Contribution ID: **184** Type: **CONTRIBUTED TALK (25min +5)**

Engineering interactions in an isolated many-body spin system

Thursday, 17 November 2022 12:00 (20 minutes)

Controlling interactions is a key to experimentally study far-from-equilibrium dynamics in isolated quantum systems. Here we present two methods of changing the symmetry properties of Heisenberg spin systems implemented with Rydberg atoms. By using time-periodic driving, a naturally given many-body Hamiltonian of a closed quantum system can be
transformed into an effective target Hamiltonian. Such Floquet engineering allows for a stroboscopic observation of vastly different many-body dynamics. For contineous probing we choosing appropriate Rydberg state combinations with which we can directly realize a large range of spin Hamiltonians. We measure the relaxation dynamics of the magnetization of disordered Heisenberg XX-, XXZ- and Ising Hamiltonians. By rescaling time of the individual dynamics, we find a collapse of the magnetization data onto a single curve. Remarkably, the observed dynamics can be captured by theoretical models that only consider localized ensembles of spins down to single pairs. Since the dynamics of pairs are independent of the type of Hamiltonian up to a scaling factor, this simplified model provides an effective integrable Hamiltonian that directly explains the emergence of the scaling behavior.

Affiliation

Universität Heidelberg

Financial Support

I apply for financial support (non-student application)

Primary authors: Dr ZÜRN, Gerhard (Heidelberg University); GEIER, Sebastian; FRANZ, Titus; Dr HAINAUT, Clément; Prof. THAICHAROEN, Nithiwadee; SALZINGER, Andre; Dr TEBBEN, Annika; GRIMSHANDL, David; BRAUN, Eduard; HORNUNG, Moritz; Prof. WEIDEMÜLLER, Matthias

Presenter: Dr ZÜRN, Gerhard (Heidelberg University)

Session Classification: Morning session