

Resonant transmission and quantized charge transfer in adiabatic quantum pumping

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A slowly varying external perturbation can produce a directed current in a coherent mesoscopic structure (adiabatic quantum pumping effect). Scattering theory of pumping predicts transfer of an almost integer number of electrons per cycle if instantaneous transmission is determined by a sequence of resonances. We explain this charge quantization in terms of loading/unloading quasi-bound virtual states. The theory is then applied to a simple model of pumping due to surface acoustic waves. The results reproduce all the qualitative features observed in actual experiments.