

# Time crystallinity in open quantum systems

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Time-crystals are genuinely non-equilibrium quantum phases of matter that break time-translational symmetry. While in non-equilibrium closed systems time crystals have been experimentally realized, it remains an open question whether or not such a phase survives when systems are coupled to an environment. Although dissipation caused by the coupling to a bath may stabilize time-crystals in some regimes, the introduction of incoherent noise may also destroy the time crystalline order. Therefore, the mechanisms that stabilize a time crystal in open and closed systems are not necessarily the same. Here, we propose a way to identify an open system time crystal based on a single object: the Floquet propagator.