

Coherent transport and shot noise in single and multibarrier diodes

Lino Reggiani and Jeremy Pousset ¹

¹Dipartimento di Matematica e Fisica, Ennio De Giorgi, Università del Salento, Italy

Shot noise suppression in resonant diodes with transport controlled by coherent tunneling has been investigated by using the tunneling transparency $D(\epsilon)$ obtained from an exact numerical solution of the Schrödinger equation in the presence of an applied voltage. The cases of two potential barriers in GaAs/AlAs heterostructures is considered. Results show that the use of an exact dependence of $D(\epsilon)$ confirms the existence of a voltage range of values where the Fano factor γ is significantly less than 0.5, in agreement with previous findings obtained within a Lorentzian approximation and with experiments available in the literature for different heterostructures. At increasing values of the barriers width the Fano factor recovers the 0.5 value common to a transport controlled by the sequential tunneling regime.

REFERENCES

1. V. Ya. Aleshkin and L. Reggiani, An exact calculation of shot noise suppression in resonant diodes under coherent tunneling, Phys. Rev. B86, 035304 (2012).