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System for Trapping Cold Neutral Atoms Around an Optical Nanofiber[1] J.A. GROVER, J.E. HOFFMAN, Z. KIM, J. LEE, I.D. SCHOCH, K.D. VOIGT, A.K. WOOD, J.R. ANDERSON, M. HAFEZI, C.J. LOBB, L.A. OROZCO, S.L. ROLSTON, J.M. TAYLOR, F.C. WELLSTOOD, Joint Quantum Institute, Dept. of Physics, UMD and NIST, College Park, MD 20742, USA, S. RAVETS, Laboratoire Charles Fabry, Institut d'Optique, CNRS Univ Paris-Sud, Campus Polytechnique, RD 128, 91127 Palaiseau cedex, France — We have constructed a robust system for studying atom-light interactions in atomtronics and hybrid quantum information. We require the loading of atomic dipole traps formed on tapered optical nanofibers and other photonic structures from magneto-optical traps. A commercially available UHV manipulator allows for controlled translation of the structures into the chamber with the trap while reducing the turn-around time to obtain ultra-high vacuum. The translation and pump out protocols require care not to destroy or contaminate the fibers and other photonic structures. We can, for example, translate a 500 nm diameter, 2 cm length optical nanofiber to the center of a ^{87}Rb cloud and load cold atoms into the evanescent field around the nanofiber. We also present experimental proposals to use the nanofiber trap as a microwave-to-optical photon transducer and as part of a stable atomic memory in a hybrid quantum processor that combines atoms and circuit-QED.

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