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An analysis of entanglement harvesting beyond perturbation theory

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A key prediction of quantum field theory that has yet to be tested experimentally is the existence of correlations between different regions in a quantum field. It is hypothesized that this phenomenon can be measured using the entanglement harvesting protocol, a process by which entanglement between detectors is induced due to their interaction with a quantum field in its vacuum state. Entanglement harvesting has been extensively researched using perturbative methods. However, experimental proposals for realizing this protocol using superconducting qubits utilize setups beyond the limits of perturbation theory. Furthermore, non-perturbative studies are very limited to particular scenarios often unfit for modeling the regimes of current experiments. Here we present results on entanglement harvesting using non-perturbative methods. We investigate the breakdown of perturbation theory as well as the non-perturbative behaviour of harvesting in realistic experimental regimes.

Author: MEMBRERE, Ireneo James (University of Waterloo)

Presenter: MEMBRERE, Ireneo James (University of Waterloo)

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