Abstract Submitted
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A nanophotonic atom trap toward collective atom-light interactions and the design of a novel protection layer for superconducting circuits toward a hybrid quantum system[1] J. LEE, JQI, UMD and NIST, College Park, MD 20742, USA, Y. MENG, D.H. PARK, M. DAGENAIS, Dept. of ECE, UMD, College Park, MD 20742, USA, S.L. ROLSTON, JQI, UMD and NIST, College Park, MD 20742, USA — A centimeter long silicon nitride nanophotonic waveguide with inverse-tapered ends has been developed to address and trap many cold neutral atoms (^{87}Rb) for studying collective atom-light interactions and a hybrid quantum system. Two-color evanescent trapping fields (750nm and 1064nm) of guided modes (TE0) can confine cold neutral atoms above the waveguide, and its inverse-tapered waveguide-end has been used for higher input coupling. For a hybrid quantum system which couples trapped cold neutral atoms to superconducting (SC) circuits through magnetic dipole coupling, we consider a novel SC protection layer because SC circuits are vulnerable to the scattered light from trapping fields. Therefore, we design several types of dielectric and lossy multi-wavelength Bragg layers to protect SC circuits from NIR scattered optical photons and from a broadband MIR blackbody radiation of the nanophotonic device, considering the maximal back-transmission of the SC circuits' electro-magnetic fields through the layer and the heat transfer to SC circuits through the protection layer from absorbed scattered photons.

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