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Quantum Control in the Parametric Oscillator[1] MARK A. AUDEN, University of Rochester, MANUEL BERRONDO, JEAN-FRANCOIS S. VAN HUELE, Brigham Young University — Simple harmonic oscillators (SHO) exhibit exactly solvable dynamics and introduce special states of the system (such as number, coherent, or squeezed states) as well as the relevant operators on those states. The SHO can easily be extended to more realistic oscillator systems with increasingly complex dynamics and interesting properties. We focus on the parametric oscillator (PO) and driven parametric oscillators (DPO), whose time-dependent frequency can lead to decreased variances of some physical variables, a.k.a. squeezing. We use a Lie Algebra method to find the evolution of POs and look for specific behavior triggered by particular frequency dependence and by single-step driving forces. We relate the parameters of these functional dependences to the evolution of coherent states in order to achieve some degree of control on the quantum system. More specifically, we study the possibility and characteristics of squeezing of coherent states by particular POs. Momentum squeezing is observed for frequencies varying as Gaussian pulses, sinusoidal oscillations around a fixed value, and exponential decay. Squeezing in position is only observed in select cases of the Gaussian pulse. Position or momentum-dependent driving terms in DPOs do not induce additional squeezing effects.

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