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Monte Carlo Simulations of Quantum Spin Systems in the Valence Bond Basis FABIAN ZSCHOCKE, University of Alberta — We propose a quantum Monte Carlo method for frustrated spin systems that partially alleviates the sign problem — thereby extending the range of frustrated couplings over which the system can be reliably sampled. The scheme is projective and takes advantage of the overcompleteness and nonorthogonality of the valence bond basis. It provides a framework for further semi-controlled approximations that are fully sign-problem-free in which the transition weights between bond configurations take on effective, renormalized values. We present results for the frustrated (J1-J2), spin-half Heisenberg model on the square lattice in the vicinity of its phase transition at $J2/J1 \approx 0.4$.

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