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Controlling transitions in a Duffing oscillator by sweeping the driving frequency. OLEG KOGAN, Caltech, BARUCH MEERSON, Hebrew University of Jerusalem — We consider a high-Q Duffing oscillator in a weakly non-linear regime with the driving frequency σ varying in time between σ_i and σ_f at a characteristic rate r. We found that the frequency sweep can cause controlled transitions between two stable states of the system. Moreover, these transitions are accomplished via a transient that lingers for a long time around the third, unstable fixed point of saddle type. We propose a simple explanation for this phenomenon and find the transient life-time to scale as $-(\ln|r-r_c|)/\lambda_r$ where r_c is the critical rate necessary to induce a transition and λ_r is the repulsive eigenvalue of the saddle. The same type of phenomena is expected to hold for a large class of driven nonlinear oscillators which are describable by a two-basin model.

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