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Inverse scattering at fixed energy on asymptotically hyperbolic Liouville surfaces

We study an inverse scattering problem on Liouville surfaces having two asymptotically hyperbolic ends. The main property of Liouville surfaces consists in the complete separability of the Hamilton-Jacobi equations for the geodesic flow. An important related consequence is the fact that the stationary wave equation can be separated into a system of a radial and angular ODEs. The full scattering matrix at fixed energy associated to a scalar wave equation on asymptotically hyperbolic Liouville surfaces can be thus simplified by considering its restrictions onto the generalized harmonics corresponding to the angular separated ODE. The resulting partial scattering matrices consists in a countable set of 2×2 matrices whose coefficients are the so called transmission and reflection coefficients. It is shown that the reflection coefficients are nothing but generalized Weyl-Titchmarsh functions for the radial ODE in which the generalized angular momentum is seen as the spectral parameter. Using the Complex Angular Momentum method and recent results on 1D inverse problem from generalized Weyl-Titchmarsh functions, we show that the knowledge of the reflection operators at a fixed non zero energy is enough to determine uniquely the metric of the asymptotically hyperbolic Liouville surface under consideration.
This is joint work with Thierry Daude (Cergy-Pontoise) and Francois Nicoleau (Nantes).