

quence of the long range of the tensor interaction. With a long tensor range a weaker tensor force suffices to give account of the deuteron quadrupole moment, and with a weaker tensor force the 4D probability in H^3 is reduced. The exchange moment, which is proportional to both the 4D amplitude and the strength of the tensor forces, is thus doubly reduced. Since it seems unlikely that an interaction which involves very strong tensor forces will give enough binding for H^3 , we can probably conclude that this exchange moment will not make a major contribution to the H^3 moment anomaly.

Parallel calculations with inclusion of the Coulomb energy were made for He^3 in order to estimate the effects of the small difference between the H^3 and He^3 wave functions on the sums of the ordinary and exchange moments;^{1,10} these effects are completely negligible.

This problem was suggested by Professor R. G. Sachs, who gave us much helpful advice; we were materially aided by information supplied us by Professor Herman Feshbach.

* Work supported by Wisconsin Alumni Research Foundation.

** AEC Predoctoral fellow.

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² R. G. Sachs, Phys. Rev. **72**, 312 (1947).

³ G. F. Chew and M. L. Goldberger, Phys. Rev. **73**, 1409 (1948).

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⁵ E. Gerjuoy and J. Schwinger, Phys. Rev. **61**, 138 (1942).

⁶ R. G. Sachs and M. Goepfert-Mayer, Phys. Rev. **53**, 991 (1938).

⁷ Huang, Frohlich, and Sneddon, Proc. Roy. Soc. **A191**, 61, who investigated the binding of light nuclei using the Møller-Rosenfeld potential, found that such functions are a very good approximation to the exact solution of the Schroedinger equation for the problem in the absence of tensor forces.

⁸ H. Primakoff, Phys. Rev. **72**, 118 (1947).

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¹⁰ R. G. Sachs, Phys. Rev. **69**, 611 (1946).

Radioactivity of K^{40} *

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February 7, 1949

A DETERMINATION of the beta-radioactivity of K^{40} has been made by an internal calibration of KCl sources with standardized amounts of Na^{24} . If the near identity of the absorption curves of the spectra of Na^{24} and K^{40} reported by Hirzel and Wäffler¹ is assumed, the method of internal calibration of the potassium source eliminates the need of corrections for differences in self-absorption, geometry, back-scattering, and intrinsic counter efficiency for the two activities. Fortunately, the short half-life of Na^{24} (14.8 hours) makes the method experimentally practical, for the sodium can be "removed" after it has been used for calibration by simply allowing it to decay.

A Co^{60} standard prepared by the National Bureau of Standards was used to calibrate an approximately equal activity of impurity-free Na^{24} on both a platinum and copper cathode gamma-counter. The ratio of the efficiency of the platinum counter for the detection of the gamma-rays of Co^{60} to its efficiency for the detection of the gamma-rays of Na^{24} was taken as 0.664, and the corresponding ratio for the copper counter as 0.584. These values are from coincidence measurements by Peacock.² Small corrections of the order of 2 percent were made in each case for the difference in absorption of the gamma-rays from the two activities in traversing quarter-inch aluminum and sixteenth-inch lead shields surrounding the counters. The statistical error in counting and the uncertainty in the assumed efficiency ratios amounted to about 4 percent in each case, while the value of Na^{24} activity measured on the copper counter agreed with that measured on the platinum to within 3 percent. A small aliquot of the Na^{24} solution, measured by pipetting and checked gravimetrically, was added to about 4 grams of KCl in solution. The mixture was brought to dryness in a nickle crucible and ground to insure homogeneous distribution of the sodium activity throughout the KCl.

Eighth-inch thick aluminum slides with the active material held in circular depressions of $\frac{3}{8}$ " depth and 5.7 square centimeters area served as source holders. The slides were held rigidly in a channel provided in the counter support, with the KCl directly beneath the 10-micron mica window of a bell-shaped beta-counter. Reproducibility of geometry and constancy of the counter efficiency were checked regularly with a thick standard source of potassium chloride. The slides were counted periodically from the original measurement, when the beta-activity of the sodium was about thirty times that of the K^{40} , until all but a negligible amount of the sodium had decayed—a total of seven measurements for each source. During the first two counting periods, an experimentally determined correction of about 3 percent was made for the effect of the Na^{24} gamma-rays, this correction being applied to all later measurements. The seven resulting counting rates for each slide gave points on the decay curve of Na^{24} , with the activity of the K^{40} present as a constant background.

From these data a best value for the counting rates of the potassium and the sodium at some initial time was calculated for each of the sources. Over the range of source thicknesses used, the ratio of the counting rates, and therefore the ratio of the net efficiencies of the counter for the two spectra, was independent of source thickness to within the statistical error of 2 percent. (See Table I.)

TABLE I. Ratio of counting rates for various thicknesses of sources.

Source thickness in milligrams/cm ²	Na^{24} betas/ K^{40} betas
43	32.2
63	33.2
74	32.8
79	32.9
97	33.0

If the absorption curves of the two spectra are identical, then their net counting efficiencies may be taken as equal. The ratio of the known activity of the sodium in each source to the activity of the potassium is then equal to the ratio of the counting rates of the two. An average of the data from the five sources gives the specific activity of potassium as 30.6 ± 2.0 betas/second/gram of ordinary potassium.

I should like to express my appreciation to Professor M. Deutsch for suggesting the method employed and to Dr. R. K. Osborne for his constant advice during the course of this research.

* Supported in part by the joint program of the ONR and the AEC.

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The Beta-Ray Spectra of Cu^{64} and the Ratio of N^+ / N^-

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February 14, 1949

IN a previous Letter to the Editor¹ reporting the investigations on the negatron and positron spectra of Cu^{64} , we pointed out that a gradual but consistent reduction of deviation *versus* the source thickness at low energy region has been observed and with the thinnest (~ 0.1 mg/cm²) and most uniform source prepared, the deviation was found to be much less than previously reported in other laboratories.²⁻⁴ Since the theoretical interpretation of the experimental results involves the Coulomb correction factor which is particularly sensitive for positrons in the low energy region, the screening and relativistic corrections calculated by Longmire and Brown⁵