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NUCLEAR MAGNETIC MOMENTS OF Sr^{87} *AND* Mg^{25}

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THE gyromagnetic ratio of the Sr^{87} nucleus was measured by us by the atomic-beam magnetic-resonance method.[1] Since the beam consisted of strontium atoms, intramolecular interactions could be disregarded and the diamagnetic correction[2] could be evaluated accurately. The beam was 378 cm long and was detected by surface ionization on an incandescent tungsten wire, upon which an oxygen jet was blowing. Under optimum conditions the coefficient of surface ionization was about 20 percent. The Sr^{87} ions were separated out by a magnetic analyzer and recorded with an electron multiplier and a galvanometer with a sensitivity of 4×10^{-10} amp/mm. The galvanometer deflection due to the narrow strontium beam at mass 87 was 250 mm. The strontium beam was produced by heating metallic strontium to 740°C in an oven made of Armco iron.

The nuclear gyromagnetic ratio g was determined from the equation[1] $g = 1.3122 \times 10^{-3} f_r/H_r$, where f_r is the resonance frequency of the oscillating field that induces the transitions, and H_r is the corresponding resonance value of the strength of the static magnetic field in which the transitions occur. The resonance values f_r and H_r are those which correspond to the minimum intensity of the refocused beam. Measurements were made both at constant field and at constant frequency. The fluctuations in beam intensity were compensated by two methods: (a) alternate measurements of beam intensity with the oscillating field on and off, and (b) continuous recording of the beam intensity by an instrument with a fast response. The frequency f was measured with a type 528 heterodyne wavemeter by observing zero beats on an oscilloscope. The magnetic field strength H was measured by proton resonance in water; the resonance frequency ν_H of the protons was measured by the method indicated above. Since the position of the field-measuring probe did not coincide with the place in the field H where the atomic beam was exposed to the oscillating field, the measured value ν_H was corrected by adding to it the difference between the proton resonance frequencies of the field-measuring probe and of another probe located in the place of beam passage; this difference had been measured before installing the electromagnet in the apparatus. A sharp and deep resonance dip of the intensity of the refocused beam, amounting to 60 percent, was observed at frequencies around 1.07 Mcs and fields around 5800 oersted. To cancel out end effects of the oscillating field[3] the measurements were carried out at opposite directions of the field H.

The maximum error of measurement — determined by nonuniqueness under reversals of magnetism, by the inhomogeneity of the field, and also by the sharpness of the resonance curves — is estimated to be 0.12 percent. The average value of 26 measurements of the gyromagnetic ratio is

$$g(\mathrm{Sr}^{87}) = 0.2423 \pm 0.0003,$$

which within the limits of the errors of the measurements agrees with the value obtained by Jeffries and Sogo by the method of nuclear induction. Because of the diamagnetism of the atom the true value H_{true} of the magnetic field strength at the nucleus is less than the measured H_r, so that $H_{\mathrm{true}} = (1-\sigma) H_{\mathrm{meas}}$, where σ is the magnetic shielding constant. According to Dickinson[5] $\sigma = 0.00345$ for strontium. With this correction and the known[6] value of the spin of the Sr^{87} nucleus, $I = 9/2$, we obtain for the magnetic moment of the Sr^{87} nucleus

$$\mu(\mathrm{Sr}^{87}) = 1.0939 \pm 0.0014 \text{ nuclear magnetons.}$$

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[1] Rabi, Zacharias, Millman, and Kusch, Phys. Rev. **53**, 318 (1938); Rabi, Millman, Kusch, and Zacharias, Phys. Rev. **55**, 526 (1939).

[2] W. E. Lamb, Jr., Phys. Rev. **60**, 817 (1941); N. F. Ramsey, Experimental Nuclear Physics, ed. by E. Segre, vol. I, part III, Sec. 4C., Wiley, N. Y., 1953.

[3] S. Millman, Phys. Rev. **55**, 628 (1939).

[4] C. D. Jeffries and P. B. Sogo, Phys. Rev. **91**, 1286 (1953).

[5] W. C. Dickinson, Phys. Rev. 80, 563 (1950).

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ERRATA TO VOLUME 7

Page	Reads	Should Read
533, title	Nuclear magnetic moments of Sr^{87} and Mg^{95}	Nuclear magnetic moments of Sr^{87}
645 Eq. (1)	$\ldots + \varkappa \sqrt{j_0 (j_0 + 1)}$	$\ldots - \varkappa \sqrt{j_0 (j_0 + 1)}$
647 Eq. (11)	$(L + 1) \lvert B_L^- \rvert^2 - L \lvert B_L^+ \rvert^2$	$L (L + 1) \left[\lvert B_L^- \rvert^2 - \lvert B_L^+ \rvert^2 \right]$
894 Eq. (12)	$\varepsilon_{11} = 1 - \sum \frac{\cdots}{\sqrt{\pi/\mu}}$	$\varepsilon_{11} = 1 - \sum \frac{\cdots}{\sqrt{\pi}\, \mu}$
897 Eq. (45)	$\sqrt{\pi/2}$	$\sqrt{\pi/8}$
979 Table II, heading	$\lvert E_\gamma > 50$ **Mev** $\lvert E_\gamma > 50$ **Mev**	$\lvert E_\gamma < 50$ **Mev** $\lvert E_\gamma > 50$ **Mev**
1023 Figure caption		a) $\omega < \omega_H$, b) $\omega > \omega_H$
1123 Eq. (2)	$\Gamma = \mu_2/\mu_1$	$\Gamma = \mu_2/\mu_1,\ \mu_\perp = (\mu_1^2 - \mu_2^2)/\mu_1$

ERRATA TO VOLUME 8

Page	Reads	Should Read
375 Figure caption	a) positrons of energy up to 0.4 ϵ, b) positrons of energy up to 0.3 ϵ.	a) positrons of energy up to 0.3 ϵ, b) positrons of energy up to 0.4 ϵ.
816 Beginning of Eq. (8)	$I_2^5 = (4\pi)^2 \ldots$	$I_2^2 = (4\pi)^5 \ldots$