**Resonances for Hamiltonians with point interactions.**

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## Abstract

We analyze the existence of almost exponentially decaying states associated to the hamiltonian corresponding to a quantum particle moving in the half line, under a point interaction. To this end, we consider the self-adjoint realization of the operator,

$$H_\omega = -\frac{d^2}{dx^2} + \omega\delta_a, \tag{1}$$

on the Hilbert space $L^2(0,\infty)$, with Dirichlet boundary conditions at $x = 0$.

The interaction $\omega\delta_a$ represents a repulsive potential acting as a thin barrier which cannot trap the particle in the interval $[0, a]$, but which, for large values of $\omega$, should create a resonance, which appears as a state $\phi \in L^2(0,\infty)$ with a large lifetime. We prove the existence of states which decay with an approximately exponential rate and which are localized on the fixed interval $[0, a]$. We also provide explicit estimates on this decay rate.

Above is part of a joint work with G.Palma and H.Prado (Usach, Chile).

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[1]The authors are partially supported by Fondecyt grant $n^o$ 1020010, 1030007 and 1040839.