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ASSESSMENT OF PHASE ABERRATION EFFECTS ON HIGH FRAME RATE IMAGING

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Limited diffraction beams have a large depth of field and could have many applications. Recently, a high-frame rate (up to 3750 frames/s over 200 mm depth for biological soft tissues) 2D and 3D imaging method (Fourier method) [1–4] has been developed. This method has great potential for high quality and high frame rate cardiac imaging.

In this report, phase aberration effects were studied for the new imaging method on data obtained from experiment. In the experiment, two broadband linear arrays (one has an aperture of 18.288 mm, central frequency of 2.25 MHz, and 48 elements, and the other has an aperture of 38.4 mm, central frequency of 2.5 MHz, and 64 elements) were used to obtained images of an ATS 539 tissue-equivalent phantom of an attenuation of 0.5 dB/MHz/cm. RF data were digitized at 20 Megasamples/s and 12–bit resolution from each element of the transducers. Random time delays were added to the RF signals. Images were obtained with both the new and the conventional dynamic focusing methods. Results show that phase aberration has about the same effects on both methods in terms of resolution, distortion, and sidelobes. This means that the new imaging method can obtain the same image quality while having a much higher frame rate and simpler beamforming hardware than conventional method.

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[1] Jian-yu Lu, "Limited diffraction beams for high frame rate 2D and 3D pulse-echo imaging," AIUM 41st Annual Convention, San Diego, California, March 23–26, 1997 (abs. accepted).

[2] Jian-yu Lu, "Improving accuracy of transverse velocity measurement with a new limited diffraction beam," in *IEEE 1996 Ultrasonics Symposium Proceedings* (to be published).

[3] Jian-yu Lu, "2D and 3D high frame rate imaging with limited diffraction beams," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* (submitted).

[4] Jian-yu Lu, "Experimental study of high frame rate imaging with limited diffraction beams," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* (submitted).

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