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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 isaffected by its spatial properties. Particularly, the displacement normal to its surface isspatially averaged because of the receiver finite size. In this study, we show, using anumerical simulation, the effectiveness of the spatial deconvolution of these effects for arectangular transducer. For that, three methods allowing the inversion of the aperture effectare tested 1) Wiener's method 2) The power spectral equalization method (PSE) and 3) themaximum a-posteriori method (MAP). The obtained results show that the three methods areable 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).