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**Detection and electrokinetic trapping of single fluorescent molecules in fused silica nanochannels** BRIAN CANFIELD, XIAOXUAN LI, WILLIAM HOFMEISTER, LLOYD M. DAVIS, University of Tennessee Space Institute — We describe experimental detection and electrokinetic trapping of single, fluorescently-labeled proteins confined within ∼100 nm fluidic channels fabricated in fused silica. Though difficult to fabricate, the fused silica environment yields lower autofluorescence than borosilicate glass, which is especially advantageous given the low light level from single molecules. The molecules are dispersed in a buffer solution at ultralow concentration ($\sim 10^{-12}$ M) to provide single-molecule occupancy of the sub-femtoliter probe volume within the nanochannel. Fluorescence is excited and collected in a custom-built confocal microscope, using two temporally interleaved beams from a modelocked dye laser focused to adjacent spots along the nanochannel. Detection is accomplished with custom single-photon avalanche diodes for time-resolved single-photon counting, and by using this time stamp information, a field-programmable gate array circuit board controls the electrokinetic trapping by modulating an applied voltage. Fluorescence correlation spectroscopy is also used to monitor the transport of molecules along the nanochannel. Electrokinetic transport can thus be characterized from changes in the autocorrelation function with voltage modulation.

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