Abstract Submitted for the MAR08 Meeting of The American Physical Society

Bose–Josephson Junction with Binary Mixture of Bosonic Atoms MARK EDWARDS, Georgia Southern University and NIST, JEFFREY HEWARD, Georgia Southern University, INDUBALA SATIJA, George Mason University and NIST, RADHA BALAKRISHNAN, Institute of Mathematical Sciences, PHILLIP NAUDUS, George Mason University — We consider a bose–Josephson junction consisting of a binary mixture of two weakly coupled Bose–Einstein condensates confined in a symmetric double-well external potential. In a single condensate confined in a double-well potential, when the condensate wavefunction is approximated as a linear combination of the lowest two eigenmodes of the potential, the result is a dynamical system analogous to those that describe the current and phase across a Josephson junction. Josephson oscillations and nonlinear self-trapping are among the effects predicted by this dynamical system. Using the same two-mode approximation, the condensate mixture can be mapped to two coupled, non-rigid pendula. Although the system is found to exhibit periodic dynamics, the tunneling dynamics of the individual components can be periodic, quasiperiodic, as well as chaotic. We also investigate the experimental signatures of these effects and the goodness of the two-mode approximation by solving the coupled Gross-Pitaevskii equations that govern the behavior of the system.

> Mark Edwards Georgia Southern University and NIST

Date submitted: 27 Nov 2007

Electronic form version 1.4