Abstract Submitted
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Dynamics of a driven quantum gas: Non-hermiticity, pseudo-spectra and phase transitions KONSTANTINOS MAKRIS, Vienna University of Technology/Princeton University, MANAS KULKARNI, New York City College of Technology, City University of New York, HAKAN TURECI, Princeton University — System of an optically driven quantum gas coupled to a single mode of a leaky cavity offers a unique platform to study open quantum systems. This system displays two exceptional points and a quantum critical point when the drive strength (equivalently, the light-matter coupling) is tuned. Here, we study [1] the non-normal properties of this system especially near these special points. Adapting the rich mathematics behind the theory of pseudo-spectra, we characterize the open quantum phase transitions in this system by studying the fluctuations. Our method offers a novel way to understand physics near criticality beyond the traditional approach of arriving at a phase diagram using the semi-classical solutions arising from a mean field approach. We further show that the quench dynamics of a driven dissipative quantum gas displays a non-Markovian dynamics featuring substantial transient amplification of the photon flux near the critical point. We also investigate the non-Hermitian physics behind two-operator products thereby shining light on higher order quantum correlations in an open quantum system.

[1] M. Kulkarni, K. G. Makris, H. E. Tureci (2014)

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