Title:
Resolution and control of solutions of the Helmholtz equation

Abstract:
We consider the inhomogeneous, variable-coefficient Helmholtz equation $\Delta + k_0^2(1+q(x))u = f$ in $\mathbb{R}^2$ and $\mathbb{R}^3$, modeling radiation by a source $f$ in the presence of a deterministic or random-medium obstacle $q(x)$. The spectral properties of the corresponding near-field radiation operator determine both the resolution and the robustness of solution of the inverse source problem to noise in the data and the resolution of a pointwise control of solution $u$ of the Helmholtz equation near the obstacle. After an analysis of these spectral properties in a rather general setting, we will present some recent numerical results on the spectrum, as well as on an industrially relevant case of the pointwise control of the near field.