



## 复旦大学数学科学学院 数学综合报告会

### 报告题目: **Efficient Computations for Transmission Eigenvalue Problems Arising in Wave Scatterings**

报告人: 李铁香

(东南大学数学系)

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报告地点: 光华东主楼 1801

**摘要:** The transmission eigenvalue problem, except for its critical role in inverse scattering problems, is of its own special interest due to the fact that the corresponding differential operator is neither elliptic nor self-adjoint. Since the problem is non-standard and non-self-adjoint, investigation of efficient and robust numerical eigensolvers becomes a critical issue. In this work, we provide the spectral analysis and propose a novel iterative algorithm for the computation of a few positive real eigenvalues and the corresponding eigenfunctions of the transmission eigenvalue problem. Based on the continuous finite element method, we first derive an associated symmetric quadratic eigenvalue problem (QEP) for the transmission eigenvalue problem to eliminate the nonphysical zero eigenvalue while preserve all nonzero ones. In addition, the derived QEP enables us to consider more refined discretization to overcome the limitation on the number of degree of freedoms. We then transform the QEP to a parameterized symmetric definite generalized eigenvalue problem (GEP) and develop a secant-type iteration for solving the resulting GEPs. Moreover, we examine the spectral analysis for various existence intervals of desired positive real eigenvalues, since a few lowest positive real transmission eigenvalues are of practical interest in the estimation and the reconstruction of the index of refraction. Numerical experiments show that the proposed method can find those desired smallest positive real transmission eigenvalues accurately, efficiently, and robustly.

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