ACOUSTICS2008/3432
Transducers for reduced aberration in HIFU by nonlinear harmonic focusing

Gregory Clement and Jason White
Harvard Medical School, Focused Ultrasound Lab - BWH Radiology, 221 Longwood Ave RM 521, Boston, MA 02115, USA

We have been investigating a low-frequency transducer design that promotes the *divergence* of the low frequency beam while promoting the *focusing* of nonlinear-induced higher harmonic frequencies. In this manner, a low frequency - and thus less absorbed and less distorted - beam is passed through the near field, peaking before the buildup of higher-frequency components. The high frequency components are then focused by means of the wavefront design. Using this approach, we expect reduced distortion of the ultrasound focus, while allowing a beam that uses mechanical or thermal effects for ablation, as opposed to cavitation. In our preliminary study we have been working to establish feasibility of the approach. Two source transducers (0.272MHz and 0.272MHz) with identical geometries were used to propagate through *ex vivo* human skull, representing strong nearfield aberration. Transmitted fields were scanned after transsskull propagation with a pvdf needle hydrophone. Reconstructions were performed at the fundamental frequencies for both scans, and for the 0.272MHz transducer, an additional reconstruction was performed at its second harmonic (by design 0.544MHz). The harmonic signal was observed to be significantly less distorted than the same frequency directly propagated from the transducer. A numeric study for optimizing the method will also be presented.