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Quantum and classical mode softening near the charge-density-wave/superconductor transition of Cu_xTiSe_2: Raman spectroscopic studies[1] MINJUNG KIM, HARINI BARATH, S.L. COOPER, P. ABBAMONTE, E. FRADKIN, Dept. of Physics and Frederick Seitz Materials Research Laboratory, University of Illinois at UC, E. MOROSAN, R.J. CAVA, Department of Chemistry, Princeton University, Princeton, NJ 08544, USA — We report temperature- and x-dependent Raman studies of the charge density wave (CDW) amplitude modes in Cu_xTiSe_2, which allow us to study the temperature- and x-dependence of the soft mode in this system. Among the key results: we find that the A_{1g} amplitude mode exhibits identical power law scaling with the reduced temperature, p=T/T_{CDW}, and the reduced Cu content, p=x/x_c, i.e., $\omega_o \sim$(1-p)$^{0.15}$, suggesting that mode softening is independent of the control parameter used to approach the CDW transition; we provide evidence that x-dependent mode softening originates from the expansion of the lattice, which leads to a x-dependent reduction of the electron-phonon coupling constant; and we infer from our x-dependent mode softening results the presence of a quantum critical point, x_c(T=0)$\sim$0.07, within the superconducting phase of Cu_xTiSe_2.

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