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Spectral asymptotics of Schrödinger operators with δ -interactions on conical surfaces

Vladimir Lotoreichik

Nuclear Physics Institute, Czech Academy of Sciences

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Fakulta jaderná a fyzikálně inženýrská ČVUT
Trojanova 13, 12000 Praha

Abstract: In the recent time there is a considerable growth of interest to spectral problems on unbounded conical domains. One of the common features shared by many such problems is infiniteness of the discrete spectrum below the threshold.

J. Behrndt, P. Exner, and myself proved in [1] infiniteness of the discrete spectrum for 3-D Schrödinger operator with constant-strength attractive δ -interaction supported on the conical surface

$$\mathcal{C}_\theta := \{(x, y, z) \in \mathbb{R}^3 : z = \cot(\theta)\sqrt{x^2 + y^2}\}, \quad \theta \in (0, \pi/2).$$

Moreover, in [1] one-sided asymptotic spectral estimates on the eigenvalues were derived as well, but the spectral asymptotics remained unknown.

T. Ourmières-Bonafos (BCAM, Spain) and myself obtained sharp spectral asymptotics for the above Schrödinger operator with δ -interaction, being inspired by the recent success [2] in solving a similar problem for Dirichlet conical layers. The talk will mainly focus on the discussion of this new result and its proof, which turns out to be substantially more involved than the one for Dirichlet layers. Besides that, several related issues will be discussed briefly, one of them is connected to a generalization of this spectral problem to higher space dimensions.

REFERENCES

- [1] J. Behrndt, P. Exner, and V. Lotoreichik, Schrödinger operators with δ -interactions supported on conical surfaces, *J. Phys. A* **47** (2014), 355202.
- [2] M. Dauge, T. Ourmières-Bonafos, and N. Raymond, Spectral asymptotics of the Dirichlet Laplacian in a conical layer, *Commun. Pure Appl. Anal.*, **14** (2015), 1239–1258.