Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Critical phenomena of a multicritical point in a driven-dissipative many-body system JEREMY T. YOUNG, Joint Quantum Institute, MICHAEL FOSS-FEIG, Army Research Lab, ALEXEY V. GORSHKOV, Joint Quantum Institute, MOHAMMAD F. MAGHREBI, Michigan State University — We study a non-equilibrium driven-dissipative bosonic model with hopping and density-density interactions, which contains multicritical points where two real fields become gapless and could be realized experimentally via Rydberg atoms in an optical lattice or a non-linearly coupled cavity array. On the level of mean field theory, these critical points are described by a cusp-Hopf bifurcation, leading to features such as bistability and limit cycles as well as other interesting phases. Beyond mean field theory, we show that these multicritical points can be mapped to a system of two coupled Ising models at different temperatures. Using a perturbative renormalization group approach, we study the critical phenomena of the multicritical point. In particular, we determine whether non-equilibrium behavior persists or if the critical phenomena are described by an equilibrium universality class.

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Date submitted: 24 Jan 2018 Electronic form version 1.4