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How Different Can Quantum States with the Given Fidelity Be? VIKTOR DODONOV, MATHEUS HOROVITS, Institute of Physics, University of Brasilia, Brazil — We address the following question: how big can the relative energy difference between two states of a harmonic oscillator (field mode) with the fixed value of fidelity F be? Exact analytical bounds are found for several popular families of quantum states: coherent, squeezed, arbitrary (mixed) Gaussian, binomial and negative binomial. Numerical bounds are calculated for various superpositions of coherent states ("Schrödinger cat states") and their generalizations. The restrictions on the minimal admissible fidelity levels for quite arbitrary (unknown) states belonging to selected families appear rather strong. For example, one can find two squeezed states with $F = 0.9$ but with the relative mean energy difference exceeding 100%. To guarantee the relative energy difference less than 10% for arbitrary coherent states, the fidelity must exceed the level 0.995. For many other sets of states (e.g., squeezed and negative binomial) the restrictions can be much stronger.

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