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Multiphoton antiresonance and quantum activation in driven oscillators[1]

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Resonantly modulated oscillators are predicted to display quantum effects, which have no analog in two-level systems. One of them is antiresonance of the coherent nonlinear response: the amplitude of forced vibrations of the oscillator displays a sharp minimum or maximum when the modulation frequency passes adiabatically through multiphoton resonance. The other is escape from metastable states of forced vibrations via quantum diffusion over quasienergy levels. The escape is studied for the cases of resonant and parametric modulation of the oscillator. In both cases, even for zero temperature, the rate of diffusion over quasienergy states is faster than the rate of interstate dynamical tunneling given that the latter is smaller than the relaxation rate. The effective activation energy of escape is a sharp function of temperature in the quantum regime. It displays a power-law dependence on the distance to the bifurcation value of the modulation amplitude or frequency. We show the fragility of the distribution over quasienergy for $T = 0$, when the system has detailed balance: it strongly differs from the distribution for $T \to 0$ and from the distribution in the presence of dephasing even where the dephasing rate is small.

1. M. I. Dykman and M. V. Fistul, Phys. Rev. B **71**, 140508 (R) (2005).
2. M. I. Dykman, Multiphoton antiresonance and quantum activation in driven systems, quant-ph/0507261.

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