Currents and nonequilibrium distributions through a coherent quantum system

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We study particle and energy currents and occupation distribution in a recently proposed model [1] for coherent quantum transport. In this model a system connected to mesoscopic Fermi reservoirs (mesoreservoir) is driven out of equilibrium by the action of superreservoirs with prescribed temperatures and chemical potentials described by a simple dissipative mechanism with the Lindblad equation. We compare exact (numerical) results for the non-equilibrium steady state currents with theoretical expectations based on the Landauer formula (linear and nonlinear regime) and show that the model reproduces the behavior of coherent quantum systems in the expected parameter region [2]. We also obtain the mesoreservoir occupation distribution in the non-equilibrium steady state and compare them with the occupation distribution in the leads in usual description of coherent quantum transport.

[1] S. Ajisaka, F. Barra, C. Mejía-Monasterio and T. Prosen, Phys. Rev. B **86** 125111 (2012).
[2] S. Ajisaka and F. Barra, Phys. Rev. B **87** 195114 (2013).