The Feynman Photon-Photon Electric Attraction, Repulsion and the Chirality of the Electron

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Abstract

Papers previously presented in regard to the interaction of charged particles have not addressed the issue of the ± value of charge $Q = \sqrt{\alpha c \hbar}$. It is presumed that there is no substance that can be identified as charge. Charge is a regarded as a fictitious substance providing equal and opposite forces on particles defined in the framework of an Electric Field. The Electric Field is regarded as a very useful but also fictitious construct.

The interaction of masses by the interference of the Feynman photon can be shown to provide the equivalent interaction without the handicap of energy densities and infinities, as well at the interchange of imaginary particles.

In a previously presented paper: "The Electron as a Composition of Two Vacuum Polarization Confined Photons Revised"[5]. A model of an electron was presented that shows the electron to be a pair of photons each with half the energy of an electron, in a closely bound orbit, held together by the mutually induced index of refraction of the vacuum polarization. The rotating photon action paths for a pair of photons exist throughout space and provide the mysterious spooky action at a distance of the forces of fields.

For a circularly polarized, spinor defining photon momentum, rotating in a circle, the Electric vector is constantly in the radial direction, and the magnetic vector is aligned along the perpendicular angular momentum vector. For an opposite charge turning in the same direction the magnetic vectors aligned with the angular momentum are opposite. The electric and magnetic vectors are not considered as electric field stress vectors, but the probability flow direction of the location of the photon and its axial vector acceleration

From Feynman's action path considerations, the action path probability of these photons constitutes the angular momentum, the spin, and the anomalous spin. There is created a time independent probability of existence

throughout space that can interact with the photons of other particles. The interactions of the probability existence of these photons, with the probability of photons from other particles, induce the effect of charge.

Particles have no charge and thus attraction and repulsion must occur as the result of the photon-photon rotational interaction of the photons.

The spin is the rotation of the central two particles and the probability paths throughout the surrounding space.

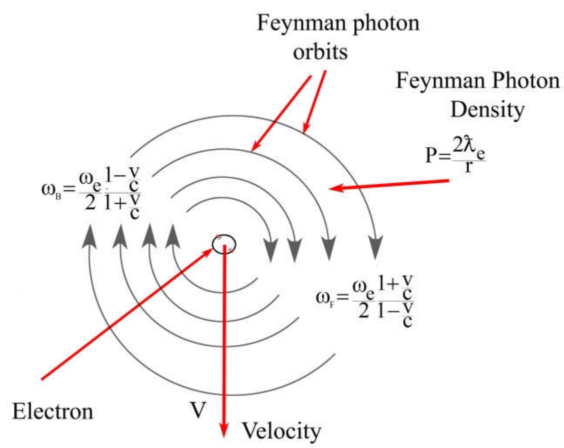

Fig. 1 The Electron showing Feynman action paths from a point perpendicular to the plane of rotation

As the electron moves with spin perpendicular to the velocity Fig. 1, there is a relativistic Doppler difference in the frequencies observed on opposite sides of the spinning particle. The difference in these frequencies constitutes cause of both the deBroglie momentum-wavelength and the diffraction pattern of the Electron.

Charge

The change in c as the result of a charged particle is exactly as for gravitation accept that the photons are rotating around an axis remain polarized

The effect of one charge on another is not as simple as it might at first. Unlike gravitation In which the exterior Feynman protons are generally random, in the case of electric effect, the relative direction of the density flow creates the effect of charge. Photons going in the same direction don't interact whereas photons going in opposite direction reduce the velocity of both flows in the region of the planar rotation, and attract the center of mass of each other.

It is not the purpose of this paper to calculate the exact value of the interaction which has been done elsewhere, but to show the mechanism of positive and negative charge occurs without the concept of charge.

Electron Angular Momentum

The angular momentum of the electron is the sum of the rotation of the two Feynman photons and the rotation around the center of mass, or orbital angular momentum

$$\vec{J} = \vec{L} + \vec{A}_S \tag{1.1}$$

As is known, the total angular momentum J, combines both the spin and orbital angular momentum. QM asserts that angular momentum applies to J, but not to L or S; spin–orbit interaction allows angular momentum to transfer back and forth between L and S, with the total remaining constant.

Also from standard QM the magnetic momentum vector $\vec{\mu}_J$ does not necessarily line up with the total angular momentum $\vec{J} = \vec{L} + \vec{A}_S$, but the Wigner-Eckart theorem [6], finds the expectation value does effectively lie on the direction of $\vec{J}$, thus $\vec{\mu}_J = \vec{\mu}_L + \vec{\mu}_S$. If, as the previous papers have demonstrated, $\vec{L}$ and $\vec{L}$ are just the same photon motion observed from different coordinate centers generated by the same photons then this makes logical sense.

The electron is a composition particle of two vacuum polarized photons, thus the sum of the angular momentum, for both the internal rotation and the orbital rotation for the two photons in, Eq.(1.1) , is:

$$\vec{J}=\vec{R}\times(m_1+m_2)\vec{v}+\sum_i r_i\times(m_1+m_2)c \qquad (1.2)$$

, or

$$\vec{J}=(m_1+m_2)\left(\vec{R}\times\vec{v}+r_i\times\vec{c}\right) \qquad (1.3)$$

The two rotating photons of the electron [3], [5], can't simultaneously rotate about two axes and must have a single rotation axis, thus the **spin is the minimum of the total angular momentum of the electron**, and is a physical justification basis for the Wigner-Eckart theorem.

For the two photon composed electron **the spin angular momentum is not** separate, or independent, of its orbital angular momentum, but part of it. The corollary to this is that the velocity vector is always in the plane of the rotation, and the spin is perpendicular to the velocity.

The theory being proposed here requires the, velocity vector to be in the plane of the angular momentum and spin. If the rotation of the Feynman photons did not reside in the plane of the velocity, (Fig, 1), the deBroglie frequency and wavelength, as determined by the difference in the Doppler shift $p=\hbar\Delta\omega/c$ would be wrong, and the electron slit diffraction pattern would be a random smear.

To restate, the total angular momentum is the sum of the two rotations in along the same axis.

$$\vec{J}=\overrightarrow{L+A_S} \qquad (4)$$

Electron Spin and Angular Momentum

The angular momentum for rotation is defined as right handed, and the angular momentum for the Feynman photons for both type of charged particles must also be right handed. The electric vectors have the same frequency of rotation as they rotate around the electron axis of rotation thus the electric vectors are frozen along the radial direction. The difference in the electron and the positron is that for the same value of the angular momentum the magnetic vector is up for one and down for the other. The vectors designated as electric and magnetic do not have charge effect, but represent location flow and flow acceleration probability directions.

The spin vector as we know it as measured by its magnetic moment is the product of the angular moment and relative direction of the magnetic vector of the radially polarized Feynman photons. Two Feynman photons from opposite charge particles rotating in the same direction have opposite magnetic vectors, thus the spin vector of the charge particle is:

$$\vec{S}' = \pm \vec{A}_F \tag{5}$$

The $\pm$ term is just the sign of the conventional left or right hand chirality of the particle. Since the emitted electrons in the Weak Force experiment have been measured and designated as being left handed, it is the required convention that all the electrons in the universe be left handed, thus for the Electron with left hand chirality.

$$\vec{J}_e = \overrightarrow{L - S} \tag{1.6}$$

The spin vector designation is opposite the angular momentum. For the Positron with right hand chirality $\vec{J}_P$, is:

$$\vec{J}_P = \overrightarrow{L + S} \tag{1.7}$$

This sign convention provides the charge $\pm$ effect for the electron-positron interaction.

Opposite Charges

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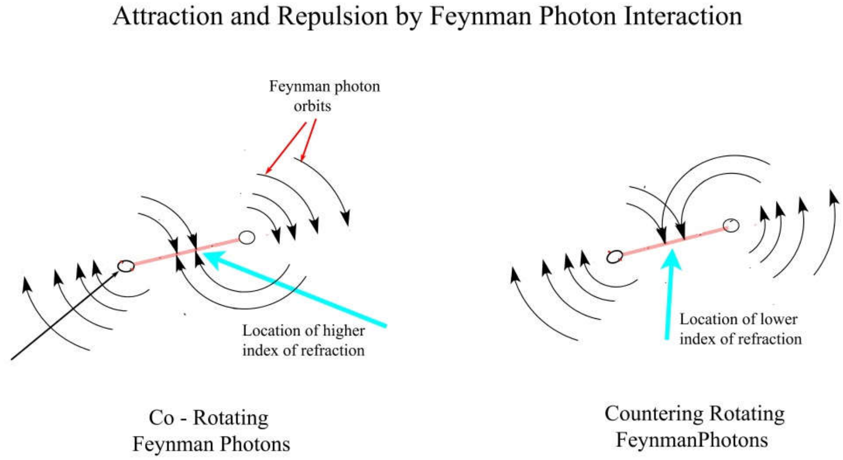
For a simple atomic system, Positronium, there are two opposite, rotating particles. Each particle is surrounded by a circulating probability of the core photons being in a planar rotating path. As shown in Fig. [2], the photons from both particles rotate, and engage the photons from the other particle.

Attraction or repulsion between the particles depends on direction of the interacting photons. This is the result of the Lorentz condition that photons in the same direction cannot interact, whereas opposite going photons have a probability of collision, and reduce each other's relative speed of light, or index of refraction.



Fig, 2. Interacting rotating particles

The direct collision probability in Eq.**Error! Reference source not found.**, shows the magnitude of the change in c as the result of a charged particle at a, distance r, Eq.**Error! Reference source not found.**:

$$\frac{\Delta c}{c} = \frac{1}{2}\frac{1}{m_e c^2}\frac{\alpha c\hbar}{r} \tag{8}$$

Δc is the change in the velocity of light or related to the index of refraction as:

$$1-\eta^{-1} = \Delta c \tag{1.9}$$

From Appendix II, the interaction for photons engaging the probability flow at any angle Δc is a function of the angle of the interaction or:

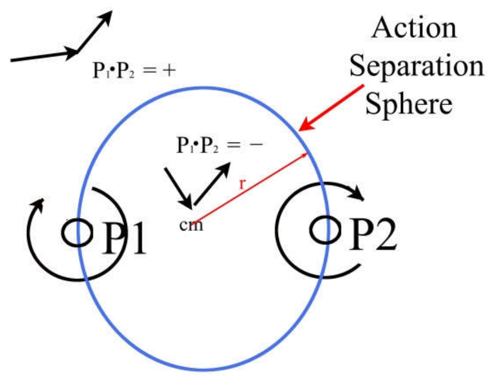
$$\frac{\Delta c}{2c_0} = \left[\frac{\Delta c}{2c_0}\right]_{\perp}\sqrt{\frac{\left[1-\cos\theta\right]}{2}} \tag{10}$$

The angle θ, is the angle between the interaction photons. From the equation photons moving in the same direction $(\cos\theta = 1)$, have no interaction.

Attraction

If the angular momentums of the particles are aligned, in the spherical volume between the rotating particles, the Feynman Photons interact. The interaction magnitude or the change in the index of refraction of two photon flow probabilities is maximum when the dot product is negative $\left(\hat{P}\bullet\hat{P}=-1\right)$, indicating a head on collision , and a decrease in the speed of light per Eq.(8)

$$\frac{\Delta c}{c}\sim\sqrt{\frac{\left[1-\cos\theta\right]}{2}} \tag{11}$$



Fig, 3. The dot product of Feynman photons from the particles switches from positive to negative at the imaginary sphere between the co-rotating particles

The dot product is negative inside the sphere Fig. 3, and positive outside.

For the interacting particles along the line connecting the particles the increase in the gradient is in the direction of the opposite particle.

$$P=\frac{2\lambda\!\!\!^{-}_e}{r_1}=\frac{2\hbar}{m_e c r_1} \tag{1.12}$$

$$\frac{dP}{dr}=-\frac{2\lambda\!\!\!^{-}_e}{r_1^{\,2}} \tag{1.13}$$

This increasing gradient in c or the index of refraction causes the Feynman action path of the photons of the second particle to move in the direction of the other particle, and causing the orbiting planes to align.

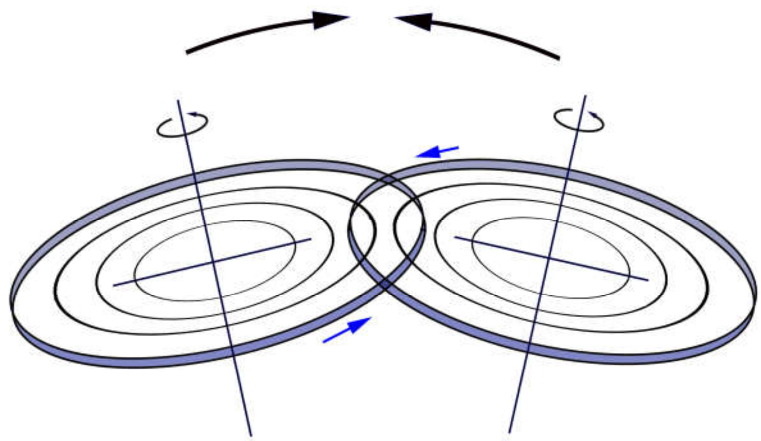


Fig. 4. The rotating planes of the Feynman photon. Represent a reduction in the in the spatial index of refract and induce the planes to alignment

As a photon probability moving around a center of mass on circular action paths encounters a gradient in c in the direction of a second particle the path will be diverted in the direction of that particle, and thus the center of mass is moved in the direction of the center of mass of the other particle. This would be the interaction of opposite charged particles, and the particles are attractive.

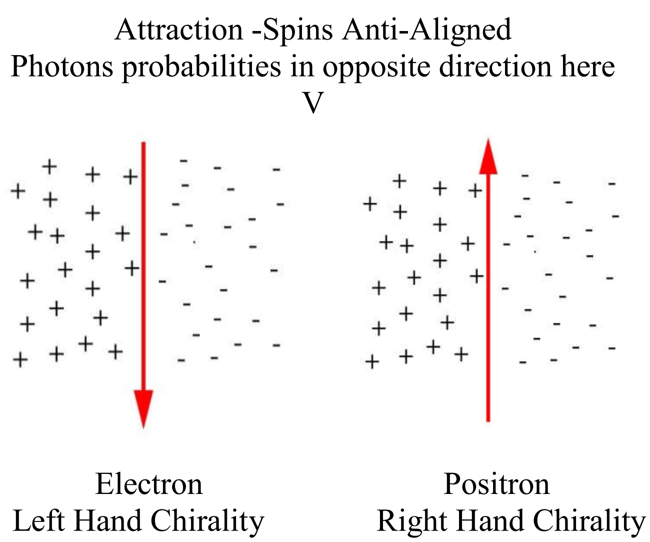


Fig. 5. Feynman probability photon rotation around the core photons Positive (+), Photons out of page. Negative (-) Photon into page.

Repulsion

If the particles have counter-rotating photons then at the same location in that sphere along that line the photons are going in the same direction with a dot product of +1 and do not interact . The maximum value of the dot product for this interaction maximizes on the opposite side of the opposite particle outside the sphere, pulling the particles apart.

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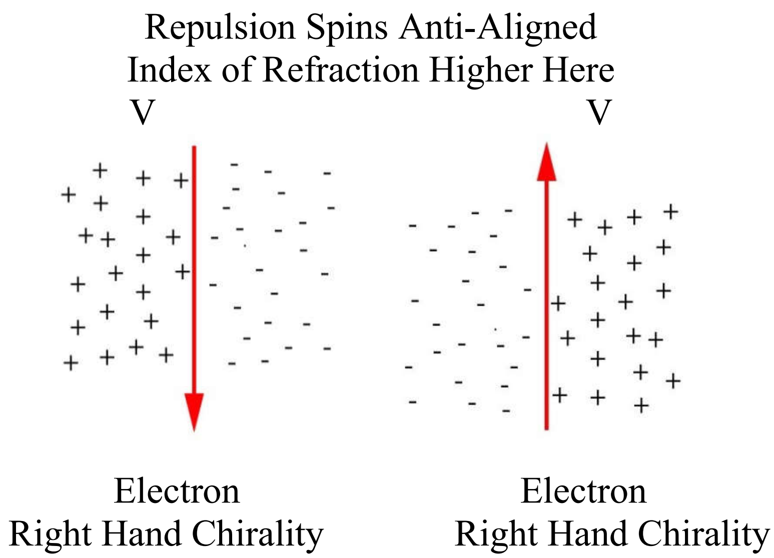

Fig. 6. Feynman probability photon rotation around the core photons
Positive (+), Photons out of page. Negative (-) Photon into page.

Critical to the process of charge is the chirality of the electron and the positron. It is normally assumed that the Electron and Positron can have spin up or down independent of their angular momentum or their charge. This development doesn't suggest that all, it presumes that the spin is the value of the angular momentum. The vector sum of the spin and orbital angular momentum is conserved, and thus project onto the same axis.

The procedure outlined here provides the mechanism of the origin of the ± sign of the charge.

The Pauli Exclusion Principle results from the fact that in an atomic system the spins of alike particles anti-align in pairs for minimum interference, *Constraints on Solutions to the Dirac Equation*

Attraction and repulsion of Electrons and Positrons by the interaction of Feynman photons as defined here, depends on the chirality of the particles, and it's not optional. Electrons and positrons have to have opposite chirality in order to attract and repel. If the selection were optional, electrons would attract or repel other electrons or positrons.

The emitted electrons in the Weak Force experiment have been measured and designated as being left handed, thus consistent designation for all electrons is to have left hand chirality, and right hand chirality for positrons..

This selection puts limits on the solutions to the Dirac equation. There are four solutions to the Dirac equation, two for an Electron and two for a Positron, each with left or right chirality [7].

The requirement here thus eliminates two solutions of the Dirac equation as being inoperative in the real world.

The other solutions may exist, and may be creatable in accelerators or particle reaction, but those particles cannot exist in nature. This consideration eliminates parity violation in Beta decay.

Appendix II

Dependence of Photon Direction on Photon-Photon Interactions

$$\frac{\Delta c}{2c} = \frac{1}{m_e c^2}\frac{Q^2}{r} = \frac{\Delta\varepsilon}{\varepsilon_T} \qquad (1.14)$$

Δc, is the change in the index of refraction for a photon moving opposite the Feynman photon density of an electron at a distance r.

From [3], the wavefunctions derived momentum 4-vector of two equal photons is:

$$\overrightarrow{P_1} = \frac{\hbar\omega_1}{c^2}\left(\gamma^k c_{1k} + \gamma^0 c\right) \qquad \left(\gamma^k\right)^2 = -1 \qquad \left(\gamma^0\right)^2 = 1$$
$$\overrightarrow{P_2} = \frac{\hbar\omega_2}{c^2}\left(\gamma^k c_{2k} + \gamma^0 c\right) \tag{1.15}$$

The scalar invariant sum of the momentum is:

$$E_I = c\left|\overrightarrow{P_1} + \overrightarrow{P_2}\right| \tag{1.16}$$

Presuming the photon trajectories are defined in the same plane

$$E_I = c\left(\overrightarrow{P_1} + \overrightarrow{P_2}\right)\left(\overrightarrow{P_1} + \overrightarrow{P_2}\right)^* = c\left(\overrightarrow{P_1}^2 + \overrightarrow{P_2}^2 + \overrightarrow{P_1}\bullet\overrightarrow{P^*{}_2} + \overrightarrow{P_1}\wedge\overrightarrow{P^*{}_2} + \overrightarrow{P_1}\bullet\overrightarrow{P^*{}_2}\right)$$
$$\overrightarrow{P_1}^2 = 0 \qquad \overrightarrow{P_2}^2 = 0 \qquad \overrightarrow{P_1}\wedge\overrightarrow{P_2} - \overrightarrow{P_2}\wedge\overrightarrow{P_1} = 0 \tag{1.17}$$

Thus:

$$E_I = +2\overrightarrow{P_1}\bullet\overrightarrow{P_2} \tag{1.18}$$

Specifically from [3],this is:

$$2\overrightarrow{P_1}\bullet\overrightarrow{P^*{}_2} = \left[-\frac{\hbar\omega_1}{c^2}\gamma^k c_{1k}\bullet\frac{\hbar\omega_2}{c^2}\gamma^k c_{2k} \quad +1\right] \tag{1.19}$$

Or:

$$E_I = E_T\sqrt{\frac{\left[1-\cos\theta\right]}{2}}$$

Thus

In the case of the interaction of Feynman photons his energy is a Lorentz scalar energy or rest frame energy associated with the slowdown of the photons E_I, thus

$$\frac{\Delta c}{2c} = \left[\frac{\Delta c}{2c}\right]_0\sqrt{\frac{\left[1-\cos\theta\right]}{2}} \tag{1.20}$$

And if $\cos\theta = 1$, indicating the angle between the direction of photon is zero the photons do not interact.

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