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Three-dimensional transport of an optically induced electrothermal microvortex STUART WILLIAMS, Purdue University, SEAN PETERSON, Polytechnic Institute of New York University, ALOKE KUMAR, STEVE WERELEY, Purdue University — A novel, 3D microfluidic instability is induced from intense laser irradiation applied to a fluid sample contained within a parallel-plate electrode microfluidic chamber. Particles follow the streamlines of this typically toroidal vortex, traveling into and out of focus, which can be visualized with the periodically-varying diffraction ring patterns. These microfluidic vortices assist particle manipulation schemes (e.g. concentration, separation, patterning) as well as show promise as microfluidic mixers. The three-dimensional structure of these vortices is explored using a diffraction-based extension of micron resolution particle image velocimetry (μPIV) in which the radius of the outermost circle in the diffraction pattern is employed as a metric for the out-of-plane position of the tracer.

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