Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Far-From-Equilibrium Measurements of Thermodynamic Length

EDWARD FENG, Sandia Livermore National Laboratory, GAVIN CROOKS, Lawrence Berkeley Laboratory — Thermodynamic length is a path function that generalizes the notion of length to the surface of thermodynamic states. Here, we show how to measure thermodynamic length in far-from-equilibrium single molecule experiments using the work fluctuation relations. For these microscopic systems, it proves necessary to define the thermodynamic length in terms of the Fisher information. Consequently, the thermodynamic length can be directly related to the magnitude of fluctuations about equilibrium. The work fluctuation relations link the work and the free energy change during an external perturbation on a system. Using these results, we determine how to re-weight the probability of a trajectory to determine the equilibrium averages at an intermediate point of the protocol in which the system is out-of-equilibrium. This allows us to measure the thermodynamic length in single molecule experiments.

Edward Feng
Sandia Livermore

Date submitted: 20 Nov 2008 Electronic form version 1.4