

# Two-scale homogenisation of a general class of high-contrast PDE systems

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**Abstract.** There has been considerable recent interest in composite materials whose macroscopic dynamical properties can be very different from those of conventional materials, often due to effects of the so-called "micro-resonances". Mathematically this leads to high-contrast homogenization of PDEs with a 'critically scaled contrast', where the resulting two-scale asymptotic behaviour appears to display a number of interesting effects. For a general class of such high-contrast PDE systems, we show that under a rather generic decomposition assumption a two-scale version of the strong resolvent convergence holds, with a well-defined two-scale limit operator. The latter implies in particular (two-scale) convergence of semigroups with applications to a wide class of micro-resonant dynamic problems. Various examples are discussed. Some of the work is joined with Ilia Kamotski.