Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Superconductor-Insulator Phase Transitions in Current-Biased Arrays of Small Josephson Junctions[1] CHRISTOPHER PORTER, DAVID STROUD, The Ohio State University — We present a variational approach to treat the metastable superconducting state in an array of small Josephson junctions driven by an applied current. The approach is a generalization of one previously used to treat such an array at zero applied current. The array Hamiltonian is treated variationally using the Gibbs-Bogoliubov inequality, using a set of harmonic "phase phonons" as the variational state. We find that, for a given J/U, where J and U are the Josephson and charging energies, a superconducting (S) to insulating (I) transition occurs as a function of applied current, or by varying the direction of the applied current at fixed magnitude. The critical values of J/U are calculated for a square, triangular, and simple cubic lattices of Josephson junctions as a function of bias current. The resulting critical J/U is found to be highly sensitive to changes in bias current magnitude, and somewhat less sensitive to current direction, for all geometries studied.

[1]Work supported in part by NSF DMR04-13395

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Date submitted: 21 Nov 2008 Electronic form version 1.4