

# One dimensional approximations of the Laplacian on thin waveguides

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## **Abstract**

We discuss one dimensional approximations of the Laplacian defined on a thin waveguide. Our analysis is restricted to a two dimensional, planar, waveguide of constant width obtained by fattening a smooth curve. We study the case in which Robin boundary conditions are taken on the boundary of the waveguide and analyze the one dimensional limit with respect to each transverse mode. We also discuss several scalings of the curvature that, in the limit, can produce one dimensional operators with point interactions.