The Relation of Electric and Magnetic Field Laws to Matter Laws

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Summary

The equations for calculating the energy and forces of matter are shown to be the equivalent of the equations for calculating electric and magnetic energy and forces. The laws are equivalent when expressed mathematically for a single electron particle as it is the commonality between matter and electric/magnetic fields.

The laws of matter, such as Einstein's mass-energy equivalence, is naturally derived to Coulomb's energy (the energy form of Coulomb's force law). Additional matter laws are shown to be the equivalent of fields laws in Table 1. Each law can be calculated to be the equivalent of each other using the conservation of energy principle, the mass of a single electron and the electron's classical radius. Each law can be derived to a lower form using wave constants from energy wave theory. These constants are found in Section 1.

The equations for induction and electromagnetism (in Sections 3 and 4 respectively) use Robert Distinti's *New Inductance*[1] and *New Magnetism*[2] due to their ability to calculate forces accurately in point particle form.

	Electric/Magnetic Laws		Matter Law	Section
At Rest	Coulomb's Law[1]	=	Einstein's Mass-Energy Energy at distance: $E=mc^2 * (r_e/r)$	Section 2
	Magnetic Moment[2]	=	Newton's Law of Gravitation Centripetal Force: $F=Gm_1m_2 / r^2$	Section 6
In Motion	New Induction	=	Newton's 2nd Law of Motion $F=ma$	Section 3
	New Magnetism	=	Newton's 2nd Law of Motion Centripetal Force: $F=mv^2 / r$	Section 4
	Induction[3]	=	Magnetism[3]	Section 5

Table 1 – Relationship of Electric/Magnetic Field Laws to Classical Matter Laws

[1] Coulomb's Law (energy form to compare with Einstein's mass-energy)
[2] Electron magnetic moment
[3] Faraday's law for the relationship of induction and magnetism

Section 1:
Energy Wave Constants and Variables

The following are the wave constants and variables used in the equations, derived from energy wave theory. Further information on the notation used and the derivation of these constants at energywavetheory.com/equations.

Symbol	Definition	Value (units)
	Wave Constants	
A_l	Amplitude (longitudinal)	$3.662796647 \times 10^{-10}$ (m)
λ_l	Wavelength (longitudinal)	$2.817940327 \times 10^{-17}$ (m)
ρ	Density (aether)	$9.422369691 \times 10^{-30}$ (kg/m^3)
c	Wave velocity (speed of light)	299,792,458 (m/s)
	Variables	
δ	Amplitude factor	variable - (m^3)
K	Particle wave center count	variable - *dimensionless*
n	Wavelength count	variable - *dimensionless*
Q	Particle count (in a group)	variable - *dimensionless*
	Electron Constants	
K_e	Particle wave center count - electron	10 - *dimensionless*
	Derived Constants*	
O_e	Outer shell multiplier – electron	2.138743820 – *dimensionless*
Δ_e / δ_e	Orbital g-factor /amp. factor electron	0.993630199 – *dimensionless* / (m^3)
Δ_{Ge}/δ_{Ge}	Spin g-factor/amp. gravity electron	0.982746784 – *dimensionless* / (m^3)
Δ_T	Total angular momentum g-factor	0.976461436 – *dimensionless*
α_e	Fine structure constant	0.007297353 – *dimensionless*
α_{Ge}	Gravity coupling constant - electron	$2.400531449 \times 10^{-43}$ - *dimensionless*

Table 1.1.1 – Energy Wave Equation Constants and Variables

Section 2:
Coulomb Force Derivation

Derivation of Particle Rest Force

The Coulomb energy can be represented as:

$$E = mc^2\left(\frac{r_e}{r}\right) \qquad \textbf{(1.2.1)}$$

The mass of a group of electrons is the summation of the electron's mass multiplied by the count of particles in the group (Q_1). *Note: Q is a **dimensionless** count of electrons – a lower case q is used for total charge.*

$$m = Q_1 m_e \qquad \textbf{(1.2.2)}$$

Substituting for mass, the energy is:

$$E = Q_1 m_e c^2\left(\frac{r_e}{r}\right) \qquad \textbf{(1.2.3)}$$

When represented as a force, the energy of the group of particles Q_1 is affected by a second group of particles Q_2 at distance (r). The unit vector is used.

$$F = E\frac{Q_2}{|r|} \qquad \textbf{(1.2.4)}$$

$$\hat{r} = \frac{r}{|r|} \qquad \textbf{(1.2.5)}$$

$$|r| = \frac{r}{\hat{r}} \qquad \textbf{(1.2.6)}$$

Substituting Eq. 1.2.3 and 1.2.6 into Eq. 1.2.4 yields:

$$F = m_e c^2 \left(\frac{r_e}{r^2}\right) Q_1 Q_2 \hat{r} \tag{1.2.7}$$

It will now be derived in terms of a common wave equation. From *Fundamental Physical Constants*[3], the electron mass and classical radius were derived and match in both value and units. Note that the electron mass is shown in two different forms, derived from longitudinal energy (Eq. 1.2.8) and transverse energy (Eq. 1.2.9). The electron's classical radius is shown in Eq. 1.2.10.

$$m_e = \frac{4\pi\rho K_e^5 A_l^6 O_e}{3\lambda_l^3} \tag{1.2.8}$$

$$m_e = \frac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l \Delta_e} \tag{1.2.9}$$

$$r_e = K_e^2 \lambda_l \tag{1.2.10}$$

The particle rest force at distance is derived using these constants to be the Force Equation, as found in the *Forces*[4] paper, which accurately calculates the electric, gravitational and strong forces. Substituting for electron mass (Eq. 1.2.9) and electron radius (Eq. 1.2.10) into Eq. 1.2.7 yields the Force Equation.

$$F = \frac{4\pi\rho K_e^7 \lambda_l^2 c^2 \delta_e}{A_l \Delta_e} \frac{Q_1 Q_2}{r^2} \hat{r} \tag{1.2.11}$$

Note: due to the electron mass having two derivations from longitudinal and transverse energy equations, there are two forms of the Force Equation. Both are equal. The Force Equation in other papers does not use the unit vector which has been added here.

$$F = \frac{4\pi\rho K_e^7 A_l^6 c^2 O_e}{3\lambda_l^2} \frac{Q_1 Q_2}{r^2} \hat{r} \tag{1.2.12}$$

Derivation of Coulomb Force

From the *Fundamental Physical Constants* paper, the elementary charge (Eq. 1.2.13) and Coulomb constant (Eq. 1.2.14) were derived correctly in both value and units. *Note: charge is measured in amplitude (meters), not Coulombs, in wave theory.*

$$e_e = \sqrt{\frac{3\pi A_l \lambda_l}{4K_e^{12} \Delta_e}} \cdot (\Delta_T^{-1}) \qquad \textbf{(1.2.13)}$$

$$k_e = \frac{16\rho K_e^{19} \lambda_l c^2 \delta_e}{3A_l^2} (\Delta_T^2) \qquad \textbf{(1.2.14)}$$

Similar to a collection of particles to measure total mass, the total charge (q) is based on the number of particles (Q) and the elementary charge.

$$q = Qe_e \qquad \textbf{(1.2.15)}$$

The Coulomb force (F_e) in Eq. 1.2.16 can be derived to the Force Equation (Eq. 1.2.18) by substituting the above from Eqs. 1.2.13 to 1.2.15. Note that the unit vector has been added to the Coulomb force equation. It is identical to the force of the rest energy of a particle at distance (F). **Both derivations of forces are equal: F=F$_e$** (Eq. 1.2.12 = Eq. 1.2.18).

$$F_e = k_e q_1 q_2 \frac{1}{r^2} (\hat{r}) \qquad \textbf{(1.2.16)}$$

$$F_e = \frac{16\rho K_e^{19} \lambda_l c^2 \delta_e}{3A_l^2} (\Delta_T^2) \left(\sqrt{\frac{3\pi A_l \lambda_l}{4K_e^{12} \Delta_e}} \cdot (\Delta_T^{-1}) \right)^2 \frac{Q_1 Q_2}{r^2} (\hat{r}) \qquad \textbf{(1.2.17)}$$

$$F_e = \frac{4\pi\rho K_e^{7} \lambda_l^2 c^2 \delta_e}{A_l \Delta_e} \frac{Q_1 Q_2}{r^2} \hat{r} \qquad \textbf{(1.2.18)}$$

Section 3:
Induction Derivation

Derivation of Newton's Second Law

The electron's mass and radius are shown in the previous calculation for the Coulomb force. They are used again here in this section. Newton's second law is first converted to energy, due to a difference in diminishing force at distance - the force of induction diminishes with distance (r) whereas Newton's second law does not. Energy is conserved at the point where it leaves the **electron's radius**. Energy is the force over this radius (Eq. 1.3.2). Force is replaced with mass and acceleration (Eq. 1.3.3). Then, the wave constants for mass and electron radius (Eqs. 1.2.8 to 1.2.10) are substituted (Eq. 1.3.4) and simplified to become the wave equation form of induction (Eq. 1.3.5).

$$F = ma \qquad \textbf{(1.3.1)}$$

$$E = Fr_e \qquad \textbf{(1.3.2)}$$

$$E = mar_e \qquad \textbf{(1.3.3)}$$

$$E = \frac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l \Delta_e} Q_1 Q_2 a \,(K_e^2 \lambda_l) \qquad \textbf{(1.3.4)}$$

$$E = \frac{4\pi\rho K_e^7 \lambda_l^2 \delta_e}{A_l \Delta_e} Q_1 Q_2 a \qquad \textbf{(1.3.5)}$$

Derivation of New Induction

Distinti's New Induction equation uses the constant K_M which is related to the magnetic constant as shown in Eq. 1.3.6. From the *Fundamental Physical Constants* paper, the magnetic constant was derived and is shown in Eq. 1.3.7.

$$K_M = \frac{\mu_0}{4\pi} \qquad \textbf{(1.3.6)}$$

$$\mu_0 = \frac{64\pi\rho K_e^{19}\lambda_l\delta_e}{3A_l^2}(\Delta_T^2) \tag{1.3.7}$$

Distinti's New Induction equation is shown in Eq. 1.3.8. To compare it to Newton's second law, it must be converted to **energy at the electron's radius** (Eq. 1.3.9), similar to the previous step. Eq. 1.3.8 is then substituted into Eq. 1.3.9 to replace the induction force. Next, the wave constants (Eqs. 1.3.6, 1.3.7, 1.2.13, 1.2.15) are substituted in Eq. 1.3.10 to become Eq. 1.3.11. Lastly, it is simplified to Eq. 1.3.12. The New Induction energy is identical to the energy of Newton's second law of motion for a particle**: E=E$_{\mathbf{i}}$** (Eq. 1.3.5 = Eq. 1.3.12).

$$F_i = K_M \frac{q_1 q_2}{|r|} a \tag{1.3.8}$$

$$E_i = F_i r_e \tag{1.3.9}$$

$$E_i = K_M \frac{q_1 q_2}{r_e} a r_e \tag{1.3.10}$$

$$E_i = \left(\frac{16\rho K_e^{19}\lambda_l\delta_e}{3A_l^2}(\Delta_T^2)\right)\left(Q_1 Q_2\left(\sqrt{\frac{3\pi A_l\lambda_l}{4K_e^{12}\Delta_e}}\cdot(\Delta_T^{-1})\right)^2\right)a \tag{1.3.11}$$

$$E_i = \frac{4\pi\rho K_e^7\lambda_l^2\delta_e}{A_l\Delta_e} Q_1 Q_2 a \tag{1.3.12}$$

Section 4:
Electromagnetism Derivation

Derivation of Particle Centripetal Energy

Once again, force needs to be converted to energy because centripetal force diminishes based on distance (r), whereas the point charge form of the Distinti New Magnetism equation diminishes at the square of distance (r^2). Energy is force over distance (Eq. 1.4.2), and then Eq. 1.4.1 is substituted into Eq. 1.4.2 to become Eq. 1.4.3. Next, the wave constant for mass (Eqs. 1.2.2, 1.2.9) is substituted into Eq. 1.4.3 to become Eq. 1.4.4. This is the wave constant form of centripetal energy.

$$F_c = \frac{mv^2}{r} \tag{1.4.1}$$

$$E_c = F_c r \tag{1.4.2}$$

$$E_c = \frac{mv^2}{r} r \tag{1.4.3}$$

$$E_c = \frac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l \Delta_e} Q_1 Q_2 v^2 \tag{1.4.4}$$

Derivation of New Magnetism (single particle)

The Distinti New Magnetism equation (Eq. 1.4.5) needs to be converted to energy. It is the energy where force is applied at the distance of the **electron's classical radius** (Eq. 1.4.6). Eq. 1.4.5 is substituted into the force in Eq. 1.4.6. Next, the wave constants (Eqs. 1.3.6, 1.3.7, 1.2.13, 1.2.15, 1.2.10) are substituted into Eq. 1.4.7 to become Eq. 1.4.8. Finally, it is simplified to become Eq. 1.4.9. The New Magnetism energy is identical to the energy of centripetal energy for a particle: $\mathbf{E_c{=}E_m}$ (Eq. 1.4.4 = Eq. 1.4.9).

$$F_m = K_M \frac{q_1 q_2}{r^2} v^2 \tag{1.4.5}$$

$$E_m = F r_e \tag{1.4.6}$$

$$E_m = K_M \frac{q_1 q_2}{r_e} v^2 \tag{1.4.7}$$

$$E_m = \left(\frac{16 \rho K_e^{19} \lambda_l \delta_e}{3 A_l^2} (\Delta_T^2) \right) \left(\frac{Q_1 Q_2 \left(\sqrt{\frac{3\pi A_l \lambda_l}{4 K_e^{12} \Delta_e}} \cdot (\Delta_T^{-1}) \right)^2}{(K_e^2 \lambda_l)^2} \right) v^2 \tag{1.4.8}$$

$$E_m = \frac{4\pi \rho K_e^5 \lambda_l \delta_e}{A_l \Delta_e} Q_1 Q_2 v^2 \tag{1.4.9}$$

Derivation of New Magnetism (multiple particles)

The point charge form of Distinti's New Magnetism equation allows for two particle groups that may be traveling in different directions and speeds. This has an equivalent in the world of objects and is calculated with classical physics equations. When two particles collide in an elastic collision, the conservation of momentum is used to determine the outcome of the collision. The incoming velocity vectors (direction and speed) are used to determine the outgoing vectors after the collision. This is illustrated in the Particle View of Fig. 16.

Since particles are waves, even if traveling waves beyond the particle's radius, then the collision of both the longitudinal waves (from reflection) and transverse waves (from spin) can be considered. This collision is known as wave interference and affects the overall wave amplitude.[5] The interference of longitudinal waves causes motion is captured in the equation for the Coulomb force. The interference of the transverse wave from particle spin is captured in the equation for New Magnetism. The latter is illustrated in the Wave View of Fig. 16.

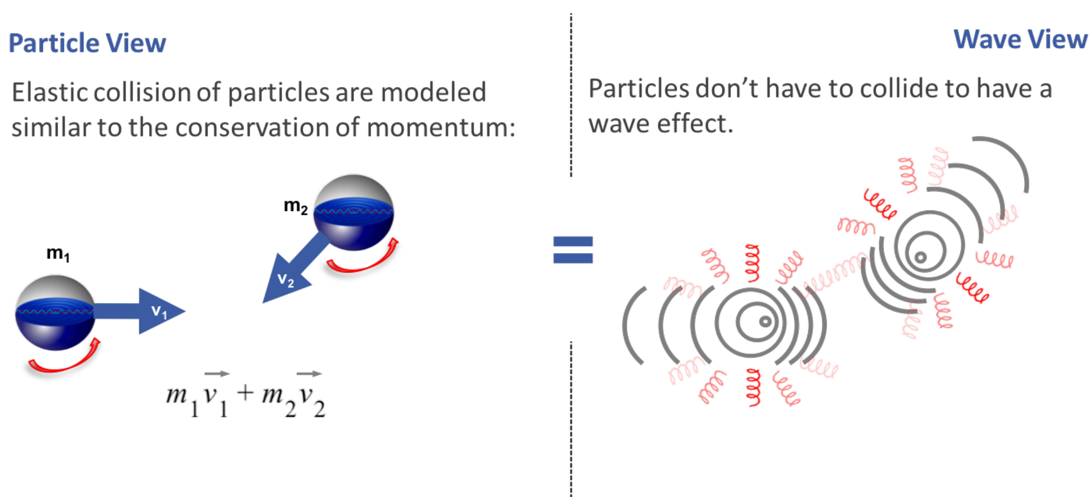

Fig 16 – Multiple particles in motion

The net effect of a second velocity (v_2) of a particle group Q_2 on the first group Q_1 has been derived Distinti and is not replicated here. It has an overall effect on the velocity (v) in Eq. 1.4.9. The two groups of particles may travel at different velocities, separated at distance (r), according to Distinti as:

$$v^2 = ((v_2 \cdot \hat{r})\, v_1 - (v_1 \cdot \hat{r})\, v_1 - (v_1 \cdot v_2)\, \hat{r}) \quad \textbf{(1.4.10)}$$

Substituting Eq. 1.4.10 into Eq. 1.4.9, yields:

$$E_m = \frac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l \Delta_e} Q_1 Q_2 ((v_2 \cdot \hat{r})\, v_1 - (v_1 \cdot \hat{r})\, v_1 - (v_1 \cdot v_2)\, \hat{r}) \quad \textbf{(1.4.11)}$$

In terms of a force, it can be expressed in wave constant form in Eq. 1.4.12. It can also be reverse-derived to become the complete equation for Distinti's New Magnetism - point charge in Eq. 1.4.13:

$$F_m = \frac{4\pi\rho K_e^7 \lambda_l^2 \delta_e}{A_l \Delta_e} \frac{Q_1 Q_2}{r^2} ((v_2 \cdot \hat{r})\, v_1 - (v_1 \cdot \hat{r})\, v_1 - (v_1 \cdot v_2)\, \hat{r}) \quad \textbf{(1.4.12)}$$

$$F_m = K_M \frac{q_1 q_2}{r^2} ((v_2 \cdot \hat{r})\, v_1 - (v_1 \cdot \hat{r})\, v_1 - (v_1 \cdot v_2)\, \hat{r}) \quad \textbf{(1.4.13)}$$

Section 5:
Faraday's Law Derivation

Relation Between Inductance and Magnetism

The relationship between inductance and magnetism is based on the conservation of energy, shown mathematically in the next equations where E_i is from Eq. 1.3.12 and E_m is from Eq. 1.4.9.

$$E_i - E_m = 0 \tag{1.5.1}$$

$$E = \frac{4\pi\rho K_e^7\lambda_l^2\delta_e}{A_l\Delta_e}Q_1Q_2a - \frac{4\pi\rho K_e^5\lambda_l\delta_e}{A_l\Delta_e}Q_1Q_2v^2 = 0 \tag{1.5.2}$$

A change in longitudinal wave amplitude causes the movement of particles (a current). The velocity of a particle also introduces a change in spin. This is illustrated in the next figure for an electron moving at velocity (v), causing the spin at the radius (r_e).

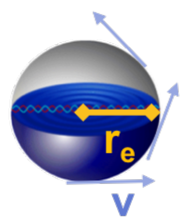

Fig 17 – Centripetal force of an electron based on velocity (v) and radius (r_e)

Acceleration occurs in a change in direction, as found in the equation for centripetal force. The centripetal acceleration of a particle is found in Eq. 1.5.3. Since the classical radius of the electron can be expressed in terms of wave constants (from Eq. 1.2.10), it is substituted in Eq. 1.5.3 to become Eq. 1.5.4.

$$a = \frac{v^2}{r_e} \tag{1.5.3}$$

$$a = \frac{v^2}{K_e^2\lambda_l} \tag{1.5.4}$$

The equation for inductance is shown again in Eq. 1.5.5. Substituting Eq. 1.5.4 into Eq. 1.5.5, and then simplifying inductance shows that it is indeed the same when using the wave equation format for magnetism. **They are related due to the conservation of energy principle.**

$$E_i = \frac{4\pi\rho K_e^7 \lambda_l^2 \delta_e}{A_l \Delta_e} Q_1 Q_2 a \qquad \textbf{(1.5.5)}$$

$$E_i = \frac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l \Delta_e} Q_1 Q_2 v^2 \quad = \quad E_m = \frac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l \Delta_e} Q_1 Q_2 v^2 \qquad \textbf{(1.5.6)}$$

Section 6:
Magnetism Derivation

Derivation of Newton's Universal Gravitation (electron)

From *Fundamental Physical Constants,* the derivation of the gravitational constant G, which matches in units and value is:

$$G = \frac{\lambda_l^3 c^2}{24\pi^2 \rho K_e^{23} A_l^2 \delta_e} (\Delta_e^2) \qquad \textbf{(1.6.1)}$$

Newton's universal law of gravitation for the mass of two electrons (m_e) separated at the electron's classical radius distance (r_e) is shown in Eq. 1.6.2. However, it needs to be converted to energy instead of a force, to compare to two other forms. Since energy is force at a distance, it becomes Eq. 1.6.3. Since the electron mass, radius and gravitational constant can be expressed in wave constant terms (Eqs. 1.2.2, 1.2.9, 1.2.10, 1.6.1), they are substituted to become Eq. 1.6.4. Finally, after simplification, the gravitational energy of an electron is found in Eq. 1.6.5. It is calculated to be 1.97 x 10^{-56} joules.

$$F = \frac{G m_e m_e}{r_e^2} \qquad \textbf{(1.6.2)}$$

$$E = \frac{G m_e m_e}{r_e} \qquad \textbf{(1.6.3)}$$

$$E = \frac{\dfrac{\lambda_l^3 c^2}{24\pi^2 \rho K_e^{23} A_l^2 \delta_e} (\Delta_e^2) \left(\dfrac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l} (\Delta_e^{-1}) \right)^2}{K_e^2 \lambda_l} Q_1 Q_2 \qquad \textbf{(1.6.4)}$$

$$E_g = \frac{2\rho \lambda_l^4 c^2 \delta_e}{3 K_e^{15} A_l^4} Q_1 Q_2 \qquad \textbf{(1.6.5)}$$

Derivation of Particle Rest Energy with Gravitational Coupling Constant (electron)

From *Fundamental Physical Constants,* the derivation of the gravitational coupling constant for the electron is the gravitational force strength of an electron relative to the electric force strength of the electron (Eq. 1.6.6). The derivation in wave constant terms is found in Eq. 1.6.7.

$$\alpha_{Ge} = \frac{F_g}{F_e} = 2.4x10^{-43} \quad \textbf{(1.6.6)}$$

$$\alpha_{Ge} = \frac{\lambda_l^3}{6\pi K_e^{20} A_l^3} (\Delta_e) \quad \textbf{(1.6.7)}$$

The rest energy of the electron is now multiplied by this coupling constant, shown in Eq. 1.6.8. Since these constants are derived in wave constant terms (Eq. 1.2.2, 1.2.9, 1.6.7), they are replaced in Eq. 1.6.9. After simplifying, the same derivation of the energy for a single electron is found in Eq. 1.6.10. It matches the alternative derivation using Newton's law of universal gravitation (Eq. 1.6.5).

$$E = m_e c^2 \alpha_{Ge} \quad \textbf{(1.6.8)}$$

$$E = \frac{4\pi\rho K_e^5 \lambda_l \delta_e}{A_l} (\Delta_e^{-1})\, c^2 \frac{\lambda_l^3}{6\pi K_e^{20} A_l^3} (\Delta_e)\, Q_1 Q_2 \quad \textbf{(1.6.9)}$$

$$E_g = \frac{2\rho\lambda_l^4 c^2 \delta_e}{3K_e^{15} A_l^4} Q_1 Q_2 \quad \textbf{(1.6.10)}$$

Derivation of Magnetic Spin Rest Energy

From *Fundamental Physical Constants,* the derivation of the Planck charge (Eq. 1.6.11) and Bohr magneton (Eq. 1.6.12) are required for the next step. They match in value. Note the units of charge are expressed in wave amplitude (meters) in wave theory.

$$q_P = \frac{A_l}{2K_e^8} (\Delta_T^{-1}) \quad \textbf{(1.6.11)}$$

$$\mu_B = \frac{c}{4K_e^8}\sqrt{\frac{A_l^3 \lambda_l \Delta_e}{3\pi}} \cdot (\Delta_T^{-1}) \qquad \textbf{(1.6.12)}$$

The spin of wave centers occurs at the core of the particle (r_{core}). This is where energy is transferred from longitudinal waves to transverse waves. It has the following form (Eq. 1.6.13), where the magnetic constant (μ_0) represents permeability in the vacuum, with the square of the Planck charge (q_P) and Bohr magneton (μ_B) at the particle's core. Note that the magnetic constant is divided by the amplitude factor constant, which is essentially one (1) for the vacuum, but this change in constructive wave interference allows for materials with different permeability. The core of the particle is found in *Particle Energy and Interaction*[6]. It has the form in Eq. 1.6.14.

$$E_{m\,(core)} = \frac{\mu_0}{\delta_e}\left(\frac{q_P \mu_B}{r_{core}}\right)^2 \qquad \textbf{(1.6.13)}$$

$$r_{core} = \frac{r_e}{K_e} \qquad \textbf{(1.6.14)}$$

To compare the energy from spin magnetism to gravity, the energy of the entire particle (to the classical electron radius – r_e) needs to be calculated. Therefore, Eq. 1.6.14 is substituted into Eq. 1.6.13. Two additional constants are added to Eq. 1.6.15. First, O_e is also added to the equation since the energy of the entire particle is being calculated. This is the multiplier of core energy to particle energy, as found in *Particle Energy and Interaction.* Second, there are two transverse waves created for spin traveling in opposite directions. A "2" precedes the equation to represent that there are two waves.

All of these constants are derived in terms of wave constants, including O_e found in Eq. 1.6.16. The remainder of the constants are found earlier in Eqs. 1.2.10, 1.3.7, 1.6.11, 1.6.12. They are substituted to become Eq. 1.6.17 (note that the g-factor has also been added). Finally, it is simplified to become Eq. 1.6.18.

$$E_m = 2\frac{\mu_0}{\delta_e}\left(\frac{K_e q_P \mu_B}{r_e}\right)^2 O_e \qquad \textbf{(1.6.15)}$$

$$O_e = \frac{3\lambda_l^4 \delta_e}{A_l^7}(\Delta_e^{-1}) \qquad \textbf{(1.6.16)}$$

$$E_m = 2\frac{64\pi\rho K_e^{19}\lambda_l\delta_e}{3A_l^2}(\Delta_T^2)\left(\frac{K_e\dfrac{A_l}{2K_e^8}(\Delta_T^{-1})\dfrac{c}{4K_e^8}\sqrt{\dfrac{A_l^3\lambda_l\Delta_e}{3\pi}}\cdot(\Delta_T^{-1})}{K_e^2\lambda_l}\right)^2\frac{\dfrac{3\lambda_l^4\delta_e}{A_l^7}(\Delta_e^{-1})}{\delta_e}(\Delta_T^2)Q_1Q_2 \qquad \textbf{(1.6.17)}$$

$$E_m = \frac{2\rho\lambda_l^4c^2\delta_e}{3K_e^{15}A_l^4}Q_1Q_2 \qquad \textbf{(1.6.18)}$$

The spin energy of an electron at rest includes magnetic energy. In many atoms, this spin energy can be cancelled from particles that have opposite spin. An atom with more same-spin particles, or electrons traveling at velocity, are what is witnessed as magnetism at the macro-level. Yet an electron is always spinning and taking energy. This reduces longitudinal wave energy, producing the shading effect known as gravity. **The magnetic energy (E_m) and the gravitational energy (E_g) of a single electron are equal. E_g=E_m** (Eq. 1.6.10 = Eq. 1.6.18).

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