Abstract Submitted
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Measuring signatures of quantum chaos in strongly-interacting systems[1] GREGORY BENTSEN, Stanford University, BRIAN SWINGLE, University of Maryland, MONIKA SCHLEIER-SMITH, PATRICK HAYDEN, Stanford University — Strongly-coupled many-body quantum systems generically exhibit signatures of quantum chaos. Recent theoretical work on black holes has focused on probing these signatures using so-called "out-of-time-order" (OTO) correlation functions, which measure a quantum-mechanical version of the classical butterfly effect. We propose a general echo-type protocol to experimentally measure these correlators in arbitrary many-body systems that involves reversing the sign of the Hamiltonian [1]. We detail a realistic implementation in a single-body system employing cold atoms and cavity quantum electrodynamics to verify feasibility with current technology. Applying this protocol to diverse experimental systems could place bounds on quantum information processing, uncover new bounds on transport coefficients, offer insight into closed-system thermalization, and perhaps even enable experimental tests of the holographic principle.

B. Swingle, G. Bentsen, M. Schleier-Smith, P. Hayden, Phys. Rev. A 94, 040302(R) (2016)

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