

INVESTIGATION OF THE BOSONIC  
SPECTRUM OF TWO-DIMENSIONAL OPTICAL  
GRAPHENE-TYPE LATTICES.  
SUPERFLUID PHASE

*I.V. Stasyuk, O.V. Velychko, I.R. Dulepa*

Institute for Condensed Matter Physics,  
Nat. Acad. of Sci. of Ukraine  
(1, *Sviientsitskii Str., Lviv 79011, Ukraine*)

S u m m a r y

The energy spectrum of a system of Bose atoms in the superfluid phase in an optical lattice of the graphene type has been studied. The dispersion laws for the energy bands and the single particle spectral densities are calculated in the random phase approximation and in the framework of the hard-core boson formalism, and their changes at the transition from the normal phase to the superfluid one are described. As a result of this transformation, the number of subbands doubles. In the case of the subband energetic equivalence, the Dirac points in the spectrum survive, and their number becomes twice as much. When the subbands are energetically nonequivalent, the Dirac points are absent. The shape of spectral densities is shown to be sensitive to the changes in the temperature and the chemical potential position.