Quantum Irreversibility of Quasistatic Protocols

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Quantum mechanically, a driving process is expected to be reversible in the quasistatic limit, aka adiabatic theorem. This statement stands in opposition to classical mechanics, where mix of regular and chaotic dynamics implies irreversibility. A paradigm that demonstrates the emergence of a novel regime of "quantum irreversibility" is introduced [1]. Specifically, an atomtronic superfuild ring is considered. Initially the ring is at rest, and the condensed bosons have zero momentum. The rotation velocity of the ring is increased gradually from zero to a finite value that is large enough to induce flow. Then, the rotation velocity of the ring is gradually decreased back to zero, and the final energy distribution of the particles is probed.

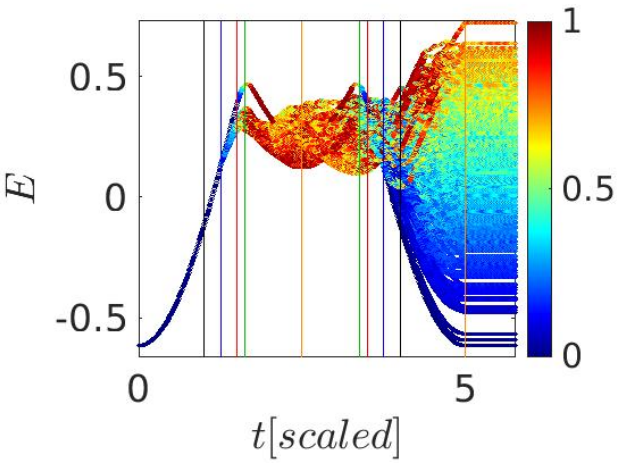

Figure 1: Spreading in energy as a function of time

References

[1] Y Winsten and D Cohen, Phys. Rev. A **107**, 052202 (2023); arXiv:2212.05512 (2022)