

Tbilisi Analysis & PDE Seminar

Dear Colleagues!

Institute of Mathematics of the University of Georgia is pleased to invite you to the Online Tbilisi Analysis & PDE Seminar. The seminar is held bi-weekly on Mondays at 16:00 GMT (at 17:00 CET, at 20:00 local time in Tbilisi).

Talk on June 7, 2021. Time: 16:00 GMT (17:00 CET and 20:00 local time in Tbilisi);

Speaker: Prof. Valery Smyshlyaev, University College London, UK;



Credit:

https://scholar.googleusercontent.com/citations?view_op=view_photo&user=ckp2DwMAAAJ&citpid=1



The title of the lecture: "High-frequency scattering of whispering gallery waves by boundary inflection: asymptotics and boundary integral equations"

Abstract: The talk is on a long-standing problem of scattering of a high-frequency whispering gallery wave by boundary inflection. Like Airy ODE and associated Airy function are fundamental for describing transition from oscillatory to exponentially decaying asymptotic behaviors, the boundary inflection problem leads to an arguably equally fundamental canonical inner boundary-value problem for a special PDE describing transition from a "modal" to a "scattered" high-frequency asymptotic regimes. An additional recent motivation comes from the problem seemingly holding the keys for numerical analysis of Galerkin-type methods for boundary integral equations (BIE) in high-frequency scattering by smooth non-convex obstacles. The talk first reviews the background, on asymptotically reducing a problem described by Helmholtz equation to the inner problem. The latter is a Schrödinger equation on a half-line with a potential linear in both space and time, and was first formulated and analysed by M.M. Popov starting from 1970-s, and has been intensively studied since then (see [1] for a review and some further references). The associated solutions have asymptotic behaviors with a discrete spectrum at one end and with a continuous spectrum at the other end, and of central interest is to find the map connecting the above two asymptotic regimes. We report recent result in [1] proving that the solution past the inflection point has a "searchlight" asymptotics corresponding to a beam concentrated near the limit ray. This is achieved by a non-standard perturbation analysis at the continuous spectrum end, and the result allows interpretations in terms of a unitary scattering operator connecting the modal and the scattered asymptotic regimes. We also review some most recent progress on a reducing the inner problem to one-dimensional boundary integral equations and their further analysis. The integral equations are of improper weakly singular Volterra type of both first and second kinds (with appropriate jump conditions for the latter) and can be shown to be well-posed. Their subsequent regularization allows to express the solution in term of limit of uniformly convergent Neumann series with anticipated further benefits for the problem's asymptotic and possibly numerical analyses. Some parts of the work are joint with Ilia Kamotski, and with Shiza Naqvi.

How to join: The seminar is organized on the platform of WEBEX. To join the seminar, please send an e-mail to seminarim@ug.edu.ge or fill in the registration form here

<https://forms.gle/xfQJ9fg1uqe7CrZw6>. You will then receive further information.

WEB of Seminar: <https://www.ug.edu.ge/en/tbilisi-analysis-and-pde-seminar>

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3. G. Tephnadze, Institute of Mathematics, University of Georgia, Tbilisi

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