Propagation d'ondes guidées SH le long de panneaux composites multi-couches et leur interaction avec des joints collés.

Propagation of SH guided waves in multilayer composite plates and their interaction with adhesive joints.

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Use of adhesives in large composite structures has become very common in aerospace industry. As the need for techniques for reliable inspection of adhesive bonds increases, the study of ultrasonic guided wave propagation in such large structures becomes important. Such studies are usually complicated by the fact that medium of propagation is heterogeneous, anisotropic and often viscoelastic. The presence of multiple layers of plies stacked together, with fiber orientation different in each ply, makes understanding the wave propagation even more difficult.

There are two ways to model composites – first is modelling all the layers considering the orientation, material properties etc. of each layer and second is using a single layer homogenized model which approximates the cumulative effect of all the layers. A number of studies have shown the use of such models [1,2] for composites while there are other studies which have shown the influence of the layers on the wave propagation in the model [3-5]. Thus, we need to be careful while using homogenized model for studying wave propagation in composites.

In this study, we look at some experimental and numerical work intended to understand the propagation of Shear Horizontal waves in multilayer composite plates and their interaction with adhesive lap joints between such plates. Numerical simulations were carried out to study Lamb modes as well as shear horizontal (SH) guided modes in the composite structure including SAFE models to plot dispersion curves [Fig. 1]. The generation propagation and detection of SH waves are studied with 2.5D FE models with experiments to confirm the results from numerical models.
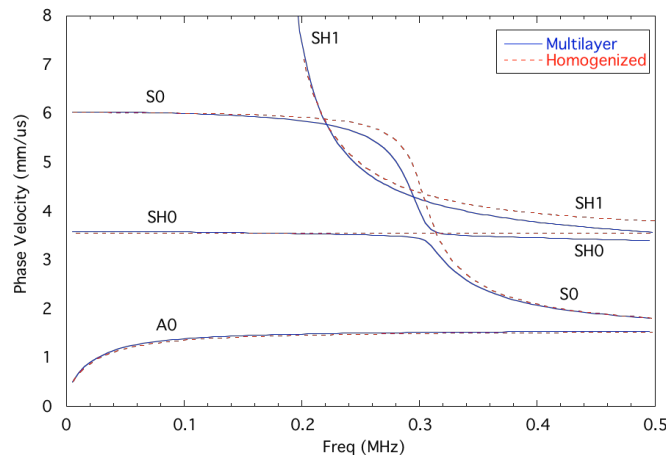

Fig. 1. Phase velocity dispersion curves

Références

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