

# Scattering and resonance effects in leaky quantum wires

Pavel Exner

*Doppler Institute*

*for Mathematical Physics and Applied Mathematics*

*Prague*

We discuss a model of quantum wires which takes tunneling into account, being formally described by Hamiltonians of the type  $-\Delta - \alpha\delta(x - \Gamma)$  in  $L^2(\mathbb{R}^2)$  where  $\Gamma \subset \mathbb{R}^2$  is a metric graph. If the geometry of  $\Gamma$  is nontrivial, such systems can exhibit interesting spectral and scattering properties. We will analyze negative-energy scattering in the case when  $\Gamma$  is a local deformation of a straight line. We will also demonstrate an approximation result which suggests existence of resonances due to the global geometry. Finally, we will present a solvable model describing a “graph”  $\Gamma$  which consists of a line and a finite family of points.

*Mailing address:*

Department of Theoretical Physics  
NPI, Czech Academy of Sciences  
CZ-25068 Řež – Prague

*E-mail:*

exner@ujf.cas.cz