The role of the spatial dependence of the electron effective mass in forming the Wannier–Stark spectrum

2009 J. Phys.: Condens. Matter 21 439801

(http://iopscience.iop.org/0953-8984/21/43/439801)

J. Phys.: Condens. Matter **21** (2009) 439801 (1pp) doi:10.1088/0953-8984/21/43/439801

Corrigendum

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N L Chuprikov 1999 *J. Phys.: Condens. Matter* **11** 1069–78

The author sincerely thanks Professor Yu V Kopaev for pointing out an important mistake made in the above paper. The model presented in the paper, which is based on the effective mass approximation, pretends to reveal the inherent energy spectrum in the Wannier–Stark problem for infinite superlattices. At the same time, as was shown in the paper itself, for a given particle's energy E the transfer matrix $\mathcal{Z}_{(-\infty,0)}(E)\mathcal{Z}_{(1,\infty)}(E)$ to describe the whole periodic structure is expressed in terms of the one-period transfer matrix Z at the energies $E \pm n\Delta$ where $n = 0, 1, \ldots$ This means that the effective mass of a particle should be taken into account at all these energies too. However, this task cannot be performed because a part of these points fall into the energy gaps where the notion of the effective mass has no physical sense. Thus, the effective mass approximation is a poor basis for solving the Wannier–Stark problem for superlattices. This is true for any value of the electric field strength.

It should be stressed here that the model presented in the paper [1] for solving this problem in the case of lattices is entirely applicable to superlattices. As regards the model considered here, its results can be applied to all physical problems where the same (by form) equations appear, provided that the equation of the model is treated beyond the effective mass approximation, as the Schrödinger equation for a particle with a spatially dependent mass (described by the periodic piecewise constant function).

Reference

[1] Chuprikov N L 1998 *J. Phys.: Condens. Matter* **10** 6707–16

