Abstract Submitted
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Dynamical gauge effects in an open quantum network[1] JIANSHI ZHAO, CRAIG PRICE, QI LIU, NATHAN GEMELKE, Penn State University — We describe new experimental techniques for simulation of high-energy field theories based on an analogy between open thermodynamic systems and effective dynamical gauge-fields following $SU(2) \times U(1)$ Yang-Mills models. By coupling near-resonant laser-modes to atoms moving in a disordered optical environment, we create an open system which exhibits a non-equilibrium phase transition between two steady-state behaviors, exhibiting scale-invariant behavior near the transition. By measuring transport of atoms through the disordered network, we observe two distinct scaling behaviors, corresponding to the classical and quantum limits for the dynamical gauge field. This behavior is loosely analogous to dynamical gauge effects in quantum chromodynamics, and can mapped onto generalized open problems in theoretical understanding of quantized non-Abelian gauge theories. Additional, the scaling behavior can be understood from the geometric structure of the gauge potential and linked to the measure of information in the local disordered potential, reflecting an underlying holographic principle.

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Jianshi Zhao
Penn State University

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