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Simulating finite-momentum states of quantum spin systems in the valence bond basis[1] ANDERS SANDVIK, KEVIN BEACH, Boston University — Quantum spin systems such as the Heisenberg model can be simulated numerically in the valence bond basis, as an alternative to the standard basis of eigenstates of the S_i^z operators [1]. One advantage of this approach is that also the triplet sector can be studied based on the configurations generated in the singlet sector [1,2]. This way an improved estimator for the singlet-triplet gap can be constructed. Here we show that also finite-momentum triplet states can be studied [in practice for q close to 0 or π due to a phase problem], thus allowing us to calculate the triplet dispersion $E(q)$. Matrix elements $\langle T(q)|S_q^z|0\rangle$ are also accessible. These matrix elements give directly the magnon weight in the dynamic structure factor $S(q,\omega)$. We also discuss how deconfined spinon excitations can be detected in this approach. [1] A. W. Sandvik, Phys. Rev. Lett. **95**, 207203 (2005).
[2] K. S. D. Beach and A. W. Sandvik, Nucl. Phys. B **750**, 142 (2006).

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