



Efficient quantum teleportation under noise with hybrid entanglement

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Quantum entanglement and decoherence are the two counterforces of many quantum technologies and protocols. For example, while quantum teleportation is fueled by a pair of maximally entangled resource qubits, it is vulnerable to decoherence. We propose an efficient quantum teleportation protocol in the presence of pure decoherence and without entangled resource qubits prior to the Bell-state measurement. Instead, we employ multipartite hybrid entanglement between the auxiliary qubits and their local environments within the open-quantum-system context. Interestingly, with a hybrid-entangled initial state, it is the decoherence that allows us to achieve high fidelities. We demonstrate our protocol in an all-optical experiment.

