Calderón Projector and Dirichlet-Neumann Operator for Fibred Cusp Operators

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In recent years, there has been great interest in the plasmonic eigenvalue problem on singular spaces. This is a two-sided boundary value problem that describes the coupling of electromagnetic fields to the electron gas of a conducting body, given by the geometry. The interest comes from the fact that the geometry can be used to specifically tailor properties of the resulting surface waves and hence electromagnetic properties of the body. As the plasmonic eigenvalue problem is directly linked to the interior and exterior Dirichlet-to-Neumann maps, which in turn can be described using the Calderón projectors, it is useful to construct and study Calderón projectors for interesting pairs of operators and geometries.

One such interesting geometry can be described by ϕ-manifolds with boundary. For instance, given two touching spheres, a quasi-homogeneous blow-up of the point of tangency will give rise to a further, singular boundary hypersurface of the exterior domain. This singular face comes equipped with a fibration onto a manifold with boundary, resembling the situation of Mazzeo & Melrose's ϕ-calculus, but with additional, regular boundary hypersurfaces.

Seeing the regular faces as carriers of boundary conditions, I will present the construction of the Calderón projector for the Laplacian of a ϕ-metric on a general ϕ-manifold with boundary and derive some of its key properties. In particular, I will show that the Calderón projector is a ϕ-pseudodifferential operator and identify its ϕ-principal symbol and normal family. If time permits, I will also talk about the resulting properties of the Dirichlet-to-Neumann map.