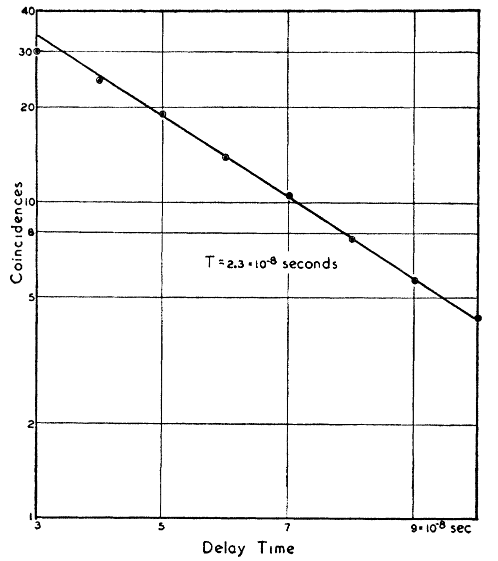

FIG. 2. Semi-logarithmic plot of Au^{198} coincidences *versus* delay time.

gamma-ray energy of 0.41 Mev this predicts a half-life of the order of 1.7×10^{-11} second for electric quadrupole and 1.5×10^{-6} second for electric octupole. The observed value falls between these two values of l equal to 2 or 3 and is thus probably a quadrupole transition.

The writer wishes to thank Professor E. C. Pollard for valuable discussions and encouragement and to Professor H. L. Schultz for discussion of coincidence techniques and circuits involved.

* Assisted by the joint program of the ONR and AEC.

[1] S. De Benedetti and F. K. McGowan, Phys. Rev. **74**, 728 (1948).
[2] P. T. Bittencourt and M. Goldhaber, Phys. Rev. **70**, 780 (1946).
[3] Donald T. Stevenson and Martin Deutsch, Phys. Rev. **76**, 100 (1949).
[4] W. J. MacIntyre, Phys. Rev. **75**, 1439 (1949).
[5] W. J. MacIntyre, Phys. Rev. **75**, 1290 (1949).
[6] F. W. Van Name, Phys. Rev. **75**, 100 (1949).
[7] L. Madansky and M. L. Weidenbeck, Phys. Rev. **72**, 185 (1947).
[8] C. E. Mandeville and M. V. Scherb, Phys. Rev. **73**, 634 (1948).
[9] A. C. Helmholtz, Phys. Rev. **60**, 415 (1941).

Mass Assignment of the 43-Minute Hg Isomer

INGMAR BERGSTRÖM AND SIGVARD THULIN
Nobel Institute for Physics, Stockholm, Sweden
May 31, 1949

THE electromagnetic isotope separator, recently built at our Institute,[1] has been used to determine the mass number of the 43^m activity of Hg. This activity has been known before to be due to an isomeric state and our results, which will be reported here, show that this activity can be uniquely ascribed to mass number 199.

When performing a determination of this kind, one can proceed principally in two different ways. One can either start by irradiation of unseparated Hg and then make the isotope separation of the irradiated sample, whereafter the activity of each mass number is determined, or one can make the separation first and then irradiate the different isotopes separately. In the first case the active isotope assignment will be unique, while the other procedure, though it does not always give an unique answer, may be advantageous when the isotope is very short-lived. In the present case both methods have been used.

One gram Hg was irradiated in a small glass container by fast Be-neutrons from our 6.5-Mev cyclotron for about 2 hours (current 50–100 μa). Immediately after irradiation the container was introduced into the ion source of the separator by means of a vacuum lock device. The mercury ion current was 10–15 μa and the time of separation 40 min., giving about 60 μg stable Hg isotopes. The separation could be started a few minutes after the irradiation in the cyclotron. The Hg spectrum was deposited on a thin Al plate, which could be taken out quickly after a convenient separation time. The Al plate was cut into strips, each corresponding to a mass number and 4 mm wide. The activity of each strip was then measured with a small bell β-counter (background 6 counts/min.). Figure 1 shows the results of such an investigation. On the abscissa axis the mass number scale is given, which is found by the visual deposition on the plate of the stable isotopes. The distance between the centers of two subsequent mass numbers on the plate is 4 mm. According to Fig. 1 the 43^m activity evidently has the mass number 199. The half-life of the activity of this mass number was also checked. Another investigation with better focusing showed an activity of 6 c/m at mass number 199 and no counts above the background for the mass numbers 198 and 200.

In order to investigate different reactions leading to the metastable level in Hg^{199} the previously mentioned second method was used. The stable isotopes of Hg were separated and deposited on a Fe plate, which was cut into strips as mentioned above. The strips were irradiated in the cyclotron and then separately treated with a diluted solution of hydrochloric acid. It was found that the isotope deposits on the strips left the active plates and flowed up to the surface of the solution. The isotopes were then filtered off, washed with water and alcohol and then dried. In this way the activity measurements could be started 10 min. after irradiation. The mass numbers 199 and 200 showed a weak activity above background with a half-life of the order of 40 min. This may mean that both the reaction $Hg^{199}(n,n)Hg^{199*}$ and $Hg^{200}(n,2n)Hg^{199*}$ occur, since earlier investigations have shown that no hydrogen compounds occur in the mass spectrum that can disturb the measurements.

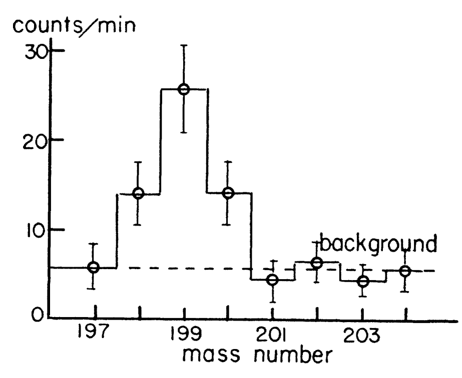

FIG. 1. Histogram showing that activity is to be assigned to mass number 199.

Our mass assignment fits well with the experiments performed by Sherr *et al.*,[2] who observed a 43 min. Hg activity obtained from a (α,n)-reaction on Pt. The mass assignment also explains why the 43 min. activity cannot be produced by a (n,α)-reaction on Pb as shown by Wu and Friedländer,[3] since there is no stable Pb^{202} isotope.

[1] Bergström, Thulin, Svartholm, and Siegbahn, Ark. f. Fysik **1**, 11 (1949).
[2] Sherr, Bainbridge, and Anderson, Phys. Rev. **60**, 473 (1941).
[3] C. S. Wu and G. Friedländer, Phys. Rev. **63**, 227 (1943).