Ultrasonic phased array reconstruction methods for the localization and the characterization of defects in inspection of complex geometry configuration

Alex Fidahoussen, Pierre Calmon, Marc Lambert

Ultrasonic phased array reconstruction methods for the localization and the characterization of defects in inspection of complex geometry configuration

Alex Fidahoussen [(1)], Pierre Calmon [(1)], Marc Lambert [(2)]

[(1)] CEA, LIST, Centre de Saclay, point courrier 120, F-91191 Gif-sur-Yvette cedex, France ;
[(2)] L2S (CNRS-Supélec), 3 rue Joliot Curie, 91192 Gif-sur-Yvette, France ;

Phased arrays are now widely used in ultrasonic non destructive testing, as they provide improved flexibility and adaptability to complex configurations with comparison to conventional probes. One other advantage of the phased arrays techniques is that they can give a large collection of data. To fully exploit this data, in order to localize and to characterize the defect, imaging and reconstruction methods based on a direct modelling of the inspection are required.
The work presented here aims at developing such reconstruction methods which use the direct models implemented in the CIVA platform. These models allow to consider complex inspection configurations and in particular geometries with irregular surface.
The proposed algorithms are derived from the so called synthetic focusing approach which is classically based on time-of-flight identification, but they also exploit CIVA modelling of the signal echo from a point-like scatterer distributed inside a region of interest used for the reconstruction area.
The adopted approach is generic and can be used with different operating modes of the array: application of electronic delays at emission or/and reception, sectorial scanning (several delay laws are applied to sweep the beam at different refraction angles), independent storage of the signals received by the elements…
In this communication we present the developed algorithms and discuss their performances with application examples on both simulated and experimental data.