Light-matter interaction for photonic implementations of quantum information processing and communications

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Abstract

Quantum states of photons provide an excellent platform to carry and encode quantum information and have been used for small-scale quantum information processing applications. Probabilistic nature of linear optical photonic quantum information and challenges in building deterministic photon sources prevents extending these small-scale demonstrations to more complicated architecture involving many qubits. Here, I will give an overview of applications for light-matter interfaces to alleviate some of these challenges. This introduction involves application of “linear” light-matter interaction in quantum memories, and light-matter interfaces for mediating non-linear interaction between photons.