Distributed Quantum Computing in Silicon

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Commercially impactful quantum algorithms such as quantum chemistry and Shor's algorithm require a number of qubits and gates far beyond the capacity of any existing quantum processor. Distributed architectures, which scale horizontally by networking modules, provide a route to commercial utility and will eventually surpass the capability of any single quantum computing module. Such processors consume remote entanglement distributed between modules to realize distributed quantum logic. Networked quantum computers will therefore require the capability to rapidly distribute high fidelity entanglement between modules. Here we present preliminary demonstrations of some key distributed quantum computing protocols on silicon T centres in isotopically-enriched silicon. We demonstrate the distribution of entanglement between modules and consume it to apply a teleported gate sequence, establishing a proof-of-concept for T centres as a distributed quantum computing and networking platform.

[1] Photonic Inc., “Distributed Quantum Computing in Silicon”, Arxiv:2406.01704.