Resonances in quantum graphs

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In the first part we discuss earlier work by Exner and Lipovský [1], where they consider quantum graphs consisting of a compact part and semi-infinite leads. Such a system may contain embedded eigenvalues in the continuous spectrum, which, under perturbation, move into the second sheet of the complex energy surface and produce resonances. We also show how the scattering and resolvent resonances in quantum graphs coincide and how "nothing is lost at the perturbation" in the sense of the number of poles.

In the second part we then introduce a cut-off technique known since the eighties [2] to our quantum graph framework. Using it, one can identify resonances through the eigenvalue behavior of the system "closed in a box." We prove its validity, which was before done only in 1D [3], and illustrate it with examples.

References

[1] P. Exner, J. Lipovský: Resonances from perturbations of quantum graphs with rationally related edges, *J. Phys. A: Math. Theor.* **43** (2010), 105301

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[3] G.A. Hagedorn, B. Meller: Resonances in a box, *J. Math. Phys.* **41** (2000), 103–117.