

Deconvolution of the transducer aperture effect in steel

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Abstract : When measuring the ultrasonic field, the signal provided by the receiving transducer is affected by its spatial properties. Particularly, the displacement normal to its surface is spatially averaged because of the receiver finite size. In this study, we show, using a numerical simulation, the effectiveness of the spatial deconvolution of these effects for a rectangular transducer. For that, three methods allowing the inversion of the aperture effect are tested: 1) Wiener's method, 2) The power spectral equalization method (PSE) and 3) the maximum a-posteriori method (MAP). The obtained results show that the three methods are able to reconstruct the ultrasonic field from the spatially averaged values and that the quality of the reconstruction depends strongly upon the SNR and the spatial frequencies bandwidth of the ultrasonic field investigated.

Keywords : Deconvolution, Spatial filter, Wiener filter, power spectral equalization method (PSE), maximum a posteriori method (MAP).