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Measurement of Phase Velocity Dispersion Curves and Group Velocities in a Plate Using Leaky Lamb Waves

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Abstract

The guided wave has been widely employed to characterize thin plates and layered media. The dispersion curves of phase and group velocities are essential for the quantitative application of guided waves. The technique using Leaky Lamb Wave (LLW) and is one of the excellent methods to obtain dispersion curves.

In the present work, a fully automated system for the measurement of LLW has been developed. The specimen moves in two dimensional plane as well as in angular rotation. The signals of LLW were measured from an elastic plate in which specific modes of Lamb wave were strongly generated. Phase velocity of the corresponding modes was determined from the incident angle. The generated Lamb waves propagated along the plate, were reflected at the edge of the plate. A portion of Lamb wave was leaked into water, so that it was detected by the same transducer. Frequency components of the detected signals were analyzed to extract the related information to the dispersion curves. The dispersion curves of phase velocity were measured by varying the incident angle. Moving the specimen in the linear direction of LLW propagation, group velocity was determined by measuring the transit time shift in the RF waveform.