Quantum state transfer between fixed-frequency superconducting qubits using an itinerant microwave photon

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Quantum communication between remote chips plays a crucial role in developing large-scale superconducting quantum computers. An itinerant microwave photon offers a way to realize such communication. Previous implementations [1-3] relied on tunable circuit elements such as a SQUID to address mismatches of device parameters between the sender and receiver devices. However, this approach introduces additional complexity that hinders scalability. Here, we demonstrate quantum state transfer between fixed-frequency superconducting qubits located on distinct chips without employing any frequency-tunable circuit elements. Our approach utilizes the frequency-tunable photon generation method we recently developed for the absorption of the emitted photon [4]. We measure the fidelity of the transfer process through quantum process tomography and provide an analysis of error sources. Our approach eliminates dedicated control lines to tune circuit parameters, contributing to hardware efficiency in quantum communication systems.

References

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