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Influence of system-bath interactions on driven-dissipative phase transitions HIL F H CHEUNG, YOGESH S PATIL, MUKUND VENGALATTORE, Cornell University — A wide range of non-equilibrium systems exhibit signatures of critical behavior and phase transitions such as critical slowing down, divergent correlation lengths and susceptibilities. Such signatures are coincident with the emergence of macroscopic phases due to the interplay between the coherent system dynamics and dissipation to the environment. In contrast to equilibrium physical systems, the physical mechanisms that give rise to this order involve both the system and the environment. Due to the different origins of these mechanisms, such driven-dissipative transitions can exhibit dynamical phase transitions where the critical behavior lies beyond the conventional universality classes of equilibrium phase transitions [1]. We describe such a driven-dissipative phase transition in a parametric oscillator-amplifier system and demonstrate that the system exhibits key signatures of a continuous phase transition, including a spontaneously broken symmetry and the emergence of goldstone modes. In contrast to an equilibrium phase transition, we show that the phase diagram and emergent phases crucially depend on the environmental correlations and that as such, can be modified by the imposition of correlations beyond the Markovian regime. We also discuss the extension of this description of universal behavior near criticality in driven-dissipative phase transitions to lower dimensions. [1] L. M. Sieberer et al., Phys. Rev. Lett. 110, 195301

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