Abeles[7] and Lax and co-workers[8] probably would not work unless the degeneracy, in this case along ⟨111⟩ axes, where lifted by the spin-orbit interaction.

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Nuclear Spin and Hyperfine Structure Interaction of the 3.1-hr Cs^{134} Isomer*

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We have performed an atomic beam magnetic resonance[1] experiment on the 3.1-hr isomer of Cs^{134}. The results of this experiment indicate that $I=8$ in units of $\hbar$, and $\Delta\nu=3675.6\pm0.6$ Mc/sec.

The apparatus is of the "flop-in" type in which one observed those atoms which have undergone the transition in the homogeneous magnetic field for which $[I+\frac{1}{2}, -(I+\frac{1}{2})]\rightleftarrows[I+\frac{1}{2}, -(I-\frac{1}{2})]$. At very weak magnetic fields this transition frequency is linear in H and is independent of $\Delta\nu$, depending only upon I. At intermediate fields the dependence upon $\Delta\nu$ becomes significant and is given accurately by the modified Breit-Rabi[1] expression permitting one to calculate $\Delta\nu$.

The Cs^{134m} for each run was prepared by irradiating approximately 100 mg of CsCl in the Brookhaven reactor for about 9 hours. It was then placed in a Monel oven with freshly cut chips of metallic barium. At about 450°C a strong steady beam of Cs atoms emerged from the oven. The focused atoms, selected by a 0.004-in. slit, are allowed to impinge for an arbitrary time interval upon a thin, flat tungsten target upon which they are adsorbed. The target could then be removed via an airlock and its activity measured with a proportional counter, thus giving a measure of the focused beam intensity for one set of magnetic field and frequency conditions. For deposition times of the order of five minutes counting rates of approximately 70 counts/min at the peak with a background of about 15 counts/min were obtained. The magnetic field was calibrated by observing the rf spectrum of Cs^{133} and using $\Delta\nu^{133}=9192.76$ Mc/sec as given by Kusch and Taub.[2]

Table I. Observed resonances.

Cs^{133} (Mc/sec)	Cs^{134m} (Mc/sec)
1.990	0.940
4.504	2.125
9.995	4.750
15.252	7.325
29.865	14.612
48.850	24.540
99.500	53.582±0.010
213.500	136.280±0.010

The frequencies at which Cs^{134m} resonances were observed are given in Table I along with the calibrating frequencies of Cs^{133}. The lower-frequency results serve to establish the spin. The constant $\Delta\nu^{134m}$ was calculated for the two highest field runs as given in the table. These combine to give a value of 3675.6±0.6 Mc/sec. Using the value[3] 0.731 for g_I of Cs^{133} and neglecting any hfs anomaly, we calculate the magnetic moment of Cs^{134m} to be $\mu=1.10\pm0.01$, with the sign undetermined.

The available proton-neutron configurations, agreeing with the measured spin, on the basis of the shell model[4] are $d_{5/2}$, $h_{11/2}$ and $g_{7/2}$, $h_{11/2}$. In the limit of a strict $J-J$ coupling two-particle wave function, the magnetic moments calculated for these two pure states are +2.72 nm and −0.35 nm, respectively. Thus it would appear that a mixed configuration, such as suggested by de-Shalit and Goldhaber,[5] is necessary to account for the magnitude of the observed moment. The proper admixture would then be 53 percent $(g_{7/2}, h_{11/2})$ and 47 percent $(d_{5/2}, h_{11/2})$ with the theory predicting a positive sign. In this connection it is interesting to note that no combination of "stripped"[6] moments for the proton and neutron, calculated from pure states, yields a magnetic moment in agreement with the observed value. Furthermore, if one analyzes the data of Bellamy and Smith[7] concerning the ground state of Cs^{134}, one finds that the above conclusion also holds here. Thus it would appear that the magnetic moments of Cs^{134} and Cs^{134m} make rather a strong case for the use of mixed configurations if one restricts the discussion to single proton-single neutron wave functions.

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