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Quantum Optics and Single Photon Quantum Information Processing

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QUANTUM OPTICS AND SINGLE PHOTON QUANTUM INFORMATION PROCESSING

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The possibility of using elementary particles, such as photons and electrons, to do information processing has been recognized for a long time, using quantum parallelism and quantum entanglement for information storage, computation and quantum key distribution. Recent advances, such as single-ion logic gates, nitrogen-vacancy diamond-based quantum logic gates and even the birth of the first silicone quantum processor, each offer distinct advantages and challenges. We begin our study of quantum information processing by studying quantum optics. We have performed experiments such as spontaneous parametric down conversion, for production of entangled photon pairs, as well as initial explorations of single-photon interference.