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Neutral atoms with cavity-assisted interaction for robust long distant quantum communication[1] PENG XUE, Institute for quantum information science, University of Calgary, INSTITUTE FOR QUANTUM INFORMATION SCIENCE, UNIVERSITY OF CALGARY TEAM — We show how to realize long distance quantum communication with long-lived quantum memories, acting on decoherence-free subspace (DFS), with neutral atoms whose interactions are catalyzed by single photons, or weak coherent light. In this matter, generation, purification and swapping of logical entangled states are obtained through cavity-assisted photon scattering that is robust to random variation in the atom-photon coupling rate, thereby avoiding the requirement for location in the Lamb-Dicke regime. The logical qubits are immunized to the dominant source of decoherence; while, additional errors as photon losses in our scheme are automatically detected, leading to signaled errors which do not affect the fidelity of the logical entanglement. Our scheme is also robust to the changes in the path lengths during long distance communication since no interferometer is required here. We show it can be implemented in the context of prominent experimental setups for quantum information processing.

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