LIGHT PRESSURE ON THE ATOMS IN THE FIELD OF COUNTERPROPAGATING LIGHT WAVES WITH SINUSOIDAL AND STOCHASTIC PHASE MODULATION

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The light force exerted on a two-level atom in the field of two counterpropagating light waves with sinusoidal and stochastic phase modulation has been investigated. The phase of one wave is supposed to repeat the phase of the other wave with some time delay. The first time derivative of the phase is the Ornstein-Uhlenbeck process. In the cases of weak fields with equal amplitudes and strong fields with different amplitudes, the analytic forms for the light force exerted on the atom are evaluated. According to the numerical simulation of the sinusoidal case, the optimal ratio of the amplitudes of the fields different from unity which gives the maximal value of the force is expected.

The comparison of numerical simulation of the force exerted on atoms in the sinusoidal and stochastic modulation cases was carried out for the case where the modulation frequency, the bandwidth of light spectrum and Rabi frequencies are equal. This choice of the parameters is believed to be close to the best values. According to the simulation, the maximal force in the stochastic field is approximately equal to the half of the maximal force in the sinusoidal-modulation field.