SPEAKER:

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TITLE:

Inverse scattering on the line

ABSTRACT:

We consider the Schrodinger $d^2/dx^2+q(x)$, $-\infty < x < \infty$, where $q(x)$ is real and has sufficient decay. Let H be a self-adjoint operator in $L^2(-\infty, \infty)$ determined by the above differential operator. H has a purely absolutely continuous spectrum $[0, \infty)$ and a finite number of bound states $k_n^2 < ... < k_n^2 < 0$. Let $f^+(x,k)$,$f^-(x,k)$ be the solutions of $Hf_j = k^2 f_j (j = 1, 2)$, with $f^+(x,k) \sim e^{ikx}$ as $x \to \infty$ and $f^-(x,k) \sim e^{-ikx}$ as $x \to -\infty$. Then

$$f^+(x,k) \sim [1/T_2(k)]e^{ikx} + [R_2(k)/T_2(k)]e^{-ikx}$$

as $x \to -\infty$, and

$$f^-(x,k) \sim [1/T_1(k)]e^{-ikx} + [R_1(k)/T_1(k)]e^{ikx}$$

as $x \to \infty$. R_1 and R_2 are the reflection coefficients. The reflection coefficient and the bound states determine the scattering data. We will first show how to obtain the scattering data from the solutions of the Schrodinger eigenvalue problem and then answer the following two questions of inverse problem: I. Uniqueness. Do the bound states and reflection coefficient determine q uniquely? II. Reconstruction. Give an algorithm for recovering q from the bound states and reflection coefficient.