

Estimating the Average Fidelity of a 7-Qubit Clifford Gate on an NMR Processor

Clifford Gates are a large and important class of quantum gates, including many important gates such as Hadamard and CNOT gates, and covering many core components of Quantum Computation such as Error Correction. Any physical implementation of a gate will necessarily include an element of noise, which can be characterised by an average fidelity. Quantum Process Tomography is impractical for many qubit systems and we demonstrate a novel method of estimating the fidelity of Clifford Gates, independent of the number of qubits. This method was demonstrated on a 7-qubit NMR processor, implementing a gate with 87.5% fidelity. The number of measurements required was reduced from 10^8 to 1656 while giving 99% statistical confidence.