Magnon decay in gapped quantum spin systems ALEXEI KOLEZHUK$^1$, SUBIR SACHDEV, Harvard University, Department of Physics — In the $O(3) \sigma$-model description of gapped spin systems, $S = 1$ magnons can only decay into three lower energy magnons. We argue that the symmetry of the quantum spin Hamiltonian often allows decay into two magnons, and compute this decay rate in model systems. For a realistic model describing two-dimensional spin dimer material $\text{(C}_4\text{H}_{12}\text{N}_2)\text{Cu}_2\text{Cl}_6$ (known as PHCC), we compare our results for the momentum-dependent magnon linewidth with recent measurements by Stone et al. (e-print cond-mat/0511266) and extract new information on the exchange coupling pattern in this material. For $S = 1$ Haldane chains, we show that two-magnon decay is allowed in the full lattice description, even though it cannot be induced by any allowed term written in powers and gradients of the $\sigma$-model field. We present estimates for the behavior of the magnon linewidth in Haldane gap chains and discuss relation to the recent experimental work.

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