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Distributed Applications of a Silicon-Vacancy Center Quantum Network

Quantum networks enable applications ranging from quantum secure communication to distributed quantum computing and quantum-enhanced non-local sensing. Silicon-vacancy (SiV) centers in diamond nano-photonic cavities are a strong quantum networking platform candidate thanks to their access to multiple qubits, high operation fidelities, and an efficient matter qubit-photon interface. I present two experimental demonstrations of networking applications with a quantum network of SiVs. The first application, blind quantum computing, allows a user to remotely run an arbitrary algorithm on a quantum computer by controlling the measurement basis of photons they receive from the quantum computer, while the quantum computer receives no information about the implemented algorithm. We demonstrate a full blind quantum gate set required to implement an arbitrary quantum algorithm with information-theoretic security. The second application is entanglement-assisted remote optical interferometry. This experiment shows how remote entangled SiVs can improve the phase sensitivity of large baseline telescope arrays to better observe weak thermal photonic signals.