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Quantum Teleportation Distance and Qubit Fidelity BRYAN GARCIA, New Mexico State University — Quantum computing improves on classical computing by using the quantum mechanical principles of superposition and entanglement. In our numerical experiment we investigate the distance dependence of qubit teleportation on a single quantum processor. All computations were performed on the open-access IBM Q platform. The payload qubit is initialized such that state 0 and state 1 are measured with equal probability. We then entangle qubit q[1] with q[2], establishing a link. In our contribution a series of phase transition gates are applied to q[0] to prepare the payload. The entangled pair (q[1] + q[2]) is then entangled with q[0] to create the pathway for teleportation. We will discuss in detail our observed decreasing fidelity of the teleported qubit with increasing teleportation distance. Therefore, this simple quantum computing example shows that error correction is increasingly important with increasing qubit distance, which must be accommodated in the present noisy intermediate-scale quantum era by designing a suitable low-distance qubit network or through algorithmic improvements.

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