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Asymptotics of the eigenvalues for a boundary value problem with δ -like coefficients. (English. Russian original) [Zbl 0907.34065](#)

Differ. Equations 33, No. 4, 469-477 (1997); translation from *Differ. Uravn.* 33, No. 4, 470-477 (1997).

The paper is centred on the spectral problem

$$(D^2 - k^2)w = -k^2\theta e^{UH}, \quad (D^2 - k^2)\theta + UH'_z D\theta = RUH'_z w,$$

$$D = d/dz, \quad -\frac{1}{2} \leq z \leq \frac{1}{2}, \quad D\theta(\pm\frac{1}{2}) = 0, \quad w(\mp\frac{1}{2}) = Dw(\mp\frac{1}{2}) = 0,$$

with δ -shaped coefficient, where $w(z)$, $\theta(z)$ are the unknown functions, $H(z, z_0)$ is a given function depending on the parameter z_0 , k and U are parameters, and R is the spectral parameter. The authors reduce this problem to an integral equation and studies the asymptotics of Green functions for differential operators from the above equations as parameter $U \rightarrow +\infty$. On this basis, the authors construct the asymptotics of maximal- and minimal-in-modulus eigenvalues and eigenfunctions associated with them for the considered spectral problem. Additionally, the obtained asymptotics are justified and their remainder terms are estimated for large values of parameter U . As an example, a specific spectral problem related to linear theory of hydrodynamical stability is analyzed.

Reviewer: [V.Chernyatin \(Szczecin\)](#)

MSC:

- [34L20](#) Asymptotic distribution of eigenvalues, asymptotic theory of eigenfunctions for ordinary differential operators
- [47E05](#) General theory of ordinary differential operators (should also be assigned at least one other classification number in Section 47-XX)
- [34A30](#) Linear ordinary differential equations and systems, general

Keywords:

spectral problem; integral equation; asymptotics; Green functions; differential operators; eigenvalues; eigenfunctions; hydrodynamical stability