Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Three-dimensional thermal noise images of single biopolymer filaments allows to determine their orientation and quantify their mechanical properties MARTIN KOCHANCZYK, TOBIAS BARTSCH, PINYU THRASHER, ERNST-LUDWIG FLORIN, The University of Texas at Austin — Intracellular biopolymer networks perform many essential functions for living cells. Most of these networks show a highly nonlinear mechanical response that is well-studied on the macroscopic scale. While much work has been done to connect the macroscopic responses of networks to specific network properties, such as filament persistence length, cross-linking geometry and pore size, there is a lack of experimental techniques that can simultaneously determine the structure and the mechanical properties of a network in situ on the single filament level. Thermal Noise Imaging is a scanning probe technique that utilizes the confined thermal motion of an optically trapped particle as a three-dimensional, noninvasive scanner for soft, biological material. It achieves nanometer precision in probe position detection at MHz bandwidth. Thermal noise imaging visualizes single biopolymer filaments as nanoscale tunnels and allows for the quantification of their mechanical properties from their transversal fluctuations. The experiments presented here pave the way for investigating force distributions inside biopolymer networks on the single filament level, as well as establish thermal noise imaging as a quantitative tool for studying biological material on the nanometer scale.

Martin Kochanczyk
The University of Texas at Austin

Date submitted: 11 Nov 2011 Electronic form version 1.4