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VI–8 Magnetic Dipole Transitions in the Vicinity of ^{208}Pb*

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Magnetic dipole transition rates are calculated in the vicinity of ^{208}Pb. The effects of core polarization and mesonic exchange current, which seem to be the two main mechanisms to renormalize the nuclear M1 operator, are taken into account. The calculated rates are in impressive agreement with the recent measurements made by the Chalk River Group. The effect of exchange current competes with that of core polarization in l-forbidden M1 transitions, but the former is negligible in allowed M1-transitions. Thus the allowed M1-transitions provide the best evidence for the renormalization of g_s caused by the core polarizations.

The numerical results are shown in Table I, where only the core polarization effect is taken into account in M_1 and B_1 (M1) but both effects of the core polarization and the mesonic current are summed up in M_2 and B_2 (M1).

Teble I. The B(M1) values (in units of n.m.^{2}).

Nucleus	$j_i \to j_f$	$B(\mathrm{M1})_{\mathrm{sp}}$	$B_1(\mathrm{M1})$	$B_2(\mathrm{M1})$	$B(\mathrm{M1})_{\mathrm{exp}}$
^{207}Pb	$p_{3/2}^{-1} \to p_{1/2}^{-1}$	1.167	0.447	0.498	0.41 ± 0.07
	$f_{7/2}^{-1} \to f_{5/2}^{-1}$	1.50	0.420	0.452	0.49 ± 0.16
	$p_{3/2}^{-1} \to f_{5/2}^{-1}$	0	5.3×10^{-3}	0.03×10^{-3}	—
^{209}Pb	$i_{11/2} \to g_{9/2}$	0	0.21×10^{-3}	1.4×10^{-3}	<0.04
^{209}Bi	$f_{5/2} \to f_{7/2}$	2.862	0.755	0.826	0.76 ± 0.15
	$f_{7/2} \to h_{9/2}$	0	1.55×10^{-2}	3.6×10^{-3}	$(4.3 \pm 0.7) \times 10^{-3}$
^{207}Tl	$d_{3/2}^{-1} \to s_{1/2}^{-1}$	0	1.68×10^{-2}	5.6×10^{-3}	—

$B(\mathrm{M1})_{\mathrm{sp}} = \dfrac{M_{\mathrm{sp}}^2}{2j_i+1}$, $B(\mathrm{M1})_{1,2} = \dfrac{M_{1,2}^2}{2j_i+1}$

$B(\mathrm{M1})_{\mathrm{exp}}$ are taken from the measurements by O. Häusser, F. C. Khanna and D. Ward. (Preprint).

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