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Electrokinetic trapping of a single fluorescent nanobead JASON K. KING, BRIAN K. CANFIELD, LLOYD M. DAVIS, University of Tennessee Space Institute — We demonstrate electrokinetic control and confinement of a single 40 nm fluorescent latex bead in 25% glycerol-water solution. Fluorescent beads are excited with a diode laser and imaged by a custom forward-illumination microscope onto a low-light CCD. The sample is loaded between two pairs of electrodes arranged in a crossed configuration on separate planes that allow generation of an electric field of variable orientation and strength. These electrodes consist of sputtered platinum over chrome patterned onto #1.5 microscope coverslips. Astigmatism is introduced to the focus of the microscope tube lens to modify the point spread function (PSF) as a function of axial position, allowing determination of the particle position in three dimensions. By collapsing the rows and columns of the acquired image to one-dimensional arrays and fitting a Gaussian to each, the planar position and width can be determined with sub-pixel precision. The axial position can be calculated from the measured PSF ellipticity combined with calibration measurements performed on immobilized fluorescent beads at fixed distances from the focal plane. With this information we can apply appropriate voltages to counteract Brownian motion and further characterize the setup for use in single-molecule trapping.

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