

# Spectral properties of quantum graphs violating the time-reversal invariance

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The main topic of this talk are quantum graphs with the vertex coupling which does not preserve the time-reversal invariance. As a case study we analyze a simple example in which the asymmetry is maximal at a fixed energy. This has an interesting consequence, namely that high-energy scattering depends crucially on the vertex parity; we will demonstrate implications of this fact for spectral and transport properties in several classes of graphs, both finite and infinite periodic ones. Furthermore, we discuss other time-asymmetric graphs and identify a class of such couplings which exhibits a nontrivial  $\mathcal{PT}$ -symmetry despite being self-adjoint. Finally, we will illustrate how the presence or absence of the Dirichlet component in the vertex coupling is manifested in the spectrum. The results come from a common work with Marzieh Baradaran, Jiří Lipovský, and Miloš Tater.

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