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Section:

10. Partial Differential Equations

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Inverse boundary problem for 2D diffusion equation

The diffusion equation $\frac{\partial \Phi}{\partial t} - \mathrm{div}_x \left[D\left(x\right) \mathrm{grad}_x \Phi \right] + c\mu_a\left(x\right) \Phi = 0,\ x \in \Omega \subset \mathbb{R}^2$ models light propagation in highly scattering medium; here Φ denotes the photon density, D and μ_a - the diffusion and the absorption coefficients respectively. The inverse boundary value problem consists in recovering $D\left(x\right)$ and $\mu_a\left(x\right)$ from the Dirichlet-to-Neumann mapping associated with the reduced diffusion equation.

We prove that the boundary data at the fixed positive frequency determine uniquely both the diffusion and absorption coefficients, provided they are close to some background constants. In the case of the null-background we estimate analytically how large can be these coefficients to guarantee the uniqueness of the reconstruction.

Reference: Inverse boundary problem for 2D diffusion equation near a constant background: Uniqueness, *Preprint Nr.4/95-N*, Universität Münster (1998).