Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Flux Solitons Studied for Energy-Conserving Reversible Computing KEVIN D. OSBORN, WALTRAUT WUSTMANN, Laboratory for Physical Sciences, College Park, MD — On-chip logic is desired for controlling superconducting qubits. Since qubits are very sensitive to photon field noise, it is desirable to develop an energy-conserving reversible logic, i.e. one which can compute without substantial energy dissipation or applied drive fields. With this goal in mind, simulations on discretized long Josephson junctions (DLJJs) have been performed, where the flux soliton is studied as a potential information carrier. Undriven soliton propagation is studied as a function of discreteness, dissipation, and uncertainty in the junction critical current. The perturbing parameters are low in the simulations such that the solitons fit well to an ideal Sine-Gordon soliton. Surprisingly, using realizable parameters a single flux soliton in a DLJJ is found to travel hundreds of Josephson penetration depths without backscattering in the absence of a driving force. In addition, even with a non-ideal launch, solitons are found to propagate predictably such that they show potential for synchronous routing into reversible logic gates.

Kevin Osborn
Laboratory for Physical Sciences, College Park, MD

Date submitted: 13 Nov 2014 Electronic form version 1.4