Deterministic loading of microwaves onto an artificial atom using a time-reversed waveform

Io-Chun Hoi
Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan

Abstract:
We demonstrate that coherent-state microwave photons, with an optimal temporal waveform, can be efficiently loaded onto a single superconducting artificial atom in a semi-infinite one-dimensional (1D) transmission-line waveguide. Using a weak coherent state (average photon number $N << 1$) with an exponentially rising waveform, whose time constant matches the decoherence time of the artificial atom, we demonstrate a loading efficiency of 96.5% from 1D semi-free space to the artificial atom. The high loading efficiency is due to time-reversal symmetry: the overlap between the incoming wave and the time-reversed emitted wave is up to 98%. Our results open up promising applications in realizing quantum networks based on waveguide quantum electrodynamics.