Lattice Green function for electrons in magnetic field

Maciej M. Maśka
Dept. of Theoretical Physics, Institute of Physics
University of Silesia, Katowice, Poland

The energy spectrum of electrons on a square lattice in an applied magnetic field composes the famous Hofstadter butterfly with a recursive internal subband structure. An effective method of calculating the Green function for such a system is proposed. The standard approach requires the explicit knowledge of the eigenstates and eigenenergies of the system; here we derive a Harper–like equation that allows us to calculate the Green function of the lattice electrons in the field directly. The method is particularly useful in the weak–field regime, where the standard calculations are cumbersome. In the case of small q ($p/q = \Phi/\Phi_0$ is the magnetic flux per unit cell in the units of the flux quantum $\Phi_0 = hc/e$), we obtain analytical expressions for the Green function; otherwise, it is determined numerically. The applications of the proposed approach are also discussed.

9.7 cm

13.4 cm

Subject category :

1. Correlated Electrons and High Temperature Superconductors

Presentation mode :
poster

Corresponding author :
Maciej M. Maśka

Address for correspondence :
Dept. of Theoretical Physics
University of Silesia
ul. Uniwersytecka 4, 40-007 Katowice, Poland

Email address :
maciek@phys.us.edu.pl