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Quantum dynamics of spin waves in ultracold bosonic systems SEBASTIAN HILD, PETER SCHAUSS, TAKESHI FUKUHARA, JOHANNES ZEIHER, FRAUKE SEESSELBERG, Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Straße 1, 85748 Garching, Germany, IMMANUEL BLOCH, Max-Planck-Institut für Quantenoptik, Garching, Germany& LMU München, Germany, CHRISTIAN GROSS, Max-Planck-Institut für Quantenoptik, Hans-Kopfermann-Straße 1, 85748 Garching, Germany — Ultracold quantum gases in optical lattices are promising candidates to simulate spin Hamiltonians, which describe a variety of different phenomena. Single-site resolved imaging of a single spin species allows for the spatially resolved measurement of spin-spin correlations. The atomic Mott insulator corresponds to a spin polarized state with very low entropy. Together with precise local or global spin manipulation, this allows for the study of the dynamics of precisely defined initial spin states. We report on experiments studying the dynamics of bound and free magnons following local spin flips as well as globally imprinted spin spirals, which are highly excited states of the system. The ability to control the tunneling rate in the ultracold atomic gas allows us to study the scaling behavior of the spin spiral lifetime in one and two dimensions. The data is compared with theoretical predictions based on direct diagonalization.

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