

Fast generation of multi-particle entanglement state with flux qubits in tunable coupled cavities

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We discussed a one-step scheme to fast generate Greenberger-Horne-Zeilinger (GHZ) states for superconducting flux qubits in a tunable coupled cavities of circuit QED system. The GHZ state can be produced within ~ 10 ns time which is much shorter than coherence time of flux qubits and comparable with single qubit operation. In our scheme, time dependent microwave field drive on the superconducting transmission line type resonator, displace the resonator in a controlled way and induce indirect qubit-qubit coupling based on geometric phase shift without residual entanglement between qubit and resonator at some instant time. The design of tunable cavities provide us the potential of extending this one-step scheme to many qubits case.