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Decay of classical quasiperiodic state and emergence of prethermalization in quenched Fermi-Pasta-Ulam system RAFAEL HIPOLITO, City University of New York, College of Staten Island, IPPEI DANSHITA, Computational Condensed Matter Physics Laboratory, RIKEN, VADIM OGANESYAN, City University of New York, College of Staten Island, ANATOLI POLKOVNIKOV, Boston University — We will discuss the relaxation of the Fermi Pasta Ulam system in the presence of quantum fluctuations. In order to make comparisons with the classical relaxation, we strongly excite a single normal mode, while the rest of the modes are initially in the quantum ground state. We confine ourselves to the quasiperiodic regime where the classical system never thermalizes. We show that the short time dynamics of the quantum problem are very different from classical evolution, with the quantum zero point energy playing a key role. The short time dynamics can be viewed as an enhancement of zero point energy, parametrically driven by the classical degrees of freedom. This introduces nontrivial off-diagonal correlations in the low momentum sector and dampens the classical oscillations eventually leading to both dephasing and decay, and we identify the time scales associated with these processes. Eventually the system reaches a nontrivial very long lived quasistationary regime where off-diagonal correlations disappear and the energy remains mostly localized in the low q sector while the high q sector relaxes to a uniform effective temperature. In this regime, correlations are very well described by a generalized Gibbs ensemble.

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