completely.

This result has been explained in two ways. Weisz² suggested that at the higher densities of ethyl-ether the photons formed during the primary discharge near the wire are so strongly absorbed by this vapor that the discharge has difficulty in spreading along the whole length of the wire. One would thus expect the region of limited proportionality to be extended at the cost of the