Anderson localization of electromagnetic and elastic waves

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We describe and discuss the recent progress in the study of propagation and localization of acoustic, elastic waves and electromagnetic wave in heterogeneous media. The heterogeneity is represented by a spatial distribution of the local elastic moduli or permittivity. Both randomly distributed elastic moduli as well as those with long-range correlations with a nondecaying power-law correlation function, are considered. The problem is studied by three approaches. One of them is based on developing a dynamic renormalization group (RG) approach to analytical analysis of the governing equations for wave propagation. The RG analysis indicates that, depending on the type of the disorder (correlated vs. uncorrelated), one may have a transition between localized and extended regimes in any spatial dimension. The second approach utilizes numerical simulations of the governing equations in one, two- and three-dimensional media. In the third approach have used the dynamic method to calculate the frequency dependence of the localization length in a disordered medium, using the amplitude change and the redshift of the spectral density of the propagating incident pulse. The frequency dependence of the localization length in an effectively one-dimensional disordered medium is computed in terms of the strength of the disorder.