We explore the possibility of inducing in heterostructures driven by an ac gate voltage the coherent current suppression recently found for nanoscale conductors in oscillating fields [1]. The destruction of current is fairly independent of the transport voltage, but can be controlled by the driving amplitude and frequency. Within a tight-binding approximation, we obtain analytical results for the average current in the presence of driving. These results are compared against an exact numerical treatment based on a transfer-matrix approach [2].

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References


Average current vs. driving amplitude obtained numerically from transfer-matrix (for heterostructures, solid line) and tight-binding (for molecular wires, dashed line) methods. Also shown is the high-frequency approximation (dashed-dotted). The inset depicts the value of the first current minimum as a function of the driving frequency. Solid (transfer-matrix) and dashed (tight-binding) line decay approx. as 1/ω. The chosen parameters are, in units of meV: η =1.15, eV = 6.0 (applied voltage), =0.16 (coupling to the leads) and =0.23 (tunnelling matrix element).}