Contribution ID: **15** Type: **Poster**

Quench dynamics of entanglement from crosscap states

The linear growth of entanglement after a quench from a state with short-range correlations is a universal feature of many body dynamics.
It has been shown to occur in integrable and chaotic systems undergoing either Hamiltonian, Floquet or circuit dynamics and has also been observed in experiments.
The entanglement dynamics emerging from long-range correlated states is far less studied, although no less viable using modern quantum simulation experiments.
In this talk, I will present the dynamics of the bipartite entanglement entropy and mutual information in quenches starting from \textit{crosscap states}, a class of states constructed by entangling antipodal points of a finite and periodic system.
We consider the evolution of these initial states, in integrable and chaotic systems for both brickwork quantum circuits and Hamiltonian dynamics.
Specifically, I will show the different patterns of behaviors that we observe in dual unitary and random unitary quantum circuits, as well as free and interacting fermion Hamiltonians, which are explained by a modified membrane picture for the former case and a quasiparticle picture that can be derived explicitly for the latter.
For chaotic systems we have constant maximal entanglement entropy, whereas for integrable systems after an initial time delay we have a linear decrease followed by a series of revivals.
Mutual information is linearly decreasing from its initial maximal value in both cases, vanishing for chaotic, while exhibiting revivals for integrable systems.

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Session Classification: Poster