Abstract Submitted
for the OSF11 Meeting of
The American Physical Society

Analytic Inspection of the Synchronization of a Single-Plaquette Josephson Junction Array[1] MA'AYAN DAGAN, Oberlin College, ZIJIE POH, BRAD TREES, Ohio Wesleyan University — We report on a study of the synchronization behavior of a single-plaquette array of Josephson Junctions (JJs). An analysis of this synchronization is motivated by the fact that the power output of synchronized JJs has been harnessed, with great potential for powering small (chip-scale) devices. The RCSJ model was used in concert with a perturbation method to produce simplified differential equations for the dynamics of the Josephson phases. Several features of the system which are not fully explicable by numerical methods are well illuminated by the analytic treatment described. For instance, synchronization of JJs in the array was shown to be linearly stable. Furthermore, a closed-form function was derived to describe the behavior of that decay in the limit of large coupling between the current-biased junctions in the plaquette. Large-coupling approximations also accurately predict the time-dependent synchronization of a JJ pair. Of particular interest is the effect of the introduction of a magnetic field perpendicular to the array. Preliminary results show the field affects both the long-time behavior and stability of JJ phase differences.

[1]M.D. and B. T. acknowledge support from NSF grant 1003992.

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Date submitted: 08 Sep 2011 Electronic form version 1.4