Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Non-linear thermoelectricity in disordered nanowires KHANDKER MUTTALIB, SELMAN HERSHFIELD, University of Florida — We consider non-linear thermoelectric transport in an effectively one-dimensional disordered semiconductor nanowire connected to a pair of three-dimensional perfectly conducting semi-infinite leads, where the impurity band of the disordered wire can be shifted relative to the conduction band of the leads by applying a gate voltage. We show how the gate voltage can be tuned to optimize a unique interplay between the microscopic parameters characterizing the transmission of electrons through the nanowire and the thermodynamic parameters that characterize the Fermi functions in the leads. Assuming a Lorentzian distribution of disorder in the wire, we calculate the full non-linear thermodynamic efficiency η as well as the power output P. We show that for a fixed set of microscopic and thermodynamic parameters η can be increased from zero to $\eta > 0.5\eta_c$, where η_c is the Carnot efficiency, by simply changing the gate voltage. The power output P can then be scaled by connecting many wires in parallel.

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Date submitted: 12 Nov 2014 Electronic form version 1.4