

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Attaining local temperatures close to absolute zero in a nonequilibrium quantum system¹ ABHAY SHASTRY, CHARLES STAFFORD, University of Arizona — We consider a question motivated by the third law of thermodynamics: Can there be a local temperature arbitrarily close to absolute zero in a nonequilibrium quantum system? We consider ballistic quantum conductors with the source reservoir held at finite temperature and the drain held at or near absolute zero, a problem outside the scope of linear response theory. We obtain local temperatures close to absolute zero when electrons originating from the finite temperature reservoir undergo destructive quantum interference. We compute the local temperature by numerically solving a nonlinear system of equations describing equilibration of a scanning thermoelectric probe with the system, and obtain excellent agreement with analytic results derived using a method analogous to the Sommerfeld expansion.

¹Research supported by the US Department of Energy, grant DE-SC 0006699.

Abhay Shastry
University of Arizona

Date submitted: 14 Nov 2014

Electronic form version 1.4