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Dual-beam Oscillating Optical Tweezers-Based 3-D Confocal Microrheometer JING WANG, CHUAN PU, H. DANIEL OU-YANG — Optical tweezers are widely used in the studies of complex fluids and biological cells and tissues. Confocal microscopy visualizes detailed structures of sample specimen with high resolution in 3-D. In this report, we present the setup, calibration and application of a new powerful microrheometer that integrates a novel high temporal and spatial resolution dual-beam oscillating optical tweezers cytorheometer (DOOTC) with spinning disk confocal microscopy. The DOOTC uses the less photodamaging 1064nm laser, and detects the forced oscillatory particle motions by a lock-in amplifier. It can operate at single oscillating beam mode or the orthogonally polarized dual-beam mode to get large deflected forward scattering signals at both high and low frequencies. The system is demonstrated to identify granular structures trapped by optical tweezers with confidence, and at the same time measure dynamic mechanical modulus in the frequency range of 0.1-3000Hz at up to 10 data point per second and with sub-nanometer spatial resolution, while monitoring the sample structure and its transformation *in situ.*

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