"Schrodinger's catapult I: coherent launch of multi-photon cavity states"

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Schrodinger's catapult II: entanglement between stationary and flying fields W. PFAFF, C. AXLINE, L. BURKHART, U. VOOL, P. REINHOLD, L. FRUNZIO, L. JIANG, M. DEVORET, R. SCHOELKOPF, Yale University — Entanglement between nodes is an elementary resource in a quantum network. An important step towards its realization is entanglement between stationary and flying states. Here we experimentally demonstrate entanglement generation between a long-lived cavity memory and traveling mode in circuit QED. A large on/off ratio and fast control over a parametric mixing process allow us to realize conversion with tunable magnitude and duration between standing and flying mode. In the case of half-conversion, we observe correlations between the standing and flying state that confirm the generation of entangled states. We show this for both single-photon and multi-photon states, paving the way for error-correctable remote entanglement. Our system could serve as an essential component in a modular architecture for error-protected quantum information processing.

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