Contribution ID: **8** Type: **not specified**

Coherent transport: Thermodynamic uncertainty relations and large deviation analysis

Thursday, June 5, 2025 2:15 PM (45 minutes)

We derive a universal thermodynamic uncertainty relation for Fermionic coherent transport, which bounds the total rate of entropy production in terms of the mean and fluctuations of a single particle current. This bound holds for any multi-terminal geometry and arbitrary chemical and thermal biases, as long as no external magnetic fields are applied. It can further be saturated in two-terminal settings with boxcar-shaped transmission functions and reduces to its classical counterpart in linear response. Upon insertion of a numerical factor, our bound also extends to systems with broken time-reversal symmetry. As an application, we derive trade-off relations between the figures of merit of coherent thermoelectric heat engines and refrigerators, which show that such devices can attain ideal efficiency only at vanishing mean power or diverging power fluctuations. To illustrate our results, we work out a model of a coherent conductor consisting of a chain of quantum dots.

Presenter: SAITO, Keiji