Current-induced torque in ferromagnetic single-electron devices in the limits of the fast and slow spin relaxation

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Theoretical analysis of the spin-transfer torque acting on the magnetic moment of the central electrode (island) in a single-electron ferromagnetic transistor has been performed for the spin relaxation time in the island ranging from fast to slow spin relaxation limits. The external electrodes of the device are assumed to be ferromagnetic with arbitrary oriented magnetic moments. Spin accumulation in the island, due to spin asymmetry of the tunneling processes, is taken into account. Electric current flowing through the device is calculated in the regime of sequential transport, and the master equation is used to calculate probabilities of different charge and spin states. The torque acting on the central electrode is then calculated from the spin current absorbed by magnetic moment of the island.

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[1] J.C. Słonczewski, Phys. Rev. B **71** (2005) 024411.
[2] M. Kowalik, J. Wiśniewska and J. Barnaś, phys. stat. sol. (b) **243** (2006) 243.

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