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Landau-Zener transitions in a two-level system that is coupled to a finite-temperature harmonic oscillator SAHEL ASHHAB, Qatar Environment and Energy Research Institute, Qatar Foundation, Doha, Qatar — The Landau-Zener (LZ) problem is a standard paradigm for studying energy transfer and adiabatic passage protocols. We consider the LZ problem for a two level system when this system interacts with one harmonic oscillator mode that is initially set to a finite-temperature thermal equilibrium state. The oscillator could represent an external mode that is strongly coupled to the system, e.g. an ionic oscillation mode in a molecule, or it could represent a prototypical uncontrolled environment. We analyze the system's occupation probabilities at the final time in a number of different regimes, varying the system and oscillator frequencies, their coupling strength and the temperature. In particular we find some surprising non-monotonic dependence on the coupling strength and temperature.

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