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Structural Identification for Layered Composite Structures through a Wave and Finite Element Methodology

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Abstract : An approach for identifying the geometric and material characteristics of layered composite structures through an inverse wave and finite element methodology is proposed. These characteristics are obtained through multi-frequency single shot measurements. However, it is established that the frequency regime of the measurements does not matter, meaning that both ultrasonic and structural dynamics frequency spectra can be employed. Taking advantage of a full FE (finite elements) description of the periodic composite, the scheme is able to account for arbitrarily complex structures. In order to demonstrate the robustness of the presented scheme, it is applied to a sandwich composite panel and results are compared with that of experimental characterization techniques. Excellent agreement is obtained with the experimental measurements.

Keywords : structural identification, non-destructive evaluation, finite elements, wave propagation, layered structures, ultrasound
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