Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Entanglement dynamics in a qubit-nanomechanical resonator system DIAN WAHYU UTAMI, AASHISH CLERK, Physics Department, McGill University, Montreal — Over the recent years, finding signatures of entanglement in macroscopic systems has been a central goal in many aspects of mesoscopic physics. Here we present our study of non-equilibrium entanglement dynamics between a qubit and a nanomechanical resonator that is coupled to a phonon bath. Unlike previous studies, we specifically look at dispersively coupled qubit-oscillator system which has been realized in many different experiments. Using master equation expressed in gaussian wigner functions, we obtained an elegant and intuitive expression for the entanglement. Two ways of generating entanglement were found; entanglement of the qubit to the amplitude of the driven oscillator and to the phase of the oscillator. A full analytical result within the zero temperature limit of the two cases were derived. We also investigate the effect of finite temperature to the entanglement dynamics and found the phase entanglement to be more robust against temperature. The result indicates that an indirect method to measure the presence of entanglement in the system is possible.

Dian Wahyu Utami
Physics Department, McGill University, Montreal

Date submitted: 27 Nov 2007 Electronic form version 1.4