IEEE TRANSACTIONS ON

ULTRASONICS, FERROELECTRICS, AND FREQUENCY CONTROL

A PUBLICATION OF THE IEEE ULTRASONICS, FERROELECTRICS, AND FREQUENCY CONTROL SOCIETY

JUNE 2007 VOLUME 54 NUMBER 6 ITUCER (ISSN 0885-3010)

Digital Object Identifier 10.1109/TUFFC.2007.358

CORRESPONDENCE

Evolution of Phase Aberration Correction using Ultrasound Radiation Force and Vibrometry Optimization

Images of the velocity measured by a laser vibrometer of a spherical target as the phase of each element of a ten element annular array is adjusted to maximize the radiation force induced vibration. The sphere had a diameter of 1.59 mm and was embedded in a gelatin phantom placed in a water tank. The phantom was placed perpendicular to the ultrasound propagation direction. The ultrasound beams were manually defocused by adjustments of the focusing phase values simulating a random phase aberrator. The top left image was acquired when the transducer was in a defocused state. The magnitude and distribution of the vibration velocity evolves to a better focus as each element of the array is optimized by changing the phase of the AM signal applied to each element and using the sphere's velocity for feedback. The image in the bottom right was acquired when the transducer was originally focused using a needle hydrophone and compares very well with the result obtained from the progressive optimization of all ten elements using the ultrasound radiation force shown immediately to the left.

Images courtesy of Matthew W. Urban, Miguel Bernal, and James F. Greenleaf, Mayo Clinic College of Medicine, Department of Physiology and Biomedical Engineering, Rochester, MN. See accompanying article on page 1142.

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