Abstract Submitted
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Out of time order correlation in Marginal Many-Body Localized systems[1] ZHEN BI, KEVIN SLAGLE, University of California, Santa Barbara, YI-ZHUANG YOU, Harvard University, CENKE XU, University of California, Santa Barbara, UCSB XU'S GROUP TEAM — In many-body localized (MBL) systems, energy, charge, and other local conserved quantities can not defuse due to the localization of excitations in the presence of strong disorder. Nevertheless, the quantum information can still propagate. The out-of-time-order correlation (OTOC) was recently proposed to quantify the quantum information scrambling and the butterfly effect in quantum many-body dynamics. We show that the out-of-time-order correlation $\langle W(t)^\dagger V(0)^\dagger W(t)V(0)\rangle$ in many-body localized and marginal MBL systems can be efficiently calculated by the spectral bifurcation renormalization group (SBRG). Previous results show that MBL system has a very slow information scrambling behavior compared to a non-integrable chaotic system. For instance, the scrambling time follows an exponential scaling with the distance. In our work, we demonstrate, in marginal MBL systems, the scrambling time t_{scr} follows a stretched exponential scaling with the distance d_{WV} between the operators W and V: $t_{scr} \sim \exp(\sqrt{d_{WV}/l_0})$, which demonstrates Sinai diffusion of quantum information and the enhanced scrambling by the quantum criticality in non-chaotic systems.

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