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Microrheology of single microtubule filaments and synthesized cytoskeletal networks MATTHIAS KOCH, ALEXANDER ROHRBACH, Lab for Bio- and Nano-Photonics, University of Freiburg — The ability to sense and respond to external mechanical forces is crucial for cells in many processes such as cell growth and division. Common models on mechanotransduction rely on the conversion of mechanical stimuli to chemical signals in the cell periphery and their translocation by diffusion (passive) or molecular motors (active). These processes are rather slow ($\sim$ seconds) and it has been argued that the cytoskeleton itself might be able to transport a mechanical signal within microseconds via stress waves. Microtubules are the stiffest component of the cytoskeleton and thus ideal candidates for this purpose. We study the frequency dependent response of single microtubule filaments and small networks thereof in a bottom-up approach using several (N=2-10) time-multiplexed optical tweezers together with back focal plane interferometry. Small synthesized networks with a defined geometry are constructed using trapped Neutravidin beads as anchor points for biotinylated filaments. The network is then probed by a defined oscillation of one anchor (actor). The frequency dependent response of the remaining beads (sensors) is analyzed experimentally and modeled theoretically over a wide frequency range.

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