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## **Steady-state currents through nano-devices: a scattering-states numerical renormalization group approach to open quantum systems**

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We propose a numerical renormalization group (NRG) approach to steady-state currents through nano-devices[1]. A discretization of the scattering-states continuum ensures the correct boundary condition for an open quantum system. We introduce two degenerate Wilson chains for current carrying left and right-moving electrons reflecting time-reversal symmetry in the absence of a finite bias  $V$ . We employ the time-dependent NRG[2] to evolve the known steady-state density operator for a non-interacting junction into the density operator of the fully interacting nano-device at finite bias. We calculate the temperature dependent current as function of  $V$  and applied external magnetic field using a recently developed algorithm for non-equilibrium spectral functions[3].

[1] F. B. Anders arXiv:0802.037

[2] F. B. Anders and A. Schiller, Phys. Rev. Lett. **95** 196801 (2005),  
Phys. Rev. B **74** 245113 (2006)

[3] F. B. Anders, J. Phys.: Condens. Matter **20**, 195216 (2008)