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Nonlinear Quantum Relaxation and Generation of Non-classical States in Duffing Oscillators AURORA VOJE, ALEXANDER CROY, ANDREAS ISACSSON, Chalmers University of Technology — The dissipative quantum dynamics of an anharmonic oscillator is theoretically investigated in the context of carbon-based nano-mechanical systems. In the short-time limit, it is known that macroscopic superposition states appear for such oscillators[1]. Linear and non-linear dissipation leads to decoherence of such non-classical states in the long-time limit. However, as a result of two-vibron losses at zero temperature, the quantum oscillator eventually evolves into a non-classical stationary state – a qubit-like state. The relaxation of the qubit due to thermal excitations and one-vibron losses is numerically and analytically studied. The possibility of verifying the occurrence of the qubit is discussed and signatures of the non-classicality arising in a ring-down setup are presented. Additionally, the generation of entanglement between two coupled oscillators in presence of strong two-vibron losses is discussed.

[1]A. Voje, J. M. Kinaret, and A. Isacsson, Phys. Rev. **B85**, 205415 (2012).

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