Exploration

The Monopolar Quantum Relativistic Electron: An Extension of the Standard Model & Quantum Field Theory (Part 2)

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Abstract

In this paper, a particular attempt for unification shall be indicated in the proposal of a third kind of relativity in a geometric form of quantum relativity, which utilizes the string modular duality of a higher dimensional energy spectrum based on a physics of wormholes directly related to a cosmogony preceding the cosmologies of the thermodynamic universe from inflaton to instanton. In this way, the quantum theory of the microcosm of the outer and inner atom becomes subject to conformal transformations to and from the instanton of a quantum big bang or qbb and therefore enabling a description of the macrocosm of general relativity in terms of the modular T-duality of 11-dimensional supermembrane theory and so incorporating quantum gravity as a geometrical effect of energy transformations at the wormhole scale.

Part 2 of this article series includes: The Mass Distribution for the Quantum Relativistic Classical Electron; Electromagnetic Mass Distribution for the Quantum Relativistic Electrodynamic Electron; The bare rest mass of the electron in the Coulombic charge quantum and the mensuration calibration in the alpha fine structure; The M-Sigma conformal mapping onto $\{m_{eo}/m_e\}^2$ in the $ß^2$ distribution; The Planck-Stoney Bounce in conformal supermembrane cosmology; and The charge radius for the proton and neutrinos in quantum relativity.

Keywords: Monopolar, quantum relativity, Standard Model, extension, quantum field theory.

The Mass Distribution for the Quantum Relativistic Classical Electron

We set Constant A in $Am_{ec} = \mu_o e^2/8\pi c^2 R_e$ for $Aß^2 = 1/\sqrt{[1 - ß^2]} - 1$
from: $c^2(m - m_{ec}) = \mu_o e^2 v^2/8\pi R_e = m_{ec}c^2(1/\sqrt{[1-ß^2]} - 1) = m_{ec}v^2 A$ with a total QR monopolar mass $m = m_{ec}/\sqrt{(1-[v/c]^2)}$

This leads to a quadratic in $ß^2$: $1 = (1 + Aß^2)^2(1-ß^2) = 1 + ß^2(2A+A^2ß^2-2Aß^2-A^2ß^4 - 1)$ and so: $\{A^2\}ß^4+\{2A-A^2\}ß^2+\{1-2A\} = 0$ with solution in roots:

$$\mathbf{ß^2 = ([A-2] \pm \sqrt{[A^2+4A]})/2A = \{(½-1/A)\pm\sqrt{(¼+1/A)}\}}$$

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and

$$\mathbf{A = -\{1 \pm 1/\sqrt{(1-ß^2)}\}/ß^2}$$

solving (in 4 roots) the quadratic $\mathbf{(2Aß^2+2-A)^2 = A^2 + 4A}$...... **[Eq.8]**

This defines a distribution of $ß^2 = (v/c)^2$ and $ß = v/c$ velocity ratios in $m_{ec}.Aß^2 = \mu_o e^2[v/c]^2/8\pi R_e$
The electromagnetic mass m_{ec} in the relation $m_{ec}A = ½m_e$ is then the monopolar quantum relativistic rest mass and allows correlation by the Compton constant and between its internal magnetopolar self-interaction with its external magnetic relativistic and kinetic effective electron ground state mass m_e respectively.

In particular $m_e = 2Am_{ec}$ and is m_{ec} for A=½ as the new minimization condition. In string parameters and with m_e in *units, $\mathbf{m_eA=30e^2c/e^*=½m_e=4.645263574x10^{-31}}$ kg*

In terms of the superstring quantum physical theory, the expression $[ec]_{unified} = 4.81936903x10^{-11}$ kg* or $[ec^3]_u = 2.7x10^{16}$ GeV* as the Grand-Unification (GUT) energy scale of the magnetic monopole, which represents the first superstring class transformation from the Planck-string class I of closure to the self-dual opening of class IIB, as the magnetic monopole of the inflaton epoch.

$\mathbf{E^* = E_{weyl} = E_{ps} = hf_{ps} = hc/\lambda_{ps} = m_{ps}c^2 = (m_e/2e).\sqrt{[2\pi G_o/\alpha hc]} = \{m_e/m_P\}/\{2e\sqrt{\alpha}\} = 1/2R_ec^2 = 1/e^*}$ ...... **[Eq.9]**

Monopolar charge quantum $e^*/c^2 = 2R_e \Leftarrow$ supermembrane displacement transformation $\Rightarrow$ $\sqrt{\alpha}.l_{planck} = e/c^2$ as Electropolar charge quantum

This implies, that for A=1, $m_{ec} = ½m_e$, where $\mathbf{m_e = 9.290527155x10^{-31}}$ **kg*** from particular algorithmic associations of the QR cosmogony and is related to the fine structure of the magnetic permeability constant $\mu_o = 120\pi/c = 1/\varepsilon_o c^2$, defining the classical electronic radius.
As $ß\geq0$ for all velocities v, bounded as group speed in c for which $ß^2=ß=1$, (and not de Broglie phase speed: $\mathbf{v_{dB} = (h/mv_{group})(mc^2/h) = c^2/v_{group} > c}$); a natural limit for the ß distribution is found at A = ½ and A = ∞.

The electron's rest mass m_{ec} so is binomially distributed for the ß quadratic. Its minimum value is half its effective mass m_e and as given in:

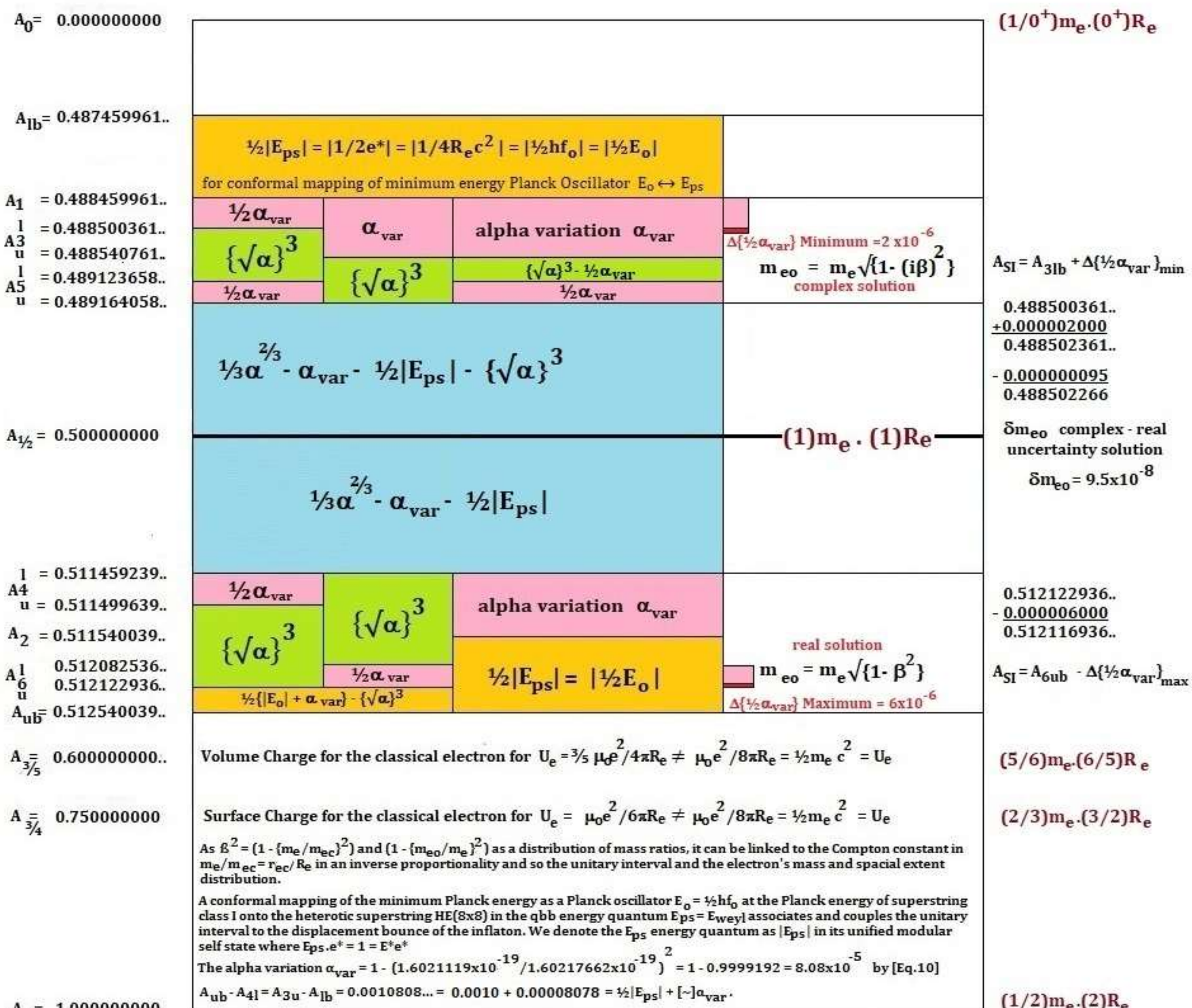
$\mu_o e^2/8\pi m_e R_e = ½m_e$ for a distributed rest-mass $m_{ec}/R_e = m_e/r_{ec}$ in A and $m_{electric} = kq^2/2R_ec^2 = \mu_o e^2/8\pi R_e = U_e/c^2 = ½m_e$ for A=½ and its maximum for A=∞ is the unity v=c for ß=1

The classical rest-mass m_o of the electron and as a function of its velocity from v=0 to v=c so is itself distributed in its magnetic mass potential about its effective rest mass $m_e=\mu_o e^2/4\pi R_e c^2$ and as a function of the classical electron radius R_e.

Derivation of the electron restmass from a super-membraned Planck Oscillator

The bare electron mass m_{eo} should be found in two intervals defined in the alpha variation applied to both a complex halving part $A_{3\ \text{upper bound}}$ - $A_{3\ \text{lower bound}}$ for a minimised δ_{min} added to $\frac{1}{2}\alpha_{var}$ and a real halving part $A_{6\ \text{lower bound}}$ - $A_{6\ \text{upper bound}}$ for a maximised δ_{max} subtracted from $\frac{1}{2}\alpha$var.
To calibrate the(*)-measurement system to the SI-mensuration units within the context of the alpha variation, the electromagnetic charge-mass ratio for the electron is used with:

$\{e/m_{eo} = 1.606456344\text{x}10^{-19}C^*/9.143202823\text{x}10^{-31}\ kg^* = 1.756995196\text{x}10^{11}\ C^*/kg^*\}$ and
$\{e/m_{eo} = 1.602111894\text{x}10^{-19}C/9.10901554\text{x}10^{-31}\ kg = 1.758820024\text{x}10^{11}\ C/kg\}$ minimised in the alpha variation maximum.



Minimum Planck Oscillator $\frac{1}{2}\lvert E_o\rvert \Leftrightarrow \lvert E_{ps}\rvert^* = 1/\lvert e^*\rvert$	$\frac{1}{2}\lvert E_{ps}\rvert$	$\frac{3}{4}\lvert E_{ps}\rvert$	$1\lvert E_{ps}\rvert$	$5/4\lvert E_{ps}\rvert$	$3/2\lvert E_{ps}\rvert$
Value in energy (Joules; Joules*)	1/1000	1/666⅔	1/500	1/400	1/333⅓
Value as modulated to A-interval as M-Sigma	$1\text{x}10^{-3}$	$1.5\text{x}10^{-3}$	$2\text{x}10^{-3}$	$2.5\text{x}10^{-3}$	$3\text{x}10^{-3}$
$\lvert E_{ps}\rvert^*/\lvert e^*\rvert$ to reunitize-renormalize $E^*e^*=1$	$2\text{x}10^{-6}$	$3\text{x}10^{-6}$	$4\text{x}10^{-6}$	$5\text{x}10^{-6}$	$6\text{x}10^{-6}$
⅔-value in partition interval $\frac{2}{3}m_e.\frac{1}{3}R_e$ for mean A=¾	1/2	3/4	1	5/4	3/2
Fraction of Renormalization effect	1/3	1/2	2/3	5/6	1
Value of $\Delta\{\frac{1}{2}\alpha_{var}\}$ in $A_{6lb} - A_{6ub}$ (real) and in $A_{3ub} - A_{3lb}$ (complex)	$2\text{x}10^{-6}$ complex min	$3\text{x}10^{-6}$	$4\text{x}10^{-6}$	$5\text{x}10^{-6}$	$6\text{x}10^{-6}$ real max
The $\frac{1}{2}a_{var}$ sub-interval so is adjusted by $6\text{x}10^{-6}$ from $A_{6ub} - \Delta\{\frac{1}{2}\alpha_{var}\} = A_{SI}$ for $ß^2_{SI}$ for m_{eo}SI for the real solution					

Its minimum condition is defined by the electric potential energy in $m_o=½m_e$ for a value of A=½ with effective rest mass m_e being the rest mass for a stationary electron v=0 without magnetic inertia component.

For v=c, the mass of the electron incorporates a purely relativistic and quantum relative self-interacting magnetic monopolar value for which $m_o=0$ and the effective rest mass m_e assumes the minimum rest energy for the electron at A=1 and generalised as $m_e=2Am_o$.

The classical rest mass $m_o=hf/c^2$ so decreases from its maximum value as $m_o=m_e$ to $m_o=0$ as a function of the velocity distribution and in the extension of the classical force to incorporate the rest mass differential
$d(m_o) = hd(f)/c^2$ by $F_{Newton} = F_a + F_\alpha$ = F-acceleration + F-alpha as the sum of the classical Newtonian linear momentum change and the quantum mechanical angular acceleration momentum change in the self-interaction for the electron. [Eq.4]

Electromagnetic Mass Distribution for the Quantum Relativistic Electrodynamic Electron

$A=\mu_oe^2/8\pi m_{ec}R_e$ $=ke^2/2m_{ec}R_ec^2$ $=ke^2/m_{ec}e^*$ $=ke^2\lvert E_{ps}^*\rvert/m_{ec}$	**$ß^2 = 1-\{m_{eo}/m_e\}^2$ $= 1-\{m_{eo}R_e/m_{ec}r_{ec}\}^2$ $ß^2 \Rightarrow (iß)^2$ for $A < ½$**	**x root**	**y root**	**self-relative-QR-m_{eo} m_{eo} kg*/ m_{eo} kg $m_{eo} = m_e\sqrt{(1-ß^2)}$ $= m_e/\gamma$ $ß^2 \Rightarrow (iß)^2$ for $A < ½$**	**v/c**	**$(v_{ps}/c)^2 = 1/\{1+r_{ec}^4/4\pi^2\alpha^2r_{ps}^4\}$ for magnetopolar.velocity.in c (m/s)* $r_{ec} = R_e/\gamma = \sqrt{(1-ß^2)}R_e$ $r_{ec}/R_e = m_e/m_{ec}$ in m***	**self-relative-QR-r_e**
0	0 ± 0	$1/0^+$	$-1/0^+$	$[1/0^+]m_e$	$i/0^+$	algorithmic metaphysicality inflaton spacetime as complex v_{ps} = ic = ci	$[\propto]$ R_e

1-½√2 = 0.292893218		**-1 = i² x-root is complex**	**1+½√2 = - 4.82842714 y-root is complex**	**0 0**	**i**	**1 c 1 0 0 R_e**	**$(2/0^+)R_e$**
{1-½√2}+O(10⁻¹⁷) = 0.292893218⁺ -{1±1/√[1-ß²]}/ß² ~- 1{1±1+½ß²}/ß²	$ß_{complex image}^2$ = -2.914213561....... ± 1.91421356200...	- 0.999999999..... . $\{i.m_e/\alpha m_{ps}\}^2$ = - 1+3.282806345 x10^{-17}	- 4.82842714 +	0^+ 0^+	i^-	v_{ps}= 2παc/√{1+4π²α²} =0.045798805 ic 13,739,641.79 [m/s]* $r_{ec}=r_{ps}=180R_e/(\pi 10^{10})$ 1.591549431x10^{-23} 5.729577953x10^{-9} R_e	349,065,850.6 R_e
A_{Ib} = 0.487459961	$ß_{Ib}^2$ = -1.55145054 ± 1.517053242	-0.034397297	- 3.06850378 2	9.129344446x10^{-31} 9.095208981x10^{-31}	0.185i	1.558679858x10^{-18} ic 4.676039573x10^{-10} 2.729585632x10^{-15} 0.982650855 R_e	1.018 R_e
A_1 = 0.488459961.	$ß_1^2$ = -1.547250706 ± 1.515668402	-0.031582303	- 3.06291910 8	9.142642017x10^{-31} 9.108456831x10^{-31}	0.177i	1.554149091x10^{-18} ic 4.662447273x10^{-10} 2.733561478x10^{-15} 0.984082159 R_e	1.016 R_e
A_{3I} = 0.488500361	$ß_{3I}^2$ = -1.547081394 ± 1.515612547	-0.031468847	- 3.06269394 1	9.143177565x10^{-31} 9.108990376x10^{-31}	0.177i	1.55396695x10^{-18} ic 4.661900851x10^{-10} 2.733721674x10^{-15} 0.984139803 R_e	1.016 R_e
A_{SI} = complex 0.488502266 [e/m]= 1.758820024 x10^{-11} C/kg with α_{var} A-root complex=real	**$ß_{SI}^2$ = -1.54707341 ± 1.515609914**	**-0.031463495**	**- 3.06268332 4**	**9.14320282x1 0^{-31} 9.109015537x10^{-31} δm_{eo} =-9.5x10^{-8} uncertainty solution complex - real**	**0.177i**	**1.553958288x10^{-18} ic 4.661874865x10^{-10} 2.733729293x10^{-15} 0.984142545 R_e**	**1.016 R_e**
A_{SI} = complex 0.488502361 [e/m]= 1.758820024 x10^{-11} C/kg with α_{var} min	**$ß_{SI}^2$ = -1.547073013 ± 1.515609783**	**-0.03146323**	**- 3.06268279 6**	**9.143204074x10^{-31} 9.109016786x10^{-31}**	**0.177i**	**1.553957936x10^{-18} ic 4.661873808x10^{-10} 2.733729603x10^{-15} 0.984142657 R_e**	**1.016 R_e**

A_{3u} = 0.488540761	**$ß_{3u}^2$** = -1.54691211 ± 1.5155567	-0.03135541	- 3.06246881	9.143712983x 10^{-31} 9.109523792x 10^{-31}	0.177i	1.553784965x10^{-18} ic 4.661354894x10^{-10} 2.733881762x10^{-15} 0.984197434 R_e	1.016 R_e
A_{5l} = 0.489123658	**$ß^{5l2}$** = -1.54447277 ± 1.514751719	-0.029721051	- 3.05922448 9	9.151423661x 10^{-31} 9.117205639x 10^{-31}	0.172i	1.551167736x10^{-18} ic 4.653503207x10^{-10} 2.73618718x10^{-15} 0.985027384 R_e	1.015 R_e
A_{5u} = 0.489164058	**$ß_{5u}^2$** = - 1.544303917 ± 1.514695982	-0.029607935	- 3.05899989 9	9.151957085x 10^{-31} 9.117737069x 10^{-31}	0.172i	1.550986921x10^{-18} ic 4.652960762x10^{-10} 2.736346668x10^{-15} 0.9850848 R_e	1.015 R_e
½	**-3/2 ± 3/2**	**0.0**	**-3**	**$m_{eo} = m_e = m_{ec}$** 9.290527148x 10^{-31} 9.255789006x 10^{-31}	**0**	**1.5050654x10^{-18} c 2.7777777...x10^{-15} = 1.00 R_e**	**R_e**
0.50078795	$ß_{realimage}^2$ = - 1.496853158 ± 1.498950686	0.00209753053 9 0.00209752801	- 2.99580384 4	9.280778463x 10^{-31} 9.246076772x 10^{-31}	0.0458	1.508228953x10^{-18} c 4.524686858x10^{-10} 2.774863014x10^{-15} 0.998950685 R_e	1.001576 R_e
A_{4l} = 0.511459239	**$ß_{4l}^2$** = - 1.455190021 ± 1.484988222	0.029798201	- 2.94017824 3	9.151059822x 10^{-31} 9.1163843161 x10^{-31}	0.173	1.551286282x10^{-18} c 2.73608263x10^{-15} = 0.98498975 R_e	1.015 R_e
A_{4u} = 0.511499639	**$ß_{4u}^2$** = -1.455035593 ± 1.484936225	0.029900632	- 2.93997181 8	9.15057674x1 0^{-31} 9.116361885x 10^{-31}	0.173	1.55145488x10^{-18} c 2.73593396x10^{-15} = 0.98493623 R_e	1.015 R_e
A_2 = 0.511540039	**$ß_2^2$** = -1.45488119 ± 1.484884234	0.030003044	- 2.93976542 4	9.150093721x 10^{-31} 9.115880672x 10^{-31}	0.1732. 86	1.55161873x10^{-18} c 2.7357895x10^{-15} = 0.98488423 R_e	1.015 R_e
A_{6l} = 0.512082536	**$ß_{6l}^2$** = -1.452810201 ± 1.484186714	0.031376513	- 2.93699691 5	9.143613382x 10^{-31} 9.109424564x 10^{-31}	0.177	1.553818818x10^{-18} c 2.73385198x10^{-15} = 0.98418671 R_e	1.016 R_e
A_{SI} = real 0.512116936 [e/m]= 1.758820024	**$ß_{SI}^2$ = -1.452679026 ± 1.484142522**	**0.031463496**	**- 2.93682154 8**	**[1.02/1.02]$m_e\sqrt{(1-x)}$ 9.14320282x1**	**0.177**	**1.553958371x10^{-18} c 2.73372922x10^{-15} = 0.98414252 R_e**	**1.016 R_e**

$\times 10^{-11}$ C/kg with α_{var} max				**0^{-31} 9.109015537x 10^{-31}**			
A_{6u} = 0.512122936	$ß_{6u}{}^2$ = -1.452656072 ± 1.484134815	0.031478742	- 2.93679088 7	9.143130852x 10^{-31} 9.108943838x 10^{-31}	0.177	$1.553982826\times 10^{-18}$ c $2.73370771\times 10^{-15}$ = 0.98413478 R_e	1.016 R_e
A_{ub} = 0.512540039	$ß_{ub}{}^2$ = -1.451067085 ± 1.483599368	0.032532283	- 2.93466645 3	9.138156632x 10^{-31} 9.103988218x 10^{-31}	0.180	$1.555675057\times 10^{-18}$ c $2.73222047\times 10^{-15}$ = 0.98359937 R_e	1.017 R_e
4(⅔√3-1) 0.618802153	-1.116025404 ±1.366025404 - ¼(1+2√3)±½√(4+ 2√3)	¼	- 2.48205008 08 -(¾+√3)	[1.24/1.24]m_e√ (1-x) 8.045832525x 10^{-31} 8.015748411x 10^{-31}	0.500	$2.006753867\times 10^{-18}$ c v_{ps} = $6.020261601\times 10^{-9}$ $2.405626121\times 10^{-15}$ = 0.866025403 R_e	1.238 R_e
¾ Mean: ½{½+1} ∑surface charge	-⅚ ± √(19/12)	0.424972405	-2.09164	**[3/2]⅔m_e√(1- x)** 7.045060062x 10^{-31} 7.018717929x 10^{-31}	0.652	$2.617379438\times 10^{-18}$ c v_{ps} = $7.852138314\times 10^{-9}$ $2.10640483\times 10^{-15}$ = 0.75830574 R_e	3R_e/2
⅚ ∑Volume charge	-7/10 ± √(29/20)	0.504159457	- 1.90415945 8	**[5/3]⅗m_e√(1- x)** 6.542012566x 10^{-31} 6.517551374x 10^{-31}	**0.710**	$3.035381866\times 10^{-18}$ c v_{ps} = $9.106145598\times 10^{-10}$ 1.9559985×10^{-15} = 0.70415946 R_e	5R_e/3
1	**-½ ± ½√(5)**	**0.618033988**	**- 1.61803398 8**	**[2]½m_e√(1-x) 5.741861551x 10^{-31} 5.720392198x 10^{-31}**	**0.786**	**$3.94031237\times 10^{-18}$ c v_{ps} = $1.182093711\times 10^{-9}$ $1.71676108\times 10^{-15}$ = 0.61803399 R_e**	**2 R_e**
1+½√2 = 1.707106781		**0.828427125 x-root is real**	**-1 = i^2 y-root is complex**	**[3.41/3.41]m_e√ (1-x) 3.848262343x 10^{-31} 3.833873334x 10^{-31}**	**0.910**	**$8.77216401\times 10^{-18}$ c $2.631649203\times 10^{-9}$ $1.150593228\times 10^{-15}$ 0.414213562 R_e =(√2 - 1) R_e**	**3.41421356 2 R_e = (2+√2) R_e**

2	0 ± ½√(3)	0.866025403	-0.866025403	**[4]⅙m_e√(1-x)** 3.400568951x 10^{-31} 3.387853908x 10^{-31}	0.931	1.123396092x10^{-17} c 3.370188275x10^{-9} 1.01673724x10^{-15} = 0.36602540 R_e	4 R_e
2.47213603	**0.095491515 ± 0.809016986**	**0.904508501**	**-0.7135255471**	**[4.94/4.94]m_e√(1-x)** **2.870930718x 10^{-31}** **2.860196042x 10^{-31}**	**0.951**	**1.576125021x10^{-17} c** **4.728375064x10^{-9}** **R_{proton} =** **0.85838052x10^{-15}** **= 0.309016987 R_e**	**4.94427206 R_e**
3	⅙ ± √(7/12)	0.930429282	-0.597195949	**[6]⅙m_e√(1-x)** 2.450493743x 10^{-31} 2.44133112x1 0^{-31}	0.965	2.163360455x10^{-17} c 6.490081364x10^{-9} 7.32673935x10^{-16} = 0.26376262 R_e	6 R_e
4	¼ ± √(½)	0.957106781	-0.457106781	**[8]⅛m_e√(1-x)** 1.924131173x 10^{-31} 1.916936668x 10^{-31}	0.978	3.50886558x10^{-17} c 1.052659674x10^{-8} 5.75296616x10^{-16} = 0.20710678 R_e	8 R_e
174,532,925.3 **-{1±1/√[1-ß^2]}/ß^2** **~-1{1±1+½ß^2}/ß^2**	**0.499999...4 ± 0.500000...5** **~ ½$^-$ ± ½$^+$**	**0.999999999......** **{$m_e/\alpha m_{ps}$}^{2} = 1-3.282806345x1$0^{-17}$**	**-0.000000...1**	**[#/#]m_e√(1-x)** **5.323079946x 10^{-39}** **5.303176457x 10^{-39}** **minimum mass (electron-neutrino)** **0.00297104794 eV*** **$m_{\nu e} = m v_\tau^2$ = 0. 002982..eV***	**0.999**	**qbb boundary of physicality** **0.045798805 c** **13,739,641.79** **$r_{ec} = r_{ps}$ =($m_e/\alpha m_{ps}$)R_e** **1.59154943x10^{-23}** **= 5.7296x10^{-9} R_e**	**349,065,850.6 R_e**
∞	½$^-$ ± ½$^+$	**1^-**	**0^-**	**[∞$^-$]$0^+$$m_e$√(1-x)=$m_e$** **$m_{eo}$=0+**	**1^-**	**algorithmic metaphysicality inflaton spacetime as complex v_{ps} = ic = ci**	**[∞] R_e**

The X-root is always positive in an interval from 0 to 1 and the Y-root is always negative in the interval from -3 to 0.

For A=∞: $ß^2=½^-±½^+$ for roots $x=1^-$ and $y=0^-$; for v=c with $U_m = (½v^2)\mu_o e^2/8\pi R_e = (½v^2)\mu_o e^2/4\pi R_e = ½m_e c^2 = m_{magnetic}c^2 = m_{electric}c^2$ and $m_o = 0m_e$

$Aß^2 = ([1-ß^2]^{-½}-1) = 1+½ß^2-3ß^4/8+5ß^6/16 -35ß^8/128+...-1$
The Binomial Identity gives the limit of A=½ in: $A=½ - ß^2\{3/8 - 5ß^2/16 + 35ß^4/128 -...\}$ and as the non-relativistic low velocity approximation of $E=mc^2$ as $KE=½m_o v^2$.

Letting $ß^2$=n, we obtain the Feynman-Summation or Path-Integral for dimensionless cycle time n = $H_o t = ct/R_{Hubble}$ with H_o=dn/dt in the UFoQR for $1 = (1-ß^2)(1+ß^2)^2$ as $ß^4+ß^2-1=0$ for T(n) = n(n+1)= 1.

The bare rest mass of the electron in the Coulombic charge quantum and the mensuration calibration in the alpha fine structure

We shall also indicate the reason for the measured variation of the fine structure constant by Webb, Carswell and associates; who have measured a variation in alpha dependent on direction.
This variation in alpha is found in the presence of the factor γ^3 in the manifestation of relativistic force as the time rate of change of relativistic momentum p_{rel}. Furthermore, the mass-charge ratio $\{e/m_{eo}\}$ relation of the electron implies that a precision measurement in either the rest mass m_{oe} or the charge quantum e, would affect this ratio and this paper shall show how the electromagnetic mass distribution of the electron crystallizes an effective mass m_e from its rest mass resulting in $m_{eo}\gamma = m_e\gamma^2$ related to the coupling ratio between the electromagnetic (EMI) and the strong nuclear interaction (SNI), both as a function of alpha and for an asymptotic (not running) SNI constant defined from first principles in an interaction transformation between all of the four fundamental interactions.

Since $\{1 - ß^2\}$ describes the $ß^2$ distribution of relativistic velocity in the unitary interval from A=0 to A=1, letting $\{1 - ß^2\} = \{\surd\alpha\}^3 = 6.232974608...\mathrm{x}10^{-4}$, naturally defines a potential oscillatory upper boundary for any displacement in the unit interval of A. An increase or decrease in the 'bare' electron mass, here denoted as m_{oe} can then result in a directional measurement variation due to the fluctuating uncertainty in the position of the electron in the unitary interval mirroring the natural absence or presence of an external magnetic field to either decrease or increase the monopolar part of the electron mass in its partitioning: $m_{electric} + m_{magnetic} + \delta m_{monopolic} = m_{ec}\{½+½[v/c]^2\} + \delta_{ps}m_{ec} = m_{ec}$ with $m_e c^2\surd\{1 + v^2\gamma^2/c^2\} = m_e c^2\gamma = m_{ec}c^2$ for $m = m_{ec}$ from the energy-momentum relation $E^2 = E_o^2 + p^2c^2$ of classical and quantum theory.

The cosmic or universal value of alpha so remains constant in all cosmological time frames; with the fluctuation found to depend on an asymptotically constant strong interaction constant as a function of alpha.
In the SI measurement system Planck's constant h = $6.62607004 \times 10^{-34}$ Js and the speed of light is c = $2.99792458 \times 10^{-8}$ m/s and the electron charge are e=$1.60217662 \times 10^{-19}$ C for a bare electron mass of $9.10938356 \times 10^{-31}$ kg.

In a mensuration system in which c would be precisely 3×10^{8} (m/s)*; the following conversions between the SI-system and the *-system are applied in this paper.

Furthermore, there exists one fundamental constant in the magnetic permeability constant μ_o = $4\pi \times 10^{-7}$ H/m which becomes numerically equal in the Maxwell constant $\mu_o = 1/\varepsilon_o c^2$ in an applied fine structure $\mu_o.\varepsilon_o = \{120\pi/c\}.\{1/120\pi c\} = 1/c^2$ (s/m)^2; (s/m)^2*. Subsequently in the calculation of alpha, the speed conversion must be incorporated for unitary consistency.

Alpha remains constant for a cosmology descriptive of a non-accelerating cosmology; but will result in a change in the electric charge quantum in a cosmology, which measures an accelerated spacial expansion, which can however be the result of a self-intersection of the light path for particular cosmological redshift intervals in an oscillating cosmology.
{https://cosmosdawn.net/index.php/en...-alpha-variation-and-an-accelerating-universe}

Here a particular alpha variation reduces the SI-measurement for the square of the charge quantum e in a factor of $(1.6021119 \times 10^{-19}/1.60217662 \times 10^{-19})^2 = 0.99991921$...for a calibrated:

alpha variation $\alpha_{var} = 1 - (1.6021119 \times 10^{-19}/1.60217662 \times 10^{-19})^2 = 1 - 0.9999192 = 8.08 \times 10^{-5}$.........[Eq.10]

Alpha $\alpha = \mu_o ce^2/2h = 2\pi.(2.99792458)(1.6021119)^2 \times 10^{-37}/(6.62607004 \times 10^{-34}) = 60\pi e^2/h = 7.2967696 \times 10^{-3} = 1/137.047072$

{s}	=	1.000978394	{s*}	=	0.999022562	{s}
{m}	=	1.001671357	{m*}	=	0.998331431	{m}
{kg}	=	1.003753126	{kg*]	=	0.996260907	{kg}
{C}	=	1.002711702	{C*}	=	0.997295631	{C}
{J}	=	1.005143377	{J*}	=	0.994882942	{J}
{eV}	=	1.00246560	{eV*}	=	0.997540464	{eV}
{K}		0.98301975	{K*}	=	1.017273559	{K}

From the unification polynomial $U(x) = x^4 + 2x^3 - x^2 - 2x + 1 = 0$ and derivative $U'(x) = 4x^3 + 6x^2 - 2x - 2$ with minimum roots at $x_1 = X$ and $x_2 = -(X+1) = Y$ and maximum root at $x_3 = ½$ we form the factor distribution (1-X)(X)(1+X)(2+X) = 0 and form a unification proportionality:

SNI:EMI:WNI:GI = [Strong Nuclear Interaction #]:[Electromagnetic Interaction $\#^3$]:[Weak Interaction $\#^{18}$]:[Gravitational Interaction $\#^{54}$]
under the Grand Unification transformation of X ⇔alpha α

X ⇔ α in ℵ(Transformation) = $\{\aleph\}^3$: $X \rightarrow \alpha\{\#\}^3 \rightarrow \# \rightarrow \#^3 \rightarrow (\#^2)^3 \rightarrow \{(\#^2)^3\}^3$ ....[Eq.11]

This redefines the Interaction proportion as: SNI:EMI:WNI:GI = [#]:[$\#^3$]:[$\#^{18}$]:[$\#^{54}$] = [1X]:[X]:[1+X]:[2+X] for the X Alpha Unification, which is of course indicated in the unitary interval from A = 0 to A =1 in the $ß^2$ distribution for the electron mass.

SNI:EMI	[1-X]:[X]	X	X	$\#:\#^3$ $\#^{-2}$	$\alpha^{-2/3}$ $1/\sqrt[3]{\alpha^2}$	Invariant Upper Bound	X-Boson
SNI:WNI	[1-X]:[1+X]	[2X-1]	X^3	$\#:\#^{18}$ $\#^{-17}$	$\alpha^{-1/3(17)}$ $1/\sqrt[3]{\alpha^{17}}$		
SNI:GI	[1-X]:[2+X]	$[1-X]^2$	X^4	$\#:\#^{54}$ $\#^{-53}$	$\alpha^{-1/3(53)}$ $1/\sqrt[3]{\alpha^{53}}$		
EMI:WNI	[X]:[1+X]	[1-X]	X^2	$\#^3:\#^{18}$ $\#^{-15}$	α^{-5} $1/\sqrt[3]{\alpha^{15}}$		
EMI:GI	[X]:[2+X]	[2X-1]	X^3	$\#^3:\#^{54}$ $\#^{-51}$	α^{-17}		

					$1/\sqrt[3]{\alpha^{51}}$		
WNI:GI	[1+X]:[2+X]		X	$\#^{18}:\#^{54}$ $\#^{-36}$	α^{-12} $1/\sqrt[3]{\alpha^{36}}$	Invariant Lower Bound	L-Boson

For the unitary interval at A=½ the Compton constant defines $m_e.R_e$, but at A=1, the constancy becomes $\frac{1}{2}m_e.2R_e$ and at the average value at A=¾ it is $\frac{2}{3}m_e.(3/2)R_e$.

This crystallizes the multiplying (4/3) factor calculated from the integration of the volume element to calculate the electromagnetic mass in the Feynman lecture: http://www.feynmanlectures.caltech.edu/II_28.html and revisited further on in this paper. if the electrostatic potential energy is proportional to half the electron mass is changed by a factor of (4/3), then the full electron mass will be modified to ⅔ of its value.

Using the $ß^2$ velocity distribution, one can see this (4/3) factor in the electromagnetic mass calculation to be the average between the two A-values as ½(½+1) = ¾ for a corrected electron mass of $\frac{2}{3}m_e$ and for a surface distribution for the electron.

The problem with the electromagnetic mass so becomes an apparent 'missing mass' in its distribution between the electric- and magnetic external fields and the magnetopolar self interaction fields as indicated in this paper.

In the diagram above the mass of the electron is distributed as m_{ec} in the unitary interval applied to the Compton constant and where exactly half of it can be considered imaginary or complex from A=0 to A=½. The mass of the electron at A=0 is however simply half of its effective mass m_e, which is realised at the half way point at A=½ as the new origin of the electron's electrostatic energy without velocity in the absence of an external magnetic field. We have seen however, that the electrostatic electron carries a minimum eigen-velocity and so magnetopolar self-energy, calculated as $v_{ps} = 1.50506548 \times 10^{-18}$ c and manifesting not as a dynamic external motion, but as $f_{\alpha\omega} = 2.84108945 \times 10^{-16} = \sum f_{ss} = \sum m_{ss}c^2/h = f_{\alpha\omega}/f_{ss} = 8.52326834 \times 10^{14}$ mass- or frequency self states.

But how can the bare electron mass be obtained from first principles? This bare electron rest mass must be less, than the effective mass m_e at A=½ and more than half of m_e at the absolute 0 state at A=0.

We know this discrepancy to be $\frac{1}{3}m_e$ on mathematical grounds and so one might relate the

Compton constant in the ⅓R_e to set the ⅓m_e interval as being centered on A=½ for two bounds A_1 and A_2 in the 'complex' region where $ß^2$ is negative and where $ß^2$ is positive respectively. To approximate the two bounds, we shall define the sought interval for the bare electron mass m_{eo} as a function of alpha and as a function of the classical electron radius.

The monopolar energy is defined in the Weyl energy of the qbb and in E_{ps} = 1/e* = 1/2$R_e c^2$ and using the modular string duality we use the magneto charge quantum not as inverse energy E_{weyl}, but as energy to set m*= E*/c^2 = 2R_e* and so the unification factor for the electron mass m_{ec} at A=1. As can be seen in the diagram, the alpha variation becomes a delta energy added to the magneto charge quantum to finetune the electron rest mass interval.

The elementary interaction ratios can be applied to the quantum nature of the electron in the form of the original superstring transforms (discussed further later in this paper) and apply here in the EMI/SNI = $\alpha^{⅔}$ to set the electron's interaction relative to the SNI and a decreasing size of the electron centered at the R_e scale decreasing towards the nuclear center with increasing speed in the 'real interval'.

As we require ⅔m_e as the average in the surface charge interval from A=½ to A=1 we define the sought bounding interval for the bare electron mass as ⅓$\alpha^{⅔}$+ ⅓$\alpha^{⅔}$ = ⅔$\alpha^{⅔}$.
The lower bound for m_{eo} so is A_{lb} = ½ - ⅓$\alpha^{⅔}$ = 0.487459961.... and the upper bound becomes A_{ub} = ½ + ⅓$\alpha^{⅔}$ = 0.512540039... for a total A-interval of A_{lb} + A_{ub} = 0.0025080078... = 2(0.012540039).

We so can define $m_e(m_{eo};ß^2) = m_e/\sqrt{(1 - ß^2)} = m_{eo}/(1 - ß^2)$ for any m_{eo} in the interval defined in the $ß^2$ distribution and [Eq.8] with the effective rest mass m_e = 9.290527148x10^{-31} kg* in * units.

$ß_{lb}^2$ (0.487459961...) = -1.55145054... + 1.517053242... = -0.034397297... (equilibrium in x-root) for $m_{eo} = m_e\sqrt{(1 - i^2ß^2)}$ = 9.129344446x10^{-31} kg* for 9.095208981x10^{-31} kg.
$ß_o^2$ (0.5000000000) = -1.50000000... + 1.5000000000... = 0.000000000... (complex in x-root) for $m_{eo} = m_e\sqrt{(1 - 0)}$ = 9.290527148x10^{-31} kg* for 9.255789006x10^{-31} kg.
$ß_{ub}^2$ (0.512540039...) = -1.451067085... + 1.483599368... = 0.032532283... (real in x-root) for $m_{eo} = m_e\sqrt{(1 - ß^2)}$ = 9.138156632x10^{-31} kg* for 9.103988218x10^{-31} kg.

So we know that the bare electron mass will be near 0.982651 of the real m_e in the complex region of the unitary interval.

To correlate the complex solution for m_{eo} with the real solution for m_{eo}, we are required to shorten the interval A_{ub} - Al_b in a symmetry for the electron mass. This will result in a complex solution in the complementary x-root. We can ignore the y-roots for $ß^2$, as they are all negative in view of the x-root always being negative in the described interval.

A reasonable approach is to remain in the described interval and next utilize the Compton constant in the form of the magneto charge quantum as the inverse of the Weyl wormhole energy, also

noting the scale of magnitude of the $1/e^* = 1/2R_ec^2$ being of the same order as alpha as $\alpha/E_{weyl} = \alpha e^* = 3.648381483$ or $e^*= 0.274094144.\alpha$.
Additionally, a conformal mapping of the minimum Planck energy as a Planck oscillator $E_o = ½hf_o$ at the Planck energy of superstring class I onto the heterotic superstring HE(8x8) in the qbb energy quantum $E_{ps} = E_{weyl}$ associates and couples the unitary interval to the displacement bounce of the inflaton. We denote the E_{ps} energy quantum as $|E_{ps}|$ in its unified modular self-state where $E_{ps}.e^* = 1 = E^*e^*$

As $ß^2 = (1 - \{m_e/m_{ec}\}^2)$ and $(1 - \{m_{eo}/m_e\}^2)$ as a distribution of mass ratios, it can be linked to the Compton constant in $m_e/m_{ec} = r_{ec}/R_e$ in an inverse proportionality and so the unitary interval and the electron's mass and spacial extent distribution.

We set the interval $A_2 = A_{ub} - ½|E_{ps}| = 0.512540039...- 0.001 = 0.511540039...$ and the conjugate interval as $A_1 = A_{lb} + ½|E_{ps}| = 0.487459961... + 0.001$
$= 0.488459961...$ $ß_1^2$ $(0.488459961...) = -1.547250706... + 1.515668402... = -0.031582303...$ (complex in x-root) for $m_{eo} = m_e\sqrt{(1 - i^2ß^2)} = 9.142642017\text{x}10^{-31}$ kg*
for $9.108456831\text{x}10^{-31}$ kg. $ß_2^2$ $(0.511540039...) = -1.45488119... + 1.484884234... = 0.030003044...$(real in x-root) for $m_{eo} = m_e\sqrt{(1 - ß^2)} = 9.150093721\text{x}10^{-31}$ kg* for $9.115880672\text{x}10^{-31}$ kg.

For the final interval fine structure we apply the alpha variation, also noting that the excess of the original upper and lower bounds is near the fractional divergent parts.

$\{A_{ub} - ½\} + \{½ - A_{lb}\} = 2(0.012540039) = 0.025080078 = 2(⅓\alpha^{⅔}) = 1/40 + 0.000080078... = ½|E_{ps}|(25) + 0.000080078... = ½|E_{ps}|(25) + [\sim]\alpha_{var}$ in $7.22\text{x}10^{-7}$ parts.
$A_{ub} - A_{4l} = A_{3u} - A_{lb} = 0.0010808... = 0.001 + 0.0000080078 = ½|E_{ps}| + [\sim]\alpha_{var}$. $A_{ub} = ½ + ⅓\alpha^{⅔} = 0.512540039...= 0.51254 + 0.000000039...$ and $A_{lb} = 0.487459961... = 1 - 0.5124 - 0.00000039...$

The alpha variation $\alpha_{var} = 1 - (1.6021119\text{x}10^{-19}/1.60217662\text{x}10^{-19})^2 = 1 - 0.9999192 = 8.08\text{x}10^{-5}$ by [Eq.10]

$A_{3l} = A_1 + ½\alpha_{var} = 0.488459961... + 0.0000404... = 0.488500361...$ and its image is $A_{4u} = A_2 - ½\alpha_{var} = 0.511540039... - 0.0000404... = 0.511499639...$
$A_{3u} = A_1 + \alpha_{var} = 0.488459961... + 0.0000808... = 0.488540761...$ and its image is $A_{4l} = A_2 - \alpha_{var} = 0.511540039... - 0.0000808... = 0.511459239...$ $ß_{3l}^2$ $(0.488500361...)$
$= -1.547081394... + 1.515612547... = -0.031468846...$ (complex in x-root) for $m_{eo} = m_e\sqrt{(1 - i^2ß^2)} = 9.143177565\text{x}10^{-31}$ kg* for $9.108990376\text{x}10^{-31}$ kg.
$ß_{3u}^2$ $(0.488540761...) = -1.54691211... + 1.5155567... = -0.03135541...$ (complex in x-root) for $m_{eo} = m_e\sqrt{(1 - i^2ß^2)} = 9.143712983\text{x}10^{-31}$ kg* for $9.109523792\text{x}10^{-31}$ kg.
$ß_{4u}^2$ $(0.511499639...) = -1.455035593... + 1.484936225... = 0.029900632...$(real in x-root) for $m_{eo} = m_e\sqrt{(1 - ß^2)} = 9.15057674\text{x}10^{-31}$ kg* for $9.116361885\text{x}10^{-31}$ kg.

$ß_{4l}^2$ (0.511459239...) = -1.455190021... + 1.484988222... = 0.029798201...(real in x-root) for $m_{eo} = m_e\sqrt{(1 - ß^2)} = 9.151059822\text{x}10^{-31}$ kg* for $9.1163843161\text{x}10^{-31}$ kg.

The bare electron mass m_{eo} should be found in two intervals defined in the alpha variation applied to both a complex halving part $A_{3\text{ upper bound}}$ - $A_{3\text{ lower bound}}$ for a minimized δ_{min} added to $½\alpha_{var}$ and a real halving part $A_{6\text{ lower bound}}$ - $A_{6\text{ upper bound}}$ for a maximized δ_{max} subtracted from $½\alpha_{var}$.

To calibrate the units of the (*) mensuration system with the SI-measurement system, the mass charge ratio for the electron and assuming a unit defined consistency, is applied in:
{$e/m_{eo} = 1.606456344\text{x}10^{-19}$ C*/$9.143202823\text{x}10^{-31}$ kg* = $1.756995196\text{x}10^{11}$ C*/kg* } and {e/m_{eo} = $1.602111894\text{x}10^{-19}$ C/$9.10901554\text{x}10^{-31}$ kg = $1.758820024\text{x}10^{11}$ C/kg } minimized in the alpha variation maximum.

There is a deviation in the symmetry between the complex solution and the real solution for the bare electron mass and this deviation mirrors the original bounce of the Planck length and the minimum Planck Oscillator $|E_o = E_{ps} = E_{weyl}|$ at the cosmogenesis of the inflaton. We recall the supermembrane displacement transformation of [Eq.9]:

Monopolar charge quantum $e^*/c^2 = 2R_e$ ⇐ supermembrane displacement transformation ⇒ $\sqrt{\alpha}.l_{planck} = e/c^2$ as Electropolar charge quantum

We so apply this bounce of the original definition for the minimum displacement to our described interval in adjusting the alpha variation interval using [Eq.11]:
$X \Leftrightarrow \alpha$ in $\aleph$(Transformation) = $\{\aleph\}^3 : X \rightarrow \alpha\{\#\}^3 \rightarrow \# \rightarrow \#^3 \rightarrow (\#^2)^3 \rightarrow \{(\#^2)^3\}^3$ by the factor $(\sqrt{\alpha})^3$ and so setting the cosmogenic displacement bounce of the qbb as being proportional to our lower and upper bounded A valued interval for the $ß^2$ distribution.

$⅔\alpha^{⅔} \propto (\sqrt{\alpha})^3$ in $⅔\alpha^{⅔} \approx 1/40 + \alpha_{var} = \{⅔\alpha^{-5/6}\}(\sqrt{\alpha})^3$

for proportionality constant $\{⅔\alpha^{-5/6}\} = 1/\{1/40 - 1.477074222\text{x}10^{-4}\} = 1/\{1/40 - 1.828.\alpha_{var}\}$….....
[Eq.12]

For $(\sqrt{\alpha})^3 = 6.232974608\text{x}10^{-4}$ then:
$A_{5l} = A_{3l} + 6.232974608\text{x}10^{-4}$ = 0.488500361...+ $6.232974608\text{x}10^{-4}$ = 0.489123658...
$A_{5u} = A_{3u} + 6.232974608\text{x}10^{-4}$ = 0.488540761...+ $6.232974608\text{x}10^{-4}$ = 0.489164058...
$A_{6u} = A_{4u} + 6.232974608\text{x}10^{-4}$ = 0.511499639...+ $6.232974608\text{x}10^{-4}$ = 0.512122936... $A_{6l} = A_{4l}$ + $6.232974608\text{x}10^{-4}$ = 0.511459239...+ $6.232974608\text{x}10^{-4}$ = 0.512082536...

for the $ß^2$ solutions:

$ß_{5l}^2$ (0.489123658...) = -1.54447277... + 1.514751719... = -0.029721051... (complex in x-root) for $m_{eo} = m_e\sqrt{(1 - i^2ß^2)}$ = 9.151423661x10^{-31} kg* for 9.117205639x10^{-31} kg.
$ß_{5u}^2$ (0.489164058...) = -1.544303917... + 1.514695982... = -0.029607935... (complex in x-root) for $m_{eo} = m_e\sqrt{(1 - i^2ß^2)}$ = 9.151957085x10^{-31} kg* for 9.117737069x10^{-31} kg.
$ß_{6u}^2$ (0.512122936...) = -1.452656072... + 1.484134815... = 0.031478742...(real in x-root) for $m_{eo} = m_e\sqrt{(1 - ß^2)}$ = 9.143130852x10^{-31} kg* for 9.108943838x10^{-31} kg.
$ß_{6l}^2$ (0.512082536...) = -1.452810201... + 1.484186714... = 0.031376512...(real in x-root) for $m_{eo} = m_e\sqrt{(1 - ß^2)}$ = 9.143613382x10^{-31} kg* for 9.109424564x10^{-31} kg.

The real solution for the bare electron mass so converges at A = 0.512082536... = 1 - 0.487917464 to its complex mirror solution at A = 0.488540761... = 1 - 0.511459239... for a $\Delta A = (\sqrt{\alpha})^3$ = 6.232974608x10^{-4} to indicate the nature of the electron mass as a function of the cosmogenesis from definiton to inflaton to instanton to continuon.

The M-Sigma conformal mapping onto $\{m_{eo}/m_e\}^2$ in the $ß^2$ distribution

As the $ß^2$ distribution is bounded in $\{A_{ub} - A_{lb} = ⅔\alpha^{⅔}\}$ as a sub-unitary interval in a smaller subinterval of $½\alpha_{var}$; the SI-CODATA value for the rest mass of the electron is derived from first inflaton-based principles in a conformal mapping of the M-Sigma relation applied to the Black Hole Mass to Galactic Bulge ratio for the alpha bound.

Minimum Planck Oscillator $½\|E_o\| \Leftrightarrow \|E_{ps}\|^* = 1/\|e^*\|$	$½\|E_{ps}\|$	$¾\|E_{ps}\|$	$1\|E_{ps}\|$	$5/4\|E_{ps}\|$	$3/2\|E_{ps}\|$
Value in energy (Joules; Joules*)	1/1000	1/666⅔	1/500	1/400	1/333⅓
Value as modulated to A-interval as M-Sigma	1x10^{-3}	1.5x10^{-3}	2x10^{-3}	2.5x10^{-3}	3x10^{-3}
$\|E_{ps}\|^*/\|e^*\|$ to reunitize-renormalize E*e*=1	2x10^{-6}	3x10^{-6}	4x10^{-6}	5x10^{-6}	6x10^{-6}
⅔-value in partition interval $⅔m_e.(3/2)R_e$ for mean A=¾	1/2	3/4	1	5/4	3/2
Fraction of Renormalization effect	1/3	1/2	2/3	5/6	1

Value of $\Delta(\frac{1}{2}\alpha_{var}\}$ in A_{6lb} - A_{6ub} and in A_{3ub} - A_{3lb}	$2x10^{-6}$ complex minimum	$3x10^{-6}$	$4x10^{-6}$	$5x10^{-6}$	$6x10^{-6}$ real maximum

The $\frac{1}{2}a_{var}$ sub-interval so is adjusted by $6x10^{-6}$ from A_{6ub} - $\Delta(\frac{1}{2}\alpha_{var}\} = A_{SI}$ for $ß_{SI}^2$ for m_{eo}SI for the real solution

The Planck-Stoney Bounce in conformal supermembrane cosmology

The pre-Big Bang 'bounce' of many models in cosmology can be found in a direct link to the Planck-Stoney scale of the 'Grand-Unification-Theories'.
In particular it can be shown, that the Square root of Alpha, the electromagnetic fine structure constant, multiplied by the Planck-length results in a Stoney-transformation factor
$L_P\sqrt{\alpha} = e/c^2$ in a unitary coupling between the quantum gravitational and electromagnetic fine structures and so couples the unitary measurement of displacement in the Planck-Length oscillation equal to Coulombic charge quantum 'e' divided by the square of the speed of light 'c^2' in a proportionality of Displacement = ChargexMass/Energy.
This couples the electric Coulomb charge quantum to the magnetic monopole quantum e* as the inverse of the 10-dimensional superstring sourcesink energy E_{ps} to the 10-dimensional superstring sinksource energy E_{ss} as the 11-dimensional supermembrane $E_{ps}E_{ss}$.

{$G_ok=1$ for $G_o=4\pi\varepsilon_o$ and represents a conformal mapping of the Planck length onto the scale of the 'classical electron' in superposing the lower dimensional inertia coupled electric charge quantum 'e' onto a higher dimensional quantum gravitational-D-brane magnetopole coupled magnetic charge quantum 'e*' = $2R_e.c^2 = 1/hf_{ps} = 1/E_{Weyl\ wormhole}$ by the application of the mirror/T duality of the supermembrane $E_{ps}E_{ss}$ of heterotic string class HE(8x8)}.

But the FRB or Functional-Riemann-Bound in Quantum Relativity (and basic to the pentagonal string/brane symmetries) is defined in the renormalization of a wavefunction B(n)=(2e/hφ).exp(alpha.T(n)), exactly about the roots X,Y, which are specified in the electron masses for A=1 in the above.

The unifying condition is the Euler Identity: $XY=X+Y = i^2 = -1 = \cos(\pi)+i\sin(\pi) = e^{i\pi}$

The charge radius for the proton and neutrinos in quantum relativity

[BeginQuote] A scientific tug-of-war is underway over the size of the proton. Scientists cannot agree on how big the subatomic particle is, but a new measurement has just issued a forceful yank in favor of a smaller proton.

By studying how electrons scatter off of protons, scientists with the PRad experiment at Jefferson Laboratory in Newport News, Va., sized up the proton's radius at a measly 0.83 femtometers, or millionths of a billionth of a meter. That is about 5 percent smaller than the currently accepted radius, about 0.88 femtometers. [EndofQuote]

https://www.sciencenews.org/article/new-measurement-bolsters-case-slightly-smaller-proton?tgt=more
https://en.wikipedia.org/wiki/Proton_radius_puzzle

It is the unitary interval between A=½ and A=1 which so determines the quantum nature for the quantum mechanics in the relativistic ß distribution.

In particular for A=½ and for $ß^2 = x = 0$, the Compton constant defines the required electron rest mass of electro stasis as $½m_ec^2 = e^2c^2/8\pi\varepsilon_oR_e\}$ for an effective electron size of R_e,
whilst for A=1 the $m_ec^2 = e^2c^2/4\pi\varepsilon_oR_e$ for a doubling of this radius to $2R_e$ for $ß^2 = x = X$.

A reduced classical electron size is equivalent to a decrease of the Compton wavelength of the electron, rendering the electron more 'muon like' and indicates the various discrepancies in the measurements of the proton's charge radius using Rydberg quantum transitions using electron and muon energies.

The calibration for the classical electron radius from the electron mass from SI units to star units is $(2.81794032\text{x}10^{-15})$.[1.00167136 m*] = $2.82265011\text{x}10^{-15}$ m* and differing from R_e = $2.777777778\text{x}10^{-15}$ m* in a factor of (2.82265011/2.777777…) = 1.01615404.
A reduction of the classical electron radius from $R_e = 2.777777778\text{x}10^{-15}$ m* to $(2.777777778\text{x}10^{-15})$.[0.998331431 m] = $2.77314286\text{x}10^{-15}$ m, then gives the same factor of (2.81794032/2.77314286) = 1.01615404, when calibrating from star units.

The units for the Rydberg constant are 1/m for a Star Unit* – SI calibration [m*/m] = 0.998331431… for a ratio $[R_e/SI]/[R_e/*]$ = (2.77314286/2.777777) = (2.81794032/2.82265011)

Reducing the classical electron radius R_e from 2.81794032 fermi to 2.77314286 fermi in a factor of 1.01615404 then calibrates the effective electron mass m_e to R_e in the Compton constant
$R_e.m_e = ke^2/c^2 = (2.77777778\text{x}10^{-15}).(9.29052716\text{x}10^{-31}) = 2.58070198\text{x}10^{-45}$ [mkg]* with

$R_e.m_e = ke^2/c^2 =$ (2.81794033x10^{-15}).(9.1093826x10^{-31}) = 2.56696966x10^{-45} [mkg] with [mkg]* = (1.00167136)(1.00375313)[mkg] = 1.00543076 [mkg].

Using this reduced size of the electron then increases the Rydberg constant by a factor of 1.01615404

Using the Rydberg Constant as a function of Alpha {and including the Alpha variation $\text{Alpha}|_{mod}$ = $60\pi e^2/h = 60\pi(1.6021119\text{x}10^{-19})^2/(6.62607004\text{x}10^{-34})$ = 1/137.047072}
as $R_{y\infty}$ = $\text{Alpha}^3/4\pi R_e$ = $\text{Alpha}^2.m_ec/2h$ = $m_ee^4/8\varepsilon_o{}^2h^3c$ = 11.1296973x10^6 [1/m]* or 11.14829901x10^6 [1/m] defines variation in the measured CODATA Rydberg constant in a factor 10,973,731.6x(1.01615404).$(137.036/137.047072)^3$ = 11,148,299.0

Subsequently, using the Rydberg energy levels for the electron-muon quantum energy transitions, will result in a discrepancy for the proton's charge radius in a factor of 10,973,731.6/11,148,299.0 = 0.98434134… and reducing a protonic charge radius from 0.8768 fermi to 0.8631 fermi as a mean value between 0.8768 fermi and 0.8494 fermi to mirror the unitary interval from A=½ to A=1 for the electron's relativistic ß distribution.

$$\frac{1}{\lambda} = R_\infty\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) = \frac{m_e e^4}{8\varepsilon_0^2 h^3 c}\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$R_\infty = \frac{m_e e^4}{8\varepsilon_0^2 h^3 c} = 10\ 973\ 731.568\ 508\ (65)\ \mathrm{m}^{-1},$$

Energy for quantization n: $E = -Ze^2/8\pi\varepsilon_oR = KE+PE = ½mv^2 - Ze^2/4\pi\varepsilon_oR$ for angular momentum $nh/2\pi= mvR$ with $mv^2/R = Ze^2/4\pi\varepsilon_oR^2$ for $v = Ze^2/2\varepsilon_onh$ and $R = n^2h^2\varepsilon_o/Ze^2\pi m = R_e/\text{Alpha}^2$ = R_{Bohr1} = 5.217x10^{-11} m* for the minimum energy n=1 for $m=m_{effective}=m_e$=9.29061x10^{-31} kg* and atomic number Z=1 for hydrogen.

$E_n = hf_n = hc/\lambda_n = -Z^2e^4(\pi m_e)/(8\pi\varepsilon_o{}^2h^2n^2) = -Z^2e^4(\pi e^2/4\pi\varepsilon_oR_ec^2)/(8\pi\varepsilon_o{}^2h^2n^2) = -Z^2e^6/(32\pi R_e\varepsilon_o{}^3h^2n^2c^2)$ for $1/\lambda_n = -Z^2e^6/(32\pi R_e\varepsilon_o{}^3h^3n^2c^3) = -Z^2.\text{Alpha}^3/4\pi n^2R_e$ for eigen state n and Rydberg constant $R_{y\infty} = \text{Alpha}^3/4\pi R_e = \text{Alpha}^2.m_ec/2h = m_ee^4/8\varepsilon_o{}^2h^3c$

In the Feynman lecture the discrepancy for the electron mass in the electromagnetic mass multiplier of 4/3 is discussed.

Its solution resides in the unitary interval for A, as the arithmetic mean of: ½{½+1} = 3/4 as the present internal magnetic charge distribution of the electron, namely as a trisection of the colour charge in 3x⅓=1 negative fraction charge in the quantum geometry of the electron indicated below in this paper.

The classical size for the proton so is likewise approximated at the mean value of its own colour charge distribution, now consisting of a trisected quark-gluon-anti-neutrino kernel of 3x⅔=2 positive fraction charges, which are 'hugged' by a trisected 'Inner Mesonic Ring' (d-quark-KIR) as a contracted 'Outer Leptonic Ring' (s-quark-KOR) for the manifestation of the electron-muon tauon lepton family of the standard model.

For the electrostatic electron the ß distribution at A=½, the Compton constant gives $m_{ec}r_{ec} = m_eR_e$ for $ß^2 = 0$ and at A=1, the Compton constant gives $m_{ec}r_{ec} = ½m_e.2R_e$ for $ß^2 = X$ and as the mean for a unitary interval is ½, the electron radius transforms into the protonic radius containing monopolar charge as internal charge distribution in $R_p = ½XR_e$ and where the factor X represents the symmetry equilibrium for a ß=(v/c} velocity ratio distribution for the effective electron rest mass m_e proportional to the spacial extent of the electron.

For the proton then, its 'charge distribution' radius becomes averaged as $R_{proton} = 0.85838052x10^{-15}$ m* as a reduced classical electron radius and for a speed for the self-interactive or quantum relativistic electron of $2.96026005x10^{-13}$ c. This quantum relativistic speed reaches its $v/c=1^-$ limit at the instanton boundary and defines a minimum quantum relativistic speed for the electron at $v_e = 1.50506548x10^{-18}$ c for its electrostatic potential, where $U_e=\int\{q^2/8\pi\varepsilon_o r^2\}dr = q^2/8\pi\varepsilon_o R_e = ½m_ec^2$ for a classical velocity of v_e=0 in a non-interacting magnetic field B=0. $2U_e=m_ec^2$ so implies a halving of the classical electron radius to obtain the electron mass $m_e=2U_e/c^2$ and infers an oscillating nature for the electron size to allow a synergy between classical physics and that of quantum mechanics.

(*Continued in Part 3*)

Received February 22, 2019; Accepted March 31, 2019