# Scattering in periodic waveguide: integral representation and spectrum decomposition

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We consider scattering problems in a periodic waveguide $\Omega = \mathbb{R} \times [0, 1]$. The problem is formulated by the following equations:

$$\Delta u + k^2 q u = f \quad \text{in } \Omega; \quad \frac{\partial u}{\partial x_2} = 0 \quad \text{on } \partial\Omega; \tag{1}$$

where $q$ is periodic and $f$ is compactly supported. Due to the existence of eigenvalues, the problem is not always uniquely solvable in $H^1(\Omega)$. To this end, the *Limiting Absorption Principle (LAP)* is adopted. Based on the Floquet-Bloch transform, we obtain a contour integral representation for the solution from LAP, and also decompose the solution with generalized eigenfunctions. An efficient numerical method is also developed based on that.

## References

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