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Loading a single photon into an optical cavity¹ SHENGWANG DU, CHANG LIU, YUAN SUN, LUWEI ZHAO, SHANCHAO ZHANG, M.M.T. LOY, Department of Physics, Hong Kong University of Science and Technology — Confining and manipulating single photons inside a reflective optical cavity is an essential task of cavity quantum electrodynamics (CQED) for probing the quantum nature of light quanta. Such systems are also elementary building blocks for many protocols of quantum network, where remote cavity quantum nodes are coupled through flying photons. The connectivity and scalability of such a quantum network strongly depends on the efficiency of loading a single photon into cavity. In this work we demonstrate that a single photon with an optimal temporal waveform can be efficiently loaded into a cavity. Using heralded narrow-band single photons with exponential growth wave packet whose time constant matches the photon lifetime in the cavity, we demonstrate a loading efficiency of more than 87 percent from free space to a single-sided Fabry-Perot cavity. Our result and approach may enable promising applications in realizing large-scale CQED-based quantum networks.

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