

## Momentum diffusion of atoms in the counter-propagating bichromatic waves

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Since the first investigation of the light pressure force on atoms in the counter-propagating bichromatic waves (BW) in 1988 [1] the so-called “bichromatic force” became an effective instrument for laser control of the atomic motion. In 2004 the physical bases of the force was elucidated [2]. Nevertheless, the momentum diffusion process, accompanying the interaction of atoms with the BW, was not investigated so far. In the report we present the numerical simulation of the atomic motion in the field of BW which includes time dependences of statistical characteristics of the atomic ensemble. An example of the results is shown in Fig.1.

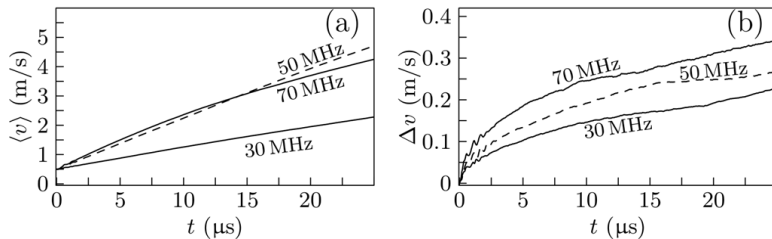


Fig. 1. The dependence of the average velocity (a) and r.m.s. deviation of the velocity from its average values (b) on time for 1000 Cesium atoms. Rabi frequency of each wave is 60 MHz, initial velocity is 0.5 m/s. Phase shift between waves is  $\pi/4$ . The curves are marked with the values of modulation frequency.

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1. *Voitsekhovich, V. S., Danileiko, M. V., Negriiko, A. M., Romanenko, V. I., Yatsenko, L. P.* Light pressure on atoms in on-coming amplitude-modulated waves // *Zhurnal Tekhnicheskoi Fiziki* -1988.-**58**.-P.1174-1176.
2. *Yatsenko, L., Metcalf, H.* Dressed-atom description of the bichromatic force // *Physical Review A*-2004.-**70**, 063402