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Nonequilibrium Dynamics beyond the Mean Field Approximation INGO HOMRIGHAUSEN, STEFAN KEHREIN, University of Goettingen — Mean field type approximations are one of the most accessible methods to study the complexity of quantum many body systems out of equilibrium. However, the validity of such approximations has to be examined in each case. Building on Ref. [1] we investigate three different quantum many particle models on finite fully connected lattices: the transverse field Ising model, the Bose-Hubbard model and the Jaynes Cummings model. In particular, we explore the nonequilibrium dynamics of the order parameter and its variance after a quantum quench. The most intriguing observation is that all three models exhibit the same universal behavior: For quenches within the ordered phase, the variance of the order parameter shows a quasiperiodic breathing behavior. The local maxima of this breathing increase in time whereas the local minima decrease. Applying a semiclassical expansion, we explain these findings and argue why the observations are generic. We also discuss the time scale of validity of our analysis by comparing to numerically exact data. [1] B. Sciolla, G. Biroli, J. Stat. Mech. (2011) P11003.

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