Norm resolvent convergence for perturbed planar waveguides

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We consider an elliptic operator in a planar infinite strip perturbed in different way:

- by a perforation by small holes along a curve:

  we impose mixed classical boundary conditions (Dirichlet, Neumann and Robin) on the holes, assuming that the perforation is non-periodic and satisfies rather weak assumptions.

- by substituting one side of the boundary by a fast oscillating curve:

  we assume that both the period and the amplitude of the oscillations are small and impose the Dirichlet condition on the upper boundary and Dirichlet, Neumann or Robin boundary condition on the oscillating boundary.

- by infinite numbers of "windows":

  we impose the Dirichlet condition on the upper boundary and frequent alternation boundary condition on the lower boundary. The alternation is introduced by the periodic partition of the boundary into small segments on which Dirichlet and Neumann (the "windows") conditions are imposed in turns.

In all cases we describe the homogenized operators, establish the norm resolvent convergence of the perturbed resolvents to the homogenized one, prove the estimates for the rate of convergence and study the convergence of the spectrum.

Based on joint work with [D. Borisov].

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