Applications of time-dependent spin wave theory: chaotic dynamical ferromagnets and many-body Kapitza pendula'

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The talk is a survey of two topics inherent the onset of novel non-equilibrium phases of matter in interacting quantum spin chains.

First, attention will be directed towards the impact of non-equilibrium quantum fluctuations at the critical point of spin chains supporting a dynamical phase diagram. Considering, as instance, a lattice spin system with competing infinite and short range interactions, I will show how fluctuations can generate a novel novel dynamical phase, employing a variant of a spin wave expansion suited to tackle non-equilibrium quantum dynamics.

With the same method, results concerning dynamical phases of periodically driven, long-range interacting, quantum spin chains can be extracted. Specifically, I will discuss the simultaneous dynamical stabilisation via periodic drive of the entire band of quantum many-body fluctuations of a model at hand for current experiments involving trapped ions. This constitutes an analog of the Kapitza pendulum for a driven quantum many body system. At the same time, I will present and discuss the properties of the whole dynamical phase diagram of this model, which establishes during the pre-thermal plateau preceding eventual heating.

References:
A. Lerose, J. Marino, A. Gambassi, A. Silva,
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.120.130603
A. Lerose, J. Marino, A. Gambassi, A. Silva, https://arxiv.org/abs/1803.04490