Abstract

Properties of Conically Propagating Electromagnetic and Elastodynamic Waves in Periodic Media

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This talk presents analysis of electromagnetic and elastodynamic waves conically propagating through a doubly periodic array of cylindrical fibres. A new method, based on a multiple scattering approach, has been proposed to reduce these spectral problems for partial differential equations to certain algebraic problems of the Rayleigh type: its matrix elements decay exponentially away from the main diagonal, giving rise to higher-order multipole coefficients that decay similarly quickly.

We obtain a formulation in terms of an eigenvalue problem that enables us to construct the high-order dispersion curves and to study both photonic and phononic bang gap structures in oblique Incidence [1].

We also address the question of a singular perturbation induced by the conical incidence parameter for both electromagnetic and elastic modes. We finally discuss some effective properties for ferro-magnetic photonic crystal fibres in the long wavelength limit [2].

References

[1] Guenneau, S., Poulton C. G. and Movchan, A. B. Oblique propagation of electromagnetic and elastic waves for an array of cylindrical fibres, Proc. Roy. Soc. (submitted)

[2] Poulton, C. G., Botten, L. C., McPhedran, R. C., Nicorovici, N. A., Movchan, A. B. Non-commuting limits in electromagnetic scattering: asymptotic analysis for an array of highly conducting inclusions, SIAM J. Appl. Math., 61 (2001) 1706-1730

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