A Measurement of the Deuteron Proton Magnetic-Moment Ratio[1]

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November 8, 1947

DURING a recent period of availability of the Massachusetts Institute of Technology cyclotron magnet, measurements were made of the ratio of the magnetic moment of the deuteron to that of the proton in liquid hydrogen and deuterium by means of nuclear-absorption experiments with circuits similar to those previously used.[2]

The resonances were presented simultaneously on an oscilloscope by means of an electronic switch. A sinusoidal sweep was used, so that with proper adjustment the observed patterns could be made symmetrical about the center-line of the oscilloscope. The shapes of the two resonance curves were rather different, and the most prominent maxima of the deuterium resonance were of the order of a half-line width from the hydrogen maxima when the desired symmetry conditions were established. This effect, though not understood in detail, is probably due to the rate of sweep through resonance.

Eleven observations were made, of which three were rejected because the photographs of the oscilloscope traces were found to be unsymmetrical. Half of the remaining eight observations were made with the Dewar containing the resonance coils rotated through 180° so that the effects of a field gradient in the magnet could be eliminated. All eight of these observations fell within the following limits:

$$\mu_D/\mu_H = 0.307021 \pm 0.000005.$$

[1] This work has been supported in part by the Signal Corps, the Air Materiel Command, and O.N.R.
[2] F. Bitter, N. L. Alpert, H. L. Poss, C. G. Lehr, and S. T. Lin, Phys. Rev. **71**, 738 (1947).

Multiple Nuclear Isomerism

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November 8, 1947

IN the course of an investigation of the activity induced in Sb by slow neutrons we noticed three previously unobserved short periods. An analysis of the decay curves obtained under various conditions of bombardment yields the following half-life periods: 1.3 min., 3.5 min., and 21 min. Though a short bombardment brings out these activities quite well relative to the long-lived known Sb^{122} (2.8 d) and Sb^{124} (60 d) activities, the saturation intensities as detected with either an end-window Geiger counter or an ionization chamber are only of the order of a few tenths of one percent of those of the long-lived activities. The new activities were observed with a number of samples of Sb of different origin, including C. P. Sb_2O_3 and Hilger's spectroscopically pure Sb metal. We could observe the activities with epicadmium neutrons as well as thermal neutrons and were able to show that all three activities induced by epicadmium neutrons are strongly

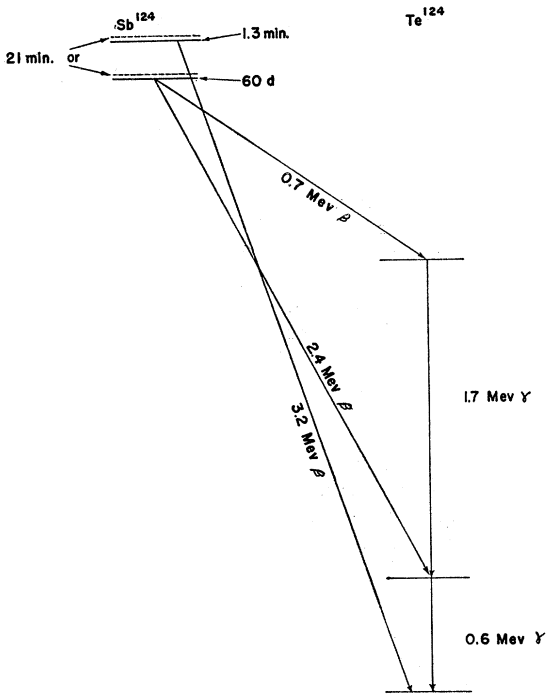

FIG. 1.

"self-absorbed" by Sb, which makes it unlikely that they are due to impurities. In addition, it was found that the short periods along with 2.8-d Sb plated out on Fe from an acid (HCl) solution of freshly bombarded Sb metal powder, whereas Sn, added as a carrier and plated out on Zn after the Sb was removed, proved inactive.

Using a sample of Sb enriched in Sb^{123} (96.3 percent Sb^{123}) we found that the 1.3- and 21-min. periods are due to isomers of Sb^{124} (60 d) and that the 3.5-min. period is due to an isomer of Sb^{122} (2.8 d). Characteristic K α-radiation of Sb was found to be associated with the 3.5-min. period, but not with the 1.3- and 21-min. periods. The 3.5- and 21-min. periods both show intense internal conversion electrons with half-value thicknesses in Al of 1.7 mg/cm²

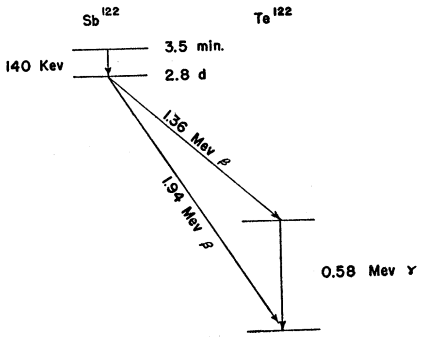

FIG. 2.