Entropy flow in Programmable quantum heat engine

Radhika H. Joshi[1,2] and Mohammad Ansari[1]

[1]*Forschungszentrum Jülich, Wilhelm-Johnen-Straße, Jülich, Germany*
[2]*Peter Grünberg Institute-Division Theoretical Nanoelectronics (PGI-2), Jülich, Germany*

We evaluate the entropy flows between two reservoirs mediated by a quantum chip. This chip in principle can be made up of multiple qubits connected in a complex manner. The goal is to find how the entropy flow to the probe reservoir can be controlled in a programmable manner by a quantum system which acts as a junction [1]. We study this problem for X-gate [2] and Cross-Resonance(CR)-gate setups. We compare and contrast the results. Both setups are seen to have advantages in different parameter regimes. Multi-world diagrams are seen to play a significant role in altering these results and hence their contributions can not be ignored. Negative differential entropy conductance (NDEC) is also observed and is shown to have different characteristics for each setup.

[1] Y. V. Nazarov, Flows of rényi entropies, Phys. Rev. B 84, 205437 (2011).

[2] M. H. Ansari and Y. V. Nazarov, Rényi entropy flows from quantum heat engines, Phys. Rev. B 91, 104303 (2015).