

Lectures on Quantum Graphs: standard, leaky, and generalized

Cours présenté par le professeur **Pavel EXNER**, le mardi 8 juin 2010, le mercredi 9 juin 2010 et le vendredi 11 juin 2010 de 10h à 12h.

Résumé: A mini-course of three lectures is devoted to various quantum graphs models. The first one is focused on the “ideal” quantum graphs. This is the most usual model in which the graph itself is the configuration space of a quantum particle. In addition to the one-dimensional motion on graph edges one has to ensure that the Hamiltonian is a self-adjoint operator by choosing properly the boundary conditions at graph vertices. We will describe how these boundary conditions look like and discuss their physical meaning.

In the second lecture we will describe a different class of models, the so-called “leaky” quantum graphs which allow us to take quantum tunneling into account. In this case the configuration space is the whole \mathbb{R}^n and the particle is attracted to a graph by a singular interaction; formally speaking, the Hamiltonian is $-\Delta - \alpha \delta(x - \Gamma)$, where Γ is the graph. We will discuss various spectral, scattering, and resonance properties of such systems.

Finally, the last lecture is devoted to “generalized” graphs in which the “edges” can be manifolds of different dimensions coupled through point contacts. We will describe how the corresponding Hamiltonians can be constructed and demonstrate various physical applications of these models.

Le Directeur de l'Ecole Doctorale

Fethi NASR BEN EL HAJ AMOR