Theory of Coherent and Incoherent Processes in Quantum Corrals.

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An approach to quantum corrals that takes into account that electrons may decay out of the corral by tunneling through the corral barriers and by absorption into the bulk is developed. The formalism is based on the solution to the Schroedinger equation in two dimensions obeying outgoing wave boundary conditions. The electrons inside the quantum corral are subjected to a complex potential whose real part and imaginary parts relate, respectively, to the coherent and incoherent processes. The local density of states is given as an eigenfunction expansion involving the two-dimensional resonant states of the system and the energy positions and decay widths characterizing the resonant energy spectra of the quantum corral. A comparison with experimental results for circular quantum corrals using a simple model for the complex potential, that yields excellent results, is presented as well as an overview of other single electron theoretical approaches.