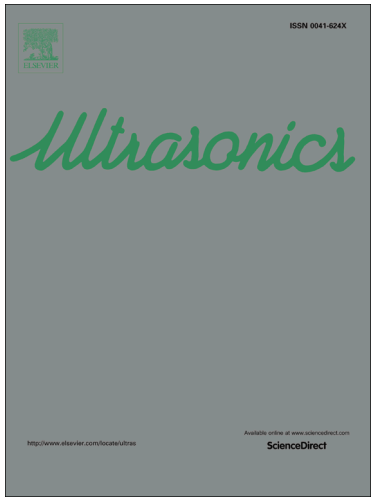

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Finite element modelling of nonlinear acoustics/ultrasonics for the detection of closed delaminations in composites

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Abstract

Linear ultrasonics methods based on the principle of reflection, transmission, dissipation of sound waves have been traditionally used to detect delaminations in composite structures. However, when the delamination is in very early stages such that it is almost closed, or closed due to a compressive load, the linear methods may fail to detect such cases of delaminations. Nonlinear acoustics/ultrasonics have shown potential to identify damages in composite structures which are difficult to detect using conventional linear ultrasonic methods. The nonlinear method involves exciting the structure with a sinusoidal signal of certain (or multiple) frequency and observing the vibrations of the structure. The vibrations of the damage region differ significantly from intact regions and can be used to identify the damage. However due to the complex and varying nature of the nonlinear phenomena created by the interaction between the exciting signal and the damage, there are

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