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Talk announcement

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The resolvent method for shear waves spectra calculation in 2D phononic crystals: dispersion equation, displacement and traction wave fields

We propose the resolvent method for calculating the shear waves spectra in 2D phononic crystal (PC) waveguides: the free PC plate and the PC plate sandwiched between two substrates. Since the propagator M over a unit cell approximated by Fourier harmonics in one coordinate can have very large components, we introduce its resolvent $R = (zI - M)^{-}1$ (z is a complex number outside of specM) as a numerically stable substitute. Another two key tools given in terms of the resolvent, a spectral projector Pd and propagator Md for the decreasing modes, come into play in the case of a waveguide with a substrate. The resolvent method providing simple dispersion and wave field equations in terms of R, Pd and Md has several advantages. It is of a good precision due to the exact solution in one direction, computationally cheap due to the reduction of the problem to one unit cell even in a semi-infinite substrate, and versatile since it is applicable to uniform, 1D- or 2D-periodic structures. Moreover, it is extendible to P/SV waves and 3D PC. In numerical examples, we model low-frequency band gaps and compare them for the mirror-symmetric and perturbed profiles. The displacement and traction wave fields are calculated for the waveguides with highly contrasting matrix/inclusions stiffness values which allows us to reveal the PC geometry. Keywords: Phononic crystals, Guided waves, Propagator, Resolvent, Spectral projector.