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representation; 3.5.2 Dynamic point-like potential; 3.5.3 Dynamic double-barrier potential; 3.5.3.1 Adiabatic approximation; 3.5.4 Unitarity and the sum over trajectories; 3.5.5 Current and the sum over trajectories; 3.5.5.1 Temperature-independent contribution to generated current; 3.5.5.2 Contribution to generated current dependent on temperature; 3.5.5.3 Nature of two contributions to generated current; 4. Direct current generated by the dynamic scatterer 4.1 Steady particle flow4.1.1 Distribution function; 4.1.2 Adiabatic regime: Current linear in the pump frequency; 4.1.3 Current quadratic in the pump frequency; 4.2 Quantum pump effect; 4.2.1 Quasi-particle picture of direct current generation; 4.2.2 Interference mechanism of direct current generation; 4.3 Single-parameter adiabatic direct current generation; 5. Alternating current generated by the dynamic scatterer; 5.1 Adiabatic alternating current; 5.2 External AC bias; 5.2.1 Second quantization operators for incident and scattered electrons; 5.2.2 Alternating current
5.2.3 Direct current

Sommario/riassunto

The aim of this book is to introduce the basic elements of the scattering matrix approach to transport phenomena in dynamical quantum systems of non-interacting electrons. This approach admits a physically clear and transparent description of transport processes in dynamical mesoscopic systems promising basic elements of solid-state devices for quantum information processing. One of the key effects, the quantum pump effect, is considered in detail. In addition, the theory for a recently implemented new dynamical source - injecting electrons with time delay much larger than the electron coheren