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The Haldane-like spin chain in the large anisotropy limit

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We consider the one dimensional spin chain similar to the one studied by Haldane, however in the opposite limit, of very large anisotropy and small nearest neighbour, anti-ferromagnetic exchange coupling between the spins. The zero order theory has a ground state that is 2ˆN degenerate, corresponding to each spin in its highest or lowest weight state. For a periodic chain with an even number of sites we show that the ground state is a superposition of the two possible Néel states. We explicitly find the instanton that mediates the tunnelling, within the spin coherent state formalism. With an odd number of spins, the Néel state must necessarily contain a defect. The position of the defect is arbitrary and the set of ground states reorganize into a band, with the ground state given by the linear superposition of the localized defect states. We show that at order 2s in perturbation theory, the localized states mix. In both cases, the ground state does not admit long range order, confirming the result that symmetry break down does not occur in one dimensional systems.

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