Higgs Mass and Deuterium Bond Electrodynamics

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Abstract

A) Mass is shown to be electrodynamic energy, a Heisenberg Uncertainty singularity.

B) Deuterium's 2.224 MeV bond energy is shown to be an energy nexus between the Strong nuclear and Electromagnetic atomic energy functions, Yukawa's and Feynman's $\alpha\sqrt{2}m_{\pi^-} + E_n = 2.224$ MeV pion Down quark exchange between particles, the quark-gluon $m_D - m_U - \frac{1}{3}E_n(m_e + E_n)/m_e = 2.224$ MeV interaction within the proton, and the atomic domain $2E_n + \frac{1}{3}E_n(m_e + E_n)/m_e = 2.224$ MeV Electron Capture bond formation the pion operates on.

C) These correlations show that this bond energy is accessible from the EM atomic domain as a non-statistical radiation free nuclear energy source.

Discussion

I) Higgs Mass Electodynamics

A) Energy

Instead of regarding energy as Strong nuclear, Electrodynamic atomic, Weak transform and Gravity forms it's more useful to view it as a mathematical function whose form depends on circumstances.

This is based on Boltzmann's $P = e^{S//k}$ probability principle that an energy state is a system entropy probability function. Because physical reality has actual limits, instead of mathematical reality's 0 and ∞, there are two 100% predictable energy states that arise from the system's "range" degree of freedom, the E_o ground and E_c saturation state limits of statistical behavior.

For instance, at E_0 ground state a one component minimum energy system would distribute energy equally in all available entropic degrees of freedom and could not achieve excited states. This follows from examining an Einstein 4-D Minkowski space-time minimum system occupying the time degree of freedom equally with the space degrees of freedom so it has an $e^{ix} = \cos x - i \sin x$ quantum continuous function periodicity like earth's orbit or a hydrogen atom at absolute 0.

Similarly, at the E_c saturation state such as light speed, there can be no statistical states because saturated components can't exchange energy and light speed is a Heisenberg resolution uncertainty state to sub-light speed components. The Uncertainty principle states that position and momentum can't be simultaneously measured with infinite resolution because resolving a particle with a wave leaves ƛ/2 wave resolution uncertainty and resolving a field with a particle leaves a particle radius uncertainty. Because sub-light speed components are subject to a $y = (1 - v^2/c^2)^{1/2}$ Lorentz space-time-mass transformation and light speed components aren't there's always a resolution uncertainty between them.

Furthermore, since saturation is an uncertainty state whose characteristics can't be resolved by sub-light speed components, the effect of the system f(x) function goes to 0. This is a $\int 1/f(x)\,dx$ singularity event that occurs when $f(x) \rightarrow 0$, like Bohr's Correspondence principle that $E_n = E_o / n^2$ quantum behavior becomes classical when the distinctions between quantum states vanish, for $n > 10^4$ or $n^2 > 10^8$, corresponding to the $c = 3 \times 10^8$ m/s speed of light resolution uncertainty.

For instance, for $n > 10^4$ hydrogen's line spectra match the electron's orbital frequency to within 0.0015%, indicating a classical EM theory orbiting charge oscillating dipole that transmits EM wave energy, an inertial motion to EM energy transformation. Conversely, a rotating magnetic dipole generates an oscillating field energy in space that constitutes an electromotive force on electrons in a conductor, but as the rotation approaches light speed the transmission of energy to the electron attenuates because the sub-light speed electrons can't resolve the light speed dipole oscillation.

B) Energy Domain Correlations

The energy field in space generated by a rotating dipole constitutes a definite energy generated by the domain's f(x) functions (i.e. $E = d\Phi_B/dt$, $B = d\Phi_E / dt$ etc.), but which cannot be resolved by the domain's $E = d\Phi_B /dt$ and $B = d\Phi_E /dt$ because at light speed rotation it's a resolution uncertainty. This is shown to be an electrodynamic generation of Higgs boson mass energy by showing that a domain's E_o and E_c limits have the same $\alpha^2 = E_c /E_c$ ratio in all domains, reference to the same $hc = h/(\mu_0\varepsilon_0)^2$ electromagnetic impedance of space that determines the speed of EM waves, and is based on the $(\frac{1}{2}eh/2\pi)$ light speed rotation of charge oriented EM energy by the following energy form derivations.

1) Impedance energy of space:

$hc = h/(\mu_0\varepsilon_0)^2 = 1.9864473 \times 10^{-25}$ J•m $= (\frac{1}{2}eh/2\pi)^{1/2}/2\alpha$, corrected to $1.9866279 \times 10^{-25}$ J•m within 0.01% of hc by $(1 - \alpha/\pi)(1 - \sqrt{2}\sqrt{3}\alpha^2)$ momentum effects.

2) Electron quantum optical and interactive radii and mass energy:

$r_{eo} = (hc/\alpha^2)\sqrt{3}\,\pi = 2.03 \times 10^{-20}$ m $\qquad r_{ei} = (r_{eo}/\alpha)3(\sqrt{2}\sqrt{3})^2 = 5.01 \times 10^{-17}$ m

$m_e = (\alpha/hc)(\frac{1}{2}eh/2\pi)3^{2/3}\sqrt{2} = 9.129378 \times 10^{-31}$ kg, corrected to within 0.0003% of m_e by $(1 - \alpha/\pi)(1 + \sqrt{2}\,\sqrt{3}\,\alpha^2)$ momentum effects.

3) Quark radii and mass energies:

$r_{qo} = (hc/\alpha^3)\pi/2 = 0.803 \times 10^{-18}$ m $\qquad r_{qi} = r_{qo}/\sqrt{3}\,\alpha = 6.353 \times 10^{-17}$m

$m_{Up} = (\frac{1}{2}m_ec^2)\sqrt{2}\,\sqrt{3}\,2\pi = 3.9323$ MeV $\qquad m_{Down} = \sqrt{3}\,m_{Up} = 6.8109$ MeV

4) Proton radii and mass energy:

$r_{po} = r_{qi}\,3^{2/3}\,2\pi = 0.83$ fm $\qquad r_{pi} = (hc/\alpha^4)pi^2\,3^{2/3}/\sqrt{2} = 1.017$ fm

$m_p = (\frac{1}{2}eh/2\pi)\sqrt{2}\sqrt{3}\,3c^3 = 3^{1/2}((m_U/\alpha) + m_D - m_U) = 1.673 \times 10^{-27}$ kg $= 938.33$ MeV

5) Higgs boson mass energy:

$m_H = [m_p - \sqrt{3}(2m_U + m_D)]/\alpha = 125.1$ GeV

6) Hydrogen ground state energy:

$E_o = (\alpha^3/hc)(½eh/2\pi)3^{2/3} / \sqrt{2} = 2.43 \times 10^{-35}$ kg = 13.60355 eV, corrected to within 0.0003% of E_o by $(1 - \alpha/\pi)(1 + \sqrt{2}\sqrt{3}\alpha^2)$ momentum effects

7) Gravity 's earth ground state orbit energy and Light Year:

a) $E = \sqrt{3} / (½eh/2\pi)2\pi = 3.263 \times 10^{52}$ eV, where $(½eh/2\pi) = (2\alpha hc)^2$ is the proton and electron EM mass energy basis, within 1.6% of the $G\, m_e m_s/r_{es} = 5.3 \times 10^{33}$ J = 3.315×10^{52} eV value

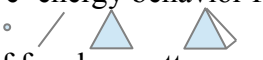
b) Light Year = $3^{4/3}\ \sqrt{2}\ \pi/2r_{pi} = 9.45 \times 10^{15}$ m, within 0.1% of the 9.46×10^{15} m value

The cumulative conclusion of these mathematical energy forms is that mass energy is a $(½eh/2\pi) = (2\alpha hc)^2$ light speed angular momentum Heisenberg Uncertainty singularity function that can't be resolved by other sub-light speed mass energies but which is resolved by the $hc = 2 \times 10^{-25}$ J•m impedance of space that interacts with the light speed dipole angular momentum because hc interacts with light speed EM waves. Thus Higgs mass requires energy to accelerate it through space according to the $\gamma = (1 - v^2/c^2)^{1/2}$ Lorentz space-time-mass transformation, is an electrodynamic effect, a bosonic force carrier since all energies have an EM basis, and operates on space's hc impedance as a Gravity effect according to Einstein's "Riemann condition" of 4-D Minkowski space-time.

C) Energy Domains

The energy domain correlations show a very specific matter construct pattern referenced to the hc impedance of space by the α size, velocity and force energy root and α^2 energy density coefficients between them with $E_o = e^{-ix} = \cos x - i \sin x$ quantum continuous ground states and E_c saturation state boundaries, and $e^{S/k}\ E_n = E_o/n^2$ quantum statistical states in between.

The domains occur by a change in the size degree of freedom that determines the amount of space, and thus energy density, in between the energy forms, which makes the energy forms the boundary conditions of the domains. The α size ratio in all the energy domains is Sommerfeld's $\alpha = e^2 / 2\varepsilon_o hc$ number that correlates the electric force energy root of a hydrogen electron ground state with respect to its speed of light velocity energy root limit, and this ratio is the same in all energy domains by the principle of Relativity that the laws of nature are the same in all frames of reference.

Thus domains are defined by α size and α^2 energy density ratio limits, e^{-ix} to $e^{S/k}$ behavior limits, and E_o predictable quantum continuous to E_c unresolvable Heisenberg Uncertainty limits, with one additional constraint. Both e^{-ix} and $e^{S/k}$ are the limits of e^x energy behavior functions and e^x is an $\Sigma_{n=o}^{n=\infty} = x^0/0! + x^1/1! + x^2/2! + x^3/3! + x^4/4! + \ldots =$  progression that follows a geometric entropic degree of freedom pattern so the probable progression of stable states are geometric energy distributions, as shown in the energy form equations, in conjunction with the $(1/2eh/2\pi) = (2\alpha hc)^2$ rotating charge EM basis of mass energy.

D) Electrodynamic Mass-Energy

The fact that the $\mu = ½eh/2\pi$ rotating charge magneton yields the correct mass energies for the proton and electron supports an electrodynamic basis for mass but this is only the internal generation side of the thesis. Confirmation of this requires agreement with the circumstantial behaviors of the mass energy. As explained in pages 6-9 of Quark Relativity Transform the proton's Up Up Down

quarks form a triton structure with an $m_D - m_U = 2.88$ MeV gluon that binds them together as it carries the Down quark's excited energy state and charge sequentially to the triton's 3 Up quark energy states. As the gluon interacts with a relatively stationary Up quark it generates a $\pi° = 135$ MeV with two energy components: the $(m_D - m_U /\pi) = 5.56$ MeV of the gluon - Up quark interaction and the $\sqrt{(3/2)[3(½m_ec^2)/\alpha + \sqrt{2}m_e]} = 129.53$ MeV that derives from the $B = d\Phi_E/dt$ mass generation function of the quark triton's orbital rotation in the proton.

This model was based on the concept of the $\mu = ½eh/m2\pi$ Bohr magneton as a $m = ½eh/\mu 2\pi$ mass definition and $E_0 = e^{-ix}$ quantum continuous ground state. If the Up Up Down quark triton's light speed orbital +e charge generates the Higgs boson mass center then the orbital must correlate to the proton's radius because the force of the triton's $\uparrow e^+$ charge motion must transmit through the mass energy to attract its $\downarrow e^+$ motion on the opposite side: $\lambda = hc / \sqrt{3}(2m_U + m_D)\ \pi\ \sqrt{2}\sqrt{3}\ 2\pi = r_{pi} = 1.01$ fm, where $hc = 2 \times 10^{-25}$ J•m is space's EM energy impedance, $\sqrt{3}(2m_U + m_D) = 25.4$ MeV $= 4.07 \times 10^{-12}$ J is the quark triton's spherical momentum mass energy, π is the ½ sphere ½ wave length it travels at light speed c, $\sqrt{2}\sqrt{3}$ is the angular and spherical quantum continuous distribution of its E_0 ground state orbital energy, and 2π is the wave length of the diametric motion of the e^+ charge through it:

Furthermore, the proton's $(r_{pi}/r_{ei})^3 / \sqrt{3}(m_p/m_e) = 2.7928$ calculated density coefficient yields the correct proton magneton when the $u = ½eh/m2\pi$ Bohr magneton relation is used. And finally, as shown in QRT pp. 6-9, the gluon's interaction with the triton's quarks triggered the $\pi° = 135$ MeV pion energy but it only generated $(m_D – m_U)/\pi = 5.56$ MeV of its energy, with the bulk $\sqrt{(3/2)[3(½m_ec^2)/\alpha + \sqrt{2}m_e]} = 129.53$ MeV deriving from decay of the $B = d\Phi_E/dt$ mass generation function, as would occur from the interruption of the triton's e^+ charge as the gluon's information carries the $e^-/3$ charge information of the Down quark state to the next Up quark in its orbital. (The Up and Down quarks are actually integral e^+ and e^- charges but the 10^{-24} s transitions resolve as $2e^+/3$ and $e^-/3$ averages.)

If the charge disruption by the pion generation causes the generated $B = d\Phi_E/dt$ mass energy to decay then the circumference of the triton's orbital of the $r_{po} = 0.83$ fm Higgs mass would be disrupted in terms of charge for as long as the pion travels outside the proton since both occur at light speed. For a $r_{po} = 0.83$ fm Higgs mass radius the circumference is $C_H = 2\pi r_{po} = 5.215$ fm, and 129.53 MeV is 13.805 % of the proton's total mass so the orbital distance traveled is $C_H \times 0.13805 = 0.72$ fm, which must match the nuclear bond length because both the $\pi°$ and triton travel at light speed. The local perspective nuclear bond is 1 fm which contracts to $1\ \text{fm}(m_e/(m_e + E_n)) = 0.4$ fm upon interaction with the neutron's electron component so the pion's 0.72 fm ½ wave distance falls right in this range, and is thus a product of the proton's mass generation.

The electron interaction adds $3(m_e + E_n) + \sqrt{2}m_e = 4.6$ MeV to yield the $129.53 + 5.56 + 4.6 = 139.7$ MeV π^- negative pion that decays when the bond is broken, which means the electron can interact with the proton's $\pi° = 135$ MeV pion to extract mass energy from the proton. This actually occurs in nature during upper atmospheric lightning discharges that result in 140 MeV gamma ray emissions, a characteristic signature of pion decay from bond cleavage effects of the lightning discharge.

Although somewhat rare this occurrence demonstrates the feasibility of interaction of EM energy and Strong force nuclear energy constructs in which an entropic domain of high energy

electrons provides a degree of freedom atmosphere for a nuclear discharge. Given the proton construct derived in QRT it's easy to see that they can be aligned and synchronized in a strong magnetic field with an orthogonal rf field, like a Larmor precession in Nuclear Magnetic Resonance Interferometry. However the purpose in this case would be interaction with a stream of electrons to generate a high energy current. In other words, a Nuclear Fuel Cell that converts the Higgs boson mass energy in protons directly into electricity without radiation or radioactive wastes.

Actual implementation would be considerably more complex but no more so than the concept of a light speed orbital triton generating a Higgs boson mass energy that maintains the triton's orbital by transmitting its opposing force to the opposite side. In essence the rotating triton charge generates a $\mu = ½eh/2\pi$ magneton whose dipole reorients at light speed to create a spherical bosonic mass energy force carrier that resonates with the pion generation function within the triton. This Mass Electodynamics concept yields the correct proton, electron and pion mass energies, the gravitational basis for earth's orbit and the Light Year, and appears to offer a readily available clean nuclear energy source.

II) Deuterium Bond Electrodynamics

The $\alpha\sqrt{2}m_{\pi^-} + E_n = m_D - m_U - ⅓E_n(m_e + E_n)/m_e = 2E_n + ⅓E_n(m_e + E_n)/m_e = 2.224$ MeV nexus between the pion, Up and Down quarks, and Electron Capture occurs at the nuclear-atomic domain boundary because:

1) Boltzmann $P = e^{S/k}$ statistiscal systems are bounded by E_o ground and E_c saturated light speed energy states;
2) the energy domains correlate by an $\alpha^2 = E_o/E_c$ Entropic Energy Density coefficient;
3) they transform between each other at their respective E_c saturated and E_o ground state energies by an $\int 1/f(x)\,dx$ Singularity Principle energy transform that occur's because a domain's f(x) function becomes a Heisenberg Uncertainty at light speed that constitutes the next domain's E_o ground state;
4) and the natural laws are the same in all relative frames of reference.

Intersecting domains form a stasis at their nexus because at E_o ground and E_c saturated energy state conditions there is either no extra energy beyond the minimum needed for the matter construct so its entropic degrees of freedom are only occupied sequentually and with periodicity or no extra energy can be accomodated for statistical behavior. They also maintain energy equilibrium ratios proportionate to their α based relative energy densities, where $\alpha = (E_o/E_c)^{1/2} = e^2/2\varepsilon_o hc$ is Sommerfeld's ratio of hydrogen's $e^2/2\varepsilon_o h$ elctrodynamic potential and c light speed kinetic energy roots, and under Weak force decay the $m_{\pi^-} = 139.6$ MeV pion undergoes a 1-D decompression from light speed to the 2-D E_o ground state orbital, a $\alpha\sqrt{2}m_{\pi^-}$ pion plus $E_n = m_n - m_p - m_e = 0.782$ MeV neutron state Beta particle to E_o ground state decay, so $(\alpha\sqrt{2}m_{\pi^-} + E_n) = 2.224$ MeV.

In Weak decay a Beta particle's energy transforms from a λ_c light speed Compton to λ_o ground state wavelength by $\lambda_c = \alpha\,\lambda_o = \alpha \times 3.325 \times 10^{-10}$ m $= 2.42637 \times 10^{-12}$ m which corresponds to a $t_{Wv} = (t_c/\alpha^4)\sqrt{2}\sqrt{32\pi} = 0.44 \times 10^{-10}$ s time "distance" change in the same domain (i.e. Relativisitc 4-D time flow duration change between events), where $t_c = \lambda_c / c = 0.809 \times 10^{-20}$ s.

The decay energy can manifest as an electromagnetic gamma ray, as a neutral pion π^o with a $t_{\pi^o} = \sqrt{3}t_c / \pi\alpha^2 = 0.838 \times 10^{-16}$ s half life decay time, or as an atomic domain Beta particle after $t_{\pi^-} = t_{Wv}\,3\sqrt{2}/\alpha = 2.57 \times 10^{-8}$ s negative pion and $t_{\mu^-} = \sqrt{3}t_{\pi^-} / \sqrt{2}\,2\alpha = 2.16 \times 10^{-6}$ s muon half life decays under typical statistical conditions. However since probability is a $P = e^{S/k}$ system entropy function by Boltzmann's $S = k \ln P$ principle when S is a system macrostate function, the entropic conditions can be controlled to "tune" the outcome by controlling statististical probabilities.

Since the $\alpha\sqrt{2}m_{\pi^-} + E_n = m_D - m_U - \frac{1}{3}E_n(m_e + E_n)/m_e = 2E_n + \frac{1}{3}E_n(m_e + E_n)/m_e = 2.22$ MeV bond energy is an atomic and nuclear domain nexus and the E_o ground and E_c saturated energy states are non-statistical $E_o = \alpha^2 E_c$ boundary conditions it means the change in their 4-D space-time entropy conditions are system state functions, where E_c is the nuclear domain state and E_o is the atomic domain state, and $\lambda_c = \alpha\lambda_o$ and $t_{Wv} = (t_c/\alpha^4)\sqrt{2}\sqrt{3}\,2\pi = 0.44 \times 10^{-10}$ s are the space-time energy transitions between the nuclear and atomic domains, and since t_{π^-} and t_{μ^-} are defined in terms of t_{Wv} it means that a controlled nuclear to atomic domain Beta decay transition is possible by controlling system entropies and providing an entropic degree of freedom for the energy.

In physical terms this means providing an E_o domain electron for energy transfer. The energy state of the light speed pion operating on the neutron's orbital electron is E_c and corresponds to the $E_D = \alpha\sqrt{2}m_{\pi^-} + E_n = 2.224$ MeV average bond energy ground state for a nuclear domain Deuteron bond. It's stable because there's no place for the E_D energy to flow to unless an E_o atomic domain electron is present to provide an entropic degree of freedom path.

However the Deuteron's 4-D space-time entropic degrees of freedom make the bond energy's access a $P = e^{S/k}$ Boltzmann principle probability in terms of synchronization and alignment. The bond itself is 100% stable, continuous and predictable because every entropic degree of freedom of the pion's interaction with the neutron's electron is a controlled system function, including the bond distance and synchronization and alignment of the pion with the neutron's orbital electron because at its 2.224 MeV bond ground state there's no extra energy for statistical behavior but an external E_o energy electron is not aligned or synchronized with the pion so its external interaction is statistical.

This alignment-synchronization problem is akin to achieving a Bose-Einstein Condensation by alignment of the construct's matter waves with super-cooling and alignment lasers. In this case however thermal alignment isn't relevant because the E_o ground state electron only needs to be synchronized with the pion's Down quark energy state transfer between the proton and neutron. This inverse Electron Capture interaction which can be achieved by a Larmor type magnetic alignment and rf field synchronization of the pion because its generation is electromagnetic and can therefore by synchronized with the matter waves of an E_o constant energy electron beam.

In Quark Relativity Transform at mqnf.com it was shown that the Up quark's mass energy is $m_U = (\frac{1}{2}m_e c^2)\sqrt{2}\sqrt{3}\,2\pi = 3.9323$ MeV and that the Down quark is an excited $m_D = \sqrt{3}m_U = 6.8109$ MeV Up quark state with an $m_D - m_U = 2.88$ MeV difference. It was further shown that in a proton this 2.88 MeV Down quark energy state is actually a gluon that binds 3 Up quarks into a triton that appears to be an Up-Up-Down configuration whose orbital electromagnetically generates the $m_H = [m_p - \sqrt{3}(m_D + 2m_U)]/\alpha = 125$ MeV bosonic Higgs mass energy, where $m_p = (\frac{1}{2}eh/2\pi)\sqrt{2}\sqrt{3}\,3c^3 = 1.6727 \times 10^{-27}$ kg is the mass energy generated by the triton's orbital charge.

The positively charged orbital triton is a $B = d\Phi_E/dt = \frac{1}{2}eh/2\pi$ EM generation function but because its velocity and pole rotations are at light speed it's a $\int 1/f(x)\,dx$ Heisenberg Uncertainty singualrity to sub-light speed components that can't differentiate light speed polarity reversals. For instance, a rotating magnet inside a coil causes its electrons to oscillate at the rotation frequency. However as rotation increases to light speed the electron oscillations decrease to 0 as their inertial mass increases by $m_o/(1 - v^2/c^2)^{1/2}$ and become increasingly less responsive to the polarity reversals until they stand still, unable to differentiate the polarity reversals while the field energy exists as an undifferentiated $\int 1/f(x)\,dx$ Higgs Heisenberg Uncertainty mass energy singularity event.

The triton's light speed orbital of the field energy it generates is a cause and effect resonance that correlates to the proton's radius because the force of the △ + triton's charge motion attracts its opposite

motion ▽+ on the opposite side by $\lambda_p = hc/\sqrt{3}(2m_U + m_D)\pi\ \sqrt{2}\sqrt{3}\ 2\pi = 1.01$ fm as descibed in Higgs Mass Energy Gravity Construct, p. 3, at mqnf.com, where $\sqrt{3}(2m_U + m_D) = 25.4$ MeV $= 4.07 \times 10^{-12}$ J. The quark triton thus maintains an equilibrium resonance with the $m = E/c^2$ mass of field energy its $B = d\Phi_E/dt$ motion generates and is bosonic because light speed polarity reversals can't be differentiated. The triton's light speed orbital forms the interactive positive charge surface with a $r_{pi} = (hc/\alpha^4)\ \pi^2\ 3^{2/3} / \sqrt{2} = 1.017$ fm radius.

Because the $\sqrt{3}(2m_U + m_D) = 25.4$ MeV mass-energy operates at light speed it contracts space between the triton and $m_p - \sqrt{3}(2m_U + m_D) = 912.9$ MeV mass-energy it generates, effectively drawing it towards the $r_{pi} = 1.017$ fm surface and since the mass-energy's size is the $r_{po} = r_{qi}3^{2/3}2\pi = 0.83$ fm volumetric radius of the quark triton's wave energies, where $r_{qi} = r_{qo} / \alpha\sqrt{3} = 6.353 \times 10^{-17}$ m and $r_{qo} = \frac{1}{2}(hc / \alpha^3)\pi = 0.803 \times 10^{-18}$ m is the quantum optical radius. The relativistic mass offset produces an arc sin $1 - (r_{pi} - r_{po})$ = arc sin $r_{pi} / r_{po} = 54.7°$ ½-spin magneton and mass-energy offset and an external magnetic alignment field aligns the generated magneton to produce a $\mu_p = (\frac{1}{2}eh/2\pi)(r_p/r_e)^3/(m_p/m_e) = 2.7928$ μ_n nuclear magneton. Thus $m_p = \frac{1}{2}eh / \mu_p 2\pi$ and equates the mass-energy, the μ_n magneton and ½-spin moment generation, and $r_{pi} = 1.017$ fm size of the triton's orbital.

The triton's 2.88 MeV gluon is significant because it equates to the 2.224 MeV bond energy. The bond forms when the proton's pion interacts with the neutron's orbital electron in its E_n energy state. This results in an electron resonance between the interacting proton and neutron's proton, thus forming two E_n states and an $\frac{1}{3}E_n(m_e + E_n)/m_e = 0.66$ MeV transition state energy between them. Two transition energies are necessary for the bond in order to form equal and opposite 2.224 MeV momentums, one for each half of the resonance, and which therefore cancel to yield the mass defect. The gluon's 2.88 MeV provides the second 0.66 MeV transition state momentum energy by colliding with the Up quarks in its light speed orbital since 2.88 MeV – 2.22 MeV = 0.66 MeV.

The gluon's collision triggers the pion generation because its transition between the Up quarks disrupts the triton's charge and the generated $B = d\Phi_E/dt$ mass-energy field starts collapsing, as explained in Higgs Mass Electrodynamics, p. 5. The charge disruption duration of the gluon-quark interaction equates to the pion's light speed transition time and distance by $r_{qi} / \sqrt{2}\alpha^2\pi = 1$ fm, where $r_{qi} = hc\pi / 2\sqrt{3}\alpha^4 = 6.353 \times 10^{-17}$ m is the quark's quantum wave field interactive radius, thus providing the interaction energy of Yukawa's pion matter wavelength. Normally this energy is returned at the resonance cycle termination but interaction with an E_o energy electron would provide an entropic degree of freedom into its lower energy atomic domain.

Three energy conditions co-exist in equilibrium in this bond resonance:

1. the pion's $\sqrt{2}\alpha m_{\pi^-} + E_n = 2.224$ MeV momentum energy;
2. the $2E_n + \frac{1}{3}E_n(m_e + E_n)/m_e = 2.224$ MeV neutron electron resonance energy between two protons; and
3. the $m_D - m_U - \frac{1}{3}E_n(m_e + E_n)/m_e = 2.224$ MeV quark-gluon interaction energy that transfers the neutron's Down quark excited energy state to the proton as part of the Feynman bond resonance function that transforms the proton and neutron into each other as the orbital electron resonates between them.

Normally the pion only interacts with the $E_n = 0.78$ MeV neutron state electron but an $E_o = 13.6$ eV electron provides a deeper energy hole degree of freedom.

Because the quark triton's orbital $B = d\Phi_E/dt$ Higgs mass-energy generation and the gluon-quark interaction charge disruption, pion energy generation, and Down quark state transfer are synchronous electrodynamic events the $\frac{1}{2}eh/2\pi$ rotating Bohr magneton can be synchronized with a Larmor type magnetic alignment and rf field to synchronize pion interaction with an E_o electron beam's composite matter wave in a controlled way in order to extract nuclear energy without fragmentation or radiation, a Nuclear Fuel Cell that converts mass-energy directly into electricity.