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Engineering a Trapped Ion Open-System Dicke Model with Dissipative Phase Transitions FLORENTIN REITER, Harvard University, MALTE D. DUEHOLM, ANDERS S. SORENSEN, Niels Bohr Institute, University of Copenhagen, SUSANNE F. YELIN, Harvard University — The Dicke model [1] is a paradigmatic model in quantum optics known to exhibit a quantum phase transition between a normal and a superradiant phase [2]. Such superradiant phase transitions have recently been observed experimentally using cavity systems [3,4]. These implementation have, however, conserved the total spin and thus restricted the dynamics. To overcome such restrictions, we consider implementation of an open-system Dicke model using systems of trapped ions. Here spontaneous emission breaks the symmetry and thereby allows the system to explore richer driven-dissipative dynamics. We observe phase transitions in the steady state with respect to both Hamiltonian and dissipative parameters, as well as novel phases which do not appear in closed systems and cavity realizations. [1] R. H. Dicke, Phys. Rev. 93, 99 (1954). [2] K. Hepp and E. H. Lieb, Ann. Phys. 76, 360 (1973); Y. K. Wang and F. T. Hioe, Phys. Rev. A 7, 831 (1973). [3] K. Baumann et al., Nature 464, 1301 (2010). [4] M. Baden et al., Phys. Rev. Lett. 113, 020408 (2014).

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