Electron Mass and State Energy Levels Resulting from Photon-Photon Interaction

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This paper presents a summary of a number of papers representing an alternate view of the physics of particle structure and particle interaction [1-8]. The papers present an alternate interaction mechanism between photons and mass particles based on the probability of photons actually existing on the Feynman action paths. The theories are far from finished but there are clear indications that electric and gravitation aspects are the same phenomena, and it is clear that the value of Fine Structure Constant is the result of the interaction of photons with sufficient energy to form an electron. Progressively there has been a better understanding of the underlying mechanisms involved in the theory and thus, there are some points that are better presented here.

Abstract

This is a new perspective on fields and forces based on the Feynman action path view of quantum mechanics.

Although the probable Feynman paths are well known and have real effects, overlooked has been the probability that the particles are actually on these paths and have real effects. Presented here is the showing that the effect of these photons is responsible for both electric and gravitational interactions.

Richard Feynman developed the sum-over-histories view of QFT more than 70 years ago, showing that the path action a photon takes in going from one point to another is the sum of all possible paths. The most compelling proof of this is the delay represented by the Anomalous Magnetic Moment of the electron and the Aharonov–Bohm effect. The anomaly is the path delay due to the probability of being off the primary path. It has been measured and calculated to incredible precision and this makes the probability of these internal rotating photons being at a distance from the center of a particle undeniable.

Order of Presentation

Introduction

Gravitation

The Feynman path integral formulation of QED has implications beyond the path delays associated with the anomalous gyromagnetic ratio. That is that the photon action paths represent the probability that photons on action paths in the mass of particles, are actually on all the defined paths throughout space. The presence of these photons can account for the speed of light, and the forces of electric charge and gravitation [7].

From the primary postulate in "Vacuum Polarization, Gravitation, Charge, and the Speed of Light",[7] the ratio of the change in c to the observer's value is the potential energy to the total energy is:

$$\frac{\Delta c}{c_0} = \frac{\bar{\lambda}_{PL}^2}{\bar{\lambda}_P^2}\frac{2\lambda_P}{r} \equiv \frac{2Gm_1}{c^2 r} = \frac{\Delta\varepsilon}{\varepsilon_0} \qquad (1)$$

Eq.(1), is a specific energy relation between the total invariant mass energy of the m_2 particle to the change of its mass energy due to the change in c generated by the Feynman photons generated by the sum of all the individual particles $m_1 = n\,m_P$ mass.

Δc is the difference between the value c at the observed position , and c_0, the value in the reference frame, $\Delta c = c_0 - c$. Eq.(1), can be rewritten as

$$\frac{\Delta c}{c_0} = \frac{2\mu}{r} \rightarrow \frac{c}{c_0} = \left(1 - \frac{2\mu}{r}\right) \qquad (2)$$

This is the Schapiro Time Delay measured change in c as the result of the presence of a local mass, found by the projection of the GR metric onto Minkowski flat space [9]. The theory is thus in physical agreement with General Relatively, in regard to the effect of gravity on c.

If there is a mass particle m_2, the specific energy ratio at the potential point the expression Eq.(1) is ,

$$\frac{\Delta c}{c_0} = \frac{2\mu}{r} = \frac{2Gm_1m_2}{\left(m_2c_0^2\right)r_1} \qquad (3)$$

This is not the gravitational field potential, but the change in the total energy, $\Delta\varepsilon / \varepsilon_T$, or $\Delta\left(mc^2\right) / mc^2$ as a function of r.

This equation defines the change in the velocity of light due to the probability of the Feynman photon density from the n protons of m_1 passing at a distance r .at the location of m_2

The change in c induces a change in the "specific" relativistic energy of $\varepsilon = m_2c^2$, which is the source of the gravitational potential energy. It is not the standard Gravitational or electric field potential, but an invariant energy potential. (See [7] for details on potentials)

$$\frac{\Delta c}{c_0} = \frac{pc_0 - pc}{pc_0} = \frac{\varepsilon_0 - \varepsilon_k}{\varepsilon_0} = \frac{\varepsilon_P}{\varepsilon_0} \qquad (4)$$

This is the invariant energy of the system due to the invariant potential energy, or the "total" energy level on falling from infinity to r_1.

$$\varepsilon_0 = \varepsilon_k + \varepsilon_P \qquad (5)$$

The energies of mass particle in a reduced velocity of light, is a specific energy function independent of the total energy. For this expression, if ε_0, is the total relativistic energy $\varepsilon_0 = hv = mc_0^2$, or the Hamiltonian of a mass, or photon in the altered c. ε_k is the kinetic energy of the photon $\varepsilon_k = mc_0 c = p_0 c$, and ε_P is the invariant potential energy or rest energy as a result of being in an altered value of c. (See: Appendix II, and the paper on photon wavefunctions, [1] for further discussion on this.)

Eq.(1), is not the gravitational field energy, but the total energy potential. In a conservative system it includes the sum of both the Kinetic and the invariant energy potential.

In a non-conservative system with the velocity of the m_2 particle in Eq.(4), fixed, the static force is:

$$\Delta\varepsilon = \left(m_2 c_0^2 - m_2 c_0 c\right) = \frac{Gm_1 m_2}{r} \tag{6}$$

Eq.(6), is as noted in Eq.(5), a Hamiltonian expression.

Since force is $d\varepsilon / dr$ the force on the m_2 particle is then:

$$f = \frac{d\Delta\varepsilon}{dr} = -m_2 c_0 \frac{dc}{dr} = -\frac{Gm_1 m_2}{r^2} \tag{7}$$

, and is the proper gravitational force on the m_2 particle.

Mass of Electron - The First Energy Level in the Universe

The electron is the lowest possible value of invariant rest energy in the universe. It is the result of the binding of two photons that have sufficient energy to create a gradient in the radial index of refraction between the particles sufficient to overcome centrifugal effects, creating a stable invariant mass particle.

The energy of the photons necessary for that is determined by the ratio of the density of the Feynman photons in the universe to the self-generated density of the rotating photons. (See Appendix I, in regard to the nature of Photons.)

Mechanics of the Electron

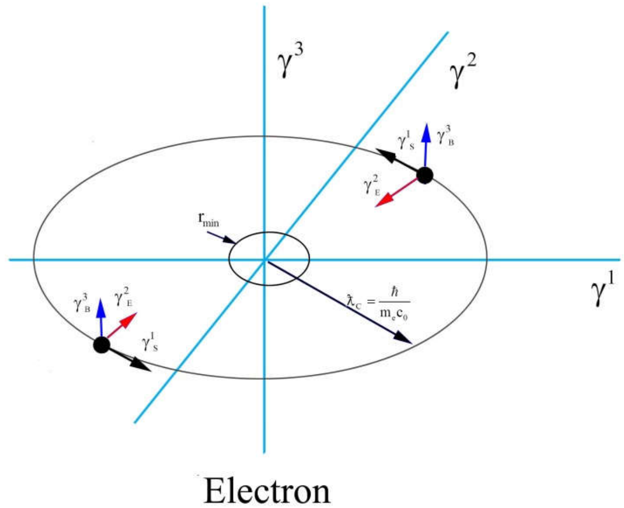

Fig.1. The vector orientation of the probability of location of two radially polarized photons rotating in the electron at the first most probable $L=\hbar$, orbit with r equal to the electron Compton radius. Red is the electric vector Blue is the magnetic vector and Black is the Poynting vector.

The electron is a composition particle composed of two photons, each with half the energy of the electron, revolving around the center of mass at a probable distance of the Compton radius. A photon passes or engages the probability of the other photon twice per revolution thus the frequency of photons passing the other photon is twice the rotation frequency. For a fixed point, there are two photon passing per revolution, which provides the proper Compton frequency for the electron. The Compton frequency is twice the rotation frequency of the photons.

From earlier papers, [2-9], noted in Eq.(1), the change in the velocity of light of a passing photon as the result of the probability of another photon passing at a perpendicular distance r is:

$$\frac{\Delta c}{c_0} = \frac{\bar{\lambda}_{PL}^2}{\bar{\lambda}_{ph}^2}\left(\frac{\bar{\lambda}_{ph}}{r}\right) = \left(\frac{\bar{\lambda}_{PL}^2}{\bar{\lambda}_{ph}^2}\right)\left(\frac{\hbar}{m_{ph} c r}\right) \qquad (8)$$

$$(\text{cross-section ratio}) \times \text{Feynman photon probability density}$$

The first term in brackets is change in the density of Feynman photons as the result of encountering the “ph” photon, and the second is the probability of the “ph” photon passing at a perpendicular distance r from the observed point. The momentum of the photon is $m_P c_0$, the Planck particle radius is $ƛ_{PL}$, and the Compton radius of the photon is $ƛ_{Ph}$.

If a photon is bound in orbit, at a frequency per revolution of ν_1, an interloping photon encounters the universal background density of Feynman photons per second, [2-4], plus the density of rotating photon. This slows the velocity of light proportional to the frequency.

$$\frac{\Delta c}{c_0} = \frac{ƛ_{PL}^2}{ƛ_1^2}\left(\frac{ƛ_1}{r}\nu_{ph}\right) \qquad (9)$$

The other photon in the electron is not an interloping photon, but participating. The velocity of the photons is proportional to the density of Feynman photons in the universe, plus the density of encountering the other photon. The change is proportional to the probability of encountering the other photon, thus the "coincidence: of the probable encounter of the photons in an orbit.

The product of the probability of the photon densities, thus the "coincident" probability of collision is:

$$P_1 P_2 = \frac{ƛ_1}{r}\nu_{ph}\frac{ƛ_2}{r}\nu_{ph} = \nu_{ph}^2\frac{ƛ_1}{r}\frac{ƛ_2}{r} \qquad (10)$$

The probability densities expressed here are for the Feynman photons of photons passing at a distance. The square of the frequencies ν_{ph}^2 is the coincident collision frequency of the photons.

QM Perspective

From the perspective of Standard QM the two probabilities of photon location in Eq.(10), would be the wave equation amplitude. The product is not actually a particle location probability but the location density of the photon-photon collision. The density of this alters the mutual velocity of light of the orbiting photon.

The orbiting photon passes a point the repetition density is once per revolution, but since the other photon is also orbiting the encounter rate is twice the frequency of rotation, thus:

$$\nu_{ph} \to 2\nu_{ph} \qquad r = ƛ_{ph}/2 \qquad (11)$$

The corresponding equation, Eq.(29), for the change in c at the center of mass for the two photons becomes:

$$\frac{\Delta c}{c_0} = \rightarrow \left(\frac{\lambda\!\!\!^{-}_{PL}\, 2v_{ph}}{r} \right)^2 \tag{12}$$

The numerator of this expression is the minimum radius of the orbiting photons, and the radius at which the centrifugal force equals the binding force of the two photons. (See Appendix IV Centrifugal force in electron)

The frequency of rotation is v_e thus the distance the photon travels at this distance in one second at the core of the electron c_e is $S = 2\pi\left(\lambda\!\!\!^{-}_{PL}\, 2v_{ph}\right)v_e$. The ratio of this distance to the distance light moves, c_0 in one second is:

$$\frac{c}{c_0} = \frac{\left(\lambda\!\!\!^{-}_{PL} v_e\right)\times 2\pi v_e}{c_0} = \frac{\Re_F\, \omega_e}{c_0} \tag{13}$$

Letting the Compton frequency of the Planck particle be $v_{PL} = c_0 / 2\pi\lambda\!\!\!^{-}_{PL}$, the ratio of the velocity of light in the center of the electron to the free value in the universe is equal to the ratio of the coincidence frequency of photons in the electron to the Compton frequency of the Planck particle:

$$\frac{c_e}{c_0} = \frac{v_e^2}{v_{PL}} \tag{14}$$

This is the condition for the formation of the electron.

From the vacuum polarization paper [7], the ratio of the velocity of light c_0 to the value at another point, c_e is inversely proportional to the ratio of the local density, to the Feynman photon density in the universe, n_f thus:

$$\frac{c_e}{c_0} = \frac{n_f}{n_e} \tag{15}$$

The density confronting the photon in the minimum orbit is the coincidence density v_e^2, but as noted before, on each orbit the photon encounters the opposite photon twice, thus the density experienced by the orbiting photons is:

$$n_e = 2v_e^2 \tag{16}$$

Putting this into Eq.(13), gives the value of c_e at the minimum possible orbit to be:

$$\frac{c_e}{c_0} = \frac{2\pi\lambdabar_{PL} v_e^2}{c_0} = \frac{n_f}{2v_e^2} \tag{17}$$

Solving this for the number density of Feynman photons in the universe gives:

$$n_f = v_e^2 v_e^2 \frac{4\pi\lambdabar_{PL}}{c_0} = 1.575538679E+38 \quad \text{photons sec}^{-1}\text{cm}^{-1} \tag{18}$$

This Feynman photon density is within about a 7%, of the estimated vacuum density of Feynman photons in the universe based on the estimated mass in the universe, i.e. $n_f = 1.6928448E+38 \ \text{photons sec}^{-1}\text{cm}^{-1}$, (see [7])

The Compton frequency and thus energy of the electron $\varepsilon = hv$ is then:

$$v_e = \sqrt[4]{\frac{c_0 n_f}{4\pi\lambdabar_{PL}}} \tag{19}$$

Eq.(17), can also be expressed in terms of the Fine Structure Constant as defined by the energy values associated with the atomic state values in the next section.

$$\frac{c_e}{c_0} = \frac{2\pi\lambdabar_{PL} v_e^2}{c_0} = \frac{n_f}{2v_e^2} = \frac{\alpha}{\sqrt{2}} \tag{20}$$

The state value of the two photons bound in the center of an electron Eq.(4), is then:

$$\frac{\Delta c}{c_0} = \frac{\Delta\varepsilon}{\varepsilon_T} = \left(1 - \frac{\alpha}{\sqrt{2}}\right) \tag{21}$$

It is asserted that this is the minimum energy necessary for a photon capable of binding with an equal photon, forming an electron, and **this is the first invariant mass energy level of the universe**.

Although Eq.(14), and Eq.(21), establishes the conditions for the mass of the electron, the minimum orbit is not a probable orbit for the electrons, for it is not a solution of the continuity relationship required as the solution of the sum of the wave equations of the two electrons.

The sums of the wave equations for two photons require geometry of a standing wave to have integral values of angular momentum. Over a given space there is an integral value of the magnitude of the sum of their momentum. i.e. $\lambda\!\!\!^{-} = \hbar / p$. [1]. That is if, $\psi = \psi_1 + \psi_2$, then:

$$\left|\gamma^{\mu} \frac{\partial\psi}{\psi\partial x}\right| \rightarrow \Delta x = \frac{np}{\hbar} \rightarrow \frac{1}{n} = \frac{\lambda\!\!\!^{-}}{p\Delta x} \tag{22}$$

Separating the integral values in Eq.(12), gives:

$$\frac{\Delta c}{c_0} = \rightarrow \left(\frac{\lambda\!\!\!^{-}_{PL} 2v_{ph}}{\lambda\!\!\!^{-}} \left[\frac{\lambda\!\!\!^{-}}{r}\right]\right)^2 \tag{23}$$

This has a solution when c = ½ c_0, thus at that radius $\lambda\!\!\!^{-}_{ph} \rightarrow \lambda\!\!\!^{-}_{ph} / 2 = \lambda\!\!\!^{-}_{e}$, and at that radius:

$$\frac{\Delta c}{c_0} = \left(\frac{\lambda\!\!\!^{-}_{PL} v_e}{\lambda\!\!\!^{-}_e} \left[\frac{1}{n}\right]\right)^2 = \frac{\Delta\varepsilon}{\varepsilon_T} \tag{24}$$

This is the state value of the photons in the electron. The following section will show the relation of this to α.

Note that the value of $\lambda\!\!\!^{-}_e$ for the photon is:

$$\lambda\!\!\!^{-}_e = \frac{\hbar}{p_e} = \frac{\hbar}{m_e \frac{c_0}{2}} = \frac{\hbar}{p_0 / 2} \tag{25}$$

The $\hbar$ photons in the electron orbit now have an angular momentum of ½ $\hbar$. The energy of the two photos $\varepsilon = v_e h$ is the energy required to bind the two photons together and we could define the radius $\Re_0 = \lambda\!\!\!^{-}_{PL} v_e$ as the Fermion radius.

Atomic Bound Particles

When two electron +/-engage the rotating planes of the opposite going photons come together since the planes represent the location of the highest index of refraction and align the photon planes. This causes a paring of opposite particles and is responsible for the Pauli Exclusion Principle

Note that the model of the atom presented here is not that of an electron orbiting a central particle or nucleus with a spherically symmetric radial attractive force.

The electrons can approach to radii of equal distance to the observation point and from that point each have an integral angular momentum, defined by the Compton radius $r = ƛ_e$. That is: the closest distance is when the Compton radii are in contact. This planar alignment gives the appearance of a spherical potential. The two photons in the electron rotate around their respective center of mass, but due to the minimizing effect on the index of refraction of the opposing velocity the rotation planes align in the same plane. The electrons can rotate around the center of mass of the two particles but the total energy and momentum in a fixed state is conserved, and the rotational orbit is not defined by centrifugal force.

The particle-particle interaction for the two particles is in principle exactly the same as for the two photons

For each electron, there are two Feynman photons, thus twice the number as for a photon and thus the frequency of the electron is the sum of the frequency of the two photons. The primary orbiting radius is at $r = ƛ_e$ where the velocity is ½ c, thus:

$$ƛ_e = ƛ_{ph} / 2 \qquad \nu_e = 2\nu_P \qquad m_1 + m_2 = m_e \tag{26}$$

The change in the velocity in the proximity of an electron is now found identical to the composition of the two photons in Eq.(12), The expression for the velocity of light for interloping photons in proximity to the electron is then:

$$\frac{\Delta c}{c_0} = \frac{ƛ_{PL}^2}{ƛ_e^2}\left(\frac{ƛ_e}{r}\nu_e\right) \tag{27}$$

The other electron in an atom is not an interloping photon, but participating and the change in c for another internal photon is proportional to the “coincidence” probability of the encounter of the photons in orbit.

The coincident probability is the probability of orbiting photon encountering the oncoming photon density of the other photons. This increase in oncoming photon density as a function of r becomes a radial gradient in c binding the photons together.

The product of the probability of the photon densities, thus the coincident probability alters the velocity of the interaction photo.

$$P_1P_2 = \frac{\lambda\!\!\!^{-}_e}{r}v_e\frac{\lambda\!\!\!^{-}_e}{r}v_e \tag{28}$$

The probability of the location of a moving photon is perpendicular to its velocity, thus orbiting photons encounter the probability of the other photon moving in an opposite direction. It is significant that Feynman's postulates regarding path directions that the path probability is in all directions.

The change in c for each of the photons from the two encountering $\pm$electrons, as the result of the other is then:

$$\frac{\Delta c}{c_0} = \frac{\lambda\!\!\!^{-}{}^2_{PL}}{\lambda\!\!\!^{-}{}^2_e}\left(\frac{\lambda\!\!\!^{-}_e}{r_e}v_e\right)\left(\frac{\lambda\!\!\!^{-}_e}{r_e}v_e\right) \tag{29}$$

With the change in c being proportional to the inverse of the speed of light, this expression provides the radial binding energies for the photons in the electron. The radii r_1, and r_2 are the distance from an observation point to the respective particle For the electron the observation point is the center of mass with $r_1 = r_2$.The value of $\Delta c = c_0 - c$, thus the change in c is just the expression of the total energy plus the photon kinetic energy pc_0. The expression can be written as:

$$\frac{mc_0^2}{mc_0^2} = \frac{p_0c}{mc^2} + \left(\frac{\lambda\!\!\!^{-}_{PL}v_{Ph}}{r}\right)^2 \tag{30}$$

The terms are recognizable, left to right as the ratio of the total energy to itself, the ratio of the kinetic energy to the total energy, and the ratio of the invariant potential energy to the total energy. This is the Hamiltonian for the bound photons, or:

$$m_ec_0^2 = p_0c + V \tag{31}$$

The Lagrangian form is:

$$L = p_0c - V = T - V \tag{32}$$

For further discussion see Appendix II and the section on photon energies in the paper, "The Dirac Equation and the Two Photon Model" [1].

The probability of the photon location exists at all radii, but as the radii of the photons goes down the binding energy goes up and the kinetic energy decreases due to the decrease in c. The limit for this is when the binding energy $\varepsilon_P = V$ or the invariant potential is equal to the kinetic energy $\varepsilon_K = T$ or.

$$p_0 c = \left(\frac{\lambdabar_{PL} v_e}{r}\right)^2 \tag{33}$$

The Lagrangian is the difference of these terms, and at the “minimum”, (r_{min}), value of r in Eq.(30), requires the Hamiltonian potential expression to become:

$$\frac{mc_0^2}{mc_0^2} = \frac{p_0 c}{mc^2} + \left(\frac{\lambdabar_{PL} v_e}{r}\right)^2 \rightarrow 1 = \frac{1}{2} + \frac{1}{2}\left(\frac{\sqrt{2}\lambdabar_{PL} v_e}{r_{min}}\right)^2 \tag{34}$$

The equipartition of the energy at minimum r requires a minimum value to c to be $c = c_0 / 2$ at:

Rewriting Eq.,(34) in terms of $\Delta c / c_0$:

$$\frac{\Delta c}{c_0} = \frac{1}{2}\left(\frac{\sqrt{2}\lambdabar_{PL} v_e}{r}\right)^2 = \frac{\Delta \varepsilon}{\varepsilon_T} \tag{35}$$

This is the expression giving the value of the ratio of the change in invariant rest energy to the total energy as the particles revolve in a mutual orbit. At $r = \sqrt{2}\lambdabar_{PL} v_e$ the value of the term in parenthesis is equal to one and the velocity of light at that orbit is $c = c_0 / 2$

Eq.(35), expresses the relation between the total energy and the speed of light between two electrical particles. See Appendix III regarding the relation between the specific energy and the electrical forces.

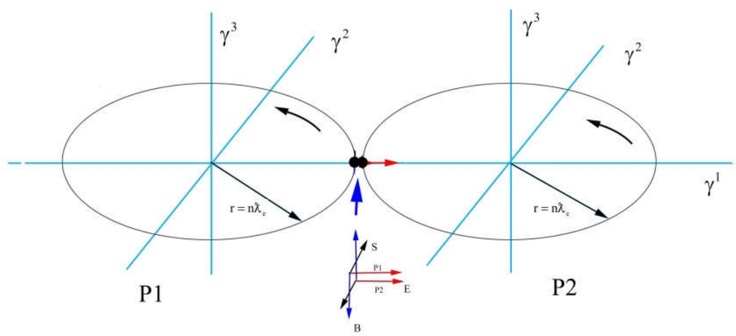

Fig. 2. The interaction of the Electron-Positron atomic system

Integral Geometric Constraints

Solutions to the electron wave equation, [1] require that the angular momentum in a geometrical configuration for the photons be integral values of $\hbar$. The equation expresses the continuity condition, in that the probability of location is a conserved quantity and is preserved when the angular momentum of the photon is integral as discussed in Eq.(22),

$$\gamma^{\mu}\frac{\partial\psi}{\psi\partial x} = \frac{np}{\hbar} = \frac{1}{\lambda} \;\rightarrow \lambda = \frac{\hbar}{np} = \frac{\hbar}{\text{n mc}} \tag{36}$$

The space interval λ is an interval representing the ratio of $\hbar$ to the angular momentum $n\lambda = \hbar / p$ Frim the electron wave equation the value of λ for the electron is the Compton radius, $\lambda_e = \hbar / m_e c_0$ .or $\ell = m_e c_0 \lambda_e$

Since this is an integral value it can be separated as a factor in Eq.(35), as an integral term. For the Compton radius of the electron this is:

$$\frac{\Delta c}{c_0} = \frac{1}{2}\left(\frac{\sqrt{2}\lambda_{PL} v_e}{\lambda_e}\left[\frac{\lambda_e}{r}\right]\right)^2 \rightarrow \frac{1}{2}\left(\frac{\sqrt{2}\lambda_{PL} v_e}{\lambda_e}\right)^2 \tag{37}$$

At that radius $c = c_0 / 2$ the wavelength of the photon is reduced to ½, making the radius equivalent to the Compton radius of the electron and the expression can is that of a state value of the energy an atom.

State Energy Levels

Solutions for state systems for the Schrodinger and the Dirac equation exist when the photon standing wave wavefunctions have integral values in a particular geometrical configuration. This is the result of the photon location probability defined by its wavefunction having continuity as discussed for Eq.(24).

Setting the angular momentum in Eq.(37), to be $r = n\lambda\!\!\!^{-}_e$, or $\ell = n\hbar$ The results for the invariant state energy, Eq.(4), of an atomic system is:

$$\frac{\Delta c}{c_0} = \frac{1}{2}\left(\frac{\sqrt{2}\,\lambda\!\!\!^{-}_{PL}\nu_e}{\lambda\!\!\!^{-}_e}\left[\frac{1}{n}\right]\right)^2 = \frac{1}{2}\left(\alpha\left[\frac{1}{n}\right]\right)^2 \tag{38}$$

It has been shown in earlier papers, that the term in parenthesis is to a high accuracy equal to the "Fine Structure Constant"[5],[6] thus the value of the binding energy is just the ratio of the Rydberg energy to the total energy of the electron.

$$\alpha = \frac{\sqrt{2}\,\lambda\!\!\!^{-}_{PL}\nu_e}{\lambda\!\!\!^{-}_e} = 1/137.0359997100 \tag{39}$$

$$\frac{\Delta c}{c_0} = \frac{\Delta\varepsilon}{\varepsilon_0} = \frac{\alpha^2}{2n^2} = \frac{1}{m_e c^2}\frac{R}{n^2} \tag{40}$$

This is the energy ratio of the electron mass energy, to the Rydberg energy, and the energy difference between two energy states in the positronium atom is:

$$\Delta\varepsilon_2 - \Delta\varepsilon = R\left(\frac{1}{n_2^2} - \frac{1}{n_1^2}\right) \tag{41}$$

The well-known ionizing spectral energy of Positronium is half the Rydberg energy:

$$\hbar\omega = \frac{R}{2} \tag{42}$$

It is asserted that the energy of the first state of Positronium Eq.(40), is the Rydberg energy, but the spectral energy observed from Positronium has only half the Rydberg of this.

It is well known that the Schrodinger Equation, defining the atomic energy levels in an atomic system is a geometrical solution to a standing wave. A single photon cannot be a conjugate phase photon to itself, and it is asserted that each level must have two conjugate photons.

Thus there are two equal conjugate phase photons emitted when the election falls into the lowest state. It is presumed that the second photon is scattered and generally lost to kinetic energy, (See Positronium Appendix V,)

Conclusion:

This paper presents physics with an alternate mechanism of the force between particle and the structure of particles. It is believed to be a gateway to the understanding and the mass of heavier particles.

This paper presents the results of a number of papers identified in the references. As there has been a better understanding of the underlying mechanisms, there are some points that are better clarified here, and some that still need work. The issue of charge sign is a straightforward application of spin and Lorentz photon interaction, but is left to a later paper.

The basic theory is far off the standard track, and thus far no one in the current physics community, sufficiently skilled to understand the implications, has paid much attention. It is not wrong however, and at some point, it will come to the forefront.

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More extensive lists of on referenced papers, are found in the references 1-6 by Author. Some of the papers 1, 2 are a little dated and need some revisions.

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Appendix I

The Photon

The photon is proposed to be a Planck particle with an area $\lambda_{PL}^2 = \mu\lambda = G\hbar / c^3$ revolving at the photon frequency ω such that, the Compton radius, is equivalent to the distance from the center that light travels in one cycle. The rotation of the photon is either right or left handed around the velocity vector. The probability of the particle location oscillates linearly back and forth through the particle center as the particle rotates. Beyond the Compton radius, the photon's probability exists, but only for that of the bare Planck particle with a density repetition rate equal to the Compton frequency. Beyond the core Compton radius of the photon there is a passing probable density of the bare Planck particle. The Frequency of the bare Planck particle is $\omega_{PL} = c_0 / \lambda_{PL} \approx 1.8E{+}43 \text{ rad sec}^{-1}$

Photons in the electron have orbital frequency matching thee Compton frequency, thus a constant radial polarization.

The probability of existence of the photons beyond the Compton radius is evidenced by the Anomalous Magnetic Moment of the electron, the Aharonov–Bohm effect, and from this development the existence of gravitation and charge. Beyond one wavelength however, the particles are so small, 10^{-66} cm^2, that the probability passes through dense mass without delay or scatter. This property is responsible for the observation that gravitational effects are not shielded. The actual effect, of the photons is to alter the speed of light, and change the relativistic energy $\varepsilon = mc^2$. For purposes here the mass of a photon is considered to be $m = p / c_0$, and the change induced by the velocity and density of the Feynman photons is:

$$\frac{\Delta c}{c_0} = \frac{\Delta\varepsilon}{\varepsilon} = \frac{\text{Change in } \varepsilon = mc^2}{\text{initial value of } \varepsilon = mc^2} \qquad (43)$$

Appendix II

The Photon wavefunction

Excerpts from "The Dirac Equation and the Two Photon Model of the Electron" [1]

For a photon there is a wavefunction that expresses the probability of location as:

$$\psi = e^{i\left(\frac{mc_1}{\hbar}\hat{k}\bullet x - \frac{m_1 c_0}{\hbar}ct\right)} \tag{44}$$

The invariant energy of a photon is then:

$$E_I = \hbar c\left|\gamma^\mu \frac{\partial}{\psi \partial x^\mu} e^{i\left(\frac{mc_1}{\hbar}\hat{k}\bullet x - \frac{m_1 c_0}{\hbar}ct\right)}\right| = 0 \tag{45}$$

The magnitude is the square root of the product of the four-vector times its conjugate.

If $c_1 = c_0$ the value of E_I vanishes thus there is no invariant rest energy, but if the location of the photon moves into a higher index of refraction such as piece of glass where $c_1 \neq c_0$ then the product or square of the four vectors is not zero, but a Lorentz invariant scalar [10], and the photon has not only relativist kinetic energy, but also a scalar invariant rest energy. This invariant rest energy creates rest mass equivalent in the rest frame of the glass. When it leaves the glass, the energy is again, pure relativistic energy, thus the glass has by slowing the velocity temporarily changed some of the energy from relativistic to invariant.

Three Parts of the Energy of a Photon

From the above discussion, the components of the total energy are; the invariant or a rest frame energy E_I, the kinetic energy E_K, and the total energy, E_T, specifically this is:

$$E_I = c_0\hbar\left|p^\mu\right| = c_0\hbar\left|\gamma^\mu \frac{\partial\psi}{\psi\partial x}\right| \qquad E_K = c_0\hbar\left|\gamma^k \frac{\partial\psi}{\psi\partial x}\right| \qquad E_T = c_0\hbar\left|\gamma^0 \frac{\partial\psi}{\psi\partial x}\right| \tag{46}$$

The difference of the kinetic and total energy is the Lorentz invariant scalar rest mass, or the binding potential energy.

Appendix III

Electric Force

The expression for the energy relation between electrical particles in Eq.,may be construed as the electrical field. It represents the specific energy change and as can be seen it is twice the Electrical energy Q^2/r this is relatively easy to reconcile.

To find the forces between charged particles the expression for the electron interaction between two particles can be written with the observation location not at the center of mass.

$$\frac{\Delta c}{c_0} = \frac{1}{2}\left(\frac{\sqrt{2}\lambda_{PL} v_e}{\lambda_e}\left[\frac{\lambda_e}{r}\right]\right)^2 \rightarrow \frac{1}{2}\left(\frac{\alpha\lambda_e}{r_1}\right)\left(\frac{\alpha\lambda_e}{r_2}\right) \tag{47}$$

The expression in Eq.(47), is the change in the specific energy of the two particles energy. It can be expressed as the coordinate differential energy if we set the observation point at the minimum radius of one of the particles $r_1 = \alpha\lambda_e$. The other r_2 is then the spatial separation. Writing this out gives:

$$\frac{\Delta c}{c_0} = \frac{1}{2}\left(\frac{\alpha\lambda_e}{r_2}\right) = \frac{1}{2}\left(\frac{\alpha c\lambda}{m_e c^2 r_2}\right) \tag{48}$$

Where r_2 is the distance from particle 1 to particle 2

$$2\left(m_e c_0^2 - m_e c_0 c\right) = \frac{Q^2}{r} \tag{49}$$

The right of this expression is the nominal electric energy, the left side is the total change in the energy of both particles, and thus the electric energy derives from the mass energy of both particles. And the force between the particles is:

$$f = \left(m_1 + m_2\right) c_0 \frac{dc}{dr} = \frac{Q^2}{r^2} \tag{50}$$

Appendix IV

Centrifugal force in electron

At the minimum radius of the electron in Eq.(12), the centrifugal force is equal to the gradient n the velocity of light that binds the photons together.

The equation is

$$\frac{\Delta c}{c_0} = \frac{\Delta \varepsilon}{m_{ph} c_0^2} = \rightarrow \left(\frac{\lambda\!\!\!^{-}_{PL} 2v_{ph}}{r_1} \right)^2 \left(\frac{\lambda\!\!\!^{-}_{PL} 2v_{ph}}{r_2} \right) \tag{51}$$

Let r_1 be equal to its minimum value $\lambda\!\!\!^{-}_{PL} 2v_{ph}$ the expression becomes the differential energy between the particles as a function of r_2

$$\frac{\Delta \varepsilon}{m_{ph} c_0^2} = \rightarrow \left(\frac{\lambda\!\!\!^{-}_{PL} 2v_{ph}}{r} \right) \tag{52}$$

Taking the differential of this expression with respect to r_2 , which is the gradient in the energy, gives the force on the photon.

$$f = \frac{d\Delta \varepsilon}{dr} = \rightarrow \left(\frac{\lambda\!\!\!^{-}_{PL} 2v_{ph}}{r} \right) m_{ph} c_0^2 \tag{53}$$

If this is set equal to the centrifugal force on the electron $f_c = m_{ph} c^2 / r$, the value of r_2 is:

$$r_2 = \lambda\!\!\!^{-}_{PL} 2v_{ph} \tag{54}$$

Thus when the particles arrive at this radius the binding forces match the centrifugal forces and the particle is created,

Appendix V

Fundamental Issues

Spin

The orbiting electrons have integral half spin angular momentum ℓ, in a two particle system the attraction between the two particles is due to their opposite going photons, and therefore the B fields are anti-aligned. If a positron is subjected to a magnetic field there is created a preferential direction for its orientation. It can flip to the opposite orientation in another state, creating the observed spectral splitting. The value of this is apparent in the wave equation solutions, [1].

Positronium State Values

It would appear in Eq.(41), that the energy value for the state is twice the proper value as noted in Eq.,(42), since the spectral energy levels for positronium is ½ R. Each photon orbiting in the electrons has a spectral energy equal to ½ R that is radiated away when the particles come together. It has been previously assumed that the spectral energy is the total energy of the state however; it appears from the preceding presentation that the state energy level is twice the spectral energy.

The Schrodinger Equation defines geometrical energy levels for standing waves as the same as described here, but ignores the fact that a standing wave represents two opposite conjugate phase waves. These states are more clearly defined in the two photon model [1], [4].

It is asserted here that the levels nominally calculated via the Bohr and Schrodinger represents represent only half the state energy levels and the other photon is scattered or lost to kinetic energy in the radiation process, and ignored.

Forces

Since Newton developed the concept of force, it has been the inspiration for a multiplicity of continuous field theories. The defined fields are generally infinitely divisible and lead to infinities with no explanation.

In the creation of a field description of a physical phenomenon, starting with the Newton concept of force the motions is expressed, in terms of physical parameters. The next step is to define a field imbued with an abundance of invisible energy that transfers the action between particles. Leibniz, refereed to gravitation as a return to occult quantities, and in reality there is magic and spooky action at a distance involved.

It is asserted that that the assignment of energy to a continuous field is a pervasive error that that cannot be fixed, and has led to the un-reconcilable differences in Gravitational and Electrical theory. This paper expresses a theory devoid of the phenomena of fields.