Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Estimating Brownian diffusion directly from colloidal particle position MINAMI YODA, HAIFENG LI, DOMENICO LIPPOLIS, Georgia Institute of Technology — Brownian diffusion coefficients of colloidal spheres are measured using a statistical method, originally proposed for studying self-diffusion of concentrated high Peclet number suspensions (Breedveld *et al.* (1998) *J. Fluid Mech.* **375**, 297). Unlike techniques that estimate diffusion from changes in cross-correlation function of the particle images in interrogation windows, this method uses particle positions obtained directly from image pairs. For each particle in the first image, displacement vectors were calculated with respect to all particles in the second image. Obviously, at most one of these displacements represents the actual particle displacement. The actual displacements for about 10^3 distinct particle images are isolated from the histogram of all possible particle displacements using a symmetry argument. Finally, the diffusion coefficient is estimated by fitting the histogram of the actual particle displacements (which approximates the probability density function of these displacements) to a Gaussian function. The technique is verified using experimental data for volumetrically illuminated tracer particles of diameter up to 300 nm in Poiseuille flow. The results, which are in good agreement with Stokes-Einstein theory, demonstrate that the technique can measure diffusion coefficients even for images with low signal to noise ratio (SNR).

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Date submitted: 27 Jul 2006 Electronic form version 1.4