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**Scattering matrix approaches for dissipative quantum transport**

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The Usuki method, which is closely related to both the scattering matrix approach and recursive Green's functions provides a stable numerical method for the simulation of quantum transport in semiconductors. It has major advantage over the Green's function method for self-consistent simulations in that the electron density involves integrals in the contacts where the distribution is near equilibrium, rather than throughout the active area. Various applications of this approach have been studied, and we discuss primarily ballistic transport in quantum dots and dissipative transport in gated quantum wire transistors. Dissipation is introduced via a proper self-energy determined in the mode representation, which is then transformed to the site representation used in the recursive approach.