

1.3.32. FLAW DETECTION WITH GUIDED WAVES USING PHASED ARRAY TECHNIQUE

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Guided waves travel in plates and hollow cylinders over large distances and propagate with multiple mode shapes. Therefore the waves can be used viably for integrity tests of large scale structures. The number of propagating modes increases with frequency. Due to their dispersive character the different modes are manageable only in a limited frequency range.

Depending on the wave length and on the angle of impingement of the wave front to the coupling surface between transducer and structure, a trace wavelength is predefined and a selective excitation of single modes becomes feasible. By using phased array technique the excited wave mode can be selected by controlling the input signal of the transducer. Different modes are excitable with a single mechanical set-up.

In a first step of the investigation, a calculation model is developed modeling the wave propagation and the selective excitation of guided wave modes depending on the control parameters. Dedicated experiments show the applicability of the method presented. The flaw detection of different sized cracks and of material thickness reductions is examined depending on the excitation wave mode.