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Mesoscopic study of the enhancement of the nonlinearity of an ultrasonic wave in inhomogeneous media

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In quantitative nondestructive evaluation of materials it is not still clear why linear elastic waves often exhibit substantial nonlinearity when traveling through inhomogeneous medium, whereas this effect exists but remains minor in most homogeneous media. A current dominant thesis claims that when damaged, intact brittle materials become nonlinear mesoscopic elastic materials. Although this model is consistent with macroscopic observations in the framework of continuum mechanics, it eludes, however, a fundamental aspect, i. e. the detailed nature of the wave/microstructure interaction like scattering and transmission through microcrack. To construct a unified theory, from the mesoscopic to the macroscopic scale, that could take account altogether such so different mesoscopic elastodynamic effects is our objective. Toward this aim, many aspects of the wave/slit interaction are thoroughly analyzed among the clapping effect and nonlinear scattering, and experimental schemes are scheduled. At the current state of our knowledge, a first general postulate is claimed.