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Qualitative Methods Applied to Biharmonic Scattering

Inverse wave propagation problems arise in various fields, including non-destructive testing and medical imaging. The central challenge is to develop stable and reliable methods for identifying hidden obstacles or defects. This talk presents recent progress in extending qualitative reconstruction methods to biharmonic scattering problems, which describe wave scattering in long, thin elastic plates. This model is relevant to numerous engineering and physical systems.

Qualitative methods recover the shape of an unknown object from measured scattering data with minimal a priori information. However, these methods often break down at certain frequencies tied to an associated transmission eigenvalue problem. These eigenvalues can, in turn, serve as target signatures for estimating material properties, since they can be recovered from the scattering data and depend (often monotonically) on the unknown parameters.

The talk will outline new analytical results in qualitative reconstruction and explore their connection to transmission eigenvalue problems. Numerical methods for recovering the scatterer from the given data will also be discussed.