

BLOCH WAVES IN CRYSTALS AND PERIODIC HIGH CONTRAST MEDIA

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Abstract. Analytic representation formulas and power series are developed describing the band structure inside periodic photonic and acoustic crystals made from high contrast inclusions. Central to this approach is the identification and utilization of a resonance spectrum for quasi-periodic source free modes. These modes are used to represent solution operators associated with electromagnetic and acoustic waves inside periodic high contrast media. Convergent power series for the Bloch wave spectrum is recovered from the representation formulas. Explicit conditions on the contrast are found that provide lower bounds on the convergence radius. These conditions are sufficient for the separation of spectral branches of the dispersion relation.

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