Autonomous quantum absorption refrigerators: towards thermal control across a chain of electronic nanocavities

Thermal control across a chain of electronic nanocavities

Landauer-Büttiker Scattering Approach

The transmission function for the quantum data:

\[ T(E) = \frac{e^{-2} e\{e^{-2} e\{E - \mu_j, T_j\} - f(E - \mu_j, T_j)\} e^{-2} e\{E - \mu_j, T_j\} - f(E - \mu_j, T_j)\}}{e^{-2} e\{E - \mu_j, T_j\} - f(E - \mu_j, T_j)} \]

The particle current:

\[ j_p = \frac{1}{\hbar} \int [f(E, T_j) - f(E, T_k)] dE \]

The energy current:

\[ j_e = \frac{1}{\hbar} \int [E f(E, T_j) - E f(E, T_k)] dE \]

The heat current:

\[ j_q = j_e - j_p \]

Thermodynamic Laws

Coefficient of Performance

\[ \eta = \frac{\frac{1}{T_0} - \frac{1}{T_c}}{\frac{1}{T_0} - \frac{1}{T_k}} \]

\[ C = \frac{Q_k}{\frac{1}{T_1} - \frac{1}{T_2}} + C_{\text{mech}} \]

Carnot Coefficient of Performance is Realized At Stopping Configurations where Cooling Power Goes to Zero.

Towards Thermal Control in Mesoscopic Physics

\[ \gamma = \frac{\Delta E_{\text{eff}}}{\Delta E_{\text{eff}}} \]

\[ C = \frac{Q_k}{\frac{1}{T_1} - \frac{1}{T_2}} + C_{\text{mech}} \]

Carnot Coefficient of Performance is Realized At Stopping Configurations where Cooling Power Goes to Zero.