Abstract Submitted
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The Dicke Quantum Phase Transition in a Superfluid Gas Coupled to an Optical Cavity CHRISTINE GUERLIN[1], KRISTIAN BAUMANN, FERDINAND BRENNECKE, TILMAN ESSLINGER, ETH Zurich, QUANTUM OPTICS GROUP TEAM — A fundamental approach to collective matter-light interaction is given by the Dicke model which has been predicted to show an intriguing quantum phase transition. We have realized the Dicke quantum phase transition in an open system formed by a Bose-Einstein condensate coupled to an optical cavity, and observed the emergence of a self-organized supersolid phase [1]. The phase transition is driven by infinitely long-ranged interactions between the condensed atoms. We show that the phase transition is described by the Dicke Hamiltonian, including counter-rotating coupling terms, and that the supersolid phase is associated with a spontaneously broken spatial symmetry. The boundary of the phase transition is mapped out in quantitative agreement with the Dicke model.

[1] K. Baumann, C. Guerlin, F. Brennecke, T. Esslinger, arXiv 0912.2361, 2009

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