

# **$l$ -forbidden M1 transitions in semimagic nuclei**

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The presence at low energy of pair of nuclear levels differing in orbital angular momentum by two units, which can be ascribed to single-particle states in the shell model, is common place in many odd-mass nuclei located near closed shells. Such single-particle states can be labelled with the radial quantum number  $n_r$ , the orbital angular momentum  $l$  and the total angular momentum  $j$ , and would correspond to  $|n_r, l, j=l+1/2\rangle$  and  $|n_r-1, l+2, j'=l+3/2\rangle$ , respectively. The pairs  $s_{1/2} - d_{3/2}$ ,  $p_{3/2} - f_{5/2}$  and  $g_{7/2} - d_{5/2}$  are examples of such orbitals. They are experimentally observed as the ground state and low-lying first-excited state in many odd-A nuclei across the nuclear chart.

Since the magnetic dipole isovector operator does not change the orbital angular momentum, magnetic dipole M1  $\Delta l=2$  transitions between pairs of states of this kind are  $l$ -forbidden in the extreme shell model picture [1]. Nonetheless these transitions still occur, although with rates typically smaller than those of allowed transitions, or even below the single-particle limit. Consequently, it is anticipated that these transitions arise from the breakdown of  $l$ -forbiddenness due to nuclear dynamic effects such as core polarization and meson exchange mechanisms [2]. Therefore the investigation of  $l$ -forbidden M1 transitions may provide insight into the role of these effects within the atomic nucleus [3].

This study is a part of a systematic investigation of  $l$ -forbidden M1 transitions in semimagic nuclei, making use of available data and our own experimental results. We focus on odd-A  $N=50$  nuclei in the vicinity  $^{78}\text{Ni}$  [4] and neutron-rich odd-A  $Z=50$  Sn isotopes [5,6]. The experimental M1 transitions probabilities are obtained from excited level lifetime measurements employing fast-timing methods.

Regarding the  $N=50$  isotopes new results will be presented for  $^{83}\text{As}$  and  $^{85}\text{Br}$ , obtained from experiments performed at ISOLDE/CERN and ILL, respectively. They will be discussed in the context of other available data for the region. In the case of tin ( $Z=50$ ), the systematic study of  $l$ -forbidden transitions in several odd-mass isotopes just below  $^{132}\text{Sn}$  will be presented.

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