

Wave Interaction Resonances in Inhomogeneous Elastic Materials

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An inhomogeneous nonlinear elastic material is considered. The inhomogeneity in density and elastic coefficients is assumed to be weak with polynomial functionality. Nonlinear interaction of two counter-propagating longitudinal waves is studied theoretically. An analytical solution is derived for the initial stage of wave interaction process in the material with finite thickness. Oscillations on the material boundaries are investigated and wave interaction resonances are clarified. Value of the resonance is sensitive to the properties of the material and to the excitation frequency. Resonance data may be used for qualitative and quantitative nondestructive characterization of inhomogeneous nonlinear elastic material. The last conclusion is supported by the results of numerical simulations.

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