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A Hybrid Nanophotonic-Magnetic Chip-Based Atom Trap CHARLES FANCHER, ADAM BLACK, MARCEL PRUESSNER, DOEWON PARK, DMITRY KOZAK, RITA MAHON, MARK BASHKANSKY, U.S. Naval Research Laboratory, FREDRIK FATEMI, U.S. Army Research Laboratory, TODD STIEVATER, U.S. Naval Research Laboratory — We report progress toward a chipbased cold atom trap using nanoscale sub-wavelength optical waveguides. Systems with subwavelength-scale optical structures, like optical nanofibers and photonic crystal cavities, exhibit enhanced coupling to emitters due to their confinement of electromagnetic modes in small areas and are of interest in quantum network applications and studies of collective atom-light interactions. Integrated rib waveguides similarly exhibit enhanced atom-light interactions, while also possessing the advantages of mechanical and thermal stability, flexibility in optical architecture design, and reliable lithographic fabrication. A principal challenge in experiments aimed at coupling atoms to fabricated nanophotonic waveguides is the efficient transfer of atoms to within hundreds of nm of the waveguide surface to reach the collective strong-coupling limit. In this work, we develop a hybrid approach to coupling atoms to the waveguide, by transferring ⁸⁵Rb atoms to the chip surface in a microscopic magnetic trap created by current-carrying wire pairs centered on the optical waveguide. After installing a new, lower optical loss, atom chip we will begin experiments loading the optical waveguides.

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