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Toward a Study of Synchronization in Quantum Mechanical Josephson Junction Arrays ROBERT ANTHONY, WILLIAM KENNY, BRAD TREES, Ohio Wesleyan University — Numerical methods of simulating dissipative quantum systems were studied with an eye toward looking for evidence of quantum synchronization in Josephson Junction (JJ) arrays. JJs are of interest because of their potential application in quantum computing as quantum bits. Synchronization between JJs is an important step in realizing this application. Classical synchronization among JJs has already been studied, and we were able to replicate such synchronization among JJs in an array coupled to a nanomechanical oscillator (NMO). Quantum synchronization of JJs, however, has yet to be studied in detail, and is a major focus of our research. Quantum mechanically, various methods exist to model the dissipative interaction between JJs and their environment (damping), including the quantum jump method and the quantum state diffusion method. For example, in the quantum jump method, at random points in time, the system loses energy to its environment, and the system "jumps" down a quantum state. Using this method, we studied the two-state JJ (qubit) coupled to an NMO and the quantum kicked pendulum, in which the pendulum experiences a position-dependent angular impulse at regular time intervals. This poster focuses on describing the quantum jump method, both the theory behind it and its implementation.

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