Abstract Submitted
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Novel phase-space Monte-Carlo method for quench dynamics in 1D and 2D spin models[1] ALEXANDER PIKOVSKI, JOHANNES SCHACHENMAYER, ANA MARIA REY, JILA, NIST & Department of Physics, University of Colorado, Boulder — An important outstanding problem is the effcient numerical computation of quench dynamics in large spin systems. We propose a semiclassical method to study many-body spin dynamics in generic spin lattice models. The method, named DTWA, is based on a novel type of discrete Monte-Carlo sampling in phase-space. We demonstare the power of the technique by comparisons with analytical and numerically exact calculations. It is shown that DTWA captures the dynamics of one- and two-point correlations 1D systems. We also use DTWA to study the dynamics of correlations in 2D systems with many spins and different types of long-range couplings, in regimes where other numerical methods are generally unreliable. Computing spatial and time-dependent correlations, we find a sharp change in the speed of propagation of correlations at a critical range of interactions determined by the system dimension. The investigations are relevant for a broad range of systems including solids, atom-photon systems and ultracold gases of polar molecules, trapped ions, Rydberg, and magnetic atoms.

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