Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Power-efficiency trade-off in low-dimensional thermoelectrics- An RTD study AKSHAY AGARWAL, BHASKARAN MURALIDHARAN, Electrical Engineering Department, Indian Institute of Technology Bombay, India — A distortion in the quantum mechanical transmission due to confinement in a low-dimensional thermoelectric often points to a better figure of merit (zT). While an enhancement in zT is a highly desirable feature for a good thermoelectric, it does not provide a complete picture of the thermoelectric operation. One such aspect not apparent with a zT-based anaylsis is the trade-off between the power generated and the efficiency resulting from such a distortion. Another aspect is the role of Coulomb charging resulting from the confinement. In this talk, we elucidate the role of charging as well as the distortion in the transmission function on the thermoelectric performance using a double barrier resonant tunneling diode (RTD) set up. Transport simulations are performed using the non-equilibrium Green's function (NEGF) formalism coupled self-consistently with the Poisson equation. Various levels of transmission distortion and charging scenarios are achieved by tailoring the physical parameter space of the RTD device. The resulting set of physical situations in the simulated RTD device will provide a detailed insight into the power-efficiency trade-off trend that should result from a generic quantum confinement scenario.

Bhaskaran Muralidharan
Electrical Engineering Department,
Indian Institute of Technology Bombay, India

Date submitted: 15 Nov 2013 Electronic form version 1.4