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Title: Quantum Melting of a Dissipative Time Crystal

Abstract:
In this talk we discuss the fate of a dissipative time-crystal upon inclusion of quantum fluctuations beyond mean-field theory.
We focus on a lattice model of bosonic quantum Van der Pol Oscillators which at the semiclassical level displays a stable limit cycle (synchronized) phase above a critical pump strength.

We study this model in the quantum regime of few bosons per sites, both in the limit of infinite lattice connectivity and beyond, by including finite connectivity effects through Dynamical Mean-Field Theory.

We discuss how time-crystalline behavior survives in this regime, through an interplay of interaction and drive leading to local gain and coherent hopping leading to synchronization among neighboring "inverted" quantum oscillators.

We identify a mechanism for quantum melting of dissipative time-crystalline order which does not come from noise (effective temperature) but purely from quantum coherent hopping events which induce an effective local dissipation.