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The Dispersion and Resolution in Guided Wave Testing

S. Adalarasu and V. K. Ravindran

Vikram Sarabhai Space Centre, Trivandrum 695022

Abstract

The work reported in this paper is focused on the experiments conducted with guided waves propagated on sheets to study the dispersion, beam spread and its effects on resolution. Unlike acousto ultrasonic technique, here angle beam is attempted, as it is possible to have an activation zone completely enclosed for lower phase velocity values. Unique characteristic behaviour of guided waves of longer distance and its practical implications are analysed. Compared to the bulk waves, guided waves also are found to have similarity in its spreading pattern, energy dissipation, wave structure across the thickness etc. Depending upon the phase velocity, points of dominant can be either in plane displacement or out of plane. This aspect is studied in this paper as it decides the sensitivity of testing. But unlike the bulk waves, guided waves are losing its resolving power as the distance increases. The increase in wave duration causes decrease in wave resolution. This limits the length of guided wave testing for detecting a particular size of defect. Experiments shown in this report indicate the need to fix a testing distance for guided wave inspection when looking for a specific size reflectors. Multiple defects are detected simultaneously by changing the distance or by changing the angle and frequency. These defects of guided wave are studied both in waves of out of plate and in-plate displacements. The experimental observations are compared and reported.