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Probing Real-Space and Time-Resolved Correlation Functions with Many-Body Ramsey Interferometry MICHAEL KNAP, Harvard University, ADRIAN KANTIAN, THIERRY GIAMARCHI, University of Geneva, IMMANUEL BLOCH, Max-Planck-Institut für Quantenoptik, MIKHAIL D. LUKIN, EUGENE DEMLER, Harvard University — We propose to use Ramsey interferometry and single-site addressability, available in synthetic matter such as cold atoms, polar molecules, or trapped ions, to measure real-space and time resolved spin correlation functions. These correlation functions directly probe the excitations of the system, which makes it possible to characterize the underlying many-body states. Moreover, they contain valuable information about phase transitions where they exhibit scale invariance. We explicitly consider examples of the two-dimensional, antiferromagnetic Heisenberg model and the one-dimensional, long-range transverse field Ising model to illustrate the technique.

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