Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Cytoskeleton dynamics studied by dispersion-relation fluorescence spectroscopy RU WANG, LEI LEI, YINGXIAO WANG, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, ALEX LEVINE, Department of Chemistry & Biochemistry and Department of Physics & Astronomy, University of California at Los Angeles, GABRIEL POPESCU, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign — Fluorescence is the most widely used microscopy technique for studying the dynamics and function in both medical and biological sciences due to its sensitivity and specificity. Inspired by the spirit of spatial fluorescence correlation spectroscopy, we propose a new method to study the transport dynamics over a broad range of spatial and temporal scales. The molecules of interest are labeled with a fluorophore whose motion gives rise to spontaneous fluorescence intensity fluctuations that can be further analyzed to quantify the governing molecular mass transport dynamics. We analyze these data by the dispersion relation in the form of a power law,$\Gamma(q) \sim q^{\alpha}$, which describe the relaxation rate of fluorescence intensity fluctuations, Γ, vs. the wavenumber, q. We used this approach to study the interplay of various cytoskeletal components in intracellular transport under the influence of protein-motor inhibitors. We found that after actin is depolymerized, the transport becomes completely random for a few minutes and then it starts to organize deterministically again. We conclude that the disrupted cytoskeletal components first diffuse in the cytoplasm, but then become attached to microtubules and get transported deterministically.

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Date submitted: 18 Nov 2012 Electronic form version 1.4