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Magnetic Charge Theory. Part 3: Neutron Structure and Dark Matter Source

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Abstract

The concept of magnetic charge is further developed to explain the electron/proton magnetic bonding that forms the neutron. The derivation leads to a minimum range for the Coulomb force of 2.35 fm that explains the lack of the Coulomb force in the nucleus. Further investigation into the nature of gravity leads to the possibility that dark matter is a byproduct of stars.

Keywords

Neutron, Dark Matter, Gravity, Coulomb Force, Magnetic Monopole, Magnetic Charge

1. Introduction

The concept of a magnetic charge that produces a magnetic field proportional to its velocity was introduced to explain dark matter [1] [2], a high interest topic in physics with no explanation. Magnetic charge is distinct from a magnetic monopole as shown in Figure 1. If dark matter is given a positive magnetic charge then a transverse wave through the dark matter produces the electromagnetic properties of light, thereby equating dark matter with the ether. Assuming this ether is an ideal gas in an adiabatically expanding universe produced the result that the speed of light was related to the ether density. This result not only explained how the universe's expansion would be interpreted as accelerating when it is decelerating but also showed that spacetime was related to the ether density. When considering the fundamental ground state vibration of a particle with both electric charge and a negative magnetic charge, the particle produced two new types of waves in the ether that had the properties to explain the transmission of the Coulomb force (vortex photons) and gravity (gaussian photons).

Magnetic Charge Theory also concluded that mass is a calculated property of

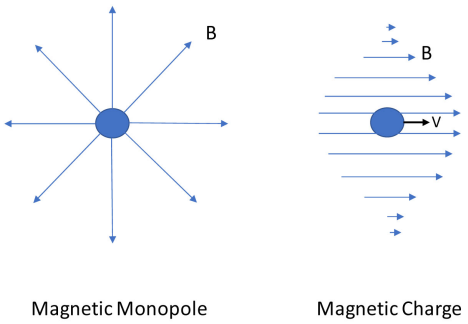

Figure 1. Magnetic monopole/magnetic charge distinction [2].

a particle that is proportional to the square of the magnetic charge [2]. A more profound result was obtained by calculating the total electromagnetic energy of a magnetic charge, vibrating in its ground state, and finding that this energy was equivalent to its rest mass energy. In other words, the rest energy of the magnetic particle was all electromagnetic energy.

This paper will further develop the result that total rest energy of particle is electromagnetic, and investigate if this result can be extended to understand the proton, neutron and electron. Specifically can these particles' rest energies be explained as purely electromagnetic? This investigation develops insight into electric and magnetic fields from charged particles that eliminate their field singularities at short distances. In addition, this work provides additional insight into gravity that was developed in a previous paper [2].

2. Electromagnetic Singularities

To calculate the total electromagnetic energy of a charged particle, the singularities that arise when calculating the electric field energy from an electric charge must be addressed. The energy in an electric field, E_E, is given by [3]:

$$E_E = \frac{1}{8\pi}\int \boldsymbol{E}\cdot\boldsymbol{D}\mathrm{d}V \tag{1}$$

where $\boldsymbol{E}$ is the electric field and $\boldsymbol{D}$ is the Displacement equal to $\varepsilon\boldsymbol{E}$, where ε is the dielectric constant (equal to one in this application).

The integral diverges when inserting the electric field from an electrically charged particle, q_e/r^2, and integrating from zero to infinity. Similarly, a moving electric charge creates a magnetic field [3]

$$\boldsymbol{B} = \frac{q_e}{c}\frac{\boldsymbol{v}\times\boldsymbol{x}}{|\boldsymbol{x}|^3} \tag{2}$$

The energy in a magnetic field is given by [3]:

$$E_B = \frac{1}{8\pi}\int \boldsymbol{B}\cdot\boldsymbol{H}\mathrm{d}V \tag{3}$$

This integral diverges for a moving, electrically charged particle when it is evaluated from zero to infinity. These divergences are not new and indicate that the singularities are inconsistent with reality, especially the coexistence of protons in

the nucleus.

Magnetic charge provides an explanation that eliminates these singularities. Electrically charged particles exchange vortex photons to exert the Coulomb force [2]. One possible explanation considers that two protons approaching each other will exchange vortex photons until the vortex photons are larger than the separation and unable to transmit the Coulomb force. Another possible explanation that could prevent attraction is that the vortex photon formation is disturbed when the two charges are too close. In either case there is a range where the electric field is reduced from the inverse square relationship. While the exact form of the electric field is unclear, a simple approximation is that the field remains inversely proportional to the separation squared outside a cutoff range, r_{co}, and zero inside this range. This leads to the electric field energy given by:

$$E_E = \frac{q_e^2}{8\pi}\int_{r_{co}}^{\infty}\frac{1}{r^4}\mathrm{d}V = \frac{q_e^2}{2r_{co}} \tag{4}$$

For an electron, setting E_E to its rest mass energy, mc^2, yields a cutoff range of 1.4 fm, however, this does not consider the electromagnetic field energies due to the vibrating ground state. It does, though, indicate that the cutoff range must be greater than 1.4 fm since vibrating charges contribute additional energy above just static electric field energy. For the proton, a similar calculation yields a cutoff range three orders magnitude smaller, but logically the cutoff range should not be dependent upon magnetic charge (or mass).

The magnetic field singularity from a moving electric charge has a different explanation. The electric field is related to the flux density of vortex photons travelling at the speed of light. The magnetic field is related to the ether density traveling at a velocity up to the speed of light. Magnetic fields approaching a singularity would mean that the ether is superluminal, but the velocity of the ether should be limited to the velocity of light. The magnetic field from a magnetic charge was previously assumed to be given by the following equation [2]:

$$\boldsymbol{B} = q_m \boldsymbol{v} \mathrm{e}^{-(\rho+|z|)/\sigma} \tag{5}$$

where the velocity is in the z direction, and ρ and z are cylindrical polar coordinates centered at the magnetic charge, q_m. Thus, if q_{met} is the magnetic charge of a particle of the ether, then the largest magnetic field, $\boldsymbol{B}_{\max}$, would be given by:

$$\boldsymbol{B}_{\max} = q_{met} c. \tag{6}$$

Thus, the magnetic field from a moving charge could follow Equation (2) until the field equals $\boldsymbol{B}_{\max}$. Inside the range where this occurs, the field would decrease to zero when the range goes to zero. The value of $\boldsymbol{B}_{\max}$ is currently unknown since q_{met} is unknown. Another interesting result is that this volume of reduced magnetic field near a moving electric charge is larger as the velocity of the charge particle increases.

In the case of lower velocities, there is another limit. With the electric field approximation being zero inside r_{co}, then its time derivative would also be zero inside r_{co} and hence, from Ampere's Law, the magnetic field is also zero. This

leads to the same approximation as the electric field, namely, the magnetic field is zero inside r_{co}. Thus, at lower velocities, inserting Equation (2) into Equation (3) and integrating from r_{co} to infinity, the magnetic field energy, E_M, is given by:

$$E_M = \frac{q_e^2 v^2}{3 r_{co} c^2} \tag{7}$$

3. Rest Mass Energy

Previous work showed that the rest mass energy of a magnetically charged particle was equal to the total electromagnetic energy that results from the particle vibrating in its ground state [2]. The analysis that follows will extend this observation by assuming that all energy is electromagnetic in nature and use this assumption to calculate r_{co} in Equation (4).

There are several components of the electromagnetic fields of a particle. First, there is the obvious electric filed due to its electric charge. The remaining fields are due to the vibration of its ground state, *i.e.*, the vibration of the electric and magnetic charges of the particle. The electric charge produces a circular magnetic field about the velocity direction, which is a maximum at maximum speed and zero at minimum speed. This changing magnetic field also yields an electric field in the velocity direction that is zero at maximum velocity and a maximum at zero velocity. Conservation of energy implies that the energy due to these vibrations is a constant, thus the energy is constantly transforming between magnetic and electric fields.

Similarly, the vibrating magnetic charge is creating magnetic and electric fields in its motion. The resulting magnetic field is in the velocity direction with a maximum at maximum speed and zero at zero speed. The changing magnetic field produces a changing electric field, circular about the velocity direction, that is maximum at zero speed and zero at maximum speed.

In both cases, the magnetic and electric fields are synchronized with the magnetic fields being a maximum at maximum speed and the electric fields being a maximum at zero speed. In addition, the magnetic fields produced by the magnetic charge are orthogonal to the magnetic fields produced by the electric charge; similarly, the electric fields are also orthogonal (but not orthogonal to the static electric field).

The total energy of the particle is the sum of the electric field energy and the magnetic field energy, which are both integrals of the fields squared over all space. The transformation of the vibrational energy between electric and magnetic fields complicates the integral for the electric field energy since the static field is not orthogonal to the vibrating electric fields. This would tend to imply that the total energy of the particle is fluctuating in defiance to the conservation of energy. There are two approaches to understand why this is not the case. First, if the vibrational electric fields are significantly contained inside the cutoff range, then the complication can be ignored, *i.e.*, $\sigma \ll r_{co}$. Second, the static electric field is a flux of vortex photons that are created by the ground state vibration of

the particle and would not exist simultaneously with the vibrational fields near the particle. Either of these explanations provide an answer consistent with energy conservation.

As a result of these arguments, the total energy of a particle, E_T, can be expressed as:

$$E_T = E_E + E_{ee} + E_{me} + E_{em} + E_{mm} \tag{8}$$

where:

E_E = static electric field energy (Equation (4)),

E_{ee} = electric field energy from electric charge motion,

E_{me} = magnetic field energy from electric charge motion,

E_{em} = electric field energy from magnetic charge motion, and

E_{mm} = magnetic field energy from magnetic charge motion.

E_{ee}, E_{me}, E_{em}, and E_{mm} are functions of time whose sum is a constant. The total energy can be calculated at any time in the cycle and, if the time is chosen at maximum speed or zero speed, two of these terms will equal zero.

4. Neutron, Proton and Electron Rest Energy Analysis

The neutron decays into a proton, an electron, and an antineutrino plus some energy, so the notion that the proton and electron are bound somehow is not a stretch of the imagination. A proton in motion produces a magnetic field according to Equation (5) inside r_{co}, and inside r_{co} there would effectively not be an electric field from electric charges; so, any binding would need to be a function of the magnetic field. An electron traveling at the same velocity would have a similar situation, but its magnetic field would be lower by the ratio of their magnetic charges. However, the proton's magnetic field is reduced at a distance and there exists a surface about the proton where its magnetic field would equal that of the electron traveling at the same velocity. If the electron were slightly displaced from this surface it would be forced back to this surface (as briefly discussed in reference [1]), hence, the electron's motion would be a sort of harmonic motion about this equilibrium surface created by the proton. Interestingly, this equilibrium surface is independent of velocity, hence, the ground state vibration of the proton would create a constant equilibrium surface where the electron would be bound as the proton's velocity changes.

While the collocation of the proton and electron negates the effect of electric charges, the total fields from the neutron are from the magnetic charges. The magnetic field of the neutron, $\boldsymbol{B}_n$, is given by Equation (5) as:

$$\boldsymbol{B}_n = \left(q_{me} + q_{mp}\right)\boldsymbol{v}\mathrm{e}^{-(\rho+|z|)/\sigma} \tag{9}$$

where q_{me} and q_{mp} are the magnetic charges of the electron and proton. The total field energy oscillates between a pure magnetic field at maximum velocity [2], c, and pure electric field at zero velocity. The total field energy can be calculated at any time with the easiest calculation occurring at maximum velocity. Inserting Equation (9) into Equation (3) yields the following as the total field energy of the

neutron, E_{Tn}:

$$E_{Tn} = \frac{1}{16}\sigma^3\left(q_{me} + q_{mp}\right)^2 c^2 = m_n c^2 \tag{10}$$

Expressions can be developed using a similar process for the electron and proton. In these cases, the electric charge contributes to the total energy, so the process is more involved. In both cases the static electric field energy is given by Equation (4).

The fields from their magnetic charges are also straight forward. Just as in the neutron calculation, the total field energy calculation can be performed at any time in the oscillation and the point of maximum velocity is again chosen. Inserting Equation (5) for the electron and proton into Equation (3) yields the magnetic field energy for the magnetic charge motion for the electron, E_{mme}, and proton, E_{mmp} at maximum velocity as:

$$E_{mme} = \frac{1}{16}\sigma^3 q_{me}^2 c^2 \tag{11}$$

$$E_{mmp} = \frac{1}{16}\sigma^3 q_{mp}^2 c^2 \tag{12}$$

The energy term relating to the magnetic field energy from the motion of the electric charge is determined by Equation (7), thus the magnetic field energy for the electron, E_{mee}, and the proton, E_{mep}, at maximum velocity are:

$$E_{mee} = \frac{q_{ee}^2}{3r_{co}} \tag{13}$$

$$E_{mep} = \frac{q_{ep}^2}{3r_{co}} \tag{14}$$

where q_{ee} and q_{ep} are the electric charges for the electron and proton.

Combining Equations (4) and (11)-(14) into Equation (8) produces the total energy for the electron, E_{Te}, and for the proton, E_{Tp}:

$$E_{Te} = \frac{q_{ee}^2}{2r_{co}} + \frac{q_{ee}^2}{3r_{co}} + \frac{1}{16}\sigma^3 q_{me}^2 c^2 = m_e c^2 \tag{15}$$

$$E_{Tp} = \frac{q_{ep}^2}{2r_{co}} + \frac{q_{ep}^2}{3r_{co}} + \frac{1}{16}\sigma^3 q_{mp}^2 c^2 = m_p c^2. \tag{16}$$

Equations (10), (15), and (16) form three equations with four unknowns that result in the following:

$$\frac{1}{r_{co}} = \frac{3c^2}{10q_e^2 m_n}\left[4m_e m_p - \left(m_n - m_p - m_e\right)^2\right] = \frac{1}{2.35\ \text{fm}} \tag{17}$$

$$\sigma^{1.5} q_{me} = -4\left[m_e - \frac{m_e m_p}{m_n} + \frac{\left(m_n - m_p - m_e\right)^2}{4m_n}\right]^{1/2} = -4.97\times10^{-15}\,\text{g}^{1/2} \tag{18}$$

$$\sigma^{1.5} q_{mp} = -4\left[m_p - \frac{m_e m_p}{m_n} + \frac{\left(m_n - m_p - m_e\right)^2}{4m_n}\right]^{1/2} = -5.17\times10^{-12}\,\text{g}^{1/2}. \tag{19}$$

These three equations were evaluated with the following: electron mass of $9.1093837015128\ (28) \times 10^{-28}$ g [4], proton mass of $1.67262192369\ (51) \times 10^{-24}$ g [5], neutron mass of $1.67492749804\ (95) \times 10^{-24}$ g [6], and electron charge of $-4.80320451\ (10) \times 10^{-10}$ esu [4].

The result that $r_{co} = 2.35$ fm from Equation (17) is consistent with the atom; being slightly greater than the size of the nucleus, it explains the lack of the Coulomb force in the nucleus, *i.e.*, the protons do not repel each other, and r_{co} is also much smaller than the Bohr radius so that the understanding of the electron cloud defined by quantum mechanics is unperturbed.

The magnetic charge results provide more insight into the proton and electron. The proton's magnetic charge is about 1040 times that of the electron from Equations (18 and 19). Further examination of their energy partition provides the results in **Table 1**, which illustrates that the proton's energy is primarily a result of its magnetic charge while the electron's energy is primarily a result of its electric charge.

The values in **Table 1** were calculated with respect to their rest energies, mc^2, and the solutions from Equations (17)-(19). The contribution from the static electric field energy is given by Equation (4). The contribution from the vibrating electric charge is given by Equations (13) and (14). The total electric charge contribution is the sum of these two contributions. The total vibrating magnetic charge contributions are from Equations (11) and (12).

The magnetic charge ratio between the proton and electron implies that their separation is about 7σ. While 7σ would seem like a large separation, σ was previously estimated to be less than 6.2×10^{-19} cm [2], hence 7σ would be less than 4×10^{-18} cm. This small separation compared to nuclear size and r_{co} would seem to justify the approximation that the proton and electron were collocated in the neutron.

The magnetic charge solutions and the σ estimate, lead to the lower bound for the proton and electron magnetic charges of $1.55 \times 10^{+16}$ sc·sec·cm^{-3} and $1.49 \times 10^{+13}$ sc·sec·cm^{-3}, respectively. This means that the peak magnetic fields that occur for the proton and electron in their ground state vibrations are greater than $4.65 \times 10^{+26}$ gauss and $4.48 \times 10^{+23}$ gauss. These extremely large fields indicate that the bonding to form the neutron is extraordinarily strong while the spatial extent of these fields is extremely limited due to their exponential nature.

Maybe the most important insight from this calculation is the neutron decay. The neutron decays into a proton, an electron, and an antineutrino, however,

Table 1. Percent energy contributions to basic particles' rest energy.

Energy Source	Electron	Proton	Neutron
Static electric charge	59.90%	0.032%	0
Vibrating electric charge	39.93%	0.022%	0
Total electric charge	99.83%	0.054%	0
Total vibrating magnetic charge	0.17%	99.946%	100%

this calculation does not require a third particle to bind the proton and electron. The electron is dominated by the proton's field, but the electron still has a ground state vibration that can perturb its motion with respect to the equilibrium surface. The electron's deviation from the equilibrium surface is driven back to the surface everywhere except when the motion takes it outside the surface at the extreme furthest distance from the proton that is normal to its vibration direction. At this extreme, any motion away from the proton (normal to the velocity) would create a cyclical motion of the electron about the proton before it exits the vicinity of the proton. This cyclical motion has the basic properties needed to produce a vortex photon, which may indicate that the antineutrino is a high-energy vortex photon. Since the vortex photon has a strong electric field impulse, this would certainly be consistent with the antineutrino creating an ionization trail in a cloud chamber.

5. Gravity Insights

In the previous paper [2], gaussian photons, g-photons, were shown to produce properties that resembled gravity. The g-photons are impulses of magnetic field in the velocity direction that radiate from the ground state vibrations of a particle. When these g-photons interact with normal matter with their negative magnetic charge, they produce an attractive force, just like gravity. By the same token, if there are particles with a positive magnetic charge, they would be repelled. As a result, in the interaction with the ether by g-photons, the ether would not be attracted and, thus, cannot explain the higher ether densities implied by the stronger gravitational field. In addition, if the ether density is larger in the galaxy center, it is not clear that this would produce a larger gravitational field.

If gravity does not attract the ether, then the obvious solution is that the ether is being created or released from stars. If this is the case, then a star should have a magnetic monopole moment.

A higher ether density at galaxy center can explain the stronger gravitational force, but not as a direct result of the additional mass of the ether. The explanation lies in the variation of space-time that results from the higher ether densities. The higher ether density will speed time up [1] and thus the particles will vibrate faster and thus produce a higher g-photon flux. The higher flux produces a larger gravitation pull and explains the observations that have led to the dark matter hypothesis.

6. Summary

The introduction of magnetic charge and the assumption that a particle's rest energy is all electromagnetic, provides a rational explanation for the magnetic binding of a proton and electron to produce the neutron. In addition, the theory results in a cutoff range for the Coulomb force of 2.35 fm, the revelation that the proton's energy is largely due to its magnetic charge, while the electron's energy

is largely due to its electric charge, and the possibility that the antineutrino is a high-energy vortex photon. All of these results are consistent with known physics and are key to understanding the proton's lack of repulsion in the nucleus.

Additional inspection of the interactions of g-photons implies the possibility that dark matter/ether is being generated or released from stars and would predict stars as having an overall magnetic monopole moment.

Magnetic Charge Theory and these results continue to explain some of the most important questions in physics, including:

- Explaining the photon, its electromagnetic fields, and why the magnetic fields do not form circuits as usually seen in other situations [2].
- Explaining that the variations in space-time are due to variations in the ether density [1].
- Explaining that the speed of light is dependent on the ether density, while explaining that the measurement of the local speed of light will always produce the same result when measured locally [1].
- Explaining that the transmission of the Coulomb force is by a flux of vortex photons emitted from the ground state vibration of matter. The repulsion/attraction forces are explained by the rotation direction of the v-photons [2].
- Explaining that the Coulomb force disappears within 2.35 fm of an electric charge and, thus, explaining why protons do not repel each other in the nucleus.
- Explaining that gravity is a flux of gaussian photons from a particle's ground-state vibration and that the g-photons possess a magnetic field impulse that interacts with a particle's magnetic charge [2]. The theory suggests that the ether is produced by stars and that stars have a magnetic monopole moment.
- Explaining how the universe's expansion is seen as accelerating (due to the assumption of a constant speed of light) when in fact the expansion is decelerating [1].
- Explaining that a particle's rest energy is purely electromagnetic, and mass is a calculated property proportional to the square of its magnetic charge.
- Explaining the neutron as a magnetically bound state of an electron and proton, and suggests that antineutrinos are high-energy v-photons.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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