Report on the Evaluation of Chapter 37 Proton and Neutron in "The Grand Unified Theory of Classical Physics" by Dr. Randell L. Mills

Prepared by

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August 25, 2020

Executive Summary

In my analysis, I verified calculations and equations involving the mass, magnetic moments, and other properties of protons and neutrons found in Chapter 37 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 these two important particles. There is a remarkable agreement between the GUTCP calculated equations and the equations I get from my calculations. I verified all the equations from 37.1 through 37.48.

Purpose

The proton and neutron are each composed of three quarks, and three photons called gluons. Furthermore, each quark is in combination with a gluon.

The GUTCP model of the proton and neutron explains the correct magnetic moments of these two particles as well as the masses of the proton, neutron, quarks, and gluons. These values from the GUTCP theory match the experimentally known values very accurately. Furthermore, the GUTCP theory gives these values in simple closed-form solutions. This is in contrast with QCD (Quantum Chromo Dynamics) which involves virtual particles, renormalization procedures, and does not yield closed-form solutions.

Relativistic corrections to the mass of gluons must be used in the GUTCP theory. A force balance equation yields the total energy of the proton, the neutron rest mass, the rest mass for the neutron quarks, the Compton wavelength of the neutron, and the Compton wavelength bar of the neutron quarks. To be consistent with experimentation, we choose a solution that is a linear combination of three spherical harmonic functions, where l=1, and three constant atomic orbitals.

The proton is made of the three quarks uud, where u = up quark, with a charge of +(2/3)e, and d = down quark, with a charge of –(1/3)e. Based on these linear combinations, the normalized quark mass-density function and the normalized charge-density function of a proton are found. Next the potential function of the gluons and the radial electric field of the gluons of a proton are found. The proton mass-density function is shown in Figure 37.1 and the proton charge-density function is shown in Figure 37.2.

The neutron is made of the three quarks ddu, where u = up quark, with a charge of +(2/3)e, and d = down quark, with a charge of –(1/3)e. Based on these linear combinations, the normalized quark mass-density function and the normalized charge-density function of a neutron are found. This leads to the potential function of the gluons and the radial electric field of the gluons of a neutron being found. The neutron mass-density function is shown in Figure 37.3 and the neutron charge-density function is shown in Figure 37.4.

To find the proton magnetic moment, we realize that each gluon is in phase with a quark. The up quark corresponds to m_l=1 and has a magnetic angular momentum projection on the z-axis of +(1/3)(h-bar). The down quark corresponds to m_l=0 and so has no magnetic projection on the z-axis. To find the magnetic moment of the proton μ_p, it's given by the sum of the contributions due to each quark of angular momentum projection +(1/3)(h-bar). That leads to a theoretical μ_p that is in extraordinary agreement with the experimental μ_p.

To find the magnetic moment of the neutron, we realize that to make the neutron (ddu) from a proton (uud) requires an up quark in the proton to change into a down quark in the neutron. So the magnetic moment of the proton is adjusted taking this quark transformation into account. This leads to a theoretical $\mu_{neutron}$ that is in remarkable agreement with the experimental $\mu_{neutron}$.

The neutron mass is found by using relativistically-corrected terms and quark masses in Eqn. (32.43), which connects proper and coordinate time. The result is a $m_{neutron}$ in remarkable agreement with the experimental $m_{neutron}$.

The relationship between proper and coordinate time has higher order resonances than just the ones that yield the three leptons, three quarks, and their antiparticles. One over-energy resonance yields the energy of the Z^o particle, whose theoretical energy is in very good agreement with its experimental energy. Another over-energy resonance yields the energy of the Higgs Boson, which again is in very good agreement with its experimental energy. Another over-energy resonance yields the energy of the W+ and the W- particle, the intermediate vector bosons. This energy is also in very good agreement with its experimental energy.

Calculations

I have verified that Equations 37.1-37.5 and their values are true and correct.

I have verified that Equations 37.6-37.13 are also correct.

I have also verified that Equations 37.14-37.17 are correct, as are Equations 37.22-37.23.

I have verified that Equations 37.26-37.29 are correct.

The theoretical value of μ_p from the GUTCP theory is very close to the experimental value for μ_p.

And I have verified that Equations 37.30-37.36 are true and correct.

The value from Eqn. 37.37 is correct. We see that the theoretical value of $\mu_{neutron}$ from the GUTCP theory is very close to the experimental value for $\mu_{neutron}$.

I have shown that the Equations 37.38-37.41 are correct as listed.

The value from Eqn. 37.42 and the equation itself is correct. We see that the theoretical value of $m_{neutron}$ from the GUTCP theory is very close to the experimental value for $m_{neutron}$.

I have shown that the Equations 37.43-37.46 are correct. The theoretical value of E_{Z^o} from the GUTCP theory is very close to the experimental value for E_{Z^o}, the Z^o particle energy.

I have shown that the Equations 37.47-37.48 are correct. The theoretical value of E_{W^-} from the GUTCP theory is very close to the experimental value for E_{W^-}, the intermediate vector boson W^- particle energy.

Conclusion

I was able to verify the GUTCP results of Chapter 37 in excellent agreement with my own calculations and derivations of equations. I successfully reproduced all of the equations and derivations found in Chapter 37. This chapter demonstrates that the GUTCP theory is very successful at predicting the magnetic moment of the proton and neutron to a high degree of accuracy. The theory's values for these are in remarkably close agreement with their values experimentally. Also the theory predicts the energy of the Z^o and W^- particles which again are in remarkably close agreement with their experimental values.

I find my results and calculations to be confirmation that the derivations and equations of Chapter 37 are indeed valid, reproducible, and accurate.