Topics in corner scattering: non-scattering waves, potential probing with a single incident wave, and the interior transmission problem

Eemeli Blåsten

Institute for Advanced Study,
The Hong Kong University of Science and Technology

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Abstract

Potentials of the Helmholtz or Schrödinger operators which have a corner jump enjoy numerous interesting properties in fixed frequency scattering: 1) all non-trivial incident waves scatter, 2) two such potentials with different supports have completely disjoint sets of scattering amplitudes, and our most recent observation, 3) transmission eigenfunctions vanish at the corners which are smaller than π of such potentials.

I will start with a short history of the interior transmission problem and how it relates to corner scattering. In essence classical inverse scattering reconstruction methods such as sampling and factorisation methods fail if there is an incident wave which produces no scattering. This is possible for radially symmetric penetrable scatterers.

With Päivärinta and Sylvester we showed that a scatterer having a right-angled corner always scatters. Hu, Salo and Vesalainen generalised this and showed an interesting consequences: *a single far-field pattern determines the support of a convex polygonal scatterer!* Quantifying these results with Hongyu Liu led to an interesting lower bound for the far-field pattern and a fortiori to the behaviour of transmission eigenfunctions.