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강연 제목: 고주파 초음파 영상 시스템의 음향 출력 측정

Acoustic Output Measurement for High-frequency Ultrasound Imaging

Abstract:

Acoustic output measurement at high-frequency above 20 MHz is challenging due to the spatial averaging effect of the hydrophone. Acoustic tweezers exhibiting their microparticle trapping capability may be an alternative for such a measurement. Single-beam acoustic tweezers (SBAT) may be implemented by a single transducer and the excitation system, eliminating the need for multiple complex transducers and their positioning system. SBAT can trap, move, press, or rupture a microstructure, including various cells and microparticles. It can generate a trapping force in the range from piconewtons (pN) to nanonewtons (nN) and a radiation pressure of several megapascals (MPa). SBAT may be used to characterize the mechanical properties of microspheres. The collapse pressure of a single hollow glass microsphere (HGM) was measured using a 20-40 MHz SBAT. Estimation of high-frequency acoustic pressure was developed based on the collapse pressure measurement to overcome the limitations of conventional hydrophone measurements. Acoustic tweezers are a promising tool well suited to characterize the mechanical properties of a single cell/particle, which can lead to a new way of high-frequency ultrasound beam characterization.

Brief Biosketch

Hyung Ham Kim received his Ph.D. degree in Biomedical Engineering from the University of Southern California, Los Angeles, CA in 2010. He worked as a Research Assistant Professor in the Department of Biomedical Engineering at the University of Southern California and Manager of the NIH Resource Center for Medical Ultrasonic Transducer Technology until he joined Analogic Inc., Peabody, MA in 2014. At Analogic, he led the research solutions business as a Director of Business Development by 2016. He is currently an Associate Professor of the Department of Electrical Engineering, Department of Convergence IT Engineering, and School of Convergence Science and Technology at Pohang University of Science and Technology (POSTECH), Pohang, Korea. His current research includes high-frequency array transducers for high-resolution ultrasound imaging, cell mechanics studies using acoustic tweezers, and industrial applications of high-frequency ultrasound.