Scattering of flexural waves in Euler-Bernoulli beams by short-range potentials

Time-harmonic flexural waves on a beam and on two elastically coupled beams with short-range localized imperfections in the mass distribution and in the position dependant coupling are considered. Thus scattering of an incident wave solution to the Euler-Bernoulli equation by a Dirac delta function and its derivative up to order three is studied, and the possible physical interpretations are outlined. Reflected, transmitted and evanescent waves exist, and their scattering data are determined. For $\delta(x)$ and $\delta'(x)$, the scattering problem is solved by standard integration. For $\delta''(x)$ and $\delta'''(x)$, the standard integration procedure does not work and solutions are obtained by regularization. In the latter case the scatterer is in general nontransparent and only partially penetrable at discrete resonances. The first few of these as well as their scattering data are determined numerically.

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