Statistical Particle Tracking Velocimetry using Single Molecule and Quantum Dot Tracers JEFF GUASTO, PETER HUANG, KENNETH BREUER, Brown University — Particle Tracking Velocimetry (PTV) with nanometer resolution is demonstrated using single molecules and quantum dots (QD) as tracer particles. Several problems are unique to this regime, including: shot noise from intensified cameras, large drop- in/drop-out (due to Brownian motion and QD blinking), sub-pixel tracer intensity profiles and lastly issues associated with tracking with high particle seeding densities. We have developed a statistical particle tracking method to successfully address these problems. The algorithm tracks all possible particles, removing non-physical matches using the global statistical properties of the system, leaving the true particle displacement distribution (and hence velocity). The algorithm is validated using FITC-Dextran molecules and QDs. Experiumental results concerning the velocity and diffusion characteristics of the nanoscale tracers are reported.

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