Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Phonon Diodes and Transistors from Magneto-acoustics SOPHIA SKLAN, JEFFREY GROSSMAN, Massachusetts Inst of Tech-MIT — The creation of non-reciprocal phononic systems holds the promise of allowing computers that would process thermal or acoustic (rather than electronic) signals. By sculpting the magnetic field applied to magneto-acoustic materials (which couple phonons to a magnetic field, typically due to effects like magnon-phonon coupling in yttrium iron garnet), phonons can be used for information processing in analogy with photonic computing. Using a combination of analytic and numerical techniques, we demonstrate designs for diodes (isolators) and transistors that are independent of their conventional, electronic formulation. We analyze the experimental feasibility of these systems, including the sensitivity of the circuits to likely systematic and random errors.

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Date submitted: 15 Nov 2013 Electronic form version 1.4