Generalized Schrödinger operators of the graph type

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We discuss generalized Schrödinger operators of the form $-\Delta - \alpha\delta(x-\Gamma)$ in $L^2(\mathbb{R}^2)$, where Γ is a planar graph. Various spectral properties of these operators can be derived by combining minimax estimates with the generalized Birman-Schwinger principle. In particular we give conditions under which the geometry gives rise to a non-void discrete spectrum for a noncompact Γ. We also discuss the relations between the asymptotic properties of such operators as $\alpha \to \infty$ and the spectral behavior of a suitable operator on $L^2(\Gamma)$ in the situation when Γ an infinite curve or a loop, as well as emergence of persistent currents in such an asymptotics.