Report on the Evaluation of Chapter 26 Quantum Hall Effect in “The Grand Unified Theory of Classical Physics” by Dr. Randell L. Mills

Prepared by

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Executive Summary

In my analysis, I verified calculations and equations involving the Hall Effect, the Integral Quantum Hall Effect, and the Fractional Quantum Hall Effect found in Chapter 26 Quantum Hall Effect of the book “The Grand Unified Theory of Classical Physics” (January 2020 edition) by Dr. Randell L. Mills. I verified equations and calculations to a high degree of accuracy that are associated with all three versions of the Hall Effect. There is a remarkable agreement between the GUTCP calculated equations and the equations I get from my calculations. I verified all the equations from 26.1 through 26.54.

Purpose

In Chapter 26, the classical Hall Effect is discussed first, ending in the Hall Resistance R_H.

It is pointed out that to get the Fractional Quantum Hall Effect, electrons in two superconducting wells need to interact. They will interact when the two wells are close to each other and separated by the magnetic length l_o, where the equation for l_o is given in the chapter.

For the Integral Quantum Hall Effect, much of the discussion proceeds from results given in Chapter 25 on Superconductors, involving system functions and Fourier transforms of the system function. The special case of a band pass is considered, as it was in Chapter 25.

For the Integral Hall Effect, the current i_z and the Hall Voltage are derived. And they are then used to find the Hall Resistance R_H for this case. Also, the velocity of each superconducting electron is found by use of the Hall Electric Field and Magnetic Field. It is found that R_H is quantized in units of $h/(ne^2)$ where n=integer. Hence the name the Integral Quantum Hall Effect.

For the Fractional Hall Effect, the discussion starts off with two superconducting wells a distance l_o apart. The result of the discussion ends with the Hall Resistance being shone to be proportional to $(j+1)/n_2 = [n_2/(j+1)]^{-1} = 1/n$, where j and n_2 are integers, and n is a fraction. Thus, the Hall Resistance is given by $R_H = h/(ne^2)$ where n=fraction. Hence the name the Fractional Quantum Hall Effect.

Calculations

I have verified that Equations 26.1-26.9 are indeed true.

I have verified that Equations 26.10-26.17 are true and correct.

I have verified that Equations 26.18-26.24 are also correct.

I have verified that Equations 26.25-26.32 are correct as listed.

I have verified that Equations 26.34-26.39 are correct.

I have verified that Equations 26.41-26.47 are correct as listed.

I have verified as correct Equations 26.49-26.54.

I have also verified as correct Equations 26.55-26.59.

Conclusion

I was able to verify the GUTCP results of Chapter 26 in excellent agreement with my own calculations and derivations of equations. I successfully reproduced all of the equations and derivations found in Chapter 26. This chapter demonstrates that the GUTCP theory is successful at describing the Hall Effect, the Integral Quantum Hall Effect, and the Fractional Quantum Hall Effect, to a high degree of accuracy.

I find my results and calculations to be confirmation that the derivations and equations of Chapter 26 are indeed valid, reproducible, and accurate.