Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Thermodynamic second law in a feedback process with time delay JAEGON UM, Korea Institute for Advanced Study, CHULAN KWON, Myongji University, HYUNGGYU PARK, Korea Institute for Advanced Study — We investigate a realistic feedback process repeated in multiple steps where a feedback protocol from measurement is applied with delay and maintains for a finite duration until next step. Unlike a feedback without delay, a composite system consists of the system and two memories where previous and present measurement outcomes are stored, leading to the 3-state Shannon entropy for the composite system. Then according to the thermodynamic second law, the change of the 3-state Shannon entropy provides the upper bound for heat flow from reservoir to system during the feedback and relaxation process. However, if the feedback protocol is depending on memory states sequentially, it turns out that the tighter bound for heat production can be obtained by integrating out the irrelevant memory state. We exemplify a cold damping case where a velocity of a particle is measured and a dissipative protocol is applied by feedback, and it is confirmed that the Shannon-entropy change of the reduced composite system gives the tighter bound for heat production.

Jaegon Um
Korea Institute for Advanced Study

Date submitted: 22 Oct 2015 Electronic form version 1.4