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The Mechanics of Electrostatic Attraction and Repulsion, a Speculative Conceptual Analysis

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Abstract

The mechanics of Coulomb attraction and repulsion between charged particles are not currently understood but can be explained using a photon-pair aether. A spin-2 photon pair with no net E or B fields can freely penetrate deep into matter. It may collide with a charged particle and be transformed through the interaction into a spin-0 photon pair. This outflow of spin-0 photon pairs forms a homogeneous (+E) or (−E) electrostatic field around the particle, depending on its charge. Charged particles in the vicinity of each other experience an asymmetry in the incoming field, from which attraction or repulsion arises. Repulsion or attraction is understood as the transfer of momentum from photons to particles, which results in the appearance of a force.

Keywords

Coulomb Attraction and Repulsion, Primordial and Electrostatic Photon Pairs, Electric Field

1. Introduction

For charged fundamental particles, no mechanistic model has been successful in explaining electrostatic interactions. Proposing a model that attains equal strengths for both attractive and repulsive fields or forces is challenging.

Some learning materials teach that arrowed lines can represent electric fields flowing out of positive and into negative particles. In this analogy, shown in Figure 1, positive charges are the sources of electric fields, and negative charges are the sinks.

Figure 1 helps with the intuition of the repulsion for +/+ interactions and attraction for +/− interactions. However, this method fails for −/− because it should represent a double attraction. The mathematical argument that '−1 × −1 = +1' is weak if (−) is also considered a sink.

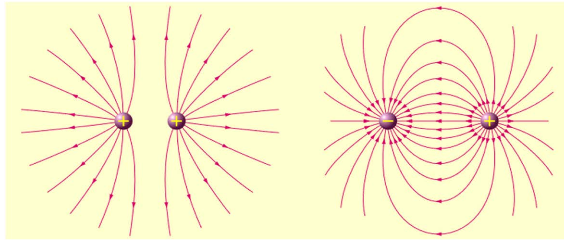

Figure 1. Electric field lines (By Andrew Jarvis—own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=79523935).

Another graphic representation of repulsion in Figure 2 shows two humans, each standing on their own small boat and passing a ball back and forth, resulting in the boats drifting apart because of the transfer of momentum each time the ball is thrown or caught.

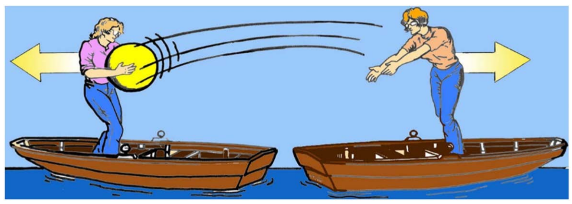

Figure 2. Repulsion analogy (Image credit Daniel Claes).

Figure 2 provides a good analogy of repulsion; however, if the same humans hoped to apply an 'attractive force' in a different scenario, this model could only work if they had a steady supply of balls to throw in the opposite direction.

With the boomerang analogy in Figure 3, the supply of materials need not be unlimited because throwing the boomerang in this manner will result in inward momentum when the boomerang is thrown and caught. However, because the interactions between charged particles must occur at the speed of light, the longer path of the boomerang analogy violates the law of causality.

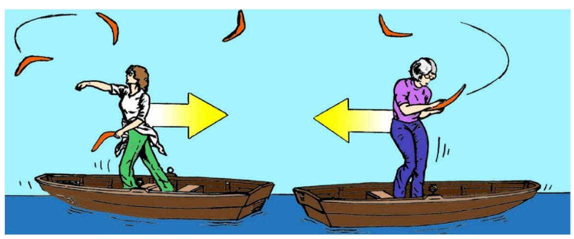

Figure 3. Attraction analogy with boomerangs (Image credit Daniel Claes).

Instead of using balls and boomerangs, the effects of charged particles that attract or repel each other can occur between charged particles and photon pairs.

In field theories, quantum theories, and Maxwell's laws and rules [1], charged particles continuously emit electromagnetic fields. Although the gradient of an electrostatic field around a particle may appear static according to Gauss' law, the

Ampere-Maxwell law clearly shows that the field is updated at the speed of light. It may only be noticeable if perturbed, such as when a charged particle moves relative to another one. Electrodynamic effects then ensue, and relativistic equations are used to solve the field dynamics. It is thus evident that electrostatic fields are not 'static.'

However, there is no 'off switch' for solitary charged particles. Charged particles emit their fields without interruption. Updating fields, as stated above, would require a constant and apparently infinite supply of energy. This would be problematic without an aether as part of the solution. One can visualise this in two ways: one, in which the particle continuously emits its own energy, yet without losing energy itself. This violates the rule of conservation of energy. Another way proposes an aether as the source of energy, where it is the function of the charged particle to convert this energy into an electric field. The source of this energy and its conversion from primordial vacuum to electrostatic fields are yet unknown but are proposed in this paper.

Thought experiment: Consider a pair of RHC (right-hand-circular polarised) spin-1 photons. The photons are identical, except for the signs of their respective electric field strengths, ±E. By convention of a sinewave wavefunction, these two photons are 180˚ out of phase and, being bosons, can exist in the same phase space. The resultant pair has a total quantum property spin projection of +2 but a total E value of zero. Using conventional techniques, such pairs would be nearly undetectable. With no E(electric) or B(magnetic) reactions to charged particles, such photons may travel unhindered through matter (with atoms understood as being 'charged particles combined in mostly empty space'). A direct collision with a charged particle may end the travel of the photon pair. Such a collision can result in a spin-spin interaction, where a particle spin is understood to act like a tiny magnet, reacting with the spins of the individual photons in the pair.

This following work is based on the concepts of Zero-Point-Fields [2] of Rueda and Haisch, and with specific reference to the paired-photon vacuum [3] of Grahn, Annila, and Kolehmainen, a caveat is added in that the photon pairs are primordial and remain paired until interacting with particles, yet each primordial pair must have a very definite energy content; otherwise, electrodynamics would have been an unmeasurable science. In this study, it will be shown, as shown in **Figure 4**, that electrostatic attraction and repulsion can be described with a photon-push solution.

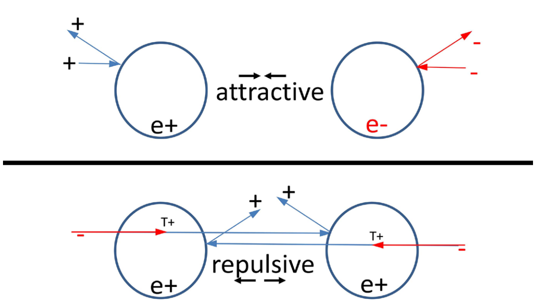

Figure 4. Electrostatic attraction and repulsion from photon interactions.

2. Photon Fields

2.1. Primordial Photon Pairs

This section proposes the aether as an encompassing ocean of spin-2 photon pairs.

The state vector of an RHC (Right-hand-circularly polarised) photon [1] may be presented as Equation (1):

$$|R\rangle = \frac{1}{\sqrt{2}}\left(|x\rangle + i|y\rangle\right) \tag{1}$$

and for a LHC (left-hand-circularly polarised) photon in Equation (2):

$$|L\rangle = \frac{1}{\sqrt{2}}\left(|x\rangle - i|y\rangle\right) \tag{2}$$

where x and y are linked to the E (electric) and B (magnetic) field vector components, respectively, and the distinction between RHC and LHC can be seen in the sign of the imaginary component.

Rewriting (R) and (L) with the E and B variables instead of x and y for clarity of concept yields into Equation (3):

$$|R_1\rangle = \frac{1}{\sqrt{2}}\left(|E\rangle + i|B\rangle\right) \tag{3}$$

as shown in **Figure 5**, with RHC representation as typical $E = (+)\sin(x)$ and $B = (+)\sin(x)$ waves, as seen from the sender's (left) point of view.

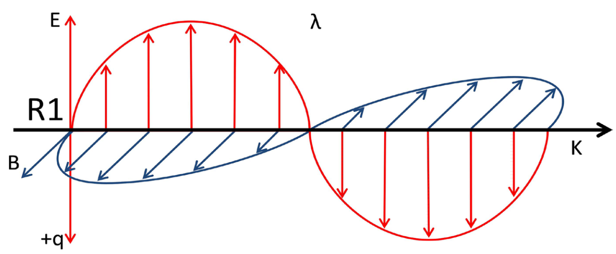

Figure 5. R_1 as an RHC photon (sinewave).

Although we know that a $+\sin(x)$ curve has positive and negative portions of its curve over a length of 2π, it seems counterintuitive that the wavefunction of R_1 of Equation (3) should enter the negative E and B domains when the state vector for R_1 has only positive E and B components. This also implies that a negative R_1 curve only needs a phase difference (in time and space) of π (180˚), and if R_1 moves only by distance π, it must transform into its negative twin. Furthermore, if a train of $+\sin(x)$ wavelets passes an observer, it may appear to be a train of $-\sin(x)$ wavelets if the observer chooses their moment (or place) of observation to be 180˚ out-of-phase. It is now problematic to understand how a field of $+\sin(x)$ wavelets can distinguish between a (+)E field and a (−)E field surrounding a (+) or (−) charged particle. Fortunately, $\sin(x)$ from 0 - 2π is not the only viable solution for a wavefunction. While the physical form of a photon has not generally been agreed upon, Shan-Liang Liu [4] argues convincingly that the photon length is restricted to a half-wavelength in space and time, which implies that **Figure 5** represents two photons in tandem: R_1 and a negative R_1 phase-following (or leading).

Presenting photons as half-wavelength packets, one can now intuitively see how each packet of energy, with any allowed orientation of the E and B fields, travels through space at velocity 'c' in its original form as it is emitted. Fluctuations, as observed in typical electromagnetic waves emitted from, e.g., dipole antennae, are achieved by sending (+) and (−) photons in tandem. Dipole antennae require charge oscillations from (+) to (−), though, whereas a single charged particle may then be considered as a 'monopole antenna'. It must emit trains of photons to form pure (+) or (−) fields, depending on the particle charge, which can be achieved with pure $(+)E$ or $(-)E$ half-wavelength photons. It is thus proposed that R_1 in Equation (3) is better represented by **Figure 6**.

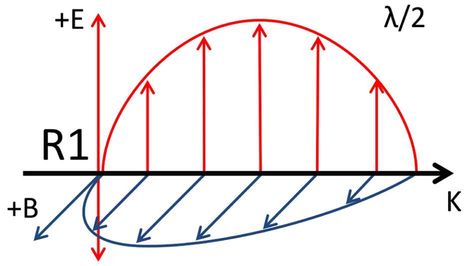

Figure 6. R_1 as an RHC half-wavelength photon.

For coupled photon pairs, and with each photon limited to half-wavelength wavefunctions, R_2 as an RHC photon in Equation (4) is envisaged, being the negative E and B values of the R_1 photon on both the x- and y-axes, but with the same propagation direction:

$$\left|R_2\right\rangle = \frac{1}{\sqrt{2}}\left(\left|E+\pi\right\rangle + i\left|B+\pi\right\rangle\right) = -\frac{1}{\sqrt{2}}\left(\left|E\right\rangle + i\left|B\right\rangle\right) = -\left|R_1\right\rangle \tag{4}$$

as shown in **Figure 7**.

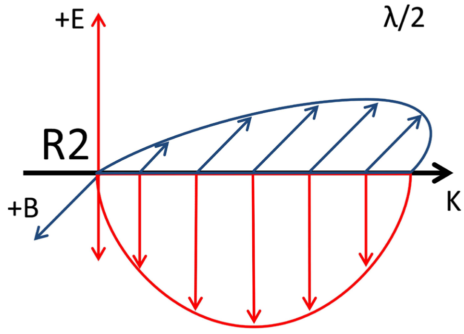

Figure 7. R_2 as an RHC half-wavelength photon.

Combining R_1 and R_2 in **Figure 8** shows a typical wave that begins to represent a photon train, or a tandem photon pair, as would originate from an oscillating dipole antenna.

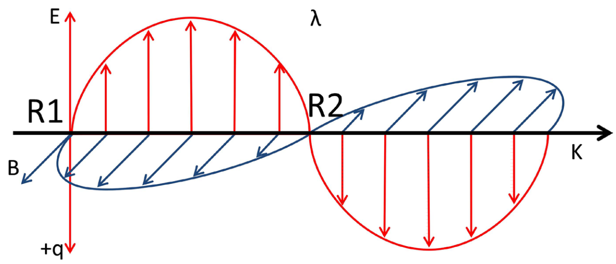

Figure 8. $R_1(x) + R_2(x-\pi)$.

Similarly, we define Equation (5) for an LHC photon, as shown in Figure 9.

$$|L_1\rangle = \frac{1}{\sqrt{2}}\left(|E\rangle - i|B\rangle\right) \tag{5}$$

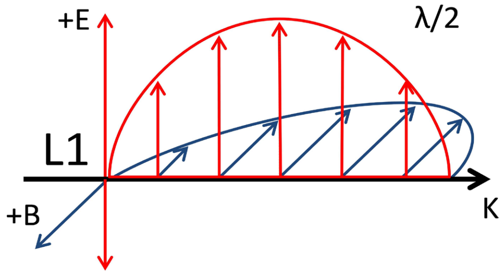

Figure 9. L_1 as an LHC photon.

and define Equation (6) for $L_2 = -L_1$ as shown in Figure 10:

$$|L_2\rangle = \frac{1}{\sqrt{2}}\left(-|E\rangle + i|B\rangle\right) = -|L_1\rangle \tag{6}$$

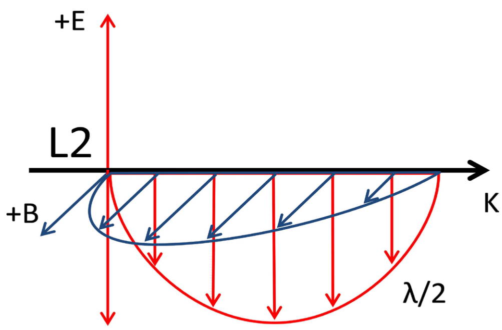

Figure 10. $L_2 = -L_1$ as an LHC photon.

For the remainder of this document, reference to 'positive photons' would mean the ($+E$) positive E curves of R_1(RHC) and/or L_1(LHC), and reference to 'negative photons' would mean the ($-E$) negative E curves of R_2(RHC) and/or L_2(LHC).

Unlike in Figure 8, where R_1 and R_2 are shown in tandem and separated by half-wavelengths, R_1 and R_2 are also bosons and may occupy the same space, but R_2 is the negative of R_1 thus, adding Equations (3) and (4) in the same space adds up to zero as shown in Equation (7):

$$\psi_1 = |R_1\rangle + |R_2\rangle = 0 \tag{7}$$

where R_1+R_2 is no longer seen as two photons in tandem, but are both existing within the same half-wavelength of space and time, as shown in **Figure 11**.

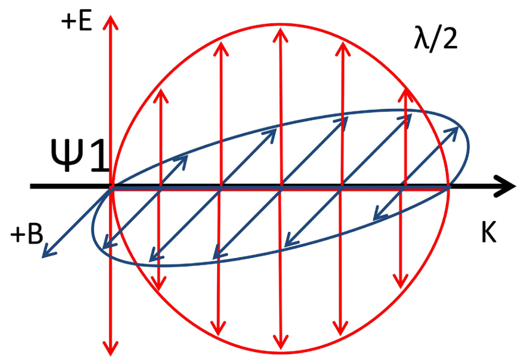

Figure 11. $\Psi_1 = R_1 + R_2 = 0$, spin = +2.

Similarly, for LHC photons, as shown in Equation (8),

$$\psi_2 = |L_1\rangle + |L_2\rangle = 0 \tag{8}$$

which represents Ψ_2 would also match Ψ_1 in **Figure 11**, except with spin = −2.

The energy density for either R_1 or R_2 equals a non-zero positive value, because the Poynting vector in Equation (9) for a photon always has a positive amplitude (ignoring sign change for direction based on a chosen coordinate system that does not change the amplitude, merely the direction of the vector).

$$\bar{S}\left(|R_i\rangle\right) = \frac{1}{\mu_0}\left(\bar{E} \times \bar{B}\right) \tag{9}$$

and is always positive for the energy in Equation (10) of each photon.

$$\bar{U}\left(|R_1\rangle\right) + \bar{U}\left(|R_2\rangle\right) > 0 \tag{10}$$

Unlike adding the state vectors R_1 and R_2 to result in zero E and B fields in Equation (7), the total energy in Equation (10) cannot yield a zero result for any photon frequency $f > 0$. Thus, the energies of Ψ_1 and Ψ_2, from Equation (7) and Equation (8), cannot be zero, due to the law of conservation of energy. However, except for the net spin-2 values, the photon pairs Ψ_1 and Ψ_2 might appear electromagnetically 'invisible'.

This may now represent what Grahn, Annila and Kolehmainen envisage for their paired vacuum, and Rueda and Haisch for their zero-point-fields. The results of the HOM [5] experiment may already provide evidence of such invisible photon pairs created in lab conditions.

Because photon pairs Ψ_1 and Ψ_2 have no net electric or magnetic field components, and thus no visible wavelengths, the triggering of a Compton effect in the vicinity of a charged particle appears improbable. For $\Psi_1 = R_1 + R_2$ the net projected spin is +2, and for $\Psi_2 = L_1 + L_2$ the net spin is −2. However, spin interactions [6] exhibit short-range effects. Thus, if the photon pairs do not interact electrically or magnetically within the atomic material, they might attain a long mean free path, even through the densest atomic matter.

It is proposed that photon pairs Ψ_1 and Ψ_2, with Ψ_1 as represented in **Figure 11**, saturate all of space, of origins yet to be determined, with the vacuum photon pairs of Annila *et al.* forming an all-pervasive aether, to which mass is mostly transparent.

2.2. Primordial Photon Pairs Transform to Electrostatic Pairs through Charged Particle Interactions

The RHC photon pair R_1+R_2 in Ψ_1 consists of equal spin states, resulting in a total projected spin state of +2, shown in Equation (11). The LHC photon pair in $L_1 + L_2$ in Ψ_2 has a total spin state of −2, shown in Equation (12). Both pairs have a net + z direction.

$$S_z\left(\left|R_1\right\rangle+\left|R_2\right\rangle\right)=\left(0,0,2\right) \tag{11}$$

and

$$S_z\left(\left|L_1\right\rangle+\left|L_2\right\rangle\right)=\left(0,0,-2\right) \tag{12}$$

With a limited probability of interacting 'electromagnetically' through E or B fields, short-range spin-spin interactions between photon pairs and charged particles (spin = ½) are the only likely or probable interaction method to decouple or transform the photon pairs Ψ_1 or Ψ_2.

From Equation (10), it is deduced that if a mechanism exists to change the wavefunction from R_1 to R_2, which equates to changing R_1 to negative R_1, or more logically that it changes a photon from $(+)E$ to $(-)E$, such a mechanism would require no energy for the transformation because the net energy of the system in Equation (10) would not change. Since the charged particle is not performing work or consuming energy, by e.g. changing R_1 to R_2, we can propose that photon transformation is a property of a charged particle.

Postulate 1:

Interactions with charged particles cause primordial spin-2 photon pairs to transform into spin-0 pairs, which in turn manifest as electrostatic fields with no magnetic fields around (static) charged particles. (Particle spin states remain unchanged after the interactions) The proposed transformation results in new photon pairs, which are pre-emptively shown here in Equations (13) and (14) as pure $(+)E$ and $(-)E$ fields of photons and then elaborated in detail:

$$\psi_3=\left|L_1\right\rangle+\left|R_1\right\rangle=+\frac{2}{\sqrt{2}}\left|E\right\rangle \tag{13}$$

$$\psi_4=\left|L_2\right\rangle+\left|R_2\right\rangle=-\frac{2}{\sqrt{2}}\left|E\right\rangle \tag{14}$$

From primordial photon pairs Ψ_1 and Ψ_2 to the transition to electrostatic photon pairs Ψ_3 or Ψ_4, the following transformation mechanisms are proposed:

Transformation T_+:

A charged positive (+) particle interacts with either photon pair Ψ_1 or Ψ_2 by interacting with each photon within the pair and:

1) Transform the ($-E$) photon wavefunction out of the pair to ($+E$) (proposed as a property of the particle);

2) Reflect the ($+E$) photon (and invert the polarisation).

As shown in Figure 12, it was colorised to enhance the T_+ transition effect.

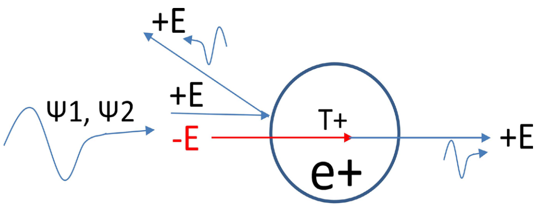

Figure 12. Reflection of a (+)E photon and T(+) transformation of a (−)E photon to a (+)E photon by a (+) charged particle.

By interacting with a (+) particle within the incoming photon pair $\Psi_1 = (R_1 + R_2)$, R_2 is transformed from $-E$ to $+E$, as shown in Equation (15). Photon spin is not changed.

$$(T_+)|R_2\rangle \Rightarrow |R_1\rangle \tag{15}$$

Reflection of R_1 changes polarisation and can be expressed as Equation (16):

$$(T_+)|R_1\rangle \Rightarrow |L_1\rangle \tag{16}$$

and within the incoming pair $\Psi_2 = (L_1 + L_2)$, L_2 is transformed from $-E$ to $+E$ as shown in Equation (17). Photon spin is not changed.

$$(T_+)|L_2\rangle \Rightarrow |L_1\rangle \tag{17}$$

Reflection of L_1 changes polarisation and can be expressed as Equation (18).

$$(T_+)|L_1\rangle \Rightarrow |R_1\rangle \tag{18}$$

resulting in outgoing pairs (of either Ψ_1 or Ψ_2 interactions) from a (+) charged particle $\Psi_3 = (R_1 + L_1)$ as was anticipated in Equation (13).

Transformation T_-:

A charged negative (−) particle interacts with either photon pair Ψ_1 or Ψ_2 by interacting with each photon within the pair, as shown in Figure 13:

1) Transform the ($+E$) photon wavefunction out of the pair to ($-E$) (proposed as a property of the particle);

2) Reflect the ($-E$) photon (and invert the polarisation).

Interacting with a (−) particle within the photon pair $\Psi_1 = (R_1 + R_2)$, R_1 is transformed from $+E$ to $-E$, as shown in Equation (19). Photon spin is not changed.

$$(T_-)|R_1\rangle \Rightarrow |R_2\rangle \tag{19}$$

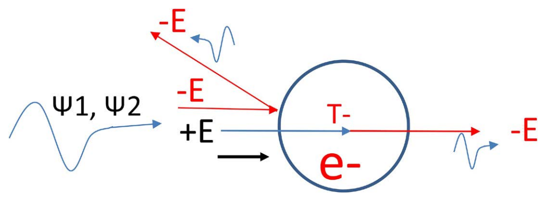

Figure 13. Reflection of a $(-)E$ photon and $T(-)$ transformation of a $(+)E$ photon to a $(-)E$ photon by a $(-)$ charged particle.

Reflection of R_2 changes polarisation and can be expressed as Equation (20):

$$(T_-)|R_2\rangle \Rightarrow |L_2\rangle \tag{20}$$

and within-pair $\Psi_2 = (L_1 + L_2)$, L_1 is transformed from $+E$ to $-E$, as shown in Equation (21). Photon spin is not changed.

$$(T_-)|L_1\rangle \Rightarrow |L_2\rangle \tag{21}$$

Reflection of L_2 changes polarisation and can be expressed as Equation (22):

$$(T_-)|L_2\rangle \Rightarrow |R_2\rangle \tag{22}$$

resulting in both outgoing pairs (of either Ψ_1 or Ψ_2 interactions) from a $(-)$ charged particle $\Psi_4 = (R_2 + L_2)$ as was anticipated in Equation (14).

End Postulate 1:

Thus, a charged (+) particle transforms any of the incoming primordial photon pairs Ψ_1 and Ψ_2 into Ψ_3, which exits with a net spin = 0 and still has a zero B field, thus forming a net positive electrostatic field flowing out from around the (+) particle, with photon pairs E and B fields, with Ψ_3 as shown in Figure 14.

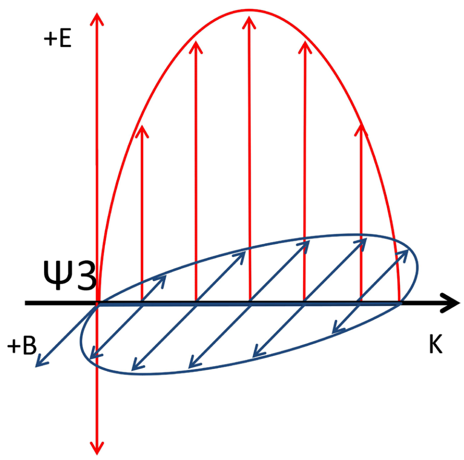

Figure 14. Outflowing photon pairs from a (+) particle have a net $+E$ component.

Thus, a charged $(-)$ particle transforms any of the incoming primordial photon pairs Ψ_1 and Ψ_2 into Ψ_4, which exits with a net spin = 0 and still has a zero B field, forming a net negative electrostatic field flowing out from around the $(-)$ particle, with photon pairs E and B fields, with Ψ_4, as shown in Figure 15.

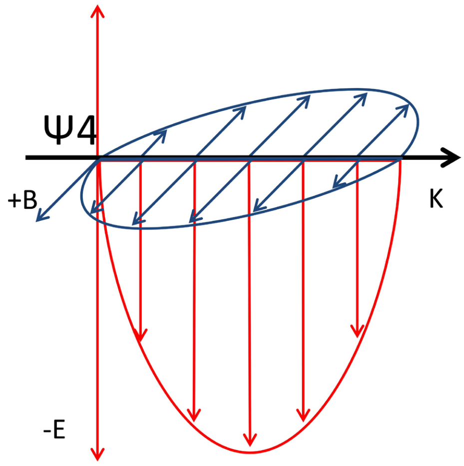

Figure 15. Outflowing photon pairs from a (−) particle have a net $-E$ component.

2.3. The Coulomb Field Equation

As a conceptual analysis of the model, the electrostatic interactions between charged particles are represented here as simplified Coulomb fields.

Charged particles exist submerged in an aether of spin-2 photon pairs Ψ_1 and Ψ_2. As shown in Figure 16, there is no net macroscopic force on a single isolated particle in a symmetric photon field. (Ignoring quantum fluctuations for now and limiting representations to a one-dimensional effect to assist with the clarity of the concept.)

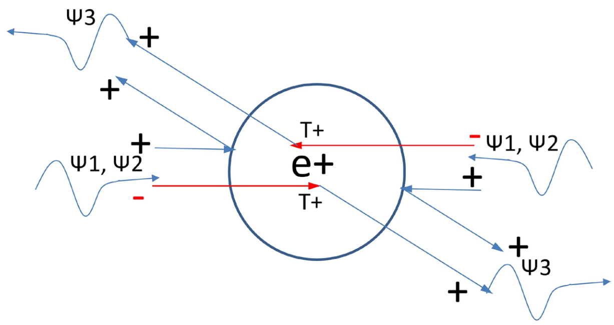

Figure 16. Zero net momentum transfer to a particle in a symmetric aether.

While primordial photon pairs Ψ_1 and Ψ_2 continue to interact with this (+) particle represented in Figure 16, trains of Ψ_3 ($+E$) photons exit in all directions, establishing the (+) electrostatic field.

Following interactions with the aether, charged particles have a field of 'new' photon pairs flowing outward from the particles. While individual particles are 'infinitely far' removed from each other, they each remain in a symmetric aether (spin-2 photon pairs Ψ_1 and Ψ_2 incoming and spin-0 photon pairs Ψ_3 and Ψ_4 outgoing for (+) and (−) particles, respectively).

From the incoming spin-2 photon pairs, Figure 16 also shows the outgoing pairs Ψ_3 (+/+), which create a net positive outflowing electric field around a (+) particle.

It is intuitive to see that from the inflow of neutral spin-2 photon pairs and the outflow of $(+)E$ or $(-)E$ spin-0 photon pairs, for charged particles, the outflowing photon pairs contain none of the opposite charge photons. This creates two types of asymmetries around charged particles:

1) $(\Psi_1 + \Psi_2)_{in} > (\Psi_1 + \Psi_2)_{out}$ (not in the scope of this document)

2) (A) For (+) charged particles $(\Psi_3)_{out} > (\Psi_3)_{in}$; $(\Psi_4)_{out} = 0$

2) (B) For (−) charged particles $(\Psi_4)_{out} > (\Psi_4)_{in}$; $(\Psi_3)_{out} = 0$

For isolated charged particles $(\Psi_3)_{in}\sim 0$ and $(\Psi_4)_{in}\sim 0$, which only enhances the asymmetries #2A and #2B, but when particles approach each other, this simplification is no longer valid.

It is known that Coulomb attraction and repulsion are not functions of particle mass since the charge value and effect of a proton are the same as those of a positron, while the two have vastly different masses. In the concept of photon-pair interactions, it can then be argued that interactions are discrete and thus not affected by volume or density (of a single charged particle).

We define Equation (23) as the total flux (intensity) of discrete photon pairs transformed at a charged particle, with μ_T the interaction coefficient, where $Flux_{T(Q)}$ in Equation (23) represents Ψ_3 or Ψ_4 outgoing photon pairs depending on particle charge Q:

$$Flux_{T(Q)} = \mu_T * (\psi_1 + \psi_2)_{in} * Q \tag{23}$$

By defining a Gaussian sphere around the charged particle, the asymmetry can be quantified as shown in Figure 17:

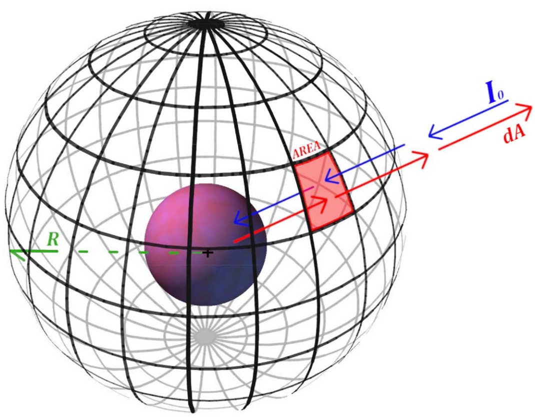

Figure 17. Gaussian sphere depicting measurement of flux at a distance (r) through area (A).

Equation (24) measures the flux asymmetry at a distance (r) from the centre of the particle:

$$E(r) = \frac{\mu_T (\psi_1 + \psi_2)_{in} * Q}{4\pi r^2} \tag{24}$$

The well-known Coulomb field equation for a charged particle Q is shown in Equation (25):

$$E(r) = \frac{k_e * Q}{r^2} \tag{25}$$

and can be rewritten as Equation (26):

$$E(r) = \frac{1}{4\pi r^2} * \mu_0 c^2 * Q \tag{26}$$

From this, it is then evident, comparing Equations (26) and (24), that the electric field strength around charged particles is a function of the transformed photon pairs:

$$\mu_T (\psi_1 + \psi_2)_{in} = \mu_0 c^2 \tag{27}$$

where in Equation (27), μ_0 is the strength of the interaction, and c^2 is the measure of the aether flux.

2.4. Electrostatic Attraction and Repulsion

An electron recoils close to another electron; in other words, it is pushed away by a negative electric field created around another electron. These fields do not push against other fields, contrary to what may have been suggested in **Figure 1**. It is also known that a positron (or proton) will not recoil in the vicinity of an electron; in other words, it is not pushed away by a negative electric field because otherwise, there could be no attraction. Ignoring for a moment that the two opposites will attract, visualise that negative and positive fields exist but go right through an opposite charge with no 'push' effect, whereas equal fields will not go through but will push against their equal particles.

In **Figure 16**, the charged particle in a symmetric aether experiences no net force from the field, and a symmetric electrostatic field forms around the particle. Although the incoming and outgoing fields are symmetric around a single isolated particle, nearby particles sense each other's fields asymmetrically. Photons approach and depart at the speed of light to and from particles so that at first appearances, it might seem as if the fields 'are always there'. Relativistic effects will certainly apply but are excluded from this concept analysis.

It is known that a reflected photon (as any other elastic scattered object) will transfer up to 2x its own momentum onto the impacted object. Thereby, momentum is conserved. The force on the impacted object can be calculated as a timed function in Equation (28):

$$F(r) = \frac{\mathrm{d}P}{\mathrm{d}t} \tag{28}$$

Following on from Postulate1, as shown in **Figure 18**:

Postulate 2: From within any photon-pair of Ψ_1, Ψ_2, Ψ_3 or Ψ_4

1) A reflected photon will transfer momentum onto the particle and appear as if it is exerting a momentary pushing force F on the particle it interacts with.

2) A transformed photon will pass through, and its effect on the particle will be

negligible.

According to Mansuripur [7] and Pfeiffer *et al.* [8], a transiting photon (e.g., through glass) only transfers momentum to the particle when entering a particle and retrieves it when exiting the particle. Considering the small size of the fundamental particles and the speed of the photon 'c' through the particle, the interaction strength is considered negligible compared with the momentum transferred by the reflected photon.

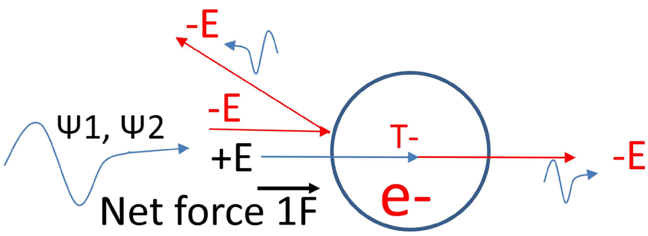

Figure 18. A net force of 1F is applied by the $-E$ reflected photon onto the (−) charged particle through the transfer of momentum. Momentum transfer by the transformed photon is negligible.

End Postulate 2:

The interactions between two particles in **Figure 19** show how an asymmetry in the opposing field is established:

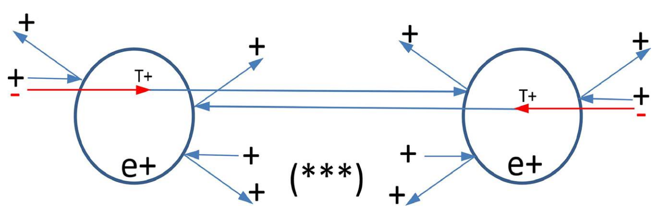

Figure 19. Symmetry is disturbed when charged particles approach, as shown for two (+) particles. (***) An asymmetry occurs as in this example; less (−) photons would approach from either opposite particle. In this image, the (+) particles shadow out (−) photons going toward their opposite particles, creating the asymmetry.

Then, reducing complexity by removing any symmetric (net zero) and insignificant force actions from the diagram and showing asymmetry between particles, electrostatic repulsion is shown in **Figure 20**:

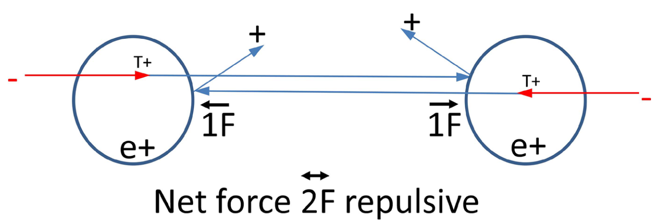

Figure 20. Repulsive Coulomb 'force' for same-charge particles due to photons pushing particles of similar charges apart.

A similar diagrammatic exercise is shown for the two oppositely charged particles in **Figure 21**:

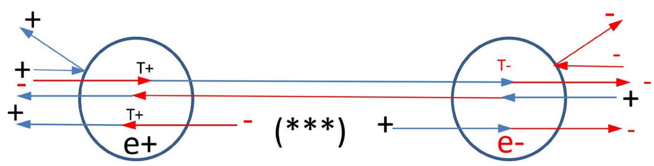

Figure 21. Symmetry is disturbed when two particles approach, as shown here for a (+) and (−) particle. (***) An asymmetry occurs in this example; less (+) photons would approach from the right, and less (−) photons would approach from the left between the particles. In this image, the (+) particle(left) shadows out (−) photons going toward the opposite (−) particle, and the (−) particle(right) shadows out (+) photons going toward the opposite (+) particle, creating the asymmetry.

Figure 22 represents an 'attraction' force (with net zero and insignificant effects removed from **Figure 21**) because photons push particles of opposite charges toward each other.

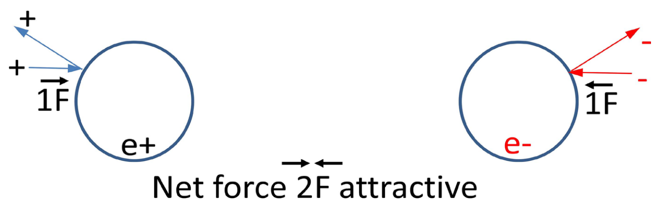

Figure 22. Attractive Coulomb 'force' for opposite charge particles due to photons pushing particles of different charges together.

3. Conclusions

Primordial superimposed photon pairs would exhibit a small cross-section and thus can travel mostly unobstructed through mass. Primordial aether photon-pairs transform to electrostatic $+E$ or $-E$ photon-pairs through interaction with charged particles. The electric fields around charged particles are reliably and repeatably measurable. This motivates aether photons and pairs to be at very specific energies; otherwise, electromagnetics would have been an unpredictable science.

Charge is a discrete effect due to the interaction of the primordial aether with individual particle spins.

Electrostatic attraction and repulsion can be visualised with an aether model.

Further studies

Further studies may reveal a mechanical model for magnetic effects; for example, $R_1 + L_2$ would constitute a purely magnetostatic field. However, there are currently no known magnetic monopoles that can transform photon pairs to this effect.

The Fatio and Le Sage models of gravity must be revisited because both transparency and energy problems, along with other prior objections [9]-[11], now seem to be resolved. The mechanics of gravity can be achieved by recognising that $|\Psi_1, \Psi_2|_{(IN)} > |\Psi_1, \Psi_2|_{(OUT)}$ for any collection of masses (charged particles), which results in an inward push on the matter.

A relativistic and detailed quantum solution with tensors is required for this simplified model, which will also lead to a further understanding of quantum gravity.

Conflicts of Interest

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

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