Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

The charge density wave transition in metallic nanowires DANIEL F. URBAN, Albert-Ludwigs Universität Freiburg, CHARLES A. STAFFORD, University of Arizona, HERMANN GRABERT, Albert-Ludwigs Universität Freiburg — A quantum mechanical stability analysis of metallic nanowires reveals an instability of the Peierls type in the regime where the Rayleigh instability is suppressed by electron shell effects. Therefore the length of stable wires with magic radii is limited. Near the Peierls transition, the singular part of the energy shows finite-size scaling consistent with the hyperscaling ansatz for a quantum phase transition. Based on this critical behavior, we study the dynamics of surface fluctuations and discuss the crossover to the CDW phase as a function of the length of the wire.

Daniel F. Urban
Albert-Ludwigs Universität Freiburg

Date submitted: 30 Nov 2004 Electronic form version 1.4