Sharing Entanglement Between Distant Nodes without Quantum Memories

Multi-node quantum network achieves long-distance entanglement swapping without atomic quantum memories.

Researchers at Purdue University have devised a multi-node quantum communication network that connects distant nodes without relying upon atomic quantum memories. Currently, quantum optical information can only travel securely over 10s of km, after which there the loss in optical fibers spoils quantum information. Therefore, there remains an unmet need for developing long-distance quantum communication techniques. Purdue researchers refined a technology that can send quantum information encoded onto optical photons over long distances. In order to overcome the loss, quantum repeaters propose to create entanglement at multiple locations and in multiple frequency bands within the telecom transmission wavelength of optical fibers, swapping information between neighboring nodes until destination and long-distance entanglement swapping is reached. In this approach, programmable delay lines and network topology play an important role in realizing long-distant communication.

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