An inverse problem for a semi-linear elliptic equation

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Abstract

We study the inverse problem of unique recovery of a complex-valued scalar function $V : M \times \mathbb{C} \to \mathbb{C}$, defined over a smooth compact Riemannian manifold (M, g) with smooth boundary, given the Dirichlet to Neumann map, in a suitable sense, for the elliptic semi-linear equation $-\Delta_g u + V(x, u) = 0$. We show that uniqueness can be proved for a large class of non-linearities. The proof is constructive and is based on a multiple-fold linearization of the semi-linear equation near complex geometric optic solutions for the linearized operator and the resulting non-linear interactions. These interactions result in the study of a weighted transform along geodesics, that we call the Jacobi weighted ray transform. The talk is based on a recent joint work with Lauri Oksanen.