Abstract Submitted
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Suppression of quantum fluctuations in a Josephson junction coupled to a nanomechanical resonator[1] YASER HELAL, BRAD TREES, Ohio Wesleyan University, JOSHUA SCHIFFRIN, Carnegie Mellon University, BRIAN SILLER, University of Illinois at Urbana-Champaign — The quantum mechanical properties of a Josephson junction (JJ) in parallel with a nanomechanical resonator were studied. The JJ phase difference was treated as a "particle" trapped in a quadratic potential well, which was used to approximate the well-known tilted washboard potential of the junction. When coupled to the resonator, the square of the uncertainty in the position of the JJ "particle" was suppressed, *i.e.* quantum fluctuations of the JJ were reduced by the resonator. The uncertainty principle was obeyed by the system, in that the square of the uncertainty in the JJ's momentum was enhanced with resonator coupling. We also included the effects of environmental damping. Damping the junction enhanced the suppression of quantum fluctuations beyond that due to resonator coupling alone. Damping the resonator, however, suppressed the effect of JJ-resonator coupling and thus resulted in less suppression of quantum fluctuations. Preliminary results for the effects on quantum fluctuations of a weak nonlinear term in the JJ's potential energy have also been obtained.

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