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Exact quantum dynamics of spin systems using the positive-P representation RAY NG, ERIK SORENSEN, McMaster University — We discuss a scheme for simulating the exact real time quantum dynamics of interacting quantum spin systems within the positive-P formalism. As model systems we study the transverse field Ising model as well as the Heisenberg model undergoing a quench away from the classical ferromagnetic ordered state. In using the positive-P representation (PPR), the dynamics of the interacting quantum spin system is mapped onto a set of stochastic differential equations (SDEs). The number of which scales linearly with the number of spins, N, compared to an exact solution through diagonalization that in the case of the Heisenberg model would require matrices exponentially large in N. This mapping is exact and can in principle be extended to higher dimensional interacting systems as well as to systems with an explicit coupling to the environment. We compare the results from using a PPR approach based on both the optical coherent states as well as SU(2) Radcliff coherent states.

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