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inspection of complex components with flexible phased array
transducer

Olivier Casula^a, Gwenael Toullelan^a and Philippe Dumas^b

^aCEA/LIST, bat 611, 91191 Gif sur Yvette, France

^bZA, rue des Savourots, 70190 Voray-sur-l'Ognon, France

Non Destructive Testing techniques using ultrasonic methods are often carried out in contact. But, the inspection performances are limited to regular surfaces. Thus, surface irregularities lead to thickness variations of the coupling layer that result in beam distortions and losses of sensitivity. In the context, CEA/LIST has designed flexible phased-array techniques for compensating the surface irregularities and fitting the surface. The independent piezoelectric elements composing the radiating surface are mechanically assembled to build an articulated structure. An embedded profilometer measures the local surface distortion allowing to compute the optimized delay laws and to master the characteristics of the focus beam. Those delay laws computed by the UT-acquisition system are applied in real-time to the piezoelectric elements. To evaluate inspection method capabilities, CEA/LIST develops a simulation software for non destructive testing, CIVA, able to simulate realistic configurations in particular with complex 2D and 3D applications. Matrix flexible phased-array probes have been designed and manufactured in collaboration with IMASONIC. This paper sums up examples of inspections in complex geometries where these flexible probes have been successfully used. Moreover, the data are reconstructed thanks to CIVA tools and allow to locate and size the flaw in the part.