Feynman Flow Density Alternative to Wavefunctions

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V060225

$\psi^*\psi$ $\phi^*\phi$

Preface

The QM wave function ψ is purely mathematical structure not physically related to anything observable, and the amplitude is not definable. It works, but no one is certain as to why. This paper will define a vector flow density of the Feynman action path integrals $\phi^*\phi$, as an alternate probability function to defined quantum states, and addresses some of the conceptual issues.

The Feynman action path integrals are generally assumed to be the amplitude of a wavefunction and, the end point being the sum over all the paths creating a vertex function. The phase summations create the state, but have no effect on the phase or motion of other particles. These same action functions can be taken as the probable flow density of photons generated by the photon on action paths inside mass particles. The difference mathematically is slight, but the probable action flow creates the difference between a passive probability of state existence, and the mechanism that interact with the action flow of other particles to create state values. The flow interaction creates the effect of charge, and energy fields without the necessity of postulating the existence of either.

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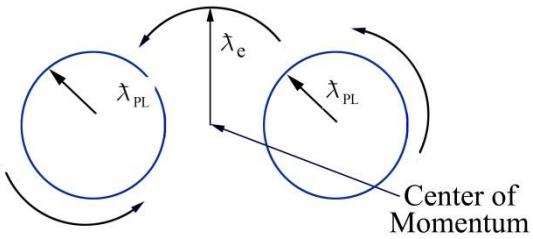
Introduction

An electron is composed of two photons consisting of two rotating Planck particles revolving around their center of mass at the Compton radius

Fig. 1 The Electron



In earlier work regarding the vacuum flow density of space and the change in the velocity of light in regard to the flow density around the electron, it was discovered the two photons consisting of Planck particles bind to form the polarized electron.

Based on vacuum flow considerations it was found that in the electron, the ratio of the number of rotation frequency of the Planck particles is the square of the number of rotations of the electron in the Compton in the same time. The distance the photons can travel around the perimeter is then: $\nu_{PL} = n_e^2$ cycles / sec . and the velocity is $\rightarrow$ $v_{PL} = \sqrt{2}\lambda\!\!\!^{-}_{PL} \times n_e^2$ cm / sec .

The ratio of the distance traveled for the photon rotation to the orbital Compton rotation is:

$$\sqrt{2}\lambda\!\!\!^{-}_{PL} n_e^2 / \lambda\!\!\!^{-}_{e} n_e = \Re_0 / \lambda\!\!\!^{-}_{e} \qquad (1)$$

n_e is the number of revolutions the Planck particle makes in the time it takes for a single orbit around the Compton radius, and $\Re_0 = \sqrt{2}\lambda\!\!\!^{-}_{PL} n_e$ is the distance traveled. $\Re_0$ is thus the most probable orbiting radius, and $\lambda\!\!\!^{-}_{e} = \hbar / m_e c_0$, is the radius at which the electrons have an action equal to $\hbar$

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Content

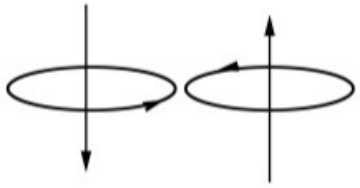
Preface

The flow functions ϕ are vectors creations of conjugate photons and for this presentation will be identified as up and down vectors as $\phi^{*}\downarrow$ and $\phi\uparrow$, and identified as conjugate flow functions. These density flows are more mathematically proper in the Geometric Algebra described in [17] but are not as descriptive.

Interaction Kernels $\phi^{*}\phi$

The interaction of the electron flow density in Eq.(2), with its conjugate, and shown in Fig.3, is the probability density of two opposite Planck action flows that create the probability density of particle-particle intersection, resulting in a ***decrease in the action flow*** between the $\pm$ kernels.

Fig, 3



The probability density of particle-particle intersection of the particles flow is the product of the opposing flow density streams on the most probable path, and for two bound $\pm$ electrons found and discussed in earlier works in Eq.(2), is:

$$\frac{\Delta\varepsilon}{m_e}=\left(\frac{\Re_0}{\lambda\!\!\!^{-}_e}\frac{1}{g_A^2}\right)\left(\left(\frac{\Re_0}{\lambda\!\!\!^{-}_e}\frac{1}{g_A^2}\right)\right)=\left(\frac{\alpha}{n_R}\right)^2\rightarrow(\phi^{*}\phi) \tag{2}$$

These scalar relations were developed earlier before the flow vectors and integrals were understood.

The product of $(\phi^{*}\phi)$ is the scalar energy created when the flow vector functions bind, and is the he energy is the ratio of the binding energy to the state energy of the free electron.

$$(\phi^{*}\phi)=\frac{\text{State Energy Created}}{\text{Free Electron State Energy } m_e c_0^2} \tag{3}$$

Eq.(2), exactly defines the energy of the Rydberg states without reference to energy fields or charge. The interaction or product of the conjugate flow vectors at Compton radius creates an

energy level exactly equal to the ratio of the fine structure constant to the Rydberg integer. This is the energy ratio of the state energy to the energy of the electron, and the state values defined are the Rydberg Atomic states.

The energy of a state composed of the product of multiple conjugate flow functions will be shown to be:

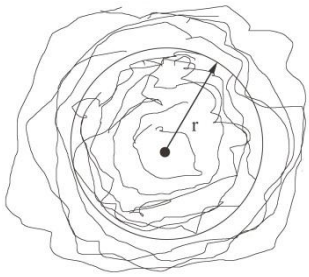
$$\phi_X * \phi_X = (\phi_1 * \phi_1)(\phi_2 * \phi_2)\bullet\bullet \rightarrow \quad \left(\frac{\varepsilon_X}{m_e}\right) = \sqrt{\left(\frac{m_1}{m_e}\right)^2\left(\frac{m_2}{m_e}\right)^2\left(\frac{m_3}{m_e}\right)^2\bullet\bullet} \tag{4}$$

Feynman Action Contour Integrals and Vertex Kernels

The flow densities shown above can be readily identified as the Feynman contour flow densities of the electron. The linear and contour Feynman integrals over all paths are illustrated in Fig.1 and 2.

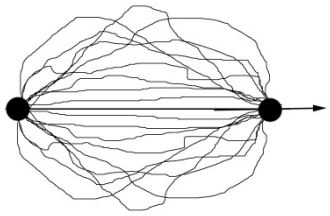
Contour loops of bound particles

Fig. 1



Linear free particles

Fig.2



Feynman action flow integrals

The Feynman integral action for rotating bound photons is similar to the linear flow integral except it repeats, giving a periodic a space-time vertex kernel.

The Dirac matrix Geometrical Algebra, GA form of the electron photons shown earlier in [10]

Starting with the two conjugate electron photons wavefunction the, the momentum four derivative of the two conjugate photons that make up the electron expressed in GA are:

$$\frac{\boldsymbol{p}_1}{\hbar} = \left[\gamma^\mu \frac{\partial}{\partial x^\mu} e^{i\left(\frac{m_1 c_0}{\hbar}\left(k\bullet x - c_0 t\right)\right)}\right] \qquad \frac{\boldsymbol{p}_2}{\hbar} = \left[\gamma^\mu \frac{\partial}{\partial x^\mu} e^{i\left(\frac{m_2 c_0}{\hbar}\left(-k\bullet x - c_0 t\right)\right)}\right] \tag{5}$$

The sum is:

$$\boldsymbol{p}_1 + \boldsymbol{p}_2 = \left| \left(\gamma^{\mu} \left(\frac{m_1 c_0}{\hbar} - \frac{m_1 c_0}{\hbar} \right) - \gamma^{k} \frac{m_1 \Delta c_1}{\hbar} \right) \right| = \left(\frac{m_e \Delta c_1}{\hbar} \right) \tag{6}$$

The magnitude of two 4 vectors has two polarizations that can be represented as up and down vectors,

$$\frac{\boldsymbol{p}_1 + \boldsymbol{p}_2}{\hbar} \rightarrow \frac{m_e c_0}{\hbar} \downarrow \text{ or } \frac{m_e c_0}{\hbar} \uparrow , \tag{7}$$

The flow vectors found in Eq.(2), by vacuum flow considerations, have been identified as the Feynman contour action flow of the two photons in the electron on the most probable path of the rotating classical electron orbit $\Re_0$

The action flow can be presumed to be photon momentum vectors, not a summation of imaginary phases, but a probability density of photons flow.

The Feynman contour flow integral vector around the most probable radius $\Re_0$ noted in Eq.(1), is:

$$\phi^* = \frac{\int_0^{\Re_0 / n_R} m_e c_0 dr}{\hbar} = \frac{\Re_0 m_e c_0}{\hbar g_A^2} \downarrow = \frac{S_e / n_R}{\hbar g_A^2} \uparrow = \frac{\alpha}{n_R} \tag{8}$$

The Rydberg integer n_R reduces the action of the free electron state. S_e from the free particle value.

The product of this flow vector and its Conjugate up vector is the state scalar energy Eq,(3)

$$\phi^* \phi = \frac{S_e / n_R}{\hbar g_A^2} \downarrow \times \frac{S_e / n_R}{\hbar g_A^2} \uparrow = \left(\frac{\alpha}{n_R} \right)^2 = \frac{\Delta \varepsilon}{m_e c_0^2} \tag{9}$$

The integer n_R is the Rydberg integer and multiplier of the action quantum, and g_A^2 is the QED Anomalous Gyromagnetic factor, of the rotating photons that is present when all possible action paths are included. (See Appendix III)

Eq.(9), defines the atomic Rydberg energy states without reference to charge or energy fields.

Kernels

Atomic - Kernels

Pictorially the created energy at the Compton radius, can be viewed as the action decrease of the free electron, as the result of the integral around a increasing radius $\lambda\!\!\!^{-}_{e} n_R$

Fig. 5

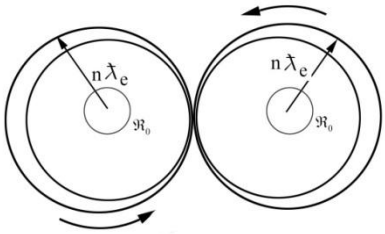


Fig. 5 shows the binding of the two vertex kernels in Eq.(8), at the most probable path. This view is based on the expanding Compton radius of the energy created by the interaction in the atomic states.

The product of the flow densities of the two conjugate atomic kernels electrons bound at the Electron Compton radius is then:

$$\phi_A * \phi_A = \left(\frac{S_e / n_R}{\hbar g_A^2}\right)^* \left(\frac{S_e / n_R}{\hbar g_A^2}\right) = \left(\frac{\alpha}{n_R}\right)^2 = \frac{\Delta\varepsilon}{m_e} = K_A * K_A \qquad (10)$$

This product of the two conjugate flow functions is the scalar binding energy of the specific Rydberg states, and will be identified as Atomic Kernels.

Nuclear Kernels

There is another group of action radii for the bound electron that are integral values of the action quantum. Which are reciprocal of the Rydberg levels or ratios of action quantum $\hbar$ to the action S_e. These are the action flow of electrons in rotation radii inside the electron radius.

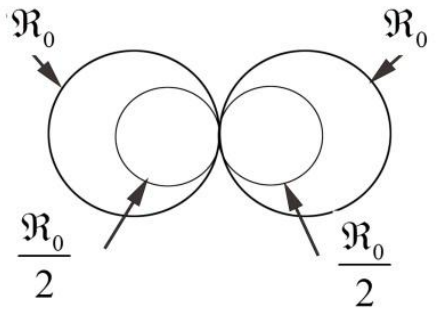
These states will be referred to as nuclear states, and the kernels as Nuclear Kernels. The ratio of the action quantum with the particle action is:

$$\phi_N = \frac{\hbar}{\int_0^{\Re_0/n_R} m_e c_0 dr} = \frac{\hbar\eta}{(S_e/n_R)} = \frac{\varepsilon}{m_e} = \frac{n_R\eta}{\alpha} \qquad (11)$$

Atomic states action ratios are thought of as multiplies of $n_R\hbar$, as an increase in the Compton radius (Eq.(2),). The interior action ratios are the reciprocal of the same ratio, $n\hbar$. Instead of the action being multiple values of the action quantum, the states appear as fractions of a single value of the action quantum. The all path integral includes the nuclear QED anomalous ratios η.

Pictorially the created mass can be viewed as action flow density as ratio electron radius to fractions of that radius Fig. 5. In both cases, interior and exterior, the actions S are integral values of $\hbar$.

Fig. 5



The corresponding expression to Eq.(10), of the exterior binding, for the interior states is the Nuclear Vertex function:

$$\phi_N * \phi_N = \left(\frac{\hbar\,\eta}{(S_e/n_R)}\right)^* \left(\frac{\hbar\,\eta}{(S_e/n_R)}\right) = \frac{\Delta\varepsilon}{m_e} = K_N * K_N \qquad (12)$$

This is the energy required by the binding of the two nuclear kernels that could be referred to as quarks. As for the atomic states this is the energy radiated away when it is created, thus must be put in when the particle is formed. The energy expressed as mass in in Eq.(12), is a deficit energy. (See Appendix VI)

The consilience between Eq.(10), and Eq.(12), is compelling if not decisive, in theoretical merit to the flow probably density concept.

Mechanics, Binding, and the Vertex Kernel

Eq.(10), and Eq.(12), are respectively the binding energy of a pair of atomic and nuclear vertex. Including the QED effect from Eq.(28), and Eq.(27), these have been identified as atomic and nuclear vertex kernels.

$$\begin{aligned} \phi_A * \phi_A = & \left(\frac{S_e / n_R}{\hbar g_A^2}\right)^* \left(\frac{S_e / n_R}{\hbar g_A^2}\right) \quad \rightarrow \quad \frac{\Delta\varepsilon}{m_e} = K_A * K_A \\ \phi_N * \phi_N = & \left(\frac{\hbar\eta}{(S_e / n_R)}\right)^* \left(\frac{\hbar\eta}{(S_e / n_R)}\right) \quad \rightarrow \quad \frac{\Delta\varepsilon}{m_e} = K_N * K_N \end{aligned} \tag{13}$$

Nuclear multiple Kermel Vertex Function

The atomic vertex represent the the Rydberg states and as shown in Fig. 4. are generally only two vertex kernels in a vertex function. The nuclear kernels can bind inside the nucleus in any number to form complex particles, as will be illustrated in the paper on vertex functions. When bound together this becomes a vertex function of the Feynman path integrals.

Fig.7

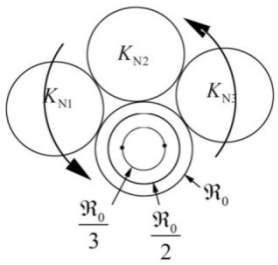


Fig.7 Multiple Bound Kernels of a nuclear vertex function

The nuclear kernels can bind in any number of multiple pairs since pairs of up, and down bound kernels have no polarization. Any group of vertex kernels can be factored into two products one with a positive kernel and one with a negative kernel, thus implying the effect of a positive and negative charge as shown in Eq,(14).

$$K_P{}^* K_P = \left(K_1{}^* K_1\right)\left(K_2{}^* K_2\right)\left(K_3{}^* K_3\right)\bullet\bullet \qquad \text{a.}$$

$$K_P{}^* = \quad K_1{}^* \sqrt{\left(K_2{}^* K_2\right)\left(K_3{}^* K_3\right)\bullet\bullet\bullet} \qquad \text{b.} \qquad (14)$$

$$K_{P1} \quad = \quad K_1 \sqrt{\left(K_2{}^* K_2\right)\left(K_3{}^* K_3\right)\bullet\bullet\bullet} \qquad \text{c.}$$

The positive and negative kernels are positive and negative vector flow particles.

Eq.17, a. shows a neutral vertex function as a group of unaligned kernel pairs, and Eq.17, b and c. shows positive and negative flow vector particles having a single polarized particle with a group of unaligned pairs. a. defines a is a neutral particle, and b. & c. define positive and negative charged particles

Binding and Factoring of Nuclear Vertex Functions

In QM the superposition or sum of QM wavefunctions ψ, creates the complete function from an infinite sum of sub-functions. The summation or superposition's of states creates the final state, or energy level.

Vertex kernels are the product an infinite number of factors that can be divided into a series of smaller factors that make the total action and mass. Each factor can be considered a mass and thus the root of a vertex can be considered the product of two mass.

Vertex kernels can be factored into an infinite number of sub particles so long as

the action is an integral value of the action quantum.

$$K_A = \frac{m_1}{m_e}\frac{m_2}{m_e}\frac{m_3}{m_e}\frac{m_4}{m_e}\frac{m_5}{m_e}\bullet\bullet\bullet$$

$$K_A = \frac{m}{m_e} = \sqrt{\frac{m}{m_e}} \times \sqrt{\frac{m}{m_e}} \quad = \quad \sqrt{\sqrt{\frac{m}{m_e}}} \times \sqrt{\sqrt{\frac{m}{m_e}}} \times \sqrt{\sqrt{\frac{m}{m_e}}} \times \sqrt{\sqrt{\frac{m}{m_e}}} \tag{15}$$

Irrational Numbers

A kernel that is part of a bound mass has to have an integral value of $n\hbar$, thus a kernel that has a value, $\left(\frac{S_e}{\sqrt{2}\,\hbar}\right)$ could not bind, but two particles such that $\rightarrow\sqrt{\left(\frac{S_e}{2\hbar}\right)^*}\sqrt{\left(\frac{S_e}{1\hbar}\right)}$ has the same mass, and both have $n\hbar$ integral action and can bind as a neutral unaligned pair in a vertex function.

Energy and Mass Binding Examples

Positronium - Atomic

Noting the center of mass orbiting radius of the $\pm$electrons in positronium is half the Compton radius of the electron, the action of Eq.(10), is reduced by half but the integer of $\hbar$ is not changed. This is the proper interaction energy of a positive and negative electron establishing the Rydberg energy levels without the concept of charge, and is the exact energy levels of positronium 6.803ev

$$\left(K_A * K_A\right) = \left(\frac{S_e/2}{n_R\,\hbar\,g_A^2}\right)^* \left(\frac{S_e/2}{n_R\,\hbar\,g_A^2}\right) = \frac{1}{4}\left(\frac{\alpha}{n_R}\right)^2 = \frac{\Delta\varepsilon}{m_e} \rightarrow \quad = \ 6.803\text{ev}/n_R \tag{16}$$

Muon -Nuclear

The muon vertex function identified in [25] was found to be the product of four nuclear kernels three of which have the same value of $n_R = 16$:

$$\left(\frac{m_\mu}{m_e}^* \frac{m_\mu}{m_e}\right) = \left[\left(\frac{\hbar}{S}\frac{\eta}{2^4}\right)^* \left(\frac{\hbar}{S}\frac{\eta}{2^4}\right)\right]\left[\left(\frac{\hbar}{S}\frac{\eta}{2^3}\right)^* \left(\frac{\hbar}{S}\frac{\eta}{2^4}\right)\right] \tag{17}$$

This is two pair of two bound photons [25], forming a positive and negative muon pair.

Each of the Muon conjugate vertex pair is neutral and can be factored into positive and negative Muons vector flow functions. Each Muon has a single odd vertex with a bound pair being a unaligned neutral vertex, as shown in Eq.(18)

$$\begin{aligned} \phi_\mu &= +\frac{m_\mu}{m_e} = \left(\frac{\hbar}{S_e}\frac{\eta}{2^4}\right)\left(\sqrt{\left(\frac{\hbar}{S_e}\frac{\eta}{2^3}\right)^*}\sqrt{\left(\frac{\hbar}{S_e}\frac{\eta}{2^4}\right)}\right) = 206.7674344 \\ \phi_\mu^* &= -\frac{m_\mu}{m_e} = \left(\frac{\hbar}{S_e}\frac{\eta}{2^4}\right)^*\left(\sqrt{\left(\frac{\hbar}{S_e}\frac{\eta}{2^3}\right)^*}\sqrt{\left(\frac{\hbar}{S_e}\frac{\eta}{2^4}\right)}\right) = 206.7674344 \end{aligned} \tag{18}$$

Several other mass values of particles and vertex functions are illustrated the paper on vertex functions [25].

Gravitation –Non-Aligned Particle Densities

The mystery of the gravitation connection to electricity has vexed theorists since Euler developed differential field theory. The energy required by the fictitious fields of gravitation is beyond calculable. Δc Mechanics for gravitation however, is much simpler than that for electron interactions because there are no states. The probability density generated by nonaligned particles is totally random and the only forces are those associated with gradients in the probability density.

The Difference between Electric and Gravitational Interaction

The electron and the kernel of all particles are composed rotating photons. Its rotation probability density lies in a plane and the generated density in that plane repeats at v_e

The repeating exterior probability flow is still present, but the rotation plane conjugate pairs are randomly oriented and at a point in space it is not repeating at the electron frequency v_e. At any point the orientation is random and there is an omnidirectional increase in the vacuum density and a decrease in the velocity of light. This reduces the effect of the interaction by v_e^2, and since the electron rotation frequency is 1.325E-20 /sec the reduction effect is about 1/1.75695025e40. This this constitutes the difference in the magnitude of electrical and gravitation. The value of gravitational interaction can be demonstrated by the probable flow densities.

Gravitational Flow Density Functions

The Flow probability density of a kernel at the Compton radius is

$$P = \frac{\sqrt{2}\lambda\!\!\!^{-}_{PL} v_e}{\lambda\!\!\!^{-}_e} \tag{19}$$

A non-aligned kernel or pair of kernels not rotating in a plane and not aligned is free to be at any angle

$$P_l = \frac{\sqrt{2}\lambda\!\!\!^{-}_{PL} v_e}{\lambda\!\!\!^{-}_e} \rightarrow \frac{\sqrt{2}\lambda\!\!\!^{-}_{PL}}{\lambda\!\!\!^{-}_e} \tag{20}$$

If the distance between the radius of the mass and the other particle is not at the Compton radius but at a distance r, then the density is:

$$\phi_r = \frac{\sqrt{2}\lambda\!\!\!^{-}_{PL}}{r} \qquad @\, r = \sqrt{2}\lambda\!\!\!^{-}_{PL} \rightarrow 1 \tag{21}$$

This is not a function of the mass of a second particle, but the value of the probability density of the first particle as a function of r.

The product of the two functions is then:

$$\phi_m\phi_r = P_l\frac{\sqrt{2}\lambda\!\!\!^{-}_{PL}}{r} \qquad @\, r = \sqrt{2}\lambda\!\!\!^{-}_{PL} \rightarrow \phi_m\phi_r = P_l \tag{22}$$

Inserting the specifics gives;

$$\phi_m\phi_r = \left(\frac{\sqrt{2}\lambda\!\!\!^{-}_{PL}m_m c_0}{\lambda\!\!\!^{-}_m}\right)\times\left(\frac{\sqrt{2}\lambda\!\!\!^{-}_{PL}}{r}\right) = \frac{S_{PL}}{\hbar}\frac{\sqrt{2}\lambda\!\!\!^{-}_{PL}}{r} = \frac{2Gm_m}{c^2 r} = \frac{\Delta c}{c_0} \tag{23}$$

The Planck radius is $\lambda\!\!\!^{-}_{PL} = \sqrt{G\hbar/c^3}$

The change in the velocity of light at the position r form the particle is the ratio of the gravitational radius to the distance, or the gravitational potential

$$\phi_m\phi_r = \frac{2Gm_m}{c^2 r} = \frac{\Delta c}{c_0} = \frac{\Delta\varepsilon}{\varepsilon_0} \tag{24}$$

This is the omnidirectional flow probability density at any point at a distance r from the mass particle, thus increasing the ubiquitous omnidirectional vacuum flow density and lowering the velocity of light:

$$\frac{\Delta c}{c_0} = \frac{c_0 - c}{c_0} = \left(\frac{2\mu_m}{r}\right) \rightarrow c = c_0\left(1 - \frac{2\mu_m}{r}\right) \tag{25}$$

This relation is the Roger Blandford, Kip Thorn, velocity of light from a mass in GR as projected onto flat space [15], and can be summed over any number of particles. The results thus match the physical results of GR, for the x particle located at r.

From Eq.(25), the ratio of the potential energy to the total energy is then:

$$\frac{m_X c_0^2 - m_X c c_0}{m_X c_0^2} = \left(\frac{2\mu_m}{r}\right) \rightarrow \Delta\varepsilon = \left(m_X c_0^2 - \frac{2Gm_m m_x}{r}\right) \tag{26}$$

Thus, the same change in energy of a mass particle, experiencing probability flow density of another mass, is the same as the change in the gravitational potential.

Δc **Mechanics thus defines the mechanism of gravitation as well as electric interactions.**

Conclusion

The flow vector density functions are a new approach to quantum mechanics without the baggage of fictitious energy fields, and inexplicable charge.

The Feynman flow probability functions are conceptually understandable and provide state interactions replacing the need for charge and field constructs that are fictitious and mathematically problematic. They provide concrete values of particle mass without inserting arbitrary coupling constants.

Whether the presentation here is as well done as it should be, is open to discussion however the process is undeniable.

This is an alternate basis for quantum mechanics, which is a purely mathematical structure, not directly related to anything observable, and the amplitude is not definable. QM makes up the missing interaction by adding an ad-hoc charge, and field energy that has no tangible basis.

The product of the vertex kernels defines the energy of the atomic states as well as the mass of the nuclear states to a very high precision, and as such this theory is very much in concert with Ellington's conjecture that particle mass should be defined by the product of masses rather than the sum [13].

> *"It was an intuition without a precise justification," said Adán Cabello, a quantum theorist at the University of Seville in Spain. "But it worked." and yet for the past 90 years and more, no one has been able to explain why. [16]*

Authors Note

The development of this theory has been a lengthy process and it is far from done. The content and the divergence of this development from standard QM is

revolutionary, and the calculated numerical values of mass particles are the proof of concept.

It was only recently that the vertex vector flow functions were identified, but finally realizing the connection of the flow density probability with the Feynman path integrals brought the concept of Δc Mechanics to a better theoretical foundation. Many of the math nuances are not finished but the basis is defined. The theory does have revolutionary aspects, but at this time there is not much interest, someday someone will pick up, and move it along. This author is not likely to be around for that.

References:

The results of the development of Δc theory can be found in a number of papers that are perhaps not as clear in the definitions presented here, primarily because the author did not understand as well at the time it was written. References 20-25 are newer and perhaps have better clarity. Most of the references n current papers are to the authors papers which contain the primary references to the work..

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19. DT Froedge, Vertex functions

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Recent Papers

The following recent papers by the author focus on the application, mechanism, and relation to current theory as well as physical applications.

20. DT Froedge, Calculated Atomic Masses in Delta-c Mechanics
January 2025
DOI: 10.13140/RG.2.2.30292.51842 https://www.researchgate.net/publication/388219158

21. DT Froedge, Structure of Elementary Nuclear Particles in in Delta-c Mechanics
November 2024
DOI: 10.13140/RG.2.2.27181.70884 https://www.researchgate.net/publication/385782943

22. DT Froedge, The Concepts and Principles Behind of Delta-c Mechanics
August 2024
DOI: 10.13140/RG.2.2.31630.37445 www.researchgate.net/publication/382850589

23. DT Froedge, Acceleration Gravitation and Origin of Centrifugal Force in Delta-c Mechanics
July 2024
DOI: 10.13140/RG.2.2.28944.42247 https://www.researchgate.net/publication/381915343

24. DT Froedge, Relativistic Time Dilation Illustrated in Delta-c Mechanics, The Twin Paradox is an Illusion
December 2023
DOI: 10.13140/RG.2.2.15584.46085 www.researchgate.net/publication/376831390

25. DT Froedge, Vertex Functions editing version 06-01-25

Appendix I

Conjugate Kernels

The factors in Eq.(10), and Eq.(12), can be referred to as conjugate kernels, and are each the probability density of two oppositely polarized photons. The asterisk does not represent an imaginary number, but one is a positive the vertex kernel of and the other a negative vertex kernel, with an opposite polarization. Conjugate ± particles such as electron-positron that can bind due to the counter flow of the probability flow density. The polarization doesn't affect the value of the product, but has internal effects on the kernels. Opposite polarized kernels bind in pairs, and become non-polarized, and alike pairs do not

The conjugate vectors concept is presented here for a visual for understanding of the process. A more proper mathematic representation is in the Dirac matrix of Geometric Algebra presented as in: "The Dirac Equation and the two Photon Model" [12]

Fig.2A $\phi * \phi$

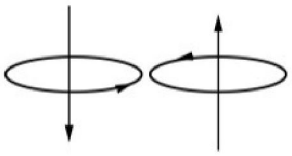
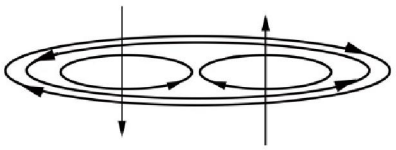


Fig. 2B $\phi * \phi *$



The relationship with Charge

Fig. 2A shows a positive and negative kernel, both rotating clockwise with opposite B vectors. Between the two aligned particles is a volume of space where the action flow probability density decreases the velocity of light or increases the index of refraction. This increase in the index of refraction pulls the action paths from one particle to the other as an opposite charge. Fig. 2B shows a pair of identical particles with B vectors anti-aligned. The photon action flow in between the particles is in the same direction and does not interfere. On the exterior however there is a flow density interaction which pulls the particles apart, just as would a repulsive charge.

For illustration, opposite particles are marked with an asterisk, but the factors are not imaginary numbers, but designating alike and opposite polarization or positive and negative vertex

Appendix II

The The Rydbeerg Integer $n_R \hbar$

The binding of vertex kernels all require integral values $n\hbar$. This results from the fact that the rotating frequency of the kernels is proportional to $\hbar$. If the numbers are integer then after a period of time the cycles repeat whereas if they were irrational that could not be true.

Particles bind at the most probable action radius, and the relative rotation of each bound particle at the contact point must be an integral number of $n\hbar$, otherwise the binding cannot be not stable.-

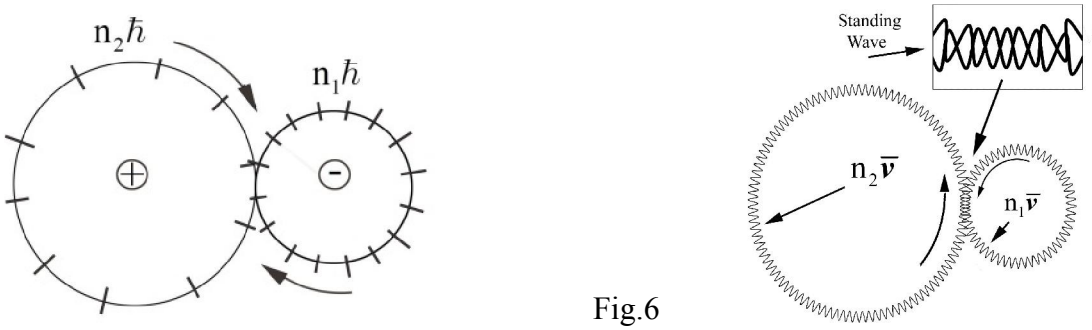


Fig.6

The interaction of a particle having action as $n_1\hbar$ with a particle having action $n_2\hbar$, results in a standing wave of probability flow at the contact point that satisfies flow continuity relations and repeats as the particles counter-rotate [18].Standing waves between Kernels is the exchange of flow probability density that satisfies the continuity condition.

The integral value $n\hbar$ is thus a requirement for vertex kernels of bound particles.

Appendix III

Anomalous QED ratios

There are two anomalous ratios that play a role in nuclear-atomic systems, shown in Eq.(10), and Eq.(12), that are the factors g_A and η. They are the QED determined loop integral delay for particles moving in bound orbits. The ratio has no effect on the free electron, but when an electron is bound in rotation in the Feynman action integral loops cause a delay that alters the particle rotation.

The first ratios that applies to atomic or Rydberg levels is the Anomalous Gyromagnetic ratio g_A. When an electron is moving in free space there are no loop delays, however when it is in rotation in the Compton orbit the QED loop delays increase the radius, due to the QED time delay, and lower the binding energy. Its value has been theoretically predicted and measured to about 12 significant digits. The value is:

$$g_A = 1.0011596521807 \tag{27}$$

This factor is an offset of the Rydberg atomic levels.

The second is here designated as Eta. η . It represents the QED effect on the rotating photons inside a nuclear vertex function.

$$\eta = 1.00060014721177 \tag{28}$$

The value of η has not yet been determined by QED methods, but it should not be dismissed as arbitrary, as it is small but crucial to the precise mass of several unconnected known particles [9]. If there is a fudge factor in this development this it is it. This ratio like g_A is not calculated from physical constants.

Appendix IV

Energy Deficit

The conjugate bound pairs in the nucleus are opposite and if in free space would annihilate. In binding however the electrons like their atomic counterparts have given up energy.

Like the atomic counterparts also have insufficient energy to escape. For a hydrogen atom the state energy has to be kinetically injected to remove the electron. For a nuclear mass the same principle applies, the energy of the entire mass has to be injected to remove the particle from the nucleus. This implies that nuclear mass exists as a deficit of energy and particles in the nucleus cannot annihilate unless energetically removed.

This gives another perspective to the Einstein energy relation, in that nuclear inertial mass exists as deficit of energy.

$$m = \varepsilon / c^2 \qquad \rightarrow \qquad m = -\varepsilon / c^2 \tag{29}$$