Wave-guided optical waveguides

This work primarily aims to fabricate and use two photon polymerization (2PP) microstructures capable of being optically manipulated into any arbitrary orientation. We have integrated optical waveguides into the structures and therefore have freestanding waveguides, which can be positioned anywhere in the sample at any orientation using optical traps. One of the key aspects to the work is the change in direction of the incident plane wave, and the marked increase in the numerical aperture demonstrated. Hence, the optically steered waveguide can tap from a relatively broader beam and then generate a more tightly confined light at its tip. The paper contains both simulation, related to the propagation of light through the waveguide, and experimental demonstrations using our BioPhotonics Workstation. In a broader context, this work shows that optically trapped microfabricated structures can potentially help bridge the diffraction barrier. This structure-mediated paradigm may be carried forward to open new possibilities for exploiting beams from far-field optics down to the subwavelength domain.

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