calibrating lines of the same energy. Though the additional width could be due to nuclear capture from the 1s level, it is possible that it originates at least in part from this unresolved line. In the case of μ mesons a corresponding broadening is not observed, but the different behavior of the two mesons could be explained in terms of the large nuclear capture probability of pions in the 2p state, which thus depresses the $2p\rightarrow 1s$ line relative to the $3p\rightarrow 1s$.

There have been some recent theoretical investigations[3,4] on the nuclear shifts of the 1s π-mesonic level. In Fig. 3 we have plotted the results obtained from the paper of Deser, Goldberger, Bauman, and Thirring. The agreement with experiment is quite good. However, this may be fortuitous both because of some possible $3p\rightarrow 1s$ admixture in our peaks, and because of the extrapolation and oversimplification involved in the theoretical estimate. In addition our preliminary results on boron, though not yet sufficiently consistent to be reported, seem to contradict the trend indicated in Fig. 3.

* Supported in part by the U. S. Atomic Energy Commission.
[1] Stearns, Stearns, DeBenedetti, and Leipuner, Phys. Rev. **96**, 804 (1954).
[2] Stearns, DeBenedetti, Stearns, and Leipuner, Phys. Rev. **93**, 1123 (1954).
[3] G. C. Wick (unpublished).
[4] Deser, Goldberger, Baumann, and Thirring, Phys. Rev. **96**, 774 (1954).

Average Number of Neutrons Emitted During the Spontaneous Fission of Cf^{252}*

W. W. T. Crane, G. H. Higgins, and S. G. Thompson
University of California, Radiation Laboratory, Livermore, California
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THE average number of neutrons per spontaneous fission of Cf^{252} has been found to be 3.10±0.15 by the manganous sulphate moderator-absorber system.

Since the discovery of spontaneous fission by Petrzhak and Flerov[1] in 1940, measurements of the number of neutrons per fission, ν, have been made upon various nuclides. Littler[2,3] and Barclay, Galbraith, and Whitehouse[4] found the best value of $\nu(U^{238})=2.4\pm0.2$, and the latter authors report $\nu(Th^{232})=2.6\pm0.3$. Recently, Barclay and Whitehouse[5] measured $\nu(Cm^{242})=3.0\pm0.3$.

Since the ratio of alpha decay to spontaneous fission is only about 42 in the decay of Cf^{252},[6] there is no measurable contribution from (α,n) reactions on low Z elements to the total number of neutrons observed from a sample. For this reason, Cf^{252} makes an ideal standard for the calibration of other neutron counting devices.

A sample of Cf^{252} of about 5×10^{-3} micrograms was mounted on a one-inch platinum disk and the number of fissions per minute was determined by direct counting. The sample was placed in a Lucite tube and immersed in a tank filled with saturated $MnSO_4$ solution until the Mn^{56} radioactivity formed by neutron capture in Mn^{55} had reached an equilibrium level. The sample was removed and the intensity of the radiations from the Mn^{56} in the tank was measured with an immersion counter which utilized an NaI crystal as a detector. The tank and counter were calibrated by measuring the activity produced from a standardized mock fission source,[7] and by comparing the activity produced by the fission spectrum from Cm^{244} in this tank with that produced in a tank which was large enough to be essentially infinite for the absorption of the neutrons from standard polonium-beryllium sources. Neutrons from the polonium-beryllium sources are presumed to be more energetic than those from any spontaneous fission source.

Over-all errors in the average value obtained from several measurements are thought to be less than 5 percent. Work is continuing on several other heavy element nuclides.

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[1] K. A. Petrzhak and G. N. Flerov, Acad. Sci. (U.S.S.R.) **28**, 500 (1940).
[2] D. J. Littler, Proc. Phys. Soc. (London) **A64**, 638 (1951).
[3] D. J. Littler, Proc. Phys. Soc. (London) **A65**, 203 (1952).
[4] Barclay, Galbraith, and Whitehouse, Proc. Phys. Soc. (London) **A65**, 73 (1952).
[5] F. R. Barclay and W. J. Whitehouse, Proc. Phys. Soc. (London) **A66**, 447 (1953).
[6] Ghiorso, Thompson, Choppin, and Harvey, Phys. Rev. **94**, 1081 (1954).
[7] D. S. Martin, Atomic Energy Commission Report AECD-3077 (unpublished).

Hyperfine Splitting and the Sign of the Magnetic Moment of Cs^{134m}

L. S. Goodman and S. Wexler
Argonne National Laboratory, Lemont, Illinois
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PREVIOUSLY published low-frequency data[1,2] from magnetic resonance experiments with 3.1-hr Cs^{134m} atomic beams, when correctly substituted in the Breit-Rabi equation, yield a hyperfine splitting $\Delta\nu=3684.3$ ±0.5 Mc/sec if a positive nuclear magnetic moment is assumed, and $\Delta\nu=3695\pm0.5$ Mc/sec if this magnetic moment is taken to be negative.

The direct hyperfine transition in Cs^{134m} has been observed at 3684.5±0.5 Mc/sec in an atomic beam experiment at this laboratory. The previous data and the present measurement are consistent only with the assumption of a positive nuclear magnetic moment.

Details will be published in a paper to be submitted in the near future.

[1] V. W. Cohen and D. A. Gilbert, Phys. Rev. **95**, 569 (1954).
[2] L. S. Goodman and S. Wexler, Phys. Rev. **95**, 570 (1954).