

Reconstruction of Pulsed Ultrasonic Fields by Deconvolution of the Spatio-temporal Effects of the Receiving Hydrophone: Theory and Simulation

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Abstract : In this study, it has been shown that it is possible to deconvolve the spatio-temporal transmission properties effect of the hydrophone. The resolution of this ill-posed inverse problem permitted the reconstruction of the pulsed ultrasonic pressure field from the signals furnished by the « measuring » system with higher resolution. The reconstruction results have shown the dependency of the reconstruction quality upon SNR, receiver aperture dimensions and axial distance to the source. The greater the SNR is, the better are results. The farther the scanned field region is, the greater the aperture dimensions can be before the limits of the reconstruction procedure are reached. The study concerned the pulsed field of a planar circular transducer and a PVDF membrane hydrophone as receiver. It can, however, be generalized to any other transmitter-receiver configurations.

Keywords : Deconvolution, spatio-temporal transmission properties, SNR, PVDF membrane hydrophone