The Quantum Hall Effect in Spin Quartets in Graphene

KESHAV SHRIVASTAVA, University of Malaya — Using the non-relativistic Schroedinger equation, we find that for \((1/2)g=(1/2)\pm s\) gives zero charge for negative sign and one charge for positive sign. This explains the conductivity at \(i = 0\) and \(1\). For \(s=3/2\), \((1/2)g=2\) for positive sign and hence \(g=4\). The substitution in the series, \(-5/2)(\mu_B H), -(3/2)(\mu_B H), -(1/2)( \mu_B H), +(1/2)( \mu_B H), +(3/2)( \mu_B H), +(5/2)( \mu_B H), \ldots, \ldots,\) etc., \(g=4\) gives, -10, -6, -2, +2, +6, +10, etc. This series is the same as observed in the experimental data of quantum Hall effect in graphene. When we take \(n=2\) in the flux quantization, i.e., \(2(\hbar c/e)\), we generate the plateaus at ±4. Thus the plateaus can occur at 0, 1, 4 and at 2, 6, 10, 14, \ldots, etc. Thus the quantum Hall effect in graphene is understood by means of non-relativistic theory. The fractions such as 1/3 or integers such as 0,1,4,\ldots, 2,6,10,14, \ldots multiply the charge and hence describe the “effective charge” of the quasiparticles. This means that there is “spin-charge locking”.
