

Abstract Submitted
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Magnetomotive Optical Coherence Elastography for Measuring Biomechanical Properties of Tissue using Magnetic Nanoparticles V. CRECEA, A.L. OLDENBURG, X. LIANG, University of Illinois at Urbana-Champaign, T.S. RALSTON, Lincoln Laboratory, MIT, M.B. ORESCANIN, M.F. INSANA, S.A. BOPPART, University of Illinois at Urbana-Champaign — Biomechanical properties of tissue are indicative of health and disease, and the ability to readily measure them is instrumental for the diagnosis of early-stage changes. We present a new method for measuring elastic properties of tissue-like phantoms, which employs Fe_3O_4 nanoparticles as contrast agents in a technique called magnetomotive optical coherence elastography (MMOCE). PDMS-based samples similar to soft biological tissue (0.5-12 kPa) were prepared, with nanoparticles embedded within their volume. The magnetic nanoparticles are displaced upon probing with an external magnetic field, engaging the sample in axial motion. M-mode MMOCE phase data was acquired concomitantly at a rate of 29 kHz, allowing for the tracking of scatterers in the sample with a displacement sensitivity of 11 nm. The scatterers in the samples underwent underdamped oscillations when the magnetic field was applied step-wise. We extracted the damping constants and the natural frequencies of oscillation (30-200 Hz) from the time-resolved displacement traces. A microindentation apparatus was used to measure the Young's moduli of the samples for validation and calibration with the MMOCE measurements. This novel real-time non-invasive technique affords the potential for *in vivo* studies.

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