JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN VOL. 34, SUPPLEMENT, 1973
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON NUCLEAR MOMENTS AND NUCLEAR STRUCTURE, 1972

VI–7 Magnetic Moments of Odd A Nuclei with Simple Configuration*

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There seems to be two main mechanisms to modify the nuclear magnetic moments of odd A nuclei. They are the mesonic corrections and the renormalization of magnetic dipole operator due to configuration mixing. The second one is frequently called the correction due to spin polarization.

Using Kuo's effective interactions from a realistic two-body force, we calculated magnetic moments of odd A nuclei with simple configuration like ^{209}Bi which has one proton outside closed shell. The corrections are estimated by first order perturbation. The observed simple energy differences are used in this calculation. Results are shown in the tables.

Agreement is reasonable except ^{121}Sb $5/2^+$, ^{209}Pb $5/2^-$, and ^{209}Bi $9/2^+$ states. The mesonic effect seems to change the gyromagnetic ratio of orbital angular momentum g_l by about 10%, namely $\delta g_l = 0.1$ for proton, and $\delta g_l = -0.1$ for neutron. If we take into account this effect, the magnetic moment of $h_{9/2}$ state of ^{209}Bi is explained, but for the magnetic moments of $g_{9/2}$ and $i_{13/2}$ states, two effects cancel with each other.

* This work is supported by U.S. Atomic Energy Commission.

Table I. $\delta\mu$ for odd Z nuclei.

		$\delta\mu_{\text{cal}}$	$\delta\mu_{\text{obs}}$
^{89}Y	$p_{1/2}$	0.04	0.12
^{113}In	$g_{9/2}^{-1}$	−1.04	−1.27
^{121}Sb	$d_{5/2}$	−0.77	−1.43
	$g_{7/2}$	0.67	0.79
^{209}Bi	$h_{9/2}$	0.79	1.46
	$i_{13/2}$	−0.60	−0.72

Table II. $\delta\mu$ for odd N nuclei.

		$\delta\mu_{\text{cal}}$	$\delta\mu_{\text{obs}}$
^{89}Sr	$g_{9/2}$	0.95	0.82
^{91}Zr	$d_{5/2}$	0.53	0.61
^{207}Pb	$p_{1/2}^{-1}$	−0.11	−0.06
	$f_{5/2}^{-1}$	−0.46	−0.72
	$i_{13/2}^{-1}$	0.85	0.92
^{209}Pb	$g_{9/2}$	0.59	0.54

We decomposed the calculated deviation of magnetic moments in terms of $\delta g_s^{\text{cp}}\langle s\rangle$, $\delta g_l^{\text{cp}}\langle l\rangle$ and $g_p^{\text{cp}}\langle[Y \times s^{(2)}]^{(1)}\rangle$; $\delta g_s^{\text{cp}} \sim \mp 1.5$, $\delta g^{\text{cp}} \sim 0.01$, $g_p^{\text{cp}} \sim \pm 1.5$.