Abstract Submitted for the DAMOP15 Meeting of The American Physical Society

An Effective Collision Rate Model for Atomtronic Devices<sup>1</sup> CAMERON J.E. STRAATSMA, JILA, and Department of Electrical, Computer, and Energy Engineering, University of Colorado, Boulder, WENG W. CHOW, Sandia National Laboratories, DANA Z. ANDERSON, Department of Physics and JILA, University of Colorado, Boulder, and National Institute of Standards and Technology — We demonstrate application of a model, previously developed for the detailed study of quantum electronic systems [1], to atomtronic devices utilizing finite temperature Bose-condensed gases. The numerical approach is based on the relaxation rate approximation where collisions effectively drive the system towards a dynamical (non-thermal) equilibrium distribution. This approach allows parametric studies involving time scales that cover both the rapid population dynamics relevant to non-equilibrium state evolution, as well as the much longer time durations typical of steady-state device operation. The model is demonstrated by studying the evolution of a Bose-condensed gas in the presence of atom injection and extraction in a double-well potential. In this configuration phase-locking between condensates in each well of the potential is readily observed, and its influence on the evolution of the system is studied.

[1] W. W. Chow and S. W. Koch, IEEE J. Quantum Elec., 41, 495 (2005)

<sup>1</sup>This work is supported by the National Science Foundation, the Air Force Office of Scientific Research, and the Sandia LDRD program

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Date submitted: 30 Jan 2015

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