Heat and charge transport in interacting nanoconductors driven by time-modulated temperatures

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We investigate the quantum transport of the heat and the charge through a quantum dot coupled to fermionic contacts under the influence of time modulation of temperatures [1].
We derive, within the nonequilibrium Keldysh Green's function formalism, generic formulas for the charge and heat currents by extending the concept of gravitational field introduced by Luttinger to the dynamically driven system and by identifying the correct form of dynamical contact energy. In linear response regime our formalism is validated from satisfying the Onsager reciprocity relations and demonstrates its utility to reveal nontrivial dynamical effects of the Coulomb interaction on charge and energy relaxations.

Reference
[1]Rosa López, Pascal Simón, Minchul Lee arXiv:2308.03426 (2023)

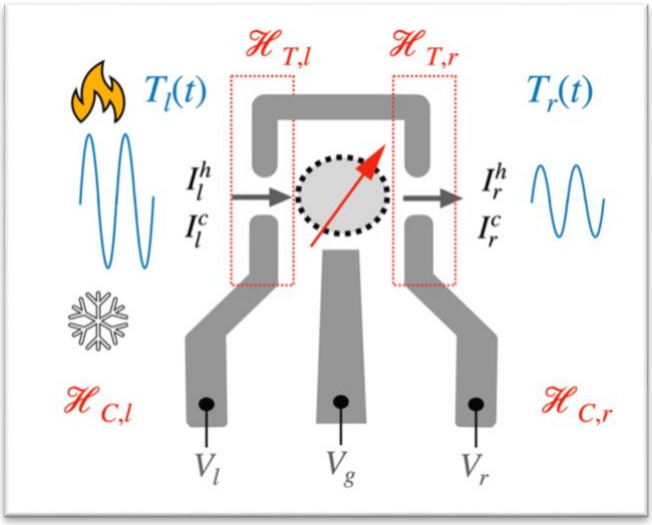

Figure 1: Lateral quantum dot system coupled to a left reservoir (l) and a right reser- voir (r) that are described by $H_{C,l}$ and $H_{C,r}$. Each reservoir is under the influence of a modulated temperature in time with $T_l(t)$ and $T_r(t)$. Left and right tunneling barriers are described by $H_{T,l}$ and $H_{T,r}$, respectively, as indicated. The central part corresponds a spinful quantum dot. Plunger gates V_l and V_r control the barrier transparency, an additional gate V_g is applied to the quantum dot region to tune the dot level position denoted by ε_σ.