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Laser Controlling Wavepacket Trains of a Paul Trapped Ion

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Abstract: We have studied the quantum and classical motions of a single Paul trapped ion interacting with a time-periodic laser field. By using the test-function method, we construct n exact solutions of quantum dynamics that describe the generalized squeezed coherent states with the expectation orbits being the corresponding classical ones. The space-time evolutions of the exact probability densities show some wavepacket trains. It is demonstrated analytically that by adjusting the laser intensity and frequency, we can control the center motions of the wavepacket trains. We also discuss the other physical properties such as the expectation value of energy, the widths and heights of the wavepackets, and the resonance loss of stability.

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Key words: Paul trap, single ion, laser field, wavepacket train

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