September 8, 2025, from 4:45 p.m. to 6:20 p.m. (Moscow time)
room 16-10 and broadcast via ZOOM

Sergej Yu. Dobrokhotov

Non-compact Lagrangian manifolds associated with billiards, and asymptotic eigenfunctions of the Laplace operator in the ellipse

The problem of the asymptotics of the eigenfunctions of the Laplace operator in an elliptic domain with various boundary conditions has been studied in the works of many scientists, in particular, in the papers and monographs of V.F. Lazutkin. These asymptotics are related to Birkhoff billiards. We use an approach based on non-compact Lagrangian manifolds generated by one-dimensional closed curves, such as fold caustics. Such manifolds in turn generate asymptotic eigenfunctions of the continuous spectrum and selection from them of functions with zero values on the boundary of the domain give the desired solutions of the initial problem. An important role here is played by the connection of the Bohr-Sommerfeld quantization rule and Graves' theorem, linking the boundary ellipse and the internal caustic of the billiard. From the point of view of asymptotics, the new result here is the global formulas of the asymptotic eigenfunctions in the form of the Airy function of a complex argument.

This work was largely stimulated by the talk of A.T. Fomenko and G.V. Belozerov at the ?onference in memory of V.P. Maslov in 2024 and was carried out jointly with V.E. Nazakinskii, A.V. Tyurin, and A.V. Tsvetkova.

SCIENTIFIC SEMINAR
"DIFFERENTIAL GEOMETRY AND APPLICATIONS"

headed by Academician of RAS Anatoly T. Fomenko

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