ACOUSTICS2008/3199
Complex edge resonance in elastic waveguides

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The resonance for different configurations of elastic waveguides with a free edge is studied from the point of view of complex resonance. We determine numerically the variations of the real part and of the imaginary part of the complex resonance frequency as a function of the Poisson ratio. For 3 different configurations, semi-infinite 2D plates, elastic cylinder and circular hole through a plate, the results show similar behaviours which are: a real resonance frequency for a zero Poisson ratio and a real resonance frequency that corresponds to a Lamé mode at one positive value of the Poisson ratio. In all the configurations, these free edges have complex resonances which have very high quality factors. The two Poisson ratio where the complex resonance frequency has a zero imaginary part (infinite quality factors) corresponds to trapped modes for which there is a decoupling between the propagating waves and the evanescent waves. The first decoupling at zero Poisson ratio is due to the special structure of the elasticity equations there and the second decoupling is due to the decoupling between the propagating Lamé mode and the higher order evanescent modes.