



FRONTIERS IN MICRORHEOLOGY



Time-domain methods for passive microrheology and anomalous diffusive transport in soft matter

Lingxing Yao, John Fricks, Timothy C. Elston and M Gregory Forest

University of North Carolina at Chapel Hill

Abstract: Passive microrheology utilizes measurements of noisy, entropic fluctuations (i.e., diffusive properties) of micron-scale spheres in soft matter to infer bulk frequency-dependent loss and storage moduli [\cite{Mason-Weitz-95, Mason-Weitz-97, Levine-LubenskyPRL00, CrockerPRL00}](#). Here, we are concerned exclusively with diffusion of Brownian particles in viscoelastic media, for which the Mason-Weitz theoretical-experimental protocol is ideal, and the more challenging inference of bulk viscoelastic moduli is decoupled. The diffusive theory begins with a generalized Langevin equation (GLE) with a memory drag law specified by a kernel, which we call a diffusive transport modulus to emphasize the distinction from the standard association of the memory kernel with a bulk viscoelastic modulus. We start with a discrete formulation of the GLE as an autoregressive stochastic process governing microbead paths measured by particle tracking. For the inverse problem (recovery of the memory kernel



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