The Concepts and Principles Behind of Delta-c Mechanics

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Δc **Mechanics** is a reformulation of physics based on the Feynman formulation of Quantum Electrodynamics (QED). Feynman's QED posits that a particle moving from one point to another can be described as the sum of all possible action paths connecting these points. Essentially, the particle's trajectory is represented by integrating over all possible paths, each weighted by its action. In Feynman and wheeler's original view, the electron is the primary particle, and its interactions are mediated by the exchange of photons.[3]

Feynman's formulation of Quantum Electrodynamics (QED) yields extraordinarily precise predictions that have been confirmed with remarkable accuracy. In QED, particles, particles move from one point to another through an infinite sum of all possible action paths. These paths, which represent possible trajectories for particles, sum to be the actual path of the particle. The action paths, which exist throughout space, are empty and have no effect on other particles except at the end points, where the particle is reconstituted as a solution to the Schrodinger equation. Through the interim paths between the end points, the paths have no substance and no interaction with external events. [4]

For the theory defined here it is presumed that there is actually a probability of density of photons on those paths that interact with the probability density of the photons from other particles. The interaction of these probability densities is shown to explain phenomena such as electricity, gravitation, and the behavior of light without the existence of energy carrying fields.

A particle based probability density is being proposed as the basis of an extended reformulation of the Feynman version of QED. [1]., the following is an outline of the methodology.

Photons and Rest Mass in Δc Mechanics

The fundamental assumption of Δc Mechanics is that the universe is a construction of photons. The photon being a Planck particle having a velocity of c, if they are not spinning they have a radius of about $^{10-}33$ cm and if spinning, has an energy of $\hbar\omega$, and a Compton radius of $\lambdabar = c_0 / \omega$. The presumption is that mass is the local confinement of spinning polarized photons. Massive particles consist of mostly of two photon self-bound pairs. The self-bound pairs are the primary leptons, and quarks. Other massive particles such as protons and mesons are bound collections of those two-photon particles.

Concurring phenomena

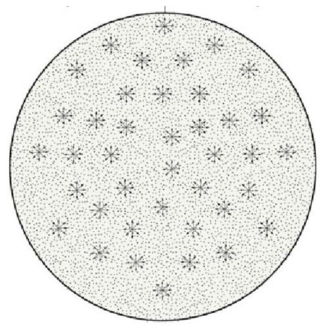
For any two photons, there is a single velocity frame in which the photons are equal and opposite, and in that frame the sum of the linear momentum is zero. The momentum and energy of two photons have a minimum energy velocity rest frame, and the energy and the momentum transforms the same as rest mass.

$$\frac{d}{dt}\left[\left(\omega_1+\omega_2\right)\mathbf{r}_{CM}=\omega_1\mathbf{r}_1+\omega_2\mathbf{r}_2\right]=0 \tag{1}$$

Trapped photons, whether in a box or as self-bound pairs, exhibit the same momentum as a massive particle with equivalent energy.

A volume of random photons within a confined space could be self-bound in pairs, or free within a black body.(Fig 1.)

Figure 1.



Random Collection of Photons

The kinetic energy of each photon is: $\varepsilon = \hbar\omega_n$, and it has inertial mass defined by its momentum , thus $\boldsymbol{p} = \mathrm{mc}$, and the value of its inertial mass is:

$$\mathrm{m} = \sum_{n} \hbar\omega_n / c^2 \tag{2}$$

When bound together the sum of these photons constitute the inertial mass of a rest particle such as the electron. The momentum is the sum of the inertial mass of the photons times the velocity of the center of mass

The total energy momentum and energy of a pair of photons from center of mass coordinate is

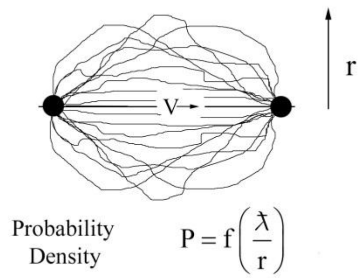
$$\boldsymbol{p} = \mathrm{M}_n \mathbf{v}_{CM} = \left(\mathrm{m}_1 + \mathrm{m}_2\right)\mathbf{v} = \frac{\hbar\omega_1}{c_0^2}\mathbf{c}_1 + \frac{\hbar\omega_2}{c_0^2}\mathbf{c}_2 \tag{3}$$

The total energy and momentum of a collection of random photons equate to those of a collection of massive particles with the same energy. Thus, it can be asserted that rest mass represents the local confinement of the kinetic mass of a collection of photons, supporting the notion that this is a physically plausible concept.

The difference in Feynman's view of QED and the presentation here, presumes that the Feynman action paths are not empty, but possess a probability of the photon actually being on the path. This probability introduces a particle-particle interaction by assuming that the fundamental particle is the photon, and in this framework, interactions between photons are mediated through the probability density of their positions on the action paths. The encounters of probability density from two sources reduce the velocity of light or increase the index of refraction for the encountering photons, [3].

Consider the actions paths of a photon moving from one point to another along a line connection the points, Fig 2:

Figure 2.



The Feynman action sum starts with the initial Schrödinger state and reproduces it at the end, but between the points, the state or the particle doesn't exist. The view here is that photons traveling from point A to point B follow all possible paths. The probability density of their flow, P is highest near the primary path and inversely proportional to the distance from it, but the total probability of the existence of the photon is present at all positions on the line of travel.

$$\mathrm{P} = f\left(\frac{\lambda\!\!\!^{-}}{\mathrm{r}}\right) \tag{4}$$

As a photon traverses all possible paths between two points not just the primary path, the probability existing on these paths interact with the probability density of other particles. This interaction results in a decrease in the velocity of light for the action paths of both particles, mutually deflecting the action paths of the other particle in its direction.(Fig 3.)

Figure 3.

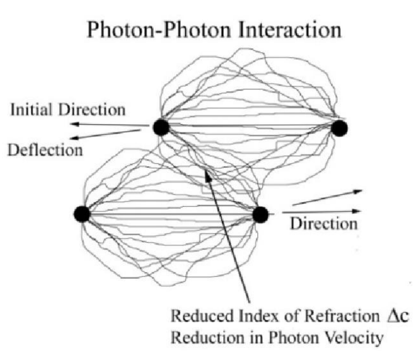


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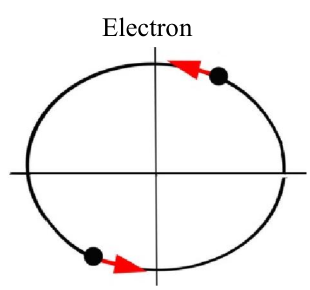
Figure 4.

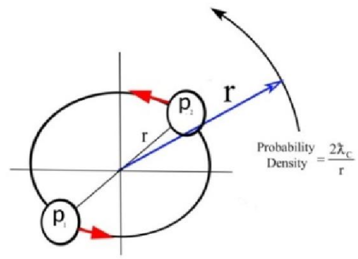


Electron $\hbar\omega_{\mathrm{P}} = 2 \times 0.25549947$ Mev

At a certain energy level of the photons $\varepsilon = \hbar\omega$, this deflection is sufficient to induce the polarized photons into a circular orbit, which manifests the binding as an electron. (Fig 4.)

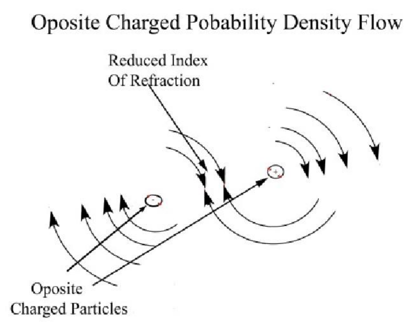
Photons moving in a self-bound orbit within the Compton radius generate a probability flow density outside this orbit, which can interact with similar particles. This interaction can be recognized as an electric field.(Fig 5.),[2]

Figure 5.



As electrons and positrons engage, the same phenomena bind the particles together as shown in. (Fig. 6.)

Figure 6.



From this model, one can derive gravitational and electric interactions as well as the fine structure constant. The change in the velocity of light as a function of distance from the particle is given by:

$$\frac{\Delta c}{c_0} = \frac{1}{2}\left[\left(\frac{\sqrt{2}\bar{\lambda}_{PL}\nu_e}{\bar{\lambda}_e}\right)\left(\frac{\bar{\lambda}_e}{r}\right)\right]^2 = \frac{1}{2}\left(\frac{\alpha\bar{\lambda}_e}{r}\right)^2 \rightarrow \frac{1}{2}\left(\frac{\alpha}{n}\right)^2 \tag{5}$$

The probability flow of two photon particles is planar, and the interaction between similar particles is in a counter-rotating planes. The interaction between the photons repeats on each revolution thus multiplying the probability of interaction by the Compton frequency ν_e^2 this makes about 10^{36} times the energy change induced by gravitation.[3]

Gravitation

The internal photons inside all mass particles generate probability flow, but because of the lack of a specific orientation the flow direction exterior to the Compton radius is random and thus the total exterior flow probability density direction is in random directions and spread over 4π radians of space. This generates a random flow of probability density changes the velocity of light for interloping photons. Since it is ubiquitous in direction and not repeating at the Compton frequency at a point, it is about 10^{36} times smaller than the electric interactions.

The change in the velocity of light for a passing photon in proximity to mass particle is the probability of hitting a Planck particle inside the Compton radius of that particle times the probability of that particle being at the distance of the passing photon is:[3]

$$\frac{\Delta\varepsilon}{\varepsilon_0}=\frac{\Delta c}{c_0}=\left(\frac{\lambda\!\!\!^{-}{}_{PL}^2}{\lambda\!\!\!^{-}{}_{p}^2}\times\frac{2\lambda\!\!\!^{-}{}_{p}}{r}\right)=\frac{G\hbar}{c^3}\frac{mc}{\hbar\ r}\quad\to\quad\frac{2GM}{c_0^2 r}\tag{6}$$

This is the change in c as the result of the test particle moving from a great distance to proximity of the mass M. the mass M is the sum of a group of particles at the center at $r = 0$. $\Delta\varepsilon$ is the change in the energy of a particle with energy ε_0 as a result of being at a distance r from the p particle with Compton radius $\lambda\!\!\!^{-}{}_p$. This is the expression that shows gravitation to be the combined probability effect of a group of single quantum particles, rather than a continuous field. Note that the Feynman photon which is defined as which is a Planck particle without a Compton radius has a cross section of about 10^{-66} cm, or about 39 orders of magnitude smaller than a neutrino.

Eq. (6) is the change in c, Δc for a test mass particle m with energy ε_0

$$\Delta\varepsilon = mc_0^2 - m'c_0^2 = \frac{2GM}{c_0^2 r}mc_0^2\tag{7}$$

This is the change in c or the change in energy of the particle as it moves from a distance to a position r near the mass M. The escape energy for such a particle is:

$$\varepsilon=\frac{MG}{r}=\frac{1}{2}v_{esc}^2\tag{8}$$

Thus the total change for the mass particle is a change in the rest mass at the position and the velocity

$$m'c_0^2 = m_0c_0^2\left(1-\frac{GM}{c_0^2 r}-\frac{1}{2}v_{esc}^2\right)\tag{9}$$

The escape energy can be dissipated thus leaving the rest mass at the "r" position as:

$$m_0c_0^2 = m_o'c_0^2\left(1+\frac{GM}{c_0^2 r}\right)\tag{10}$$

Note that the dissipation of the kinetic energy leaves a rest mass less than the free mass, m_0 and unable to escape.

Combined Relativistic Velocity and Gravitational Attraction

A test particle moving in a proximity to a mass particle has a change in its rest mass, due to the decrease in the velocity of light, and a change in its observed mass due to the relative velocity of light.

Eq.(11), gives the relation between the rest mass and the relativistic velocity mass , and Eq.(10),(12) , gives the relativistic gravitational mass independent of its velocity.

$$m_0 c_0^2 = m'_v c_0^2 \left(1 - \frac{1}{2}\frac{v^2}{c_0^2}\right) \quad (11) \qquad m_0 c_0^2 = m'_o c_0^2 \left(1 + \frac{GM}{c_0^2 r}\right) \quad (12)$$

The relativistic velocity rest mass of Eq.(11), is the relativistic proximity mass of gravitation Eq.(12) due to the presence of a gravitating mass, thus the two expressions can be combined as:

$$m_0 c_0^2 = m'\, c_0^2 \left(1 + \frac{GM}{r}\right)\left(1 - \frac{1}{2}\frac{v^2}{c_0^2}\right) \tag{13}$$

This forms the relativistic Lagrangian which is the same as the same as Eq.(9), when the velocity is equal to the escape velocity .

$$\varepsilon_0 \quad = \quad m' c_0^2 \left(1 + \frac{GM}{c_0^2 r} - \frac{1}{2}\frac{v^2}{c_0^2}\right) \tag{14}$$

Conclusion

The concept of a photon based QED such as has been described here as, Δc Mechanics, can provide the mechanical basis of Electric, Gravitational, and Velocity, particle-particle mass interactions without reference to an energy density field.

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