Solitons in a system of a coupled bilayer graphene waveguides

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We consider a propagation of ultra-short optical pulses, which can be represented as discrete solitons in the bilayer graphene waveguides. The effective equation, which has the form of an analog of the classical sine-Gordon equation was obtained. And the effects associated with changing of the width of initial momentum and of the Coulomb energy were investigated.

The unique properties of graphene and bilayer graphene [1-2], largely related to the periodical dispersion law, and also works on ultrashort optical pulses amplification in nanotubes and graphene [3] give additional incentive to study the problem of the propagation of electromagnetic pulses through a system consisting of several bilayer graphene sheets.

Studying the dynamics of the momentum carried in the nine parallel bilayer graphene planes. The dependence of electric field on waveguide number is presented in Figure. The dependences suggest a significant effect of the pulse width β on the energy distribution between the waveguides.

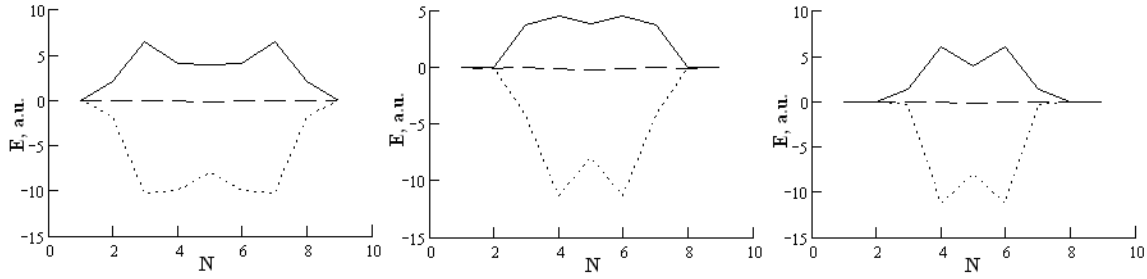

Figure. Dependence of the electric field on the waveguide number. All magnitudes are in the non-dimensionless units. For the solid curve the time is t=130, for the dotted curve t=200, for the dashed curve t=250: a) β=1; b) β=2; c) β=3.

This work was supported by the Federal Target Program "Scientific and pedagogical manpower" for 2010-2013 (project № NK-16(3)) and by the Grant for younger scientists of VolSU №3-2011-MU/VolSU.

[1] K.S. Novoselov, A.K. Geim, S.V. Morozov, D. Jiang, Y. Zhang, S.V. Dubonos, I.V. Grigorieva, A.A. Firsov. *Science* **306**, 666 (2004).
[2] K.S. Novoselov, A.K. Geim, S.V. Morozov, D. Jiang, M.I. Katsnelson, I.V. Grigorieva, A.A. Firsov. *Nature* **438**, 197 (2005).
[3] N.N. Yanyushkina, M.B. Belonenko, N.G. Lebedev. *Opt. and Spec.* **108**, 618 (2010).