Abstract Submitted
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Efficient Guidance of Higher Order Modes in Subwavelength Optical Nanofiber Waveguides[1] J.E. HOFFMAN, JQI, Physics, UMD and NIST, S. RAVETS, Laboratoire Charles Fabry, Institut d'Optique, Palaiseau, France, P. KORDELL, L.A. OROZCO, S.L. ROLSTON, JQI, Physics, UMD and NIST, College Park, MD 20742, G. BEADIE, F. FATEMI, Naval Research Laboratory, Washington DC, USA — Optical nanofibers show great promise in the design, integration, and interconnection of nanophotonic devices. When the diameter of the waveguide becomes smaller than the wavelength, there exists an intense evanescent component propagating outside of the waveguide, providing a platform for probing non-linear physics or light-matter interaction. Previous work has seen high transmission of the fundamental mode through such waveguides. Working with higher-order modes allows the use of a larger nanofiber diameter than the fundamental mode regime, increasing robustness. Mode interference can produce unusual field distributions on the waist of the fiber, which may be of interest for atom trapping. In this talk, we demonstrate transmissions of 92% for the first family of excited modes through an optical nanofiber with a radius of 400 nm. We achieve efficient guidance by choosing a fiber with a reduced cladding radius, which allows for a less stringent adiabatic condition as there are fewer modes to couple to in the waveguide. Additionally, controlling the angle of the taper geometries allows us to better meet the adiabatic criterion. We present a novel spectrogram measurement of mode beating during the fiber pull that allows characterization of the modes excited.

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