Out of Equillibrium Thermoelectric Transport in Three Terminal Quantum Dot of Ferromagnetic and Superconducting Lead

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We investigate spin-dependent thermoelectric properties of three terminal system based on quantum dot coupled to two ferromagnetic(FM) and an s-wave superconductor(SC) lead with finite intradot Coulomb interaction. Since linear approximation may not be sufficiently accurate for temperature gradient across leads comparable to the superconducting gap[1], here we focus on non-linear response. We implement Keldysh's non equilibrium Green's function approach and solve corresponding equation of motion within Hubbard I approximation. In our system, the non-local transport phenomena is naturally expected[2]. There exists four types of electron tunneling processes viz. quasi particle tunneling between FM and SC lead, Andreev and cross Andreev processes and the normal single particle tunneling between two FM leads. We examine the particle and heat current as a function of different voltage bias and temperature configurations and show that the presence of second FM lead optimises differential conductance. Furthermore, we examine the considered hybrid system working as particle exchange heat engine. The effectiveness of device is characterised by power output and corresponding efficiency calculated relative to the Carnot efficiency.

References:

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