MOMENTUM DIFFUSION OF ATOMS AND NANOPARTICLES IN AN OPTICAL TRAP FORMED BY SEQUENCES OF COUNTER-PROPAGATING LIGHT PULSES

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S u m m a r y

The motion of atoms and nanoparticles in a trap formed by sequences of counter-propagating light pulses has been analyzed. The atomic state is described by a wave function constructed with the use of the Monte Carlo method, whereas the atomic motion is considered in the framework of classical mechanics. The effects of the momentum diffusion associated with the spontaneous radiation emission by excited atoms and the pulsed character of the atom-to-field interaction on the motion of a trapped atom or nanoparticle are estimated. The motion of a trapped atom is shown to be slowed down for properly chosen parameters of the atom-to-field interaction, so that the atom oscillates around the antinodes of a non-stationary standing wave formed by counter-propagating light pulses at the point where they "collide".