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Velocities of Goldstone and critical modes in SU(2) symmetric quantum spin systems[1] ARNAB SEN, Max-Planck-Institute, Dresden, ANDERS SANDVIK, Boston University — The low-energy excitations of many interesting quantum spin systems are gapless and linearly dispersing. Examples include Goldstone modes in the Néel phase and critical modes at a z=1 quantum critical point. We calculate the velocities of such modes for a variety of SU(2) symmetric S=1/2 systems using quantum Monte Carlo (QMC) methods. We use two complementary approaches:a)The lowest triplet gap from the singlet ground state is calculated using T=0 projector QMC by measuring appropriate imaginary-time correlation functions. The velocity is obtained from extracted momentum dependent gaps.b)We use a method based on tuning the system to the cubic regime by varying its temperature to equate the variance of spatial and temporal winding numbers, which was recently used by Jiang [1] for a system with Goldstone modes. We find that this method can also be applied to a z=1 critical point (the critical point of an S=1/2 Heisenberg bilayer) and to the 1D Heisenberg spin chain, where there are no Goldstone modes. We also extract the velocity of the critical modes of the J-Q model. It agrees very well with the velocity obtained from a phenomenological approach [2] based on a spinon gas picture. [1] Jiang, Phys. Rev B 83, 024419 (2011) [2] Sandvik et al., Phys. Rev. Lett. 106, 207203 (2011)

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