

1.3.25. ULTRASONIC INSPECTION THROUGH COMPLEX SURFACES WITH FLEXIBLE ARRAYS

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The ultrasonic inspection of parts showing variable or irregular geometries is a real challenging issue. The conventional methods using contact probes are limited by the problem of coupling between the probe and the part. Moreover the efficiency of both immersed and contact techniques suffer from the perturbations induced on the transmitted beam by the interaction between the wave and the surface. A solution based on the use of flexible array is developed at CEA LIST in the aim of overcoming these effects and enabling efficient inspection of irregular and complex parts. To master the characteristics of the focus beam during the scanning, the smart flexible array techniques couple flexible apertures for fitting the surface, embedded profilometer for measuring the local surface distortion and real time processes for computing the optimized delay laws. Those delay laws are computed by the M2M acquisition system and applied in real-time to the piezoelectric elements. The 2D and 3D-flexible probes are manufactured by IMASONIC Company.

In this communication, we present recent developments and examples of results obtained with this technique on industrial applications to locate and to size the flaw in the part.

Moreover, real time reconstruction of parts exploiting the measurement from the external and the internal geometries thanks to the embedded profilometer and the acoustical backwall echo are presented.

Finally, advanced reconstruction algorithms coupled to smart flexible phased array are evaluated on representative mock-ups.