Small antferromagnetic spin systems: just beyond the rotational band mode

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Investigation of molecules containing magnetic centers is one of the most important topics in contemporary physics. In the case of antifrromagnetic couplings the rotational band model, satisfying the Landé interval rule, is frequently assumed to describe the thermodynamic properties of such a system. However, the *classical* Landé rule is not fulfilled in quantum spin systems besides some special cases [1]. *E.g.*, it is satisfied for spins placed in vertices of a square or a rhombus [2]. We consider systems very close to those mentioned above: (a) 4 spins s in vertices of a isosceles trapezium and (b) a ring of 6 small spins. In both cases the total spins of sublattices, $S_{A(B)}$, are not good quantum numbers. In the first case changes in molecule geometry (or, equivalently, in exchange integrals), whereas in the second case the number of spins are responsible for this effect. In all these cases the thermodynamic properties can be easily determined, but we concentrate on eigenstates and discuss 'mixing' of states with given $S_{A(B)}$ or, in the other words, their mean values (over the quantum eigenstates).

References:

[1] L. Engelhardt, M. Luban, Phys. Rev. B **73**, 054430 (2006)
[2] W. Florek et al., Physica B **405**, 3811 (2010)