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Propagation property and inverse scattering for fractional powers of the negative Laplacian

We define the fractional power of the negative Laplacian as the self-adjoint operator acting on $L^2(\mathbb{R}^n)$:

$$H_{0,\rho} = (-\Delta)^\rho/(2\rho)$$

for $1/2 \leqslant \rho \leqslant 1$ where $\Delta = \sum_{j=1}^n \partial_{x_j}^2$. If $\rho = 1$, $H_{0,1}$ denotes the free Schrödinger operator $H_{0,1} = -\Delta/2$. On the other hand, if $\rho = 1/2$, then $H_{0,1/2}$ denotes the massless relativistic Schrödinger operator $H_{0,1/2} = \sqrt{-\Delta}$. We study one of the propagation estimates (Enss-type estimate) for the free dynamics $e^{-itH_{0,\rho}}$ and try to apply this estimate to inverse scattering for $\rho > 1/2$ by using the Enss-Weder time-dependent method. We report that the high velocity limit of the scattering operator uniquely determines the short-range interactions. This work was partially supported by the Grant-in-Aid for Young Scientists (B) No.16K17633 from JSPS.