Scattering Analysis Of Nonlinear Lamb Wave Due To Debonding In Metallic Stiffened Panel

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This work analyses the higher harmonic generation of the Lamb wave at debonding in stiffened panel in a new actuator sensor configuration. In the present configuration, the actuator and sensor are mounted in bonding region of the skin-stiffener along the stiffener. The nonlinearity caused by contact acoustic nonlinearity (CAN), a clapping phenomenon constituted by the Lamb wave interaction between interfaces associated with the debonding. The higher harmonics of the Lamb wave induced by the debonding of metallic stiffened panels are examined in detail. A three-dimensional finite element model is modelled and validated with experiment for the propagation of Lamb waves in stiffened panel in current actuator sensor configuration. Then the validated numerical model is used for further studies. The results demonstrate that the suggested numerical model can generate higher harmonics up-to third harmonic by contact acoustic nonlinearity quite well. The principal source of contact acoustic nonlinearity in stiffened panels was revealed to be debonding. The scattering of generated higher harmonic of lamb waves due to debonding at various debonding size is analysed. The findings of this work can be used to improve the performance of nonlinear guided wave debonding assessment systems.