

# Mirza Karamehmedovic

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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  $\mathbf{R}^2$  and  $\mathbf{R}^3$ , 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.