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Model-based reconstruction methods of NDT ultrasonic array data

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Ultrasonic array techniques are more and more used in NDT applications because of their flexibility and of their adaptability to complex configurations. In addition they can provide richer data than conventional methods. An optimal exploitation of such data in the aim of localizing and characterizing the detected flaws requires the application of imaging and reconstruction techniques based on a direct modeling of the propagation of ultrasound from the transmitter to the receiver. The quantitative models for the propagation which are available in the CIVA software platform developed at CEA-LIST allow such direct modelling in parts of possibly complex geometries and materials. Different array data reconstruction methods based on the exploitation of these direct models have been studied and implemented in the plat-form. Thus, in this communication we present in particular algorithms derived of synthetic focusing approach. These algorithms exploit the time of flight identification and can be apply to any set of array data. We also present a reconstruction method based on the post-processing of the transfert matrix of the array and the application of MUSIC algorithm. We show and discuss results obtained with these methods both on simulated and experimental data.