# Fermi's rule and high-energy asymptotics for quantum graphs

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We investigate resonances in non-compact quantum graphs with general coupling conditions. Inspired by the recent result of Lee and Zworski for graphs with standard coupling, we derive Fermi's golden rule for general graphs, i.e. the behaviour of the second derivative of the square root of energy $k$ with respect to the parameter giving length of the edges of the graph in the vicinity of the former eigenvalue of the graph. We approximate the trajectories of the resonances by parabolas. Furthermore, we give high-energy asymptotics of the resonances for $\delta$ and $\delta'_{\mathrm{s}}$-coupling. We prove that if there is $\delta'_{\mathrm{s}}$-coupling at all the vertices where the half-lines are attached, the resonances approach to the real axis with $\mathrm{Re}\, k \to \infty$. To obtain all the results, we use the method of pseudo-orbit expansion of the resonance condition.

This is a joint work with prof. Pavel Exner.

## References

[1] Pseudo-orbit approach to trajectories of resonances in quantum graphs with general vertex coupling: Fermi rule and high-energy asymptotics, *J. Math. Phys.* **58** (2017), 042101.