AVERAGED EQUATIONS of RELATIVISTIC particle MOTION IN the field of TWO LASER BEAMs

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The relativistic generalization of certain high intensity fields leads to new features of the particle motion, depending on specific field characteristics [1–3]. It has been shown in [4] that in a beat wave ﬁeld of intense laser radiation with circular polarization, which is described as a superposition of two Gaussian beams in the main mode, the ponderomotive force has no potential form and essentially depends on the slowly changing phase of the beat wave. The averaged action on the particle is essentially decreased due to the relativistic effects and diffractive spreading of the beams.

We present an analytical and numerical research on the relativistic motion of a charged particle in a two laser beam field, propagating along an external magnetic field. The beams are describing using the paraxial approximation. Thus the parameter *g*, which is defined as the ratio of the oscillating momentum to the rest momentum, is considered to be in the order of one and the ratio of the wavelength to the beam waist is small. The difference between the beams carrier frequencies is close to the cyclotron frequency. By the Bogoliubov averaging method the equations for the smoothed variables of a particle and additional equation for the phase of the beat wave are obtained. Fast oscillating additions to the guiding center of the particle and to the smoothed components of the momentum are also calculated. The smoothed quantities are considered as those averaged over the fast phases of the partial waves. The expressions for the ponderomotive force in the different forms and the total averaged energy of the particle are obtained.

References

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