Ramionics

Geometric Calculation of the Fine-Structure Constant, Theory of Everything

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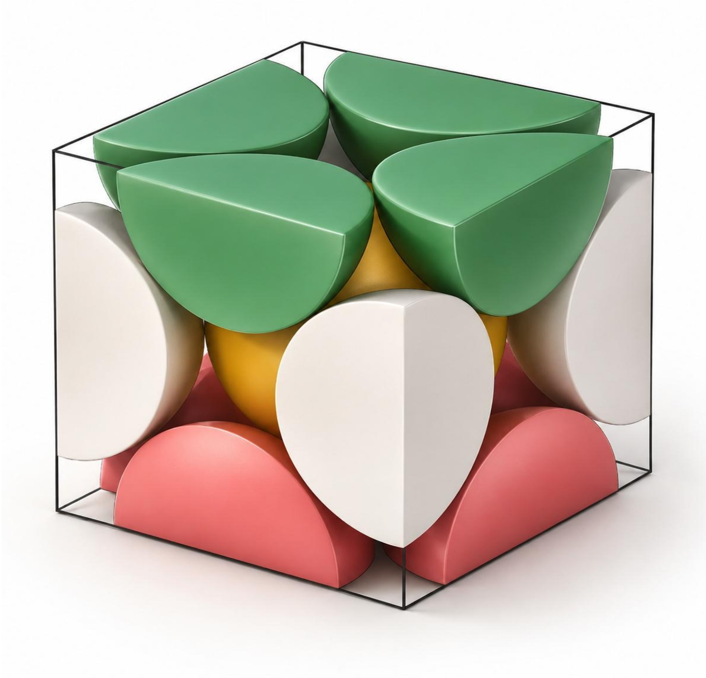

Electron Family Genetic Sequence represents their growth pattern:

$$\mathring{N} = 4^0 . 4 . 4 . 6 . 6 . 4 . 4 . 2 . 2 = 36864$$

Number of Ramions (energy quanta) on each of the 12 wings of the Baryon:

$$N = \text{Ceil10}((\pi^2/10)\mathring{N}) = 36390$$

The quantization factors of SpaceTime and PotentialEnergy:

$$\alpha^{-1} = 160\sqrt[3]{(\pi/5)} . (1 - 1/N)$$

$$\alpha^{-1} = 137.03599920783327093$$

Game over! Welcome to the geometric depths of the physics of the Universe:
Ramionics Based on Spacetime Geometry and Kissing Numbers!

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Theorem 30: Geometric Calculation of Alpha, the Ramion Planck Constant, and the Coulomb Constant

This is Theorem 30 of Ramionics, but it is presented at the beginning as an introduction to Ramionics and also to its notation system. Therefore, read it briefly at first, and after reading Theorems 1 to 29, return to it with greater care.

Ramionics is a new physics that, geometrically, that is, by discovering the geometry of the universe and spacetime, and only by using the scaling parameters, namely the speed of light c, the Planck constant ħ, the electron energy E_e, the electron charge q_e, and the Boltzmann constant K_β, without using tensors, fields, lines, or hypothetical or irrelevant particles such as the graviton, gluon, photon, Higgs boson, Z or W, and simply by multiplication and division, precisely formulates and calculates all fundamental constants such as the Coulomb constant K, the gravitational constant G, the fine-structure constant α, the gyromagnetic factor g, the structure, radius, mass, and charge of particles even down to the electron, quark, and neutrino, spacetime relativity, the fundamental forces and unification of forces, dark energy and so-called dark matter. It also simply formulates and explains the nature of energy, mass, and electric charge, Ramionic processes such as matter-energy exchange, black holes, antimatter and its asymmetry, relativity and quantum theory and quantum gravity and entanglement, and even the genetic code of particles, meaning the way smaller particles combine until reaching larger particles such as the electron and quark. It also calculates the energy density of the universe and, approximately through the Hubble constant, the size of the universe, and solves the Hubble tension and the catastrophe of physics regarding the energy density of the universe; it is therefore the theory of everything in physics.

In Ramionics theorems it is proven that our universe is an FCC cubic crystal network of Ramions, meaning {beads, particles, vessels, chambers, capsules, measures, spheres, or three-dimensional bubbles} of energy {and consequently space, time, mass, and electric charge} in two equal parts {linear-radial} and {rotational-angular-tangential}. The linear-radial part produces {space, pressure, radial force, linear momentum, linear acceleration, linear velocity, and linear moment of inertia, namely mass, and ultimately relativity and gravity}, while its rotational-angular-tangential part produces {time, torque, tangential force, rotational momentum, angular acceleration, angular velocity, rotational moment of inertia I, charge and indentation, and electric, magnetic, and electromagnetic fields and forces}. The gravitational field is transmitted through pressure and relativity, and the static electric field through Ramion indentation, not through hypothetical field lines and not through photons, which, for a static field, even hypothetically has no meaning.

In Ramionics it becomes clear that physical constants, and even local mass and the speed of light, are all relative and depend on particle generation. However, any parameter without indices such as e for the electron family or generation, m for the muon family, t for the tau family, and v for neutrinos, by default belongs to the electron family, such as the Planck, Coulomb and gravitational constants, alpha, and the gyromagnetic factor g. However, the vacuum speed of light c by default belongs to the remote-vacuum Ramions far from masses.

The lowest-energy Ramions in the universe, namely E_s Ramions or relaxed Ramions, that is, remote-vacuum Ramions in Far Steady State Space, are known as the energy reference and have the lowest energy and the greatest speed of light.

In the following, look at formulas 1 to 300 only as fundamental Ramionics formulas from the viewpoint of notation, and then continue reading the introduction from formula 301.

Ramionics Formula Abstract:

Scaling Factors:

(1) $c = 2.99792458(10)^{8}$ m/s

(2) $h = 6.62607015(10)^{-34}$ J.s

; $\hbar = h/(2\pi)$

; $\hbar = 1.05457181764616(10)^{-34}$

(3) $E_e = 0.51099895070055057$ MeV

Ramionics describes the Universe as a lattice of three-dimensional energy-space-time quanta called Ramions. The electron rest energy in units of this energy quantum is:

(4) $E_{es} = E_e / E_s = 54527$

Therefore, defining the joule through the electron energy is exactly equivalent to defining it through the reference Ramion energy in the Far Steady State Space: the resting state without additional energy:

; $E_s = 9.37148478186128919$ eV

Currently Ramionics uses energy scaling by E_e instead of time scaling by the Caesium-133 hyperfine-transition frequency:

; $F_{cs133ht} = F_{cs} = 9.19263177(10)^{9}$ Hz

E_e is calculated by fine calibration of CODATA 2022 data:

; $E_{ex} = 0.51099895069 \pm 16(10)^{-11}$ MeV

(5) q_e=$1.602176634(10)^{-19}$ Coulomb

The Boltzmann constant defines the kelvin:

(6) $K_\beta = 1.380649(10)^{-23}$ J/K

The Avogadro constant defines the mole:

(7) $N_{av} = 6.02214076(10)^{23}$ 1/mol

The six factors above are sufficient to define the metre, second, joule or kilogram, electric charge in coulombs, temperature in kelvins, and amount of substance in moles. Ramionics geometrically calculates all physical constants and particle parameters—including the Coulomb and gravitational constants, the fine-structure constant, gyromagnetic factors, charge, mass, and structural radii—from these six values.

Experimental Values:

x index means experimental or external calculation: out of Ramionics like QED or QCD

CODATA 2022:

(8) $\alpha_x^{-1} = 137.035999177 \pm 21(10)^{-9}$

(9) $g_{ex} = 2.00231930436256 \pm 35(10)^{-14}$

(10) $E_{ex} = 0.51099895069 \pm 16(10)^{-11}$ MeV

(11) $E_{px} = 938.27208943 \pm 29(10)^{-8}$ MeV

(12) $E_{nx} = 939.56542194 \pm 48(10)^{-8}$ MeV

(13) $G_x = 6.67430 \pm 15(10)^{-15}\ m^3 \cdot kg^{-1} \cdot s^{-2}$

CODATA 2018:

(14) $\alpha_{x2018}^{-1} = 137.035999084 \pm 21(10)^{-9}$

(15) $g_{ex2018} = 2.00231930436118 \pm 11(10)^{-14}$

(16) $E_{ex2018} = 0.51099895000 \pm 15(10)^{-11}$ MeV

(17) $E_{px2018} = 938.27208130 \pm 58(10)^{-8}$ MeV

(18) $E_{nx_{2018}} = 939.56541330 \pm 58(10)^{-8}$ MeV

(19) $G_{x_{2014}} = 6.67408 \pm 31(10)^{-15}\ m^3 \cdot kg^{-1} \cdot s^{-2}$

CODATA 2022 data compared to 2018:

(20) $\Delta\alpha_{x_{2022}}{}^{-1} = 4.428\sigma_{2018}$

(21) $\Delta g_{ex_{2022}} = 12.545\sigma_{2018}$

(22) $\Delta E_{ex_{2022}} = 4.600\sigma_{2018}$

(23) $\Delta E_{px_{2022}} = 1.401\sigma_{2018}$

(24) $\Delta E_{nx_{2022}} = 1.488\sigma_{2018}$

FCC Space Time Quantisation Factors:

Ramions in layer number n:

(25) $L(n) = 10 . n^2 + 2$

Total Ramions to layer n:

(26) $T(n) = (10n^3 + 15n^2 + 11n + 3)/3$

; IT(n): Ceil(Inversed function of T)

Volume Occupancy Factor: φ

(27) $\varphi = \pi/(3\sqrt{2})$

; $\varphi = 0.74048048969306091$

Radius Freedom Factor: γ

(28) $\varphi = (10/8)/(3\gamma^3)$

; $\gamma = \sqrt[3]{((10/8)/(3\varphi))} = \sqrt[3]{(10\sqrt{2}/(8\pi))}$

; $\gamma = 0.82557850950146439$

Surface Coverage Factor: β

(29) $\beta = (10/8)/(2\gamma^2) = \sqrt[3]{(5\pi^2)}/4$

; $\beta = 0.91698716849356754$

Zeta Sphericity & Stability Factor: ζ

(30) $\zeta = \varphi/(\gamma^3 4/3) = \varphi^2/(\beta\gamma^2 8/9) = \pi^2/10$

; $\zeta = 0.9869604401089358$

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Approximations:

(31) $2\beta^8 = 0.9998527934578344$

; $\varphi^7 2^{10}/5^3 = 0.99996611718041117$

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Surface-bisecting radius of the first-layer Ramions:

(32) $R_s = \sqrt{5}\, r_r$

Indentation of two spheres with radii r and R and centre separation D:

(33) $d = R+r-D$

(34) $V_{common} = V_c = \pi d^2[(R+r-d)^2 + 2(R+r-d)(R+r) - 3(R-r)^2]/[12(R+r-d)]$

(35) $d = 2r$, $V_c = (4/3)\pi R^3/2$, $x = R_v/r$ gives:

; $3x^4 - 16x^3 + 18x^2 + 11 = 0$

Volume-bisecting radius of FCC layer 1:

; $R_v = 2.12191578090305999\, r_r$

Baryons Evolution:

Electrin Family

Genetic code:

(36) $127//31 = 7/5$

Genetic sequence:

(37) $\mathring{N} = 4^o . 4 . 4 . 6 . 6 . 4 . 4 . 2 . 2 = 36864$

Before baryon separation, the common 12-wing inertia is:

(38) $12 \times (1/2)mr^2 = 6mr^2$

The baryon inertia after separation from the common hole is:

$(10/3)mr^2$

; while the characteristic velocity increases by the factor φ.

Conservation of rotational energy therefore scales the effective mass by:

$(6/(10/3)) \times \varphi^2 = (18/10)\varphi^2 = \pi^2/10$

giving:

(39) $\acute{N} = (\pi^2/10)\mathring{N}$

; $\acute{N} = \zeta\mathring{N} = (\pi^2/10)\mathring{N}$

; $\acute{N} = 3.638330966417581(10)^4$, default reference for $\mathring{N}$, N, or every parameter is electron

Number of E_s Ramions on one wing of the 12-wing structure, with total energy 12N:

(40) $N = \mathrm{Ceil}_{10}(\acute{N})$

Ceil_n or Floor_n means the nearest higher or lower multiple of n:

; $N = \mathrm{Ceil}_{10}((\pi^2/10)\mathring{N})$

; N = 36390

Zeta (ζ: $\pi^2/10$) Quantisation Effects:

The extra energy for any wing, emitted as neutrino radiation during baryon separation from the common hole:

(41) $\Delta\mathring{N} = \mathring{N} - N = 474$

In neutrino generation:

(42) $u\Delta\mathring{N} = \mathrm{Ceil}_{10}(\Delta\mathring{N}) = 480$

(43) $\Delta u = \mathrm{Ceil}_{10}(\Delta\mathring{N}) - \Delta\mathring{N} = 6$

(44) $\Delta\acute{N} = N - (\pi^2/10)\mathring{N} = 6.69033582419069717$

(45) $\Delta N = \text{Round}(\Delta \acute{N}) = 7$, another source of the value 7 is the proton-to-neutron ratio

Relative Energy Notation:

(46) $E_{e_s} = E_e/E_s$

; $E_{e_s} = E_{3s} = E_{0s}/E_{03} = 12N/E_{03}$

Energy Quantisation Factors:

Zeta Quantisation Factor:

(47) $\zeta = \acute{N}/\mathring{N} = \pi^2/10$

Ceil10 Quantisation Factors:

(48) $\acute{\theta} = \acute{N}/N$

; $\acute{\theta} = 0.99981614905676863$

(49) $\theta = \text{Round}(\acute{N})/N = 1-\Delta N/N$

; $\theta = 0.99980763946139051$

Zeta and Ceil10 Quantisation Factors:

(50) $\theta^{\circ} = N/\mathring{N}$

; $\theta^{\circ} = 0.98714192708333337$

(51) $\theta^{u} = N/(N+u\Delta\mathring{N}) = N/(\mathring{N}+\Delta u)$

; $\theta^{u} = 36390/(36390+480) = 36390/(36864+6) = 0.98698128559804721$

Potential Quantisation Factors:

(52) $\eta_{w} = \sqrt{(1 - 1/(wN))}$

w: wing number

; Default $\eta = \eta_{1}$

Relative η_{w} for one particle:

; $\eta_{12/9}, \eta_{12/4}, \eta_{12/1}, \eta_{6/1}, \eta_{4/1}, \eta_{2/1}$

Relative η_{w} for two particles:

; $\eta_{6/1me} = \eta_{6/1m}/\eta_{6/1e} = \eta_{6/1m}/\eta_{6/1}$

; $\eta_{6/1m} = \eta_{6m}/\eta_{1m}$

; m: muon, t: tau

Ramion Energy Equation, Relativity, and Quantum Gravity:

(53) $E_r = \mathring{m}_r.\mathring{c}_r^2 = I_r.\omega_r^2 = 2\hat{E}_r = 2\check{E}_r = \rho_r.V_r = 2P_r.V_r = 2r_r.F_r/3 = 6/5.G_r.\mathring{m}_r^2/r_r = 2.\mathring{K}_r.q_r^2/r_r$

In the above relation, $\hat{E}_r = E_{(Linear)}$ denotes the linear energy, $\check{E}_r = E_{(Rotational)}$ denotes the rotational energy, P_r is the pressure, and the remaining quantities represent other Ramion parameters. The diacritical marks on $\hat{E}_r$ and $\check{E}_r$ are equivalent to the subscripts Linear and Rotational. Likewise, local, relative, or internal particle or Ramion parameters are indicated by their corresponding marks, such as $\mathring{K}$.

The above equation determines the scaling factor of every Ramion or wing parameter for a system with energy $N.E_s$.

Ramionic Projection Powers for N-times Energy Scaling:

Energy, radius, electrical charge, and absolute mass: N^1

Surface area: N^2

Volume: N^3

Internal local relative energy density, pressure, and light or energy velocity c, $\mathring{c}$: N^{-2}

Time: N^{-1}

Planck constant ħ: N^4

Local relative mass $\mathring{m}$: N^5

Gravitational constant G: N^{-8}

Internal local relative Coulomb constant $\mathring{K}$: N^0

FCC external Coulomb constant K: N^2

(54) $\mathring{E}_r = 2r_r.F_r/3$

To maintain force equilibrium, the radius also scales by a factor of N, thereby producing more space. Consequently, the volume increases by N^3, while the energy density, pressure equal to half the energy density, the internal light or energy velocity, and the external linear speed of light are all reduced by N^2. As a result, time undergoes dilation by a factor of N. This reduction in local pressure is identified as gravity, providing an interpretation of quantum gravity, or equivalently, relativistic quantum mechanics.

Different Ramions, or different observers, always measure each other's speed of light to be the same because each observer measures the other's distance using its own time, or equivalently the other's time using its own distance. This is the principle of the invariance of the speed of light.

Fine-Structure Constant

(55) $\alpha = \beta/(40\pi \, . \, \eta^2)$

; $\alpha = \beta/(40\pi \, . \, (1 - 1/N))$

; $\alpha^{-1} = 160\sqrt[3]{(\pi/5)} \, . \, (1 - 1/N)$

; $\alpha^{-1} = 137.03599920783327093$

; $\alpha_x^{-1} = 137.035999177$

; $\Delta\alpha = -1.5\sigma$

; $\alpha = 0.00729735256268951$

; $\alpha_x = 0.00729735256433142$

N∞ limit and approximation:

(56) $\alpha_\infty^{-1} = 40\pi/\beta$

; $\alpha_\infty^{-1} = 137.03976507112184891$

Alpha correction factor:

(57) $\alpha_c = \sqrt{(\alpha/\alpha_x)}$

; $\alpha_c = 0.99999999988749932$

(58) $K_e = \alpha\hbar c/q_e^2$

; $K_e = 8.987551784146631(10)^9$

; Mutual $K = K_e(1-1/N_e)/\sqrt{((1-1/N_1)(1-1/N_2))}$

Particle Potentials:

Particle Potential Values, Model P-2:

The η ratio enters the particle potential with power −2. The reason is that the potential is a quadratic effect, while the same effect appears with power one in the g formula. Therefore, if the η effect appears with power one in the g formula, it must appear as the inverse square of that effect in the particle potential.

(59) c = 3, 2, 1 and 0 correspond respectively to the ±3/3, ±2/3, ±1/3 and neutral particles such as the electron, up quark, down quark and naryons.

Parabolic Part of the Particle Potential:

(60) $n_9 = \mathrm{Floor}_9(R_9^{-2}((c/3)^2 \,.\, 9(N/2-\Delta N+1) - c\Delta\mathring{\dot{N}}))$

; $R_9 = \eta_{12/9}, \eta_{12/4}, \eta_{12/1}$ for c:3,2,1

Linear Part of the Particle Potential:

(61) $n_{12} = \mathrm{Floor}_2(R_{12}^{-2}((c/3) \,.\, 12(N/2+\Delta N+1/2)+c(\Delta\mathring{\dot{N}}+\Delta N)))$

; $R_{12} = \eta_{6/1}, \eta_{4/1}, \eta_{2/1}$ for c:3,2,1

For the electron (c:3):

(62) $n_9 = 162279$

; $n_{12} = 219874$

; $U_{es} = n_9 + n_{12} = 382153$

; $E_{e_s} = 12N - U_{e_s} = 54527$

Up quark:

(63) $n_9 = 71802$

; $n_{12} = 146582$

; $E_{u_s} = 218296$

Down quark:

(64) $n_9 = 17712$

; $n_{12} = 73290$

; $E_{d_s} = 345678$

Proton and Neutron:

Minimum RMS solution using CODATA 2022:

(65) $E_{ps} \approx 100119897$

; $E_{ns} \approx 100257904$

Minimize RMS(ΔE_e, ΔE_p, ΔE_n):

; $E_s \approx 9.37148477520110568$ eV

; $E_e \approx 0.51099895033739062$ MeV

; $E_p \approx 938.27209043020286572$ MeV

; $E_n \approx 939.56542092957397472$ MeV

; $\Delta E_e \approx -2.2\sigma$

; $\Delta E_p \approx +3.4\sigma$

; $\Delta E_n \approx -2.1\sigma$

Although the proton energy changes by only one Ramion energy E_s, corresponding to about one part per billion of the proton energy, the CODATA 2018 proton value provides a significantly better agreement.

Using the CODATA 2018 proton value:

(66) $E_{ps} = 100119896$ OK

; $E_{ns} = 100257904$ OK

Minimize RMS(ΔE_e, ΔE_p, ΔE_n):

; $E_s = 9.37148478186128919$ eV

; E_e = 0.51099895070055057 MeV

; E_p = 938.27208172553503118 MeV

; E_n = 939.56542159731009178 MeV

; ΔE_e = +0.1σ

; ΔE_p = +0.7σ 2018

; ΔE_n = -0.7σ

Formula and value of NeutronExtraAbsorption:

(67) NeutronExtraAbsorption = $(E_n-E_p)-(E_d-E_u) = E_{n-p}-E_{d-u}$ = 138008−127382 = 10626

Gravitational Constant:

(68) $E_s = 2 . ((3/5) . G_s . \mathring{m}_s^2/r_s)$

Ramion:

(69) $E_s = \mathring{m}_s . c_s^2$

Relative local mass:

(70) $E_s \cdot r_s = \hbar_s \cdot c_s$

ħ definition:

(71) $\hbar_s = \hbar_e/(12^2 \cdot 5\varphi \cdot N^4)$

ħ projection:

(72) $\hbar_s = 1.12798109821315(10)^{-55}$

(73) $c_s = c \cdot \varphi$

Light speed in Ramion space:

(74) $c_s = 2.219904661061264(10)^8$

Also E_s: E_e/E_{e_s}

(75) $G_s = (5/6) \cdot \hbar_s \cdot c_s^5/E_s^2$

; $G_s = (5/6) \cdot (E_{e_s}/E_e)^2 \cdot (\hbar_e/(12^2 \cdot 5\varphi \cdot N^4)) \cdot (c \cdot \varphi)^5$

(76) $G = G_s \cdot 144 \cdot K_g/(N^8 \cdot (1-1/N))$

; $G_1 = (5/6) \cdot (1/E_{ex}^2) \cdot (\hbar_e/(5\varphi)) \cdot (c \cdot \varphi)^5/(N^{12} \cdot (1-1/N))$

; $G = G_1 \cdot K_g \cdot (E_{e_s}E_{ex}/E_e)^2$

; $G = G_1 \,.\, K_{\mathcal{g}} \,.\, (E_{ex}/E_s)^2$

Thus G depends only on E_s after the electron-energy ratio is applied.

Exact and approximate $K_{\mathcal{g}}$, G:

(77) $K_{\mathcal{g}} = 5^2 \,.\, \beta/(2^2 \,.\, \varphi^8)$

; $K_{\mathcal{g}} = 63.40657792335298382$

; $G = 6.67431795880859458(10)^{-11}$

; $\Delta G = +0.1\sigma$

(78) $K_{\mathcal{g}} = 2^8 \,.\, \beta/(5 \,.\, \varphi)$

; $K_{\mathcal{g}} = 63.40442952971246626$

; $G = 6.67409181409731822(10)^{-11}$

; $\Delta G = -1.4\sigma$

Gyromagnetic Factor Coefficient g_e:

Simple Formula, Dirac's Mode:

x: 3, 2, 1, 0

for electron, up quark, down quark and neutral particles:

(79) $E_{0x} = 24/(24 - 9(x/3)^2 - 12(x/3))$

; $E_{0x} = 1/(1 - (9/24)(x/3)^2 - (1/2)(x/3))$

(80) $g_e = IhwCosD/(E_{03} \,.\, Iws - (E_{03} - 1) \,.\, IhwCosD)$

Inertias:

(81) $IhwCosD = 32/9$

; $Iws = 10/3$

Quantumized Formula Forms:

Form1:

(82) $g_e^{-1} = R_\beta \,.\, E_{03} \,.\, 15/16 - R_a \,.\, (E_{03} - 1)$

Form2:

(83) $g_e^{-1} = R_a - R_\beta \,.\, E_{03}/16$

Form3:

(84) $g_e^{-1} = (12N \,.\, 15/16 - R_9 n_9 - R_{12} n_{12})/E_{es}$

; $R_9 = \eta_{12/9}, \eta_{12/4}, \eta_{12/1}$ for c:3,2,1

; $R_{12} = \eta_{6/1}, \eta_{4/1}, \eta_{2/1}$ for c:3,2,1

(85) $g_e^{-1} = (12N \,.\, 15/16 - \eta_{12/9}n_9 - \eta_{6/1}n_{12})/E_{es}$

; $g_e = 2.00231930436348549$

; $\Delta g_e = +2.6\sigma$ OK

Up and Down Quarks:

The current quark potential values are reported in the Particle Potential Values section above.

For the selected NeutronExtraAbsorption target:

(86) $E_{d\_u} = 127382E_s$

(87) NeutronExtraAbsorption = 10626

Baryon Packet:

(88) E_BaryonPacket = $E_{\beta\beta}(p) = (2^{p-1} - 1)E_2 + (2^{p-2} + 1)E_1 + (2^{p-2} - 1)E_3$

For the normal electron family packet:

(89) $E_{\beta\beta}(5) = 15E_2 + 9E_1 + 7E_3$

; $E_{\beta\beta}(5) = 15E_u + 9E_d + 7E_e$

Which results in:

; $E_{hh} = E_{7p1n7e} = 7E_p + E_n + 7E_e$

means 7 for the proton-to-neutron ratio:

; $E_{\beta\beta} = 6767231E_s$

; $E_{\beta\beta} = 63.41900233183995539$ MeV

Hadrons:

Neutron Extra Absorption:

(90) $\text{NeutronExtraAbsorption} = (E_n - E_p) - (E_d - E_u) = E_{n-p} - E_{d-u} = 138008 - 127382 = 10626$

This quantity represents the excess of the neutron-proton energy difference over the down-up quark energy difference. Since the proton consists of two up quarks and one down quark, while the neutron is the reverse and consists of two down quarks and one up quark, this value would be zero if no extra energy absorption occurred in the neutron; however, in Ramionics it is obtained as 10626 Ramions.

In conventional QED and QCD calculations, this difference usually appears as a negative value of about −2.5 MeV, which is difficult to explain directly.

In Ramionics, the same difference is obtained as 10626 Ramions, equivalent to about 0.09957 MeV, which is a very small and positive value and can be interpreted based on the tendency of the system toward greater symmetry and lower entropy.

Proton Extra Absorption:

(91) ProtonExtraAbsorption = NeutronExtraAbsorption/7

; ProtonExtraAbsorption = 1518

Because there are seven protons in the Hadron Packet, the share of each proton from this extra absorption is taken to be one seventh of NeutronExtraAbsorption.

Therefore:

(92) $E_{n-p} = E_{d\_u}$ + NeutronExtraAbsorption

; $E_{n-p} = 127382 + 10626 = 138008$

(93) $E_{7p1n} = 7E_p + E_n$

; $E_{7p1n} = 801097176E_s$

(94) E_{hh} = E_HadronPacket = $E_{7p1n} + 7E_e = 7E_p + E_n + 7E_e$

; $E_{hh} = 801478865E_s$

; E_{hh} = 7511.0469863309590437 MeV

Up to layer 127, the Baryon Packets are formed, and they form the primary core of the Hadron Packet.

Then up to the strong layer:

(95) $624 = 5^4 - 1$

the Naryon Packets are formed and their energy is absorbed into the Hadron Packet.

Simultaneously with the formation of each Naryon Packet, a Neutrino Packet is also produced, and the energy:

(96) $12 \,.\, \text{Ceil10}(\Delta\mathring{N}) = 12 \,.\, 480$

or:

(97) $12 \,.\, \Delta\mathring{N} = 12 \,.\, 474$

is released as neutrino radiation.

Presentation A:

In this presentation, all extra energy from baryon formation up to layer 127 is assumed to have the opportunity to escape, and in the neutrino radiation, the Ceil10 function is not applied to the produced neutrino itself.

However, for Naryon or Baryon formation, the $\pi^2/10$ factor and the Ceil10 function always apply.

(98) $E_{hh} = T_{624} - 58 \,.\, 31 \,.\, 12 \,.\, \Delta\mathring{N} - (T_{127} - E_{\beta\beta}) - \text{ExtraRadiation}$

; E_{hh} = 811851249 − 10227024 − 142058 − 3302

; E_{hh} = 801478865

(99) ExtraRadiation = 3302

; ExtraRadiation = 10626/3 − 240

In this framework, the factor that keeps the proton and neutron masses fixed everywhere in the Universe is the constancy of layer 624 and the relation:

(100) 10626 − 720 = 3 . 3302

Presentation B:

In this presentation, it is assumed that all extra energy from baryon formation up to layer 127 does not have the opportunity to escape, and in addition, the Ceil10 function is also applied in the neutrino radiation; therefore, each wing receives 6 extra Ramions from the environment during neutrino formation.

(101) E_{hh} = T_{624} − 58 . 31 . 12 . Ceil10($\Delta\mathring{N}$) − ExtraRadiation

; E_{hh} = 811851249 − 10356480 − 15904

; E_{hh} = 801478865

In this framework, the factor that keeps the proton and neutron masses fixed everywhere in the Universe is the constancy of layer 624 and the three-to-one ratio between ExtraRadiation and NeutronExtraAbsorption:

(102) 15904 + 35 = 1.5 × 10626

Here, NeutronExtraAbsorption must be a multiple of 6 and 7, meaning a multiple of 42. Therefore, the remaining 35 Ramions are released as radiation up to layer 624, and the relation above holds exactly.

Radius and Density:

(103) $r_s = \hbar_s c_s / E_s$

; $r_s = 1.66769776684889(10)^{-29}$ m

Electron radius:

(104) $r_e = N r_s$

; $r_e = 6.06875217356312(10)^{-25}$ m

Ramion energy density:

(105) $\rho_s = E_s/((4/3)\pi r_s^3)$

; $\rho_s = 7.72819633980566(10)^{67}$ J/m³

Space energy density:

(106) $\rho\_space = \rho_{ss} = \varphi \rho_s$

; $\rho\_space = \rho_{ss} = 5.72257861014342(10)^{67}$ J/m³

Cosmology:

Hubble Tension in Ramionics:

In Ramionics, the correct cosmic expansion rate is the locally measured Hubble constant:

(107) $H_0Local \approx 73$ km/s/Mpc

The quantity:

H_0CMB/β

also gives approximately the same value:

(108) $H_0(corrected) \approx H_0CMB/\beta \approx 73.5$ km/s/Mpc

This agrees with local measurements and provides an explanation for the Hubble tension. In this interpretation, the surface coverage factor β, arising from the quantized nature of the FCC surface, was omitted in the analysis of the Planck satellite data.

Cosmic Expansion Rate:

At present, the expansion rate of the Universe is determined by the size of the observable Universe rather than by the enormous internal energy of the Ramions.

(109) $R_{(obs)} = 4\gamma c_0/H_0 = 4\gamma R_h = 3.3R_h$

; $R_{(obs)} \approx$ 43.94 billion light years

; for $H_0 \approx 73.50$ km/s/Mpc

(110) $R_{(obs)} \approx$ 44.22 billion light years

; for $H_0 \approx 73.04$ km/s/Mpc

MOG:

Apparent Dark Matter from Cosmic Expansion and the Origin of the Factor 19:

For the force generated by the internal pressure of the Ramions:

(111) $F_0 \approx P\pi r^2$

and for an FCC shell:

(112) $F_{(net)} \approx (5\pi/\gamma)Pr^2n$

; $F_{(net)} \approx 19.02Pr^2n$

The factor 19.02 is a purely geometric coefficient arising from the curvature of the FCC lattice. It shows that the geometry of the Universe naturally produces an outward radial pressure component.

Combined with the conventional gravitational force law, this produces an overall factor of approximately 20, corresponding to the observed baryonic fraction of about 5% of the total cosmic energy. In Ramionics, however, only an extremely small fraction of the Ramion energy—the dark energy that constitutes the fundamental energy of the Universe—is converted into matter.

Likewise, the apparent dark matter fraction is:

(113) $1 - \varphi = 0.25951951030693909$

which results from neglecting the quantization of volume.

MOND:

Apparent Dark Matter from the Neglect of the Exponential Factor:

Neglecting the exponential factor in the gravitational equations, which limits the fraction of emitted energy that appears as mass, produces the apparent dark matter effect on galactic scales and provides an explanation for MOND.

In Ramionics, the galactic component of the gravitational potential is described by the exponential term, whose amplitude is determined simultaneously by gravitational-field energy conservation and by the MOND transition radius. Using the two corresponding relations and substituting the resulting expressions directly yields the fundamental relation:

(114) $a_0 = c^2/(2R\mathit{d})$

Thus, in Ramionics, the MOND acceleration scale is not an independent empirical constant but arises naturally from the cosmological cutoff radius of the gravitational field, giving a_0 a fundamentally cosmological origin.

Kissing Numbers for Any Dimension:

(115) $k_m(d) = kf(d)\ .\ kf_{ull}(d)$

(116) $kf_{ull}(d)$ = (2d)2^(d/2): kissing full number

(117) $kf(d)$ = 1/2+cc(d)/2: kissing factor

(118) cc(d) = $(\cos^2(\pi\ .\ (\log_4{}^2(d/6))^{\wedge}1))^{\wedge}1$

Criteria:

1&2: Base Dimensions Condition:

(119) $k_1 = 2$, $k_2 = 6$

2d: Divisibility by 2d:

(120) k mod (2d) = 0, for d > 2

2k: Recursive Upper Bound:

(121) k(d) ≤ 2 . k(d−1), for d > 2

GF: Greatest Factor Condition:

(122) GF(k/d) ≤ 1 + d/2

GF1: Greatest Factor Single-Power Condition:

(123) Power(GF(k/d)) = 1

GFA: All Greatest Factors Single-Power Condition, optional:

(124) Power(p) = 1, for every prime p > 3 dividing k/d

Parity: Even-Power Balance Condition:

(125) $Power_2(k) \geq$ Count(odd powers of primes > 2)

no2: Not a Pure Power of Two Condition:

$k \neq 2^n$

Result kissing numbers: k_1=2 k_2=6 k_3=12 k_4=24 k_5=40 k_6=72 k_7=126 k_8=240 k_9=360 k_{10}=540 k_{11}=792 k_{12}=1080 k_{13}=1456 k_{14}=2016 k_{15}=2700 k_{16}=4320 k_{17}=6120 k_{18}=10368 k_{19}=17024 k_{20}=30800 k_{21}=51744 k_{22}=81312 k_{23}=129536 k_{24}=196560 k_{25}=283500 k_{26}=397488[393120]

Notation:

Neutrino: u

Neutrino with 480 Ramion energy in any wing: u_{480}

Electron family:

Baryons: e_1=d=Down , e_2=u=Up , e_3=e=Electron

Hadrons: p=Proton(udu) , n=Neutron(dud)

Muon family:

m_1=Strange, m_2=Charm, m_3=m=Muon(μ)

Tau family:

t_1=Bottom , t_2=Top , t_3=t=Tau(τ)

The symbols above refer to ordinary matter: particles with index c=3 are leptons with full negative charge; particles with index c=1 have charge -1/3 relative to the same-family lepton, and particles with index c=2 have charge +2/3.

For antiparticles, the same symbols are used with a tilde hat:

$\tilde{e}_1=\tilde{d}$=AntiDown , $\tilde{e}_2=\tilde{u}$=AntiUp , $\tilde{e}_3=\tilde{e}$=AntiElectron

ñ=AntiNeutron

p̃=AntiProton

$\tilde{m}_1$=AntiStrange, $\tilde{m}_2$=AntiCharm, $\tilde{m}_3=\tilde{m}$=AntiMuon(μ^+)

$\tilde{t}_1$=AntiBottom , $\tilde{t}_2$=AntiTop , $t_3=\tilde{t}$=AntiTau(τ^+)

The energy of each antiparticle is equivalent to the energy of the corresponding particle, so no additional energy notation is required.

End Of Absolute Formula

FCC Geometry: Geometry of Spacetime and the Universe

(301) $k_3 = 12$

To understand 12, consider each Ramion at the centre of a cube, with another Ramion touching it at the midpoint of each of the 12 edges. The diagonal of each face of this cube is 4r, and therefore each side is $2\sqrt{2}r$. Since one complete sphere and twelve quarter-spheres are inside this cube, φ, the volume occupancy factor, is:

(302) $\varphi = (1 + 12/4).(4\pi r^3/3)/(2\sqrt{2}r)^3$

; $\varphi = \pi/(3\sqrt{2})$

In Ramionics, mass is formed from the explosion of a number of Ramions, the spreading of their energy through the Ramions of the universe (more strongly the closer they are), and the remaining of a black-hole cavity. Conversely, conversion of matter into energy occurs through the collapse of high-energy Ramions into energy and the birth of new Ramions.

Mass is the pattern of distribution of Ramion energy, and at its centre there is nothing but a black hole, not even spacetime. This means that small particles are also black holes similar to large black holes, and primordial black holes in the universe are entirely expected; that is, instead of being formed like secondary black holes from the combination of stars, they were formed directly by large ruptures of FCC, meaning spacetime, in the beginning of the universe, like small particles, and for this reason they are supermassive.

Electric charge is also the model of rotational energy, meaning the rotation of Ramions and their torque, and it is positive on one side of a Ramion and negative on the other side; that is, a Ramion has electric charge $\pm q_r$, but in total it is neutral.

The total linear and rotational energy of a particle that is distributed in space is modelled on twelve hypothetical wings of the same size as its black-hole cavity, while the black-hole surface is actually covered by a very large number of Ramions.

A summary of the relations that lead us to the geometric formula for alpha:

Gravitational and Electric Potential inside a Ramion

(303) $E_r = \mathring{m}_r.\mathring{c}_r^2 = I_r.\omega_r^2 = 2\hat{E}_r = 2\check{E}_r = \rho_r.V_r = 2P_r.V_r = 2r_r.F_r/3 = 6/5.G_r.\mathring{m}_r^2/r_r =$

$2.\mathring{K}_r.q_r^2/r_r$

In the above relation, the linear energy $\hat{E}_r = E_{(Linear)}$, the rotational energy $\check{E}_r = E_{(Rotational)}$, the pressure P_r, and the other Ramion parameters are shown. The marks on $\hat{E}_r$ and $\check{E}_r$ are equivalent to the subscripts Linear and Rotational, and local, relative, or internal parameters of particles or Ramions also have their own mark, such as $\mathring{K}$.

The above formula fixes the coefficient of each Ramion or wing parameter with energy $N.E_s$:

(304) Ramionic projection powers for N-times energy scaling: powers of N in the projection of physical constants and variables

Energy, radius, electrical charge and absolute mass: N^1

surface: N^2

volume: N^3

Internal Local Relative Energy density, Pressure and Light or Energy Velocity c, $\mathring{c}$: N^{-2}

time: N^{-1}

Planck constant ħ: N^4

local Relative mass $\mathring{m}$: N^5

gravitational constant G: N^{-8}

Internal Local Relative Coulomb Constant $\mathring{K}$: N^0

FCC External Coulomb Constant K: N^2

(305) $\mathring{E}_r = 2r_r.F_r/3$

For force equilibrium, the radius is also multiplied by N; that is, it produces more space. As a result, the volume becomes N^3 times larger, and the energy density and the pressure, which is half of it, and the speed of light or internal energy velocity and the external linear speed of light are all divided by N^2. Thus time undergoes dilation with slowing by the factor N. The reduction of local pressure is gravity, and this is the explanation of quantum gravity or relativistic quantum mechanics.

Different Ramions or observers evaluate each other's speed of light as equal, because either they measure the other side's distance with their own time, or conversely; this too is the principle of the constancy of the speed of light.

FCC Geometric Factors:

Number of Ramions in layer n:

(306) $L(n) = (12 - 2).n^2 + 2 = 10.n^2 + 2$

Total number of Ramions from layer one to n:

(307) $T(n) = (10/3).n^3 + 5.n^2 + (11/3).n + 1$

(308) $\pi = 3.141592653589793115997963468544185162$

Volume Occupancy:

(309) $\varphi = \pi/(3\sqrt{2})$

; $\varphi = 0.74048048969306101$

; $\varphi = (10/8)/(3\gamma^3)$

Radius Freedom:

(310) $\gamma = (10/(24.\varphi))^{1/3}$

; $\gamma = 0.82557850950146436$

; Surface Covering

(311) $\beta = (10/8)/(2\gamma^2)$

; $\beta = 0.91698716849356763$

Electron Genetic Factors in Generation Sequencing

(312) $\mathring{N}_e = \mathring{N} = 4^o\ 4\ 4\ 6\ 6\ 4\ 4\ 2\ 2$

; $\mathring{N} = 36864$

(313) $N = \text{ceil10}((\pi^2/10).\mathring{N})$

; $N_e = N = 36390$

In the formula $\mathring{N}_e$ of the electron, there are five 4s, which means that the electron packet and its counterparts contain $2^5 - 1$ particles:

15 up + 9 down + 7 electron

which in the next stages becomes:

1 neutron + 7 proton + 7 electron

and this is the reason for the 7-to-1 proton-to-neutron ratio in the universe. The sum of the factors above 4 is equal to 2, which is related to the retreat of particles against the non-Mersenne number 15. The sum 5 + 2 equals 7, meaning that the seventh strong layer, numbered 2^7, prevented the collapse of further layers. Of the factors 2, one is related to the charging of the baryon packet, which on average halves their energy, and the other is the extra energy up to layer 127.

Quantum Factors of the Wings

The following relation shows the ratio of electrically charged energy in quantum form as a wing relative to the continuous state in the Ramion:

(314) $\eta_{w}^{p} = \sqrt{(1 - 1/(w.N))}^{p}$

; p : ±1, ±2

; w : 1⁄2, 1, 6, 12 : number of wings

Speed of Light and Planck Constant

The local, relative, or internal rotational-linear speed of energy or light inside a Ramion or wing relative to the linear speed of light in the FCC outside it:

(315) $\mathring{c}_r = \varphi.c_r$, $\mathring{c}_r = \mathring{c}_s/N^2$, $c_r = c_s/N^2$

For the Ramion E_s, which has the lowest energy and the greatest speed of light:

; $\mathring{c} = \varphi.c$, $\mathring{c}_s = \mathring{c}$, $c_s = c$

;c_s=2.21990466106126426⑽⁸m/s

Ratio of the Ramion and electron electric charge and Planck constant:

(316) $\hbar_s=\hbar_e/(12^2 5\varphi N^4)$, $q_s=q_e/(12N)$

;$\hbar_s$=1.1279810982131467⑽⁻⁵⁵J.s

;q_s=3.66899476504534180⑽⁻²⁵C

Summary of Alpha Calculations

(317) $\alpha = \beta/(40.\pi \,.\, \eta^{-2})$

; $\alpha = \beta/(40.\pi.(1 - 1/N)\ )$

; $\alpha_e = \beta/(40.\pi \,.\, (1 - 1/36390)\ )$

; α = 0.007297352562689513

;α^{-1}= 137.03599920783324

The index x denotes experimental values:

; α_x^{-1} = 137.035999177 (±21)

; $\Delta\alpha$ = -1.47σ

(318) $K_e = \alpha_e.\hbar_e.c/q_e^2$

;$K=K_e$= 8.987551786848775⑽⁹N.m²⁄C²

Experimental value:

; K_x= 8.9875517923⑽⁹N.m²⁄C²

Explanation of Alpha Calculations

Structural Potential of the Electron:

In Ramionics, electric charge is not an independent fundamental quantity, but another expression of the rotational energy of the Ramion. Therefore, in calculating rotational energy, the sign of charge is not important, and only the square of charge appears.

If the $\pm q_s$ charges of the Ramion are considered as two opposing disks, since all components in the Ramion are at distance r from the axis, and since only the positive repulsive potential is calculated and not the negative attractive potential, the energy of each hemisphere or disk, like a point charge, is equal to:

(319) $E_{(half)} = \mathring{K}_s.q_s^2/(2r)$

(320) $E_{(Rotational)} = \mathring{K}_s.q_s^2/r$

(321) $E_s = 2E_{(Rotational)}$

(322) $E_s = 2\mathring{K}_s.q_s^2/r$

(323) $1/2 = \mathring{K}_s.q_s^2/(r.E_s)$

Definition of the Planck Constant and Alpha:

According to Theorem 22, from the definition of the Planck constant and the following relation:

(324) $E_s.r = \hbar_s.\mathring{c}_s$

We define alpha for the Ramion E_s:

(325) $\alpha_s = \mathring{K}_s.q_s^2/(\hbar_s.\mathring{c}_s)$

(326) $\alpha_s = 1/2$

This relation means that the alpha constant for the Ramions themselves is the starting point for calculating alpha at the scale of the electron or other particles.

In fact, we define alpha, the fine-structure constant, for the Ramion just as alpha is defined for the electron, so that we can project it in two stages {the electron wing and outside it} to obtain α_e for electron-like particles, meaning the electron family.

The electron family includes the electron e, the up quark u and down quark d, their antiparticles ẽ, ũ, and d̃, and the neutral state of all six particles, which is called the naryon, and consequently the proton p and neutron n and their antiparticles p̃ and ñ.

Projection of the Planck Constant from Ramion to Wing

It is known that for a Ramion, when the energy becomes N times E_s, the local or relative Planck constant becomes N^4 times larger, because E_s and r each become N times larger, and the local speed of light also becomes $1/N^2$ times smaller.

(327) $\hbar_r = N^4.\hbar_s$

However, for projecting ħ onto the wing and into the FCC outside it, the following coefficients are required.

Because, in the definition of the Planck constant, it was shown to be proportional to the rotational moment of inertia, we assign the same average coefficient for the ratio of particle inertia to wing inertia:

(328) $I_e/I_w = (10/3)/(2/3) = 5$

And the coefficient φ is used for replacing c; that is, because from the following relation for a Ramion or wing

; $E = \hbar.\omega = \hbar.\mathring{c}/\lambda$

we want to measure the wavelength for the FCC outside the Ramion or wing using c; therefore:

; $\hbar_w = \hbar_s.5\varphi N^4$

Projection of the Planck Constant from Wing to Particle

In Theorem 22 it was stated that when a Ramion or particle receives additional rotational energy, which is in fact a photon, during the short time of carrying it, in addition to the main angular velocity ω, which is electric, it acquires a rotation axis and angular velocity ω_m and magnetic energy E_m, and in fact two time dimensions:

; $d\theta/dt = d\theta/dt_1 + d\theta/dt_2$

; $\omega_{(total)} = \omega + \omega_m$

; $E_{(total)} = ½I.(\omega + \omega_m)^2$

; $E_m = \frac{1}{2}I.((\omega + \omega_m)^2 - \omega^2)$

; $E_m = \frac{1}{2}I.(2.\omega.\omega_m + \omega_m^2)$

; $E_m = I.\omega.\omega_m.(1 + \omega_m/(2.\omega))$

Definition of the Planck constant:

; $\hbar_r = I.\omega$

; $E_r.r = \hbar_r.\mathring{c}_r$

Planck formula with the nonlinear term:

; $E_m = \hbar_r.\omega_m.(1 + \omega_m/(2.\omega))$

With these preliminaries, if in the formula $\hbar_r$ in the form $I.\omega$ we compare the rotational inertia of the electron with that of its wing, because of the greater radius it has an inertia coefficient 10/3, which we previously added on average in the wing section. It also receives a factor 12 because the mass becomes 12 times larger, and in addition, since ω is proportional to the inverse of the particle's rotation period, due to greater time dilation relative to the wing it receives another factor 12 from there. Thus, the Planck constant for the particle is 12^2 times that of the wing:

(329) $\hbar_e = \hbar_s 12^2 5\varphi N^4$

; $\Leftrightarrow \hbar_s = \hbar_e/(12^2 5\varphi N^4)$

; $c = \mathring{c}/\varphi \Leftrightarrow \mathring{c} = \varphi.c$

; $E_e = 12NE_s/E_{03} \Leftrightarrow E_s = E_e E_{03}/(12N)$

Thus, theoretically, because all physical phenomena arise from Ramions, we must project the Ramion energy E_s, the Planck constant $\hbar_s$, and the speed of light inside the Ramion $\mathring{c}$ to particles and FCC space. But because those measurements are difficult, we project from the electron to the Ramion.

Projection of the Coulomb Constant

If we assume the force to be proportional to $K_e.Q_1.Q_2/r^2$, then for projecting the ring-like or point-like K from inside the Ramion, namely $\mathring{K}_s$, to FCC space, the following coefficients are required.

Considering the presence of r^2 in the denominator of the force fraction, to project the area $4\pi r^2$, it must be multiplied by $N^2\beta$. N^2 is for projecting the area, and β is the surface-coverage coefficient for compensating spatial discreteness. It must also be divided by η^2 to compensate the discreteness of electric charge on the wing.

(330) $K_e = \mathring{K}_s.N^2\beta/(4\pi\eta^2)$

Alpha and K are the same for the electron and its wing, and in general for all baryons and hadrons of its family; otherwise the electric force for the electron and different quarks would not be proportional, for example the neutron would not become exactly neutral. Therefore, each wing applies its own electric force independently.

Definition and Simplification of Alpha for the Electron Family:

(331) $\alpha_e = K_e.q_e^2/(\hbar_e.c)$

Substitution of the projections:

(332) $\alpha_e = (\mathring{K}_s.N^2\beta/(4\pi\eta^2)).(12N.q_s)^2/((\hbar_s 12^2 5\varphi N^4).(\mathring{c}_s/\varphi))$

By simplifying N^4, φ, and 12, and using the following relation:

(333) $\mathring{K}_s.q_s^2/(\hbar_s.\mathring{c}_s) = 1/2$

(334) $\alpha = \beta/(40\pi\eta^2)$

; $\alpha_e = \beta/(40\pi.(1 - 1/N_e))$

In the mutual state between two particles of different generations:

(335) $K = K_e(\eta_e^2/N^2).N_1N_2/(\eta_1\eta_2)$

History of Experimental Measurement of the Fine-Structure Constant

For each period, $\Delta\alpha_{xx}$ has been calculated relative to the value and uncertainty of the previous period.

1986

$\alpha_x = 0.00729735308\ (\pm 330)$

$1/\alpha_x = 137.0359895\ (\pm 6100)$

1998

$\alpha_x = 0.007297352533\ (\pm 27)$

$1/\alpha_x = 137.03599976\ (\pm 500)$

$\Delta\alpha_{xx} = -1.658\sigma$

2002

$\alpha_x = 0.007297352568\ (\pm 24)$

$1/\alpha_x = 137.03599911\ (\pm 460)$

$\Delta\alpha_{xx} = +1.296\sigma$

2006

$\alpha_x = 0.0072973525376\ (\pm 50)$

$1/\alpha_x = 137.035999679\ (\pm 94)$

$\Delta\alpha_{xx} = -12.667\sigma$

2010

$\alpha_x = 0.0072973525698\ (\pm 24)$

$1/\alpha_x = 137.035999074\ (\pm 44)$

$\Delta\alpha_{xx} = +6.440\sigma$

2014

$\alpha_x = 0.0072973525664\ (\pm 17)$

$1/\alpha_x = 137.035999139\ (\pm 31)$

$\Delta\alpha_{xx} = -1.417\sigma$

2018

α_x = 0.0072973525693 (±11)

$1/\alpha_x$ = 137.035999084 (±21)

$\Delta\alpha_{xx}$ = +1.706σ

2022

α_x = 0.0072973525643 (±11)

$1/\alpha_x$ = 137.035999177 (±21)

$\Delta\alpha_{xx}$ = -4.545σ

Ramionics:

α = 0.007297352562689513

; α^{-1} = 137.03599920783324

; Δα = -1.47σ

This means that the difference between alpha in Ramionics and the 2022 experimental value is about one third of the difference between the 2022 experimental alpha and the 2018 experimental value.

Theorem 1: Reality

If the universe, or anything whatsoever, is real, namely self-subsistent and absolute rather than dependent or relational, then it necessarily possesses at least one real quantity, namely an absolute and self-grounded quantity not contingent upon hypothetical or virtual lines and fields. This follows because the universe is constituted of quantities and qualities, while qualities are relational and, in most cases, are founded and superimposed upon quantitative structures. If quantities themselves were entirely relational, no ontological ground for reality, which is absolute, would remain. In such a case, every quantity would require definition through another quantity, thereby generating an unfounded logical regress, and consequently no determinate or absolute magnitude could ever become definable.

Elaboration:

Within every theorem or section there exist explanatory passages designated as elaborations, whereas the text preceding them constitutes the concise summary of the subject. During rapid review, these elaborations may be skipped.

This theorem merely asserts that circularity and infinite regress are invalid within the domains of logic and mathematics, while making no assertion concerning the domains of space, time, causality, or existence. For instance, under conditions involving the absence, disordering, or closure of space or time, one cannot necessarily claim that “if A is ahead of B, then B cannot simultaneously be ahead of A.” However, under all conceivable conditions, one may assert that “if the number A is greater than B, then B cannot be greater than A.”

A real entity, in contrast to a non-real entity — whether truthful Truth or virtual Virtual — denotes a self-subsistent and ontologically independent entity rather than one contingent upon another. It signifies the objective rather than the abstract, imaginative, conceptual, philosophical, logical, mathematical, or geometrical. It signifies the absolute rather than the relative, the observer-independent rather than the observer-dependent, the Object rather than the Subject, and the real and ontologically grounded rather than the hyperreal or surreal.

The distinction between truthful and virtual entities is solely that a truthful entity is grounded upon a real entity, whereas a virtual entity is grounded upon other non-real or virtual entities.

Reality denotes “a true proposition concerning a real entity,” whereas truth denotes “a true proposition concerning a truthful entity.” Consequently, reality and truth themselves are not real entities, since both are propositional in nature.

Definition of Ramionics

Ramionics is a triangular epistemological and ontological framework composed of physics, philosophy, and experience. The intersection of physics and philosophy is mathematics; the intersection of experience and physics is sensation and observation; and the intersection of experience and philosophy is cognition and perception.

Certain branches of mathematics, such as logic and set theory, function as the language of philosophy. Since physics fundamentally relies upon three principal pillars — quantitative measurement, analysis of quantitative variation, and the conceptual visualization of quantities and their transformations as qualitative phenomena — branches of mathematics such as number theory, differential calculus, and geometry become the language of physics. Other branches of mathematics may presently lack direct application within physics or philosophy, although such applications may emerge in the future. For example, Ramionic physics proposes that baryonic packet structures are founded upon Mersenne prime numbers and that the geometry of the universe is fundamentally structured upon the kissing number arising in discrete geometry.

Within this triangular framework, experience is regarded as an independent axis extending from sensation and empirical observation toward cognition and intuition. At the level of sensation and observation, information is primarily acquired through sensory perception. However, such information becomes cognition only when it is situated within the correct physical loci of the neural architecture of the brain and subsequently compared against prior sensory or cognitive information, while relational structures among them are evaluated. The outcome of this cognitive process may include confirmation and reinforcement of prior information, correction and revision of existing structures, or the generation of entirely new inquiries.

Accordingly, the intersection between physics and experience manifests as sensation and experimentation, wherein experience acquires objective realization in the form of experiment. Likewise, the intersection between philosophy and experience manifests as cognition, wherein empirical data enters the domain of interpretation and meaning.

Conversely, philosophy, much like mathematics, also contains domains that depart from physics, mathematics, and even formal structures, approaching instead the domains of emotion, intuition, and subjective insight. This demonstrates that each side of this triadic structure possesses not only intersections with the others but also an independent epistemic extension.

Philosophy encompasses metascholarship, wisdom, insight, visionary cognition, and intuitive apprehension of truth beyond sensation and observation. It represents the pursuit of truth beyond mere pursuit of reality and extends into ontology itself, constituting unrestricted contemplation concerning all things, including infinite transcendental recursive chains such as thought concerning thought concerning thought.

Logic constitutes the structural framework for the articulation and transmission of reasoning.

Historically, Socrates established dialectics and the pursuit of truth through interrogative discourse. Plato, a disciple of Socrates, became one of the founders of philosophy, while Aristotle, a disciple of Plato, became one of the founders of formal logic.

If the domains of physics, philosophy, and experience, together with their three overlapping regions — mathematics, observation, and cognition — are conceptualized as a hexagon or circle, then Ramionics represents each of these six elements grounded upon the common intersection and reflective synthesis of the other five. Ramionics is therefore a physics founded upon nature, sensation, experience, cognition, philosophy, logic, and mathematical instruments such as numbers, differential structures, and geometry, ultimately returning once again to nature. Ramionics is simultaneously a mathematics interconnected with physics and philosophy, and a philosophy grounded upon physics, experience, and mathematics.

Logic

Every science is founded upon three essential pillars: logic, definitions, and principles.

Logic provides the structural framework for the articulation and communication of thought, especially for valid reasoning, and is assumed by default to be Aristotelian logic. Other logical systems, such as fuzzy logic, are themselves ultimately grounded upon Aristotelian logic or constitute extensions and generalizations thereof. Formal Logic likewise represents an extension of Aristotelian logic through mathematical symbolism capable of supporting greater structural complexity. Formal logic assumes or stipulates propositions designated as axioms, while the validity of subsequent propositions, or at least the validity of subsequent inferences, depends exclusively upon formal structure rather than semantic content or consequences.

A definition is a proposition distinguishing an entity or concept from other related concepts. The preceding sentence itself constituted a definition of definition. A proposition is a declarative statement capable of truth or falsity and therefore distinct from interrogative, imperative, or exclamatory expressions.

Principles are relations among defined concepts. Within formal logic, principles correspond to axioms. The application of terms such as Law or Rule to scientific principles should not generate conceptual confusion, since laws are legislatively imposed by lawmakers and are revocable. Rules, likewise, originate from convention or collective agreement and are not necessarily cosmically grounded. For example, the right-hand rule for determining rotational axis orientation is merely a human convention.

Theorems are propositions inferred through a process of reasoning grounded upon logic, definitions, principles, and previously proven theorems. Inference therefore constitutes the terminal stage of the reasoning process.

In the proof of a theorem, reasoning generally proceeds either deductively or inductively, provided that the induction is either complete or mathematical. Other forms of reasoning may nevertheless suffice for justification, including synthesis through experience, internal analytical reasoning independent of empirical evidence, analogy, and parsimonious reasoning asserting that among similar explanatory conditions the simplest explanation is preferable.

Aristotelian Logic

Law of Identity

(1.1) $A = A$

First Principle: Identity asserts that every entity is identical to itself and equivalent to itself, thereby guaranteeing that concepts and propositions retain stable and determinate meaning throughout a process of reasoning.

Law of Non-Contradiction

(2) $\sim(A \land \sim A)$

Second Principle: Non-contradiction asserts the impossibility of contradictory conjunction, namely that among two contradictory propositions at least one must necessarily be false.

Law of Excluded Middle

(3) $A \lor \sim A$

Third Principle: Excluded middle asserts the impossibility of contradictory absence, namely that among two contradictory propositions at least one must necessarily be true.

The impossibility of contradictories combines the second and third principles and states that among two contradictory propositions one must necessarily be true while the other must necessarily be false.

Foundational logical operators and structures:

Negation

(4) $\sim A$

Also:

(5) $\neg A$

Conjunction

(6) $A \wedge B$

Meaning “A and B,” which is true only when both propositions are true and false otherwise.

Disjunction

(7) $A \vee B$

Meaning “A or B,” which is true whenever at least one proposition is true and false only when both are false.

Conditional

(8) $A \rightarrow B$

Meaning “if A then B,” which is false only when A is true while B is false and true in all remaining cases.

Contrapositive

(1.9) $(A \rightarrow B) = (B \vee \sim A) = (\sim B \rightarrow \sim A)$

Within the expression $A \rightarrow B$, proposition A constitutes the antecedent or sufficient condition for B, while B constitutes the consequent or necessary condition for A. If A is always false, then the conditional proposition is regarded as vacuously true through denial of the antecedent. From the ontological or causal perspective, $A \rightarrow B$ signifies that A is the cause of B and B is evidence for A. If A and B are both necessary and sufficient conditions for one another, then they are equivalent and, ontologically speaking, identical.

Consequently, two principal forms of demonstration exist:

A priori demonstration proceeds through deduction, inference, and proof. It is deductive reasoning from cause to effect, wherein the mind proceeds from causal principles toward consequences. Since the explanatory ground or “why” of the phenomenon is known, the resulting outcome may be predicted.

A posteriori demonstration proceeds through induction. It is inductive reasoning from effect to cause, wherein the mind traverses the reverse direction from consequence toward causal origin. In this case, one merely knows that something exists, without necessarily knowing why it exists. Such reasoning becomes logically valid only when the observed effect possesses an exclusive cause. For example, from the fact that the ground is wet, one may infer with certainty that rainfall has occurred only if rainfall constitutes the sole possible cause of such wetness under those conditions.

Forms of deductive reasoning:

Categorical Syllogism

Example: All humans are mortal. Socrates is human. Therefore, Socrates is mortal.

Predicative Syllogism

Example: All birds possess wings. A crow is a bird. Therefore, a crow possesses wings.

Hypothetical Syllogism

Example: If rain occurs, the ground becomes wet. If the ground becomes wet, it becomes slippery. Therefore, if rain occurs, the ground becomes slippery.

Disjunctive Syllogism

Example: Either it is day or it is night. It is not day. Therefore, it is night.

Reductio ad Absurdum

Example: Suppose a number is simultaneously even and odd. A contradiction follows. Therefore, no such number exists.

Immediate Inference

Example: All humans are mortal. Therefore, some mortals are human.

Modus Ponens / Modus Tollens

Modus Ponens Example: If fire exists, smoke exists. Fire exists. Therefore, smoke exists.

Modus Tollens Example: If fire exists, smoke exists. Smoke does not exist. Therefore, fire does not exist.

Theorem 2: Computability

If the universe or anything is formula-governed (computable), then it requires at least two formulas with absolute quantities (not relative ones): first, a conservation formula for an absolute quantity to stabilize the global structure, and second, a formula with absolute quantities for balancing details.

If the universe is both real and computable, then it possesses at least one conserved real quantity and at least one fundamental equation for equilibrium among real quantities.

Conservation of a quantity means that its total sum throughout the universe remains constant.

Theorem 3: Components

If the universe or anything is made of real components (even with wavy and fluctuating boundaries), then there must exist at least one real discrete and encapsulated quantity capable of forming components, because if all its real quantities were continuous, no boundary and therefore no distinguishable thing could emerge; in continuity, nothing is separable.

Theorem 4: Contact and Repulsion

On one hand, those units of real quantities that constitute the universe must repel one another; because if they attracted one another or were even neutral, the boundaries between them would immediately or gradually vanish, and nothing would remain distinguishable within continuity.

On the other hand, for energy, force, light, and information to be transferred {physically and truly} between the components of the universe, these units must, despite repelling one another, possess a slight mutual indentation so that they can transmit energy, force, or rotation.

Therefore first, repulsion between units does not mean separation but rather contact; that is, repulsion is resistance against deeper indentation, whereas attraction is the strengthening and continuation of indentation toward greater merging of two units.

Second, that indentation must be sufficiently small so that the units are contiguous tangent neighbors, meaning they are at the boundary or overlap between separation and indentation.

Theorem 5: Isotropy and Sphericity

If the universe possesses isotropy or radial symmetry, meaning that physical formulas and constants such as the speed of light appear identical in all directions, then those units of real quantities must be spherical {in the MES state or more precisely than MES}; that is, units that behave identically in all directions must possess spherical symmetry.

Definition of MES:

Mean &: probable equilibrium stable

Theorem 6: Energy

Energy (in Ramionics, energy means motion precisely) is not only a real self-subsistent and absolute quantity in the universe, but also the only self-subsistent quantity and likewise the only absolute quantity in the universe, because all quantities of the universe depend on spacetime, whereas energy not only does not depend on space and time, but units of energy can themselves create and determine space, time, and even the dimensions of spacetime. That means their identity contains not only no space or time, but not even an imposed number of spatial or temporal dimensions. The number of dimensions of space and time, which for our universe in the MES state are three and one, are determined by the interactions of these energy units themselves.

To explain how energy creates space and time, consider for example a spherical unit of energy. Energy or motion has two modes: {linear, radial} and {rotational, angular, tangential}.

Linear energy: components of energy collide through linear motion and, like gas molecules, create repulsion among themselves, generating pressure on the shell of the unit, although that pressure itself is made of energy but with one lower dimension. This pressure and expansion create volume and therefore space. Since the universe is unlimited or at least has not yet encountered a boundary, this pressure and expansion continue enlarging volume, which means cosmic expansion. Thus, the energy of Ramions is dark energy; yet it not only expands space, but space, time, mass, electric charge, the four fundamental forces, and elementary particles are all different forms or products of that same energy.

Rotational energy: causes components of energy to rotate around an axis. This rotation resembles the hand of a clock, though not ordinary clock hands that move time forward; rather, this hand itself is time and advances itself. Whenever an energy unit rotates around two or more axes, time for that Ramion becomes two-dimensional or multidimensional.

Linear energy (motion) has no rotation and therefore produces no time, but it creates pressure and consequently space. In rotational motion there is no crowding or collision to produce pressure and space, but rotation exists and therefore creates time. Thus, the linear and rotational parts of energy units generate or provide space and time respectively, and since they do not decay, one may say they continuously provide space and time.

It will later be shown that besides creating space and time, the linear part of energy also creates pressure, relativity, gravity, and mass, while the rotational part of energy creates torque, electric charge, indentation, field, force, and electric, magnetic, and electromagnetic energies and transfers them. Therefore the full names of these two energy sectors are linear-radial-pressure-gravitational energy and rotational-angular-tangential-torque-electrical energy.

Ramionics explains space and time, mass and electric charge, gravity and electromagnetism quantum mechanically, and with precise formulas also describes the near-range and powerful forms of gravity and electromagnetism, namely the strong and weak interactions. Consequently, based on the geometry of the universe, it explains all four fundamental interactions and all elementary particles.

We name these energy units Ramions:

Rotational_electrical Linear_gravitational Real Absolute energy Anti Matter And Matter Ion

Theorem 7: Conservation of Energy

According to Theorem 2 and Theorem 6:

According to Theorem 2, the universe must contain at least one conserved real quantity, and according to Theorem 6 the only real quantity is energy. Therefore energy is conserved, meaning that its total amount, namely the total energy of all Ramions throughout the universe, remains constant. Thus energy or motion may be regarded as the soul, essence, seed, core, extract, or quintessence of the universe.

(7.1) $\sum \mathring{E}_r = \text{constant}$

The ring above E or any parameter denotes the space or universe inside each Ramion.

Theorem 8: Energy Equilibrium

According to Theorem 2, the universe must contain at least one equation governing equilibrium among real quantities even in the smallest components. But according to Theorem 6, the only real quantities of the universe are energy and its linear and rotational sectors. Therefore the only possible equation is equality between the two sectors of energy, namely linear and rotational energy. Hence the linear and rotational energies of each component of a Ramion (and consequently of the Ramion itself and ultimately of the entire universe) must be equal. Since the sum of these two sectors equals the total energy, each sector must therefore equal one half of the total energy.

(8.1) $\hat{E} = \breve{E} = \frac{1}{2} \mathring{E}$

To represent each parameter in its linear form $\hat{E}$ and rotational form $\breve{E}$, these marks above the letters are used.

(2) $E_{(Linear)} = E_{(L)} = \hat{E}$

(8.3) $E_{(Rotational)} = E_{(R)} = \breve{E}$

This equation holds for every component of a Ramion, for the Ramion itself, and for the entire universe.

This theorem states that when a Ramion itself creates space, time, and even the dimensions of space and time, it is impossible for something external to disrupt the equilibrium of these two sectors.

These two sectors represent the Ramion’s focus on creating space and time, and such equilibrium cannot become imbalanced.

The first and second equations truly summarize all Ramionic physics and govern the entire universe more precisely than the MES approximation, and probably govern any other real universes as well. Moreover, the equilibrium equation governs even Ramions and their internal components.

Theorem 9: The MES State

Energy or motion constitutes the living units of the universe. Therefore the universe is inherently oscillatory, wavy, fluctuating, dynamic, and non-static. In addition, the universe is filled with gravitational, electromagnetic, and neutrino radiation. On the other hand, according to Theorem 3, the universe is inherently discrete and quantized because it is composed of energy units.

Therefore every physical quantity and every equation, except the two laws of conservation and equilibrium, is wavy and fluctuating. These two Ramionic equations both make it possible to calculate these waves and fluctuations and also make MES calculations possible, which represent the default state.

Definition of MES:

Mean &: probable equilibrium stable

As an example concerning the spherical shape of Ramions: if one were hypothetically to film a Ramion over a long time interval, or photograph many Ramions at a single instant, the resulting mean or most probable shape of a Ramion would be a sphere. Moreover, the most enduring, balanced, stable, and equilibrium state after the transient phase would also be spherical. One therefore says that the Ramion’s shape in the MES state is spherical, or that the most MES-like shape of a Ramion is a sphere.

Theorem 10: Heisenberg Uncertainty Principle

Based on Theorems 6 through 8, every quantity except total energy, linear energy, or rotational energy possesses an intrinsic limitation in measurement precision:

The product of the measurement uncertainty of a quantity and the measurement uncertainty of the rate of change of that same quantity cannot fall below a threshold limit.

If this quantity is the position of a particle, then this relation is called the Heisenberg uncertainty principle.

Therem 11: Derivation Newton's Physics

The energy of a Ramion and its shorter notation are defined as follows:

(11.1) $\mathring{E}_r = E_{(Linear)} + E_{(Rotational)} = E_{(L)} + E_{(R)}$

(2) $\mathring{E}_r = \hat{E} + \breve{E}$

These symbols are also used to distinguish other linear and rotational parameters. The subscript r denotes Ramion. The subscript R represents the rotational part Rotational and the subscript L represents the linear part Linear. Parameter r is the Ramion radius radius and parameter R is the distance of every point in the universe from the Ramion center, which is considered the coordinate origin. Parameter $\vec{r}$ is the position vector.

Subscript s denotes Ramions with minimum energy:

(3) $\mathring{E}_s = \min(\mathring{E}_r)$

Linear energy defines space and rotational energy defines time.

Position

By defining space, the position vector and angle are defined:

(4) $\vec{r} = x\,\vec{i} + y\,\vec{j} + z\,\vec{k} = (x, y, z)$

(5) θ = (arc length)/(radius)

Here $\vec{i}$, $\vec{j}$ and $\vec{k}$ are unit vectors along the coordinate axes.

A vector is like a number that has components equal to the number of spatial dimensions or degrees of freedom of a problem. Since in matrix notation using [ ], columns of one row are written with spaces without commas, and rows are separated by commas, it is better to consider a vector as a one-column number with several rows separated by commas.

A vector is the one-dimensional generalization of an ordinary number or scalar or zero-dimensional point, just as a line is the one-dimensional extension of a zero-dimensional point. A matrix is a generalization of a vector and may have more than one dimension.

(6) $[x, y, z] = (x, y, z)$

Velocity

By defining time t and variables x, y, z, θ, their derivatives with respect to t are defined as linear and angular velocities:

(7) $\vec{v} = d\vec{r}/dt = v_x \vec{i} + v_y \vec{j} + v_z \vec{k} = (v_x, v_y, v_z)$

(8) $v_x = dx/dt$, $v_y = dy/dt$, $v_z = dz/dt$

(9) $\vec{\omega} = (d\theta/dt)\, \vec{n}$

Vector $\vec{n}$ is the unit vector along the rotation axis.

The positive direction of $\vec{\omega}$ is determined by the right-hand rule, meaning that if the fingers of the right hand curl in the direction of rotation, the thumb points in the direction of $\vec{\omega}$. In other words, if the rotation is viewed from the positive direction of axis $\vec{n}$, the rotation appears counterclockwise.

(10) $|\vec{v}| = \sqrt{(v_x^2 + v_y^2 + v_z^2)}$

Here speed is the scalar magnitude of velocity.

Acceleration

(11) $\vec{a} = d\vec{v}/dt = a_x \vec{i} + a_y \vec{j} + a_z \vec{k} = (a_x, a_y, a_z)$

(12) $\vec{\alpha} = d\vec{\omega}/dt$

(13) $a_x = d^2x/dt^2$, $a_y = d^2y/dt^2$, $a_z = d^2z/dt^2$

Force and Torque

(14) $\vec{F} = \pm \nabla \hat{E}$

Definition of gradient:

(15) $\nabla \hat{E} = (d\hat{E}/dx, d\hat{E}/dy, d\hat{E}/dz)$

(16) $\vec{\tau} = \pm (d\check{E}/d\theta)\, \vec{n}$

The positive or negative sign depends on energy transfer to or from the system.

Torque relation with the vector product of radius and tangential force tangent for a small portion of energy or mass undergoing rotational motion:

(17) $\vec{\tau} = d\check{E}/d\theta = r \times (d\check{E}/(r\, d\theta)) = r \times F_{(rot)}$

(18) $\check{F} = F_{(Rotational)} = F_{(Tangent)} = F_t$

(19) Default $F = \hat{F} = F_{(Linear)} = F_{(L)} = F_{(Pressure)} = F_p$

The symbol $\vec{\tau}$ originates from periodic or temporal phenomena or Time, but it is also compatible with Tangent.

Definition of Inertia

Linear inertia, abbreviated as mass m, and rotational-angular inertia, abbreviated as inertia I, are defined as:

(20) $m = |\vec{F}|/|\vec{a}|$

(21) $I = |\vec{\tau}|/|\vec{\alpha}|$

Summary of the Proof of Newtonian Principles

For Ramion components considered as bodies, and by extension for bodies in the universe, based on the definitions and relations above:

First, if energy does not change, the time derivatives of linear and angular velocities are zero. Therefore, a body moves with constant linear velocity in a fixed direction and rotates with constant angular velocity around a fixed axis.

Second, the spatial derivative of energy, namely force, is proportional to the time derivative of linear velocity, and the angular derivative of energy, namely torque, is proportional to the time derivative of angular velocity.

Third, whenever two bodies exert forces on each other, due to energy conservation, the increase of energy in one equals the decrease of energy in the other. Therefore, the force of each body equals the negative of the other.

Thus Newtonian physics principles are proven inside the Ramion, meaning among its internal components, and are always valid there. These same Newtonian relations produce relativity and gravity outside the Ramion. That is, outside the Ramion and not inside it, Newtonian equations in high gravities and velocities must be replaced by more precise relativistic relations.

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Details

Momentum

Linear momentum is defined as the product of linear inertia mass and linear velocity, and correspondingly angular momentum is defined as the product of rotational inertia I and angular velocity:

(22) $\hat{p} = m \, . \, \vec{v}$

(23) $\check{p} = I \, . \, \vec{\omega} = \vec{L} = \vec{J}$

The letter p originates from the Latin words ponderum or pondus meaning weight or heaviness. Angular momentum is also denoted by the letters L or J. Based on these definitions, taking the time derivative of momenta leads to force and torque:

(24) $d\hat{p}/dt = m \, . \, d\vec{v}/dt = m \, . \, \vec{a} = \vec{F}$

(25) $d\check{p}/dt = I \, . \, d\vec{\omega}/dt = I \, . \, \vec{\alpha} = \vec{\tau}$

Energy in Terms of Velocity

The rate of change of linear energy with respect to position equals force, namely mass times acceleration:

(26) $d\hat{E}/dL = \hat{F} = m \, . \, dv/dt$

Variable transformation shows that the derivative of energy with respect to velocity equals mass times velocity:

(27) $d\hat{E}/dv = m \, . \, dL/dt = m \, . \, v$

The result of integrating the above relation:

(28) $\hat{E} = ½ \, m \, . \, v^2$

Similarly, the same procedure applies to rotational energy:

(29) $d\check{E}/d\theta = \tau = I \, . \, d\omega/dt$

(30) $d\check{E}/d\omega = I \, . \, \omega$

(31) $\check{E} = ½ \, I \, . \, \omega^2$

Constant Acceleration and Velocity Relation

(32) $a = dv/dt = dv/dL \, . \, dL/dt = dv/dL \, . \, v$

(33) $\int a \, dL = \int v \, dv$

(34) $v^2 - v_0^2 = 2 \, a \, L$

Similarly, for rotational motion with constant angular acceleration:

(35) $\omega^2 - \omega_0^2 = 2 \, \alpha \, \theta$

Centripetal Acceleration and Apparent Centrifugal Force

Consider the position vector in an inertial frame:

(36) $\vec{r}(t) = r\,(\cos(\omega t), \sin(\omega t))$

Velocity:

(37) $\vec{v} = d\vec{r}/dt = r\,\omega\,(-\sin(\omega t), \cos(\omega t))$

Speed:

(38) $|\vec{v}| = r\,\omega$

Acceleration:

(39) $\vec{a} = d\vec{v}/dt = -r\,\omega^2\,(\cos(\omega t), \sin(\omega t)) = -\omega^2\,\vec{r}$

Therefore:

(40) $\vec{a} = -\omega^2\,\vec{r}$, $a_{c} = \omega^2\,r = v^2/r$

In the inertial frame this acceleration and force, namely centripetal acceleration and force, are real:

(41) $\vec{F} = m\,.\,\vec{a} = -m\,.\,\omega^2\,\vec{r}$

However, in a rotating frame with angular velocity ω, centrifugal acceleration and force are apparent:

(42) $F_{centrifugal} = +m\,.\,\omega^2\,\vec{r}$

Coriolis Acceleration

To describe motion in a rotating frame, the time-derivative transformation between inertial and rotating frames must be considered. For an arbitrary vector $\vec{A}$:

(43) $(d\vec{A}/dt)_{inertial} = (d\vec{A}/dt)_{rot} + \vec{\omega} \times \vec{A}$

This relation shows that real changes in the inertial frame consist of two parts: changes in the rotating frame and the effect of frame rotation.

For the position vector:

(44) $\vec{v}_{inertial} = \vec{v}_{rel} + \vec{\omega} \times \vec{r}$

where $\vec{v}_{rel}$ is the velocity of the body relative to the rotating frame.

Taking the time derivative:

(45) $\vec{a}_{inertial} = \vec{a}_{rel} + 2\,\vec{\omega} \times \vec{v}_{rel} + \vec{\omega} \times (\vec{\omega} \times \vec{r})$

This relation contains three important physical terms:

(46) $a_{Coriolis} = 2\,\vec{\omega} \times \vec{v}_{rel}$

(47) $a_{(centrifugal)} = \vec{\omega} \times (\vec{\omega} \times \vec{r})$

Therefore Coriolis acceleration appears only when the body has relative velocity in the rotating frame, and its direction is perpendicular to $\vec{\omega}$ and $\vec{v}_{(rel)}$.

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Gyroscopic Effect

For a rigid body in rotation, the main quantity is angular momentum:

(48) $\vec{L} = I \cdot \vec{\omega}$

If an external torque is applied:

(49) $\vec{\tau} = d\vec{L}/dt$

In the case where the magnitude of $\vec{L}$ remains constant but its direction changes:

(50) $d\vec{L}/dt = \vec{\Omega} \times \vec{L}$

where $\vec{\Omega}$ is the angular precession velocity.

Substituting into the torque relation:

(51) $\vec{\tau} = \vec{\Omega} \times \vec{L}$

Magnitude of this relation:

(52) $|\vec{\Omega}| = |\vec{\tau}|/|\vec{L}|$

This result shows that under torque, the rotation axis begins angular precession instead of falling. This is gyroscopic stability.

Here: $\vec{\omega}$ is the rotational velocity of the body relative to the inertial frame, $\vec{\Omega}$ is the angular velocity of the change in direction of the rotation axis, and $\vec{v}_{(rel)}$ is the velocity of the body relative to the rotating frame.

These two phenomena, Coriolis and gyroscopic effects, both arise from motion analysis in non-inertial frames, but the first concerns translational motion in a rotating frame while the second concerns angular momentum of rigid bodies.

Integral Relation of Inertia

For a mass element dm at distance r from the axis:

(53) $v = \omega \times r$

Note that × is the vector product. Its rotational energy:

(54) $d\breve{E} = ½\, dm \cdot v^2 = ½\, dm \cdot (r^2\, \omega^2)$

For the whole body:

(55) $\breve{E} = \int \frac{1}{2} r^2 \omega^2 \, dm$

Since ω is the same for the whole body:

(56) $\breve{E} = \frac{1}{2} \omega^2 \int r^2 \, dm$

Definition of rotational energy:

(57) $\breve{E} = \frac{1}{2} I \, . \, \omega^2$

Comparing the two relations:

(58) $I = \int r^2 \, dm$

Here: r is the perpendicular distance from the rotation axis in the inertial frame or in the frame where the axis is defined, and ω is the angular velocity of the rigid body relative to the same frame.

Effective Radius

If the previous relation is divided by the total mass:

(59) $I/m = (1/m) \int r^2 \, dm$

An effective radius can be defined:

(60) $r_{eff}^2 = (1/m) \int r^2 \, dm$

Therefore:

(61) $I = m \, . \, r_{eff}^2$

This quantity r_{eff} has an important physical interpretation: it is the distance at which if all mass were concentrated, the same rotational inertia would be produced.

Power, Pressure, Stress and Strain

Power is the change of energy attributed to something per unit time, with unit joule per second or watt:

(62) $E = \int \text{Power} \, dt$

Pressure is force applied per unit area, with unit newton per square meter or pascal:

(63) $F = \int \text{Pressure} \, dS$

In this article, momentum is denoted by lowercase p and pressure by uppercase P.

Stress σ with unit pascal Pa includes three states:

1. Normal including tension and compression, where pressure is the isotropic form in fluids, and the combination of tension and compression namely bending.
2. Parallel including shear or simple slip and torsion.
3. Combined normal and parallel.

Strain is denoted by ε and represents the relative deformation of a body.

Hooke's relation, where E_Y is Young's modulus for a material:

(64) $\sigma = E_Y . \varepsilon$

Comparison with a spring that depends on body geometry and material type:

(65) $F = k_s . x$

If a rod with Young's modulus E_Y, radius r and length L is shaped into a spring with radius R, its spring constant becomes:

(66) $k_s = (E_Y . \pi r^4)/(4 R^2 L)$

If a strip with Young's modulus E_Y, width b, thickness t and length L is shaped into a torsional spring, its torsional stiffness becomes:

(11.67) $k_s = (E_Y . b t^3)/(12 L)$

Theorem 12: Second Proof of Theorem 6

A systematic examination of physical quantities shows that all physical quantities can be classified into two broad categories: those associated with linear motion and those associated with rotational motion.

In the domain of **linear–radial–pressure–gravitational energy**, there are quantities such as linear velocity, linear acceleration, linear inertia (mass m), linear force, linear momentum, pressure, relativity, and gravity. In the domain of **rotational–angular–tangential–torque–electrical energy**, there are quantities such as angular velocity, angular acceleration, rotational inertia I, tangential force F_t, torque, angular momentum, electric charge, and electric, magnetic, and electromagnetic fields, forces, and energies.

Except for energy, none of these quantities simultaneously possesses both a linear and a rotational nature. For example, linear and tangential velocity, acceleration, force, and momentum are mutually **perpendicular**; therefore, they share no common component. Consequently, mass and electric charge, together with their associated forces, are mutually independent.

Now consider a linear spring, a torsional spring, a charged battery, or a reservoir filled with water (that is, charged with gravitational energy, which is fundamentally linear energy). Energy can be exchanged freely among all of them. This shows that energy possesses a nature beyond merely being linear or rotational; it encompasses both forms.

Therefore, energy is the only quantity that can serve as the absolute and fundamental origin of all other physical quantities and can be used as the foundation for defining and explaining them. Hence, energy is the only truly fundamental physical quantity.

Theorem 13: Second Proof of Theorem 5 and Entropy

In Theorem 5, based on isotropy (radial symmetry), it was concluded that the quanta composed of the real quantity must be spherical (at least in the MES state). Now that this real quantity has been identified as energy, we provide a second proof of the spherical nature of these quanta.

A d-dimensional sphere is the most complete and simplest geometric object among all d-dimensional bodies.

From a geometric viewpoint, completeness means that among all d-dimensional bodies, the sphere encloses the maximum volume for a given surface area, or equivalently, requires the minimum surface area for a given volume. Thus, it has the maximum volume-to-surface ratio. From a physical viewpoint, this means that for a given amount of gas at a specified pressure, or a given amount of energy at a specified energy density, the sphere exerts the minimum force on its enclosing surface. In other words, if a shell has a finite pressure tolerance, the spherical shape can store the greatest amount of energy. For example, a balloon reaches its maximum possible volume under a given pressure when it is spherical. This property demonstrates the maximum efficiency of the sphere for energy storage.

Furthermore, the sphere is the most symmetric geometric shape. Geometrically, symmetry means simplicity, that is, the minimum amount of information required to describe its structure, position, and orientation. Physically, greater symmetry (that is, a more uniform force distribution) together with lower information content (that is, the absence of sharp edges and corners) both reduce the maximum pressure throughout the system. Therefore, maximum symmetry corresponds to minimum entropy (maximum order), just as minimum energy represents the natural tendency of every physical system. Consequently, the natural tendency of systems toward minimum entropy, maximum order, and minimum energy leads to the MES macroscopic (large-scale) spherical form of Ramions.

In summary, the completeness of the sphere means minimizing the total force acting on the enclosing surface, while its symmetry means distributing that force more uniformly, thereby minimizing the maximum pressure.

To clarify the concept of information, suppose we wish to order an object made of a specified material. A sphere is the simplest possible shape because it is fully specified by only one parameter: its radius or diameter. Even a cube requires additional information: one parameter for the edge length (or space diagonal), plus the number six to specify its six-faced structure. A rectangular prism requires even more parameters, such as length, width, and height.

From the viewpoint of spatial position, in a d-dimensional space every object requires d coordinates to specify its location. However, except for the sphere, other objects also require $d(d-1)/2$ additional parameters to specify their orientation in space, namely their rotations about the coordinate axes:

Roll: rotation about the x-axis.
Pitch: rotation about the y-axis.
Yaw: rotation about the z-axis.

Therefore, in the MES state, the spherical shape is the most natural and most stable configuration for Ramions.

Theorem 14: Second Proof of Theorem 8: Energy Equilibrium

Since Ramions constitute the container of space-time, distinctions among direction, distance, and linear velocity disappear, at least in the far-field computational framework.

(14.1) $\hat{c} = \check{c} = \mathring{c}$

Here, $\mathring{c}$ denotes the speed of energy (or light) inside a Ramion and is proportional to the speed of light c propagating through its internal space.

Furthermore, because the Ramion itself constitutes the space-time container, all of its constituent elements observe the same radius r and the same angular velocity ω. Consequently, the tangential velocity is identical for all components:

(2) $\check{c} = r \,.\, \omega = \mathring{c}$

Therefore, from equations (1) and (2), we obtain:

(3) $\hat{c} = \check{c} = r \,.\, \omega = \mathring{c}$

The linear energy of each component is:

(4) $\hat{E} = \frac{1}{2} m \,.\, \mathring{c}^2$

The rotational energy is:

(5) $\breve{E} = ½ I . \omega^2$

Substituting:

(6) $I = \mathring{m} . r^2$

and using equation (2):

(7) $\breve{E} = ½ \mathring{m} . r^2 . \omega^2 = ½ \mathring{m} . \mathring{c}^2$

Therefore:

(14.8) $\hat{E} = \breve{E}$

which is precisely the equilibrium between linear and rotational energy.

This result is exactly the statement of Theorem 8 and demonstrates that the equality of these two energy components follows not only from their definition but also from the space-time structure of the Ramion itself.

To understand why all components of a Ramion observe the same radius and angular velocity, consider the moment of inertia of a point mass, a ring perpendicular to the axis of rotation, or a thin rod or cylinder parallel to the axis of rotation. In all these cases, every point observes the same radius and the same angular velocity.

Theorem 15: Proof of the Mass–Energy Equivalence Principle

Theorems 8 and 14 independently demonstrate that:

(15.1) $\breve{E} = ½ \mathring{m} . r^2 . \omega^2 = ½ \mathring{m} . \mathring{c}^2 = \hat{E}$

Therefore:

(15.2) $\mathring{E}_r = 2 (½ \mathring{m} . \mathring{c}^2) = \mathring{m} . \mathring{c}^2$

Theorem 16: Rotational Inertia

Rotational inertia (moment of inertia) of common bodies with uniform surface or volume distribution

Point mass at distance R from the rotation axis:

(16.1) $I = m R^2$, point mass

Thin ring about the central axis:

(2) $I = m R^2$, thin ring central axis

Thin cylindrical shell about the central axis:

(3) $I = m R^2$, thin cylindrical shell

Thin rod parallel to the rotation axis at distance R:

(4) $I = m R^2$, thin rod parallel axis

The four relations above mean exactly that the effective radius is equal to the same radius of the body.

Ring about its own diameter:

(5) $I = \frac{1}{2} m R^2$, ring about diameter

Solid cylinder about the central axis:

(6) $I = \frac{1}{2} m R^2$, solid cylinder

Disk about the axis perpendicular to the plane:

(7) $I = \frac{1}{2} m R^2$, disk central axis

Disk about its own diameter:

(8) $I = \frac{1}{4} m R^2$, disk about diameter

Thin rod about the center and perpendicular to its length:

(9) $I = \frac{1}{12} m L^2$, rod center perpendicular

Spherical shell:

(10) $I = \frac{2}{3} m R^2$, spherical shell

Solid sphere:

(11) $I = \frac{2}{5} m R^2$, solid sphere

Important calculations in Ramionics for calculating mass torque, electric torque, and the gyromagnetic factor:

Consider twelve equal spheres of radius R that are tangent to each other and to a hypothetical spherical cavity of the same radius. Let each of them be called a wing. Then consider the centers of each two symmetric wings with respect to the center as a pair, lying on an axis that passes through the center of the body, that is, the center of the cavity. Based on this, divide each wing into two hemispheres: far (from the center) and near (to the center). Define a local spherical coordinate system at the center of each wing with the z-axis aligned with the radius emitted from the center of the body, and based on that imagine the far and near hemispheres and the equatorial plane.

Inertia for uniform mass distribution on the surfaces of the spheres:

(12) $I_{ws} = 10/3\ m R^2$

On the volumes of the spheres:

(13) $I_{wv} = 46/15\ m R^2$

On the equatorial plane, the common disk between the far and near hemispheres:

(14) $I_{wdisk} = 3\ m R^2$

On the surfaces of the far hemispheres:

(15) $I_{hw} = 14/3\ m R^2$

On the surfaces of the far hemispheres, but in the differential case, meaning the inertia of mass on the far hemisphere minus the inertia of the same amount of mass on the near hemisphere:

(16) $I_{hwD} = 8/3\ m R^2$

And two other inertias assuming a distribution with coefficient cos(θ), which belongs to the local system of that same sphere:

(17) $I_{hwCos} = 46/9\ m R^2$

Differential case:

(18) $I_{hwCosD} = 32/9\ m R^2$

Detail

In this section, the inertia calculations are performed directly from the integral definition:

(19) $I = \int r^2\, dm$

This relation states that the contribution of each mass element to the total inertia is proportional to the square of its distance from the rotation axis; therefore, the spatial distribution of mass is the main determinant of the inertia value, and the farther the mass is from the axis, the more its contribution to inertia increases quadratically.

For continuous distributions, depending on the type of distribution, dm is written as surface or volume form:

(20) $I = \int r^2\, \sigma\, dA$

(21) $I = \int r^2\, \rho\, dV$

If the surface or volume density is uniform, calculating inertia reduces to determining the effective radius, and the total equivalent mass is considered at an effective distance from the axis, which is the root-mean-square distance.

(22) $I = m R_{(eff)}^2$

(23) $R_{(eff)}^2 = (1/m) \int r^2 \, dm$

In the case of uniform surface distribution:

(24) $R_{(eff)}^2 = (1/A) \int r^2 \, dS$

In the case of uniform volume distribution:

(25) $R_{(eff)}^2 = (1/V) \int r^2 \, dV$

Important theorems:

Parallel Axis Theorem

If the rotation axis does not pass through the center of mass, the total inertia is equal to the sum of the inertia about the center of mass and a term proportional to the square of the distance of the new axis from the center of mass; this term is always positive and increases the inertia. This relation is independent of the shape of the body and depends only on mass and distance. Validity condition: the two axes must be parallel, one must pass through the center of mass, the body must be rigid, and the perpendicular distance between the axes must be d.

(26) $I = Icm + m d^2$

Euler Inertia Tensor Theorem

Inertia is a second-rank tensor quantity that becomes diagonal in the principal-axis coordinate system, and the components become independent; in this state, rotational motion analysis becomes simpler. Validity condition: the body must be rigid, the mass distribution must be known, the axes must pass through a common point, and the principal axes must be selected. The following relations are not simultaneously valid, and each is valid only for its corresponding planar case.

(27) $I_x + I_y = I_z$

This relation is valid for a planar body in the xy plane or when the z component is zero for all mass elements.

(28) $I_x + I_z = I_y$

This relation is valid for a planar body in the xz plane or when the y component is zero for all mass elements.

(29) $I_y + I_z = I_x$

This relation is valid for a planar body in the yz plane or when the x component is zero for all mass elements.

Euler Cosine Inertia Theorem

The inertia about an arbitrary axis is equal to the weighted sum of the inertias about the principal axes, where the weights are the squares of the cosines of the angles; this relation shows the directional dependence of inertia. Validity condition: the axes must be principal axes or the tensor must be diagonal, and the arbitrary axis must be a unit vector.

(30) $I = I_x \cos^2\theta_x + I_y \cos^2\theta_y + I_z \cos^2\theta_z$

(31) $\cos^2\theta_x + \cos^2\theta_y + \cos^2\theta_z = 1$

Maxwell Perpendicular Axes Theorem

For planar bodies, the inertia about the perpendicular axis is equal to the sum of the inertias about two orthogonal axes in the same plane. Validity condition: the body must be planar, the mass must lie in one plane, and all three axes must pass through a common point.

(32) $I_z = I_x + I_y$

Axis Transformation Theorem (Otto Mohr)

This relation describes the change of inertia under rotation of the coordinate system in a plane and includes the product-of-inertia term. Validity condition: the transformation must occur in one plane and the axes must pass through a common origin.

(33) $I(\theta) = I_x \cos^2\theta + I_y \sin^2\theta - 2\, I_{xy} \sin\theta \cos\theta$

(34) $I_{xy}(\theta) = (I_y - I_x) \sin\theta \cos\theta + I_{xy} (\cos^2\theta - \sin^2\theta)$

Thin Ring About Its Own Diameter

Linear density:

(35) $dm = (m / 2\pi R) \cdot R\, d\theta$

Distance from the axis:

(36) $r = R \sin\theta$

Substitution:

(37) $I = \int_0^{2\pi} (R^2 \sin^2\theta) \cdot (m / 2\pi R) \cdot R\, d\theta$

(38) $I = \frac{1}{2} m R^2$

This result shows that the mean-square distance of the ring points relative to the diameter equals half of the square of the radius.

Disk About the Axis Perpendicular to the Plane

Surface density:

(39) $dm = (m / \pi R^2) . 2\pi r\, dr$

(40) $I = \int_0^R r^2 . (m / \pi R^2) . 2\pi r\, dr$

(41) $I = (2m / R^2) \int_0^R r^3\, dr = ½\, m R^2$

In this case, the mass distribution extends from the center to the radius, and the mean-square distance becomes equal to half the square of the radius.

Disk About Its Own Diameter

(42) $I = \int_0^{2\pi} \int_0^R (r^2 \sin^2\theta) . (m / \pi R^2) . r\, dr\, d\theta$

(43) $I = ¼\, m R^2$

This result is obtained from halving the inertia relative to the perpendicular axis due to planar symmetry.

Spherical Shell

Surface density:

(44) $dm = (m / 4\pi R^2) . (R^2 \sin\theta\, d\theta\, d\varphi)$

(45) $I = \int_0^{2\pi} \int_0^{\pi} (R^2 \sin^2\theta) . (m / 4\pi R^2) . R^2 \sin\theta\, d\theta\, d\varphi$

(46) $I = ⅔\, m R^2$

In this case, the mass distribution on the sphere surface causes the mean-square distance to be larger than that of the disk.

Solid Sphere

Volume density:

(47) $dm = (m / (4⁄3\, \pi R^3)) . r^2 \sin\theta\, dr\, d\theta\, d\varphi$

(48) $I = \int_0^R \int_0^{\pi} \int_0^{2\pi} (r^2 \sin^2\theta) . dm$

This integral takes into account the contribution of all volume points and has a stronger dependence on inner radii.

(49) $I = ⅖\, m R^2$

This result shows that compared with the shell, part of the mass is closer to the axis and the inertia decreases.

Ramionics Calculations for 12 Spheres

In this calculation, the total mass m is uniformly distributed among 12 spheres, and the center distances are considered in two groups of 4 and 8.

(50) $m_1 = m / 12$

The distance of the four middle spheres from the axis is equal to twice the radius.

(51) $d_4 = 2R$

The distance of the other eight spheres is equal to the square root of two times the radius.

(52) $d_8 = \sqrt{2}\, R$

Inertia of 12 Spherical Shells

The inertia of the four spheres includes intrinsic and translational contributions.

(53) $I_{4s} = 4 \,.\, (\frac{2}{3} (m/12) R^2 + (m/12)(2R)^2)$

The inertia of the eight spheres with smaller distance from the axis is calculated.

(54) $I_{8s} = 8 \,.\, (\frac{2}{3} (m/12) R^2 + (m/12)(\sqrt{2}\, R)^2)$

The total inertia is equal to the sum of the two groups.

(55) $Iws = I_{4s} + I_{8s}$

This is the final result for the total surface inertia of the system.

(56) $Iws = 10/3\ m R^2$

Inertia of 12 Solid Spheres

The volumetric inertia of the four spheres is calculated by considering the internal distribution.

(57) $I_{4v} = 4 \,.\, (\frac{2}{5} (m/12) R^2 + (m/12)(2R)^2)$

The contribution of the other eight spheres is included in the volumetric inertia.

(58) $I_{8v} = 8 \,.\, (\frac{2}{5} (m/12) R^2 + (m/12)(\sqrt{2}\, R)^2)$

The total inertia equals the sum of the two groups.

(59) $Iwv = I_{4v} + I_{8v}$

This is the final result for the total volumetric inertia of the system.

(60) $Iwv = 46/15\ m R^2$

Theorem 17: The Kissing Number

The Kissing Number Problem and the Maximum Dimensional Density Problem

In d-dimensional space, every arrangement of beads, that is, equal-sized d-dimensional spheres with radius r, fills a particular relative volume φ of its containing space. This is called the occupancy factor, coverage factor, compressing factor, or packing factor. In other words, φ is a function of the arrangement. Such an arrangement also has an average number of beads tangent to a given bead, known as the kissing number or contact number, denoted by k; this too is a function of the arrangement.

The maximum relative volume that the densest possible lattices can occupy in d-dimensional space is denoted by φ_d and is called the dimensional density of dimension d; it is a function of d. Likewise, the maximum number of spheres that can be in contact with a single sphere in that dimension is denoted by k_d, and it too is a function of d.

The kissing conjecture for any number of dimensions d is as follows. First, every lattice that reaches the maximum φ necessarily also has the maximum k. Second, every lattice that reaches the maximum k necessarily also has the maximum φ. Third, for d greater than 2, there is always a cubic lattice that has both the maximum φ and the maximum k.

In the three-dimensional case, the kissing conjecture was Kepler's conjecture, proposed around 1611. It was proved after 400 years, in 2014. Of course, this three-dimensional proof alone is sufficient for formulating the three-dimensional universe in Ramionics physics.

(17.1) FCC = CPC Lattice = Face-Centred Cubic = Cubic Packed Configuration

This means similar cells in the form of a d-dimensional cube, with maximum filling along the edges and diagonals, possessing geometrically the greatest simplicity, symmetry, and isotropy, and physically the greatest softness, meaning the greatest resistance to fracture and rupture.

History of the Kissing Number and Dimensional Density

$k_1 = 2$

$k_2 = 6$

$k_3 = 12$; 1611, conjecture by Johannes Kepler 1998, proof by Thomas Hales 2014, formal proof (Flyspeck), Fulkerson Prize (2009, Hales)

$k_4 = 24$; 1979, Oleg Musin (final proof 2003)

k_5: 40 ≤ k_5 ≤ 44; 1953, John Leech 2003, upper bound Oleg Musin

k_6: 72 ≤ k_6 ≤ 78; 1953, John Leech (lower bound) 2003, Oleg Musin (upper bound improvement)

k_7: 126 ≤ k_7 ≤ 134; 1953, John Leech 2000s, numerical improvements

k_8 = 240 1967; John Leech (Leech lattice) 2016, optimality proof by Maryna Viazovska 2017, Salem Prize 2022, Fields Medal

k_9: 306 ≤ k_9 ≤ 380; 1990s–2000s, semidefinite programming

k_{10}: 500 ≤ k_{10} ≤ 566; 2000–2010, SDP improvements

k_{11}: 582 ≤ k_{11} ≤ 870; 2000–2010, Henry Cohn and collaborators

k_{12}: 840 ≤ k_{12} ≤ 1355

k_{13}: 1154 ≤ k_{13} ≤ 2064

k_{14}: 1606 ≤ k_{14} ≤ 2562

k_{15}: 2564 ≤ k_{15} ≤ 2728

k_{16} = 4320; 1988 Boris Venkov

k_{17}: 5346 ≤ k_{17} ≤ 6528

k_{18}: 7398 ≤ k_{18} ≤ 10668

k_{19}: 10668 ≤ k_{19} ≤ 17064

k_{20}: 17400 ≤ k_{20} ≤ 40960

k_{21}: 27720 ≤ k_{21} ≤ 67584

k_{22}: 49896 ≤ k_{22} ≤ 89112

k_{23}: 126720 ≤ k_{23} ≤ 237168; SDP bounds (Henry Cohn, Noam Elkies, Christine Bachoc et al.)

k_{24} = 196560; 1968, John Leech 2016, final proof by Maryna Viazovska, Henry Cohn, Abhinav Kumar, Stephen Miller, Danylo Radchenko 2022, Fields Medal

In summary, so far the exact value of the kissing number is known, with proven calculations, only in seven dimensions: 1, 2, 3, 4, 8, 16, and 24. In the other dimensions, relatively precise bounds are known only up to dimension 24; beyond that, the bounds have been approximated as follows:

(17.2) $k(d) \approx 2^{(0.401\, d)}$

Reference table: proven or computed values or ranges obtained so far using geometric and numerical methods.

Reference table of kissing numbers from d1 to d24:

(3) (2), (6), (12), (24), 40 to 44, 72 to 78, 126 to 134, (240), 306 to 380, 500 to 566, 582 to 870, 840 to 1355, 1154 to 2064, 1606 to 2562, 2564 to 2728, (4320), 5346 to 6528, 7398 to 10668, 10668 to 17064, 17400 to 40960, 27720 to 67584, 49896 to 89112, 126720 to 237168, (196560)

The calculation of the maximum dimensional density φ has been proven only in five dimensions:

(4) $\varphi_1 = 1$
(5) $\varphi_2 = \pi/(2\sqrt{3}) = 0.90689968$
(6) $\varphi_3 = \pi/(3\sqrt{2}) = 0.74048049$
(7) $\varphi_8 = \pi^4/384 = 0.25366951$
(17.8) $\varphi_{24} = \pi^{12}/12! = 0.00192957$

Geometric algorithm

In a d-dimensional cube of side length a, we must place spheres of radius r at the centre and at the maximum possible number of edge midpoints.

If contact is maximal, then at least along a diagonal of dimension Q the entire length of that diagonal lies inside the spheres; that is, the diagonal is equal to the diameter of the central sphere plus two radii of the surrounding spheres. Therefore:

(1) $a\sqrt{Q} = 4r$

We take the centre of the cube as the origin of the coordinate system, and assume that the vectors of the edge-midpoint points are formed from coordinates ±1. Thus:

(2) $a = 2$
(3) $t = \text{threshold} = (2r)^2 = Q$

If the square of the distance between two centres, namely DistanceSquare, is denoted by diss, then the indentation, meaning the depth of overlap, is:

(4) $\text{Indentation} = 2r - \sqrt{\text{diss}} = \sqrt{Q} - \sqrt{\text{diss}}$

The conditions for two spheres to overlap and to be tangent are:

(5) Indentation > 0 ; Indentation = 0

which can be calculated without radicals:

(6) $Q - \text{diss} > 0$, $Q - \text{diss} = 0$

We even have a simple criterion for the strength of the overlap depth without needing to calculate a radical, namely Q − diss.

For each dimension d, we can search Q from 2 to d, and for each Q obtain a separate kissing number. The largest z is then the kissing number for d, and the corresponding Q is called the full kissing diagonal.

The algorithm for finding k may be single or paired. Paired means a centre whose coordinates are all symmetric. Independently of this, it may be subtractive or additive.

Subtractive model: this may be based first on the number of overlaps and then the strength of overlap, or first on the strength of overlap and then the number of overlaps; two cases.

The additive model may also be simple, based on minimum or maximum distance, or it may be combined separately for sisters, meaning those that share a zero coordinate, and relatives, meaning those that do not share a zero coordinate. Each of these may use either the minimum-distance or maximum-distance model; that gives six cases.

Altogether, there are 16 cases.

For each dimension, all algorithms are checked. Any algorithm that gives an incorrect answer in one dimension is not used in higher dimensions.

In every algorithm, contact with the central sphere is also checked and counted.

The volume of a d-dimensional sphere of radius r, and the shell or (d−1)-dimensional surface of the same sphere, are:

(7) $V(d) = \pi^{(d/2)}/\Gamma(d/2 + 1) . r^d$
(8) $S(d) = 2\pi^{(d/2)}/\Gamma(d/2) . r^{(d-1)}$
(9) $V(d) = S(d) . r / d$

Recursive relations:

(10) $V(2) = \pi$, $V_3 = 4\pi/3$, $V(d) = (2\pi/d) . V(d-2)$
(11) $S(2) = 2\pi$, $S(3) = 4\pi$, $S(d) = (2\pi/(d-2)) . S(d-2)$

In d-dimensional space, the maximum volume of a cube that fits inside the unit sphere, under the condition that the corner of the cube touches the sphere, is given by:

(12) $\sqrt{d} . a = 1$
(13) $a = 1/\sqrt{d}$

Side length of the cube:

(14) $L = 2a = 2/\sqrt{d}$

Volume of the cube:

(15) $V\_cube = L^d$
(16) $V\_cube = (2/\sqrt{d})^d$
(17) $V\_cube = 2^d/d^{(d/2)}$
(17.18) $V\_cube(d) = 2^d/d^{(d/2)}$

Logarithmic algorithm

Instead of numbering the conditions of the kissing number, we name them:

Condition one-two, 1&2: It is clear from the elementary facts of geometry that the kissing numbers for dimensions 1 and 2 are 2 and 6. This is not affected by the conditions of the kissing number in higher dimensions; rather, it affects the conditions of higher dimensions, meaning that the factors 2 and/or 3 remain in them, because every dimension arises from the extension of lower dimensions.

k_1 is two because every one-dimensional sphere, meaning a line segment of length 2r with a shell of dimension d−1, namely zero-dimensional, meaning a point, clearly comes into contact with two other spheres at maximum density.

k_2 is six because two-dimensional spheres, meaning circles, can be reconstructed with triangular cells, and in two-dimensional space six circles fit around each circle. This is because each angle of a triangle is 180/3 degrees, and a full circle is 360 degrees.

Condition 2d: for d greater than 2, the kissing number is divisible by 2d.

In relation to FCC, this value 2d is the number of (d−1)-dimensional faces of a d-dimensional cube. For example, the number of two-dimensional faces of a three-dimensional cube is 6.

For dimension 2, as stated earlier, k_1 and k_2 are self-evident and are not affected by the conditions of higher dimensions. In fact, k_2 is divisible not by 2d, but only by d, because it is based on the triangle rather than the two-dimensional cube, namely the square.

Condition 2k: because dimension d is obtained from the extension of dimension d−1:

(1) $k(d) \le 2 \cdot k(d-1)$ for $d>2$

Consequently:

(2) $k \le 3 \cdot 2^{(d-1)}$

GF condition (Greatest Factor): in k/d, the largest factor other than two and three is less than or equal to 1+d/2.

GF1 condition: in k/d, the largest factor other than two and three has exponent one.

Optional GFA condition: in k/d, all factors other than two and three have exponent one. This condition generates a special type of symmetric network of the same name. If it differs from the main answer, meaning if it has a k different from that of the main network, it is reported. The conditions GF1 and GFA guarantee the greatest power for the fundamental factors 2 and 3, which are observed in k_1 and k_2 and are inspired by the electron genetic code.

Parity condition: in the number k, the exponent of the factor two is greater than or equal to the number of non-two factors with odd exponent. In other words, the kissing number can be written as the product of 1 or 2 and several terms 2p, where p is a prime number. These three conditions are inspired by the electron genetic code in Ramionics and by the capacities of atomic orbitals, 2, 6, 10, and 14.

The no2 condition means that k is not a pure power of 2.

The k𝒻 condition compensates for dimensional interference in high dimensions through the highest possible symmetry in the dimensional distribution of spheres.

(3) $k_m(d)$ = k𝒻(d) . k𝒻ull(d)
(4) k𝒻ull(d) = (2d)2^(d/2) : kissing full number
(5) k𝒻(d) = 1/2+cc(d)/2 : kissing factor
(6) cc(d) = $(\cos^2(\pi . (\log_4{}^2(d/6))$^g))^t

For calculating k, the cosine function with g=t=1 is sufficient. However, for parameters more complex than k, it involves functions more complex than cc and ss, with values other than 2 for g and t:

(7) ss(d) = $(\sin^2(\pi . (\log_4{}^2(d/6))$^g))^t

In this case, the dimension 6 . 2^(√2) has the minimum k𝒻 and is surprisingly close to the integer 16.

(8) 6 . 2^(√2) = 15.99086485614

Use the reference values, namely k_r, only for the final comparison, not for calculating k_m, k_u, k𝑑, or k.

Table:

For each value of d, the parameters k𝒻, k𝒻ull, and their product k_m are calculated. The nearest integers greater than k_m and less than or equal to k_m that satisfy the kissing-number conditions are reported as k_u and k𝑑, and their ratios to k𝒻ull are reported as k_u𝒻 and k𝑑𝒻. Values related to GFA, if different, are reported in [ ].

The kissing number is k𝑑 except in exceptional cases, such as dimensions 1 and 2, where k𝑑 is obtained as zero, or 164^n, where k𝒻ull is an integer and, at the same time, unlike 44^n or 24*4^n, the parameter $k_u𝒻$ is not above 1. Under these conditions, k_u is the kissing number k.

Other parameters:

Pk is the sum of the exponents of the factors of the kissing number k.

SPk is the sum of Pk for the prime factors of d, with their exponents in d.

k′ = k/d

Pk′ is the sum of the exponents of the factors of k′.

SPk′ is the sum of Pk′ for the prime factors of d, with their exponents in d.

k″ = k^2/d

Pk″ is the sum of the exponents of the factors of k″.

SPk″ is the sum of Pk″ for the prime factors of d, with their exponents in d.

q=... s(d,q)=...

Description: Ramionics kissing-number model with continuous k_m.Range: 1 to 33.

Format: GFA alternatives are shown inside [].

Definitions:

k = kissing number. Pk = sum of prime-factor exponents of k. SPk = sum of Pk values of prime factors of d, counted with their powers in d.

k' = k/d. Pk' = sum of prime-factor exponents of k'. SPk' = sum of Pk' values of prime factors of d, counted with their powers in d.

k″ = k^2/d. Pk″ = sum of prime-factor exponents of k″. SPk″ = sum of Pk″ values of prime factors of d, counted with their powers in d.

Parameters:

k_r = reference kissing number or reference range.

k𝒻 = kissing factor.

$k𝒻_{ull}$ = full geometric kissing capacity.

k_m = $k𝒻 * k𝒻_{ull}$.

k_u = first valid integer above k_m.

kd = first valid integer at or below k_m.

k = selected final kissing number.

q = optimized FCC side dimension.

s(d,q) = Comb(d,q)*2^(d-q).

GF and GF1 are mandatory. GFA is optional.

Each dimension is printed immediately after completion.

$d=1$ $k_r=2=2$

$k\mathit{f}=0.630$ $k\mathit{f}_{ull}=2.828$ $k_m=1.783$

$k_u\mathit{f}=0.707$ $k_u=2$ $=k$ ✓

$k_u=2=2$

$k\mathit{d}\mathit{f}=0.000$ $k\mathit{d}=0$

$k\mathit{d}=0=0$

q=0 s(d,q)=2

k=2 Pk=1 SPk=0

k'=2 Pk'=1 SPk'=0

k″=4 Pk″=2 SPk″=0

$d=2$ $k_r=2.3=6$

$k\mathit{f}=0.577$ $k\mathit{f}_{ull}=8.000$ $k_m=4.613$

$k_u\mathit{f}=0.750$ $k_u=6$ $=k$ ✓

$k_u=6=2.3$

$k\mathit{d}\mathit{f}=0.000$ $k\mathit{d}=0$

$k\mathit{d}=0=0$

q=- s(d,q)=- ; no q satisfies s(d,q)>=6

k=6 Pk=2 SPk=(2)

k'=3 Pk'=1 SPk'=(1)

k″=18 Pk″=3 SPk″=(3)

$d=3$ $k_r=2^2.3=12$

$k\oint=0.750$ $k\oint_{ull}=16.971$ $k_m=12.728$

$k_u\oint=1.061$ $k_u=18$

$k_u=18=2.3^2$

$k d\oint=0.707$ $k d=12$ $=k$ ✓

$k d=12=2^2.3$

$q=1$ $s(d,q)=12$

k=12 Pk=3 SPk=(3)

k'=4 Pk'=2 SPk'=(2)

k″=48 Pk″=5 SPk″=(5)

$d=4$ $k_r=2^3.3=24$

$k\oint=0.965$ $k\oint_{ull}=32.000$ $k_m=30.872$

$k_u\oint=1.500$ $k_u=48$

$k_u=48=2^4.3$

$k d\oint=0.750$ $k d=24$ $=k$ ✓

$k d=24=2^3.3$

$q=2$ $s(d,q)=24$

k=24 Pk=4 SPk=4

k'=6 Pk'=2 SPk'=2

k″=144 Pk″=6 SPk″=6

d=5 40<=K_r<=44

$k\oint=0.999$ $k\oint_{ull}=56.569$ $k_m=56.485$

$k_u\oint=1.061$ $k_u=60$

$k_u=60=2^2.3.5$

$k d\oint=0.707$ $k d=40$ $=k$ ✓

$k d=40=2^3.5$

q=3 s(d,q)=40

k=40 Pk=4 SPk=(4)

k'=8 Pk'=3 SPk'=(3)

k″=320 Pk″=7 SPk″=(7)

d=6 72<=K_r<=78

$k\not{f}=1.000$ $k\not{f}_{ull}=96.000$ $k_m=96.000$

$k_u\not{f}=1.125$ $k_u=108$

$k_u=108=2^2.3^3$

$kd\not{f}=0.750$ $kd=72$ =k ✓

$kd=72=2^3.3^2$

q=3 s(d,q)=160

k=72 Pk=5 SPk=5

k'=12 Pk'=3 SPk'=3

k″=864 Pk″=8 SPk″=8

d=7 126<=K_r<=134

$k\not{f}=0.999$ $k\not{f}_{ull}=158.392$ $k_m=158.272$

$k_u\not{f}=1.061$ $k_u=168$

$k_u=168=2^3.3.7$

$kd\not{f}=0.795$ $kd=126$ =k ✓

$kd=126=2.3^2.7$

q=4 s(d,q)=280

k=126 Pk=4 SPk=(4)

k'=18 Pk'=3 SPk'=(3)

k″=2268 Pk″=7 SPk″=(7)

d=8 $k_r=2^4.3.5=240$

$k\not{f}=0.991$ $k\not{f}_{ull}=256.000$ $k_m=253.671$

$k_u\not{f}=1.125$ $k_u=288$

$k_u=288=2^5.3^2$

$kd\not{f}=0.938$ $kd=240$ $=k$ ✓

$kd=240=2^4.3.5$

q=5 s(d,q)=448

k=240 Pk=6 SPk=6

k'=30 Pk'=3 SPk'=3

k″=7200 Pk″=9 SPk″=9

d=9 306<=K_r<=380

$k\not{f}=0.965$ $k\not{f}_{ull}=407.294$ $k_m=392.936$

$k_u\not{f}=1.061$ $k_u=432$

$k_u=432=2^4.3^3$

$kd\not{f}=0.884$ $kd=360$ $=k$ ✓

$kd=360=2^3.3^2.5$

q=6 s(d,q)=672

k=360 Pk=6 SPk=6

k'=40 Pk'=4 SPk'=4

k″=14400 Pk″=10 SPk″=10

d=10 500<=K_r<=566

$k\not{f}=0.914$ $k\not{f}_{ull}=640.000$ $k_m=585.221$

$k_u\not{f}=0.938$ $k_u=600$

$k_u=600=2^3.3.5^2$

$kd\not{f}=0.844$ $kd=540$ $=k$ ✓

$kd=540=2^2.3^3.5$

q=7 s(d,q)=960

k=540 Pk=6 SPk=6

k'=54 Pk'=4 SPk'=4

k″=29160 Pk″=10 SPk″=10

d=11 582<=K_r<=870

$kf=0.840$ $kf_{ull}=995.606$ $k_m=836.622$

$k_u f=0.884$ $k_u=880$

$k_u=880=2^4.5.11$

$kdf=0.795$ $kd=792$ =k ✓

$kd=792=2^3.3^2.11$

q=8 s(d,q)=1320

k=792 Pk=6 SPk=(6)

k'=72 Pk'=5 SPk'=(5)

k″=57024 Pk″=11 SPk″=(11)

d=12 840<=K_r<=1355

$kf=0.750$ $kf_{ull}=1536.000$ $k_m=1152.000$

$k_u f=0.844$ $k_u=1296$

$k_u=1296=2^4.3^4$

$kdf=0.703$ $kd=1080$ =k ✓

$kd=1080=2^3.3^3.5$

q=9 s(d,q)=1760

k=1080 Pk=7 SPk=7

k'=90 Pk'=4 SPk'=4

k″=97200 Pk″=11 SPk″=11

d=13 1154<=K_r<=2064

$kf=0.656$ $kf_{ull}=2353.251$ $k_m=1544.685$

$k_u\not{f}=0.663$ $k_u=1560$

$k_u=1560=2^3.3.5.13$

$k d\not{f}=0.619$ $k d=1456$ =k ✓

$k d=1456=2^4.7.13$

q=10 s(d,q)=2288

k=1456 Pk=6 SPk=(6)

k'=112 Pk'=5 SPk'=(5)

k″=163072 Pk″=11 SPk″=(11)

d=14 1606<=K_r<=2562

$k\not{f}=0.575$ $k\not{f}_{ull}=3584.000$ $k_m=2060.187$

$k_u\not{f}=0.625$ $k_u=2240$

$k_u=2240=2^6.5.7$

$k d\not{f}=0.562$ $k d=2016$ =k ✓

$k d=2016=2^5.3^2.7$

q=11 s(d,q)=2912

k=2016 Pk=8 SPk=6

k'=144 Pk'=6 SPk'=4

k″=290304 Pk″=14 SPk″=10

d=15 2564<=K_r<=2728

$k\not{f}=0.519$ $k\not{f}_{ull}=5430.580$ $k_m=2820.690$

$k_u\not{f}=0.530$ $k_u=2880$

$k_u=2880=2^6.3^2.5$

$k d\not{f}=0.497$ $k d=2700$ =k ✓

$k d=2700=2^2.3^3.5^2$

q=12 s(d,q)=3640

k=2700 Pk=7 SPk=7

k'=180 Pk'=5 SPk'=5

k″=486000 Pk″=12 SPk″=12

d=16 $k_r=2^5.3^3.5=4320$

k∯=0.500 k∯$_{ull}$=8192.000 k_m=4096.014

k_u∯=0.527 k_u=4320 =k ✓

$k_u=4320=2^5.3^3.5$

kd∯=0.492 kd=4032

kd=$4032=2^6.3^2.7$

q=13 s(d,q)=4480

k=4320 Pk=9 SPk=8

k'=270 Pk'=5 SPk'=4

k″=1166400 Pk″=14 SPk″=12

d=17 5346<=K_r<=6528

k∯=0.520 k∯$_{ull}$=12309.315 k_m=6402.990

k_u∯=0.530 k_u=6528

$k_u=6528=2^7.3.17$

kd∯=0.497 kd=6120 =k ✓

kd=$6120=2^3.3^2.5.17$

q=13 s(d,q)=38080

k=6120 Pk=7 SPk=(7)

k'=360 Pk'=6 SPk'=(6)

k″=2203200 Pk″=13 SPk″=(13)

d=18 7398<=K_r<=10668

k∯=0.577 k∯$_{ull}$=18432.000 k_m=10628.199

k_u∯=0.615 k_u=11340

k_u=11340=$2^2.3^4.5.7$

$k\mathcal{d}\not{f}$=0.562 $k\mathcal{d}$=10368 =k ✓

$k\mathcal{d}$=10368=$2^7.3^4$

q=14 s(d,q)=48960

k=10368 Pk=11 SPk=8

k'=576 Pk'=8 SPk'=5

k″=5971968 Pk″=19 SPk″=13

d=19 10668<=K_r<=17064

$k\not{f}$=0.660 $k\not{f}_{ull}$=27514.939 k_m=18158.844

$k_u\not{f}$=0.663 k_u=18240

k_u=18240=$2^6.3.5.19$

$k\mathcal{d}\not{f}$=0.619 $k\mathcal{d}$=17024 =k ✓

$k\mathcal{d}$=17024=$2^7.7.19$

q=15 s(d,q)=62016

k=17024 Pk=9 SPk=(9)

k'=896 Pk'=8 SPk'=(8)

k″=15253504 Pk″=17 SPk″=(17)

d=20 17400<=K_r<=40960

$k\not{f}$=0.757 $k\not{f}_{ull}$=40960.000 k_m=30994.207

$k_u\not{f}$=0.773 k_u=31680

k_u=31680=$2^6.3^2.5.11$

$k\mathcal{d}\not{f}$=0.752 $k\mathcal{d}$=30800 =k ✓

$k\mathcal{d}$=30800=$2^4.5^2.7.11$

q=16 s(d,q)=77520

k=30800 Pk=8 SPk=8

k'=1540 Pk'=5 SPk'=5

k″=47432000 Pk″=13 SPk″=13

d=21 27720<=K_r<=67584

k𝒻=0.852 $k𝒻_{ull}$=60822.497 k_m=51798.615

k_u𝒻=0.870 k_u=52920

$k_u=52920=2^3.3^3.5.7^2$

k𝑑𝒻=0.851 k𝑑=51744 =k ✓

k𝑑=51744=$2^5.3.7^2.11$

q=17 s(d,q)=95760

k=51744 Pk=9 SPk=7

k'=2464 Pk'=7 SPk'=5

k″=127497216 Pk″=16 SPk″=12

d=22 49896<=K_r<=89112

k𝒻=0.931 $k𝒻_{ull}$=90112.000 k_m=83851.188

k_u𝒻=0.938 k_u=84480

$k_u=84480=2^9.3.5.11$

k𝑑𝒻=0.902 k𝑑=81312 =k ✓

k𝑑=81312=$2^5.3.7.11^2$

q=18 s(d,q)=117040

k=81312 Pk=9 SPk=8

k'=3696 Pk'=7 SPk'=6

k″=300529152 Pk″=16 SPk″=14

d=23 126720<=K_r<=237168

k𝒻=0.982 $k𝒻_{ull}$=133230.231 k_m=130855.842

k_u𝒻=0.994 k_u=132480

$k_u=132480=2^7.3^2.5.23$

$k_{d}\not f$=0.972 k_{d}=129536 =k ✓

k_{d}=129536=2^9.11.23

q=19 s(d,q)=141680

k=129536 Pk=11 SPk=(11)

k'=5632 Pk'=10 SPk'=(10)

k″=729546752 Pk″=21 SPk″=(21)

d=24 $k_r=2^4.3^3.5.7.13$=196560

$k\not f$=1.000 $k\not f_{ull}$=196608.000 k_m=196608.000

$k_u\not f$=1.007 k_u=198000[199584]

$k_u=198000=2^4.3^2.5^3.11[199584=2^5.3^4.7.11]$

$k_{d}\not f$=1.000 k_{d}=196560 =k ✓

$k_{d}=196560=2^4.3^3.5.7.13$

q=19 s(d,q)=1360128

k=196560 Pk=10 SPk=9

k'=8190 Pk'=6 SPk'=5

k″=1609826400 Pk″=16 SPk″=14

d=25 K_r=unreferenced

$k\not f$=0.983 $k\not f_{ull}$=289630.938 k_m=284586.196

$k_u\not f$=0.987 k_u=286000

$k_u=286000=2^4.5^3.11.13$

$k_{d}\not f$=0.979 k_{d}=283500 =k ✓

$k_{d}=283500=2^2.3^4.5^3.7$

q=20 s(d,q)=1700160

k=283500 Pk=10 SPk=8

k'=11340 Pk'=8 SPk'=6

k″=3214890000 Pk″=18 SPk″=14

d=26 K_r=unreferenced

$k\not{f}=0.934$ $k\not{f}_{ull}=425984.000$ $k_m=397662.714$

$k_u\not{f}=0.938$ $k_u=399360$

$k_u=399360=2^{11}.3.5.13$

$kd\not{f}=0.933$ $kd=397488[393120]$ =k ✓

$kd=397488=2^4.3.7^2.13^2[393120=2^5.3^3.5.7.13]$

q=21 s(d,q)=2104960

k=397488[393120] Pk=9[11] SPk=8

k'=15288[15120] Pk'=7[9] SPk'=6

k″=6076796544[5943974400] Pk″=16[20] SPk″=14

d=27 K_r=unreferenced

$k\not{f}=0.860$ $k\not{f}_{ull}=625602.825$ $k_m=538323.237$

$k_u\not{f}=0.862$ $k_u=539136$

$k_u=539136=2^9.3^4.13$

$kd\not{f}=0.855$ $kd=534600[532224]$ =k ✓

$kd=534600=2^3.3^5.5^2.11[532224=2^8.3^3.7.11]$

q=22 s(d,q)=2583360

k=534600[532224] Pk=11[13] SPk=9

k'=19800[19712] Pk'=8[10] SPk'=6

k″=10585080000[10491199488] Pk″=19[23] SPk″=15

d=28 K_r=unreferenced

$k\not{f}=0.774$ $k\not{f}_{ull}=917504.000$ $k_m=710062.797$

$k_u\not{f}=0.778$ $k_u=713440[720720]$

$k_u=713440=2^5.5.7^3.13[720720=2^4.3^2.5.7.11.13]$

$kd\not{f}=0.773$ $kd=709632$ =k ✓

$k\mathcal{d}=709632=2^{10}.3^2.7.11$

q=23 s(d,q)=3144960

k=709632 Pk=14 SPk=8

k'=25344 Pk'=11 SPk'=5

k″=17984913408 Pk″=25 SPk″=13

d=29 K_r=unreferenced

$k\not{f}=0.685$ $k\not{f}_{ull}=1343887.550$ $k_m=920987.058$

$k_u\not{f}=0.691$ $k_u=928928$

$k_u=928928=2^5.7.11.13.29$

$k\mathcal{d}\not{f}=0.684$ $k\mathcal{d}=918720$ =k ✓

$k\mathcal{d}=918720=2^6.3^2.5.11.29$

q=24 s(d,q)=3800160

k=918720 Pk=11 SPk=(11)

k'=31680 Pk'=10 SPk'=(10)

k″=29105049600 Pk″=21 SPk″=(21)

d=30 K_r=unreferenced

$k\not{f}=0.606$ $k\not{f}_{ull}=1966080.000$ $k_m=1191081.244$

$k_u\not{f}=0.609$ $k_u=1198080$

$k_u=1198080=2^{11}.3^2.5.13$

$k\mathcal{d}\not{f}=0.604$ $k\mathcal{d}=1188000[1182720]$ =k ✓

$k\mathcal{d}=1188000=2^5.3^3.5^3.11[1182720=2^{10}.3.5.7.11]$

q=25 s(d,q)=4560192

k=1188000[1182720] Pk=12[14] SPk=9

k'=39600[39424] Pk'=9[11] SPk'=6

k″=47044800000[46627553280] Pk″=21[25] SPk″=15 d=31 K_r=unreferenced

kf=0.545 kf_{ull}=2873138.901 k_m=1565076.770

$k_u$$f$=0.545 k_u=1566864

k_u=1566864=$2^4.3^5$.13.31

k$d$$f$=0.544 k$d$=1562400[1547520] =k ✓

kd=1562400=$2^5.3^2.5^2$.7.31[1547520=2^8.3.5.13.31]

q=26 s(d,q)=5437152

k=1562400[1547520] Pk=11[12] SPk=(11)[(12)]

k'=50400[49920] Pk'=10[11] SPk'=(10)[(11)]

k″=78744960000[77252198400] Pk″=21[23] SPk″=(21)[(23)]

d=32 K_r=unreferenced

kf=0.509 kf_{ull}=4194304.000 k_m=2133277.705

$k_u$$f$=0.513 k_u=2150400[2154240]

k_u=2150400=$2^{12}.3.5^2$.7[2154240=$2^8.3^2$.5.11.17]

k$d$$f$=0.508 k$d$=2132480[2129920] =k ✓

kd=2132480=$2^9.5.7^2$.17[2129920=2^{15}.5.13]

q=27 s(d,q)=6444032

k=2132480[2129920] Pk=13[17] SPk=10

k'=66640[66560] Pk'=8[12] SPk'=5

k″=142108467200[141767475200] Pk″=21[29] SPk″=15

d=33 K_r=unreferenced

kf=0.501 kf_{ull}=6117005.402 k_m=3062994.132

$k_u$$f$=0.503 k_u=3075072

k_u=3075072=2^{10}.3.7.11.13

k$d$$f$=0.500 k$d$=3057912 =k ✓

kd=3057912=$2^3.3^5.11^2$.13

q=28 s(d,q)=7594752

k=3057912 Pk=11 SPk=9

k'=92664 Pk'=9 SPk'=7

k″=283358357568 Pk″=20 SPk″=16

++++++++++++++++++

Conditions checked: 1&2, 2d, GF_on_k_over_d, GF1_on_k_over_d, parity, no2

Optional condition checked: GFA_on_k_over_d.

For d > 24, final k is marked accepted because no reference range is used.

Downward scan reports kd=0 and kdf=0 if no valid kd exists.

Final one-line report preserves [] options only when they belong to the selected side.

SPk, SPk', and SPk″ are computed from d factorization, not from k factorization.

All reported nonzero values passed their active conditions.

kissing numbers:

k_1=2 k_2=6 k_3=12 k_4=24 k_5=40 k_6=72 k_7=126 k_8=240 k_9=360 k_{10}=540 k_{11}=792 k_{12}=1080 k_{13}=1456 k_{14}=2016 k_{15}=2700 k_{16}=4320 k_{17}=6120 k_{18}=10368 k_{19}=17024 k_{20}=30800 k_{21}=51744 k_{22}=81312 k_{23}=129536 k_{24}=196560 k_{25}=283500 k_{26}=397488[393120] k_{27}=534600[532224] k_{28}=709632 k_{29}=918720 k_{30}=1188000[1182720] k_{31}=1562400[1547520] k_{32}=2132480[2129920] k_{33}=3057912

Theorem 18: The Universe Is a Three-Dimensional Cubic Crystal

Cubic Crystal (FCC) Layering: In an FCC lattice, let one sphere be defined as the central sphere, or layer 0, and let its center be the origin of the d-dimensional spherical coordinate system of the FCC crystal lattice. Define layer 1 as the set of spheres tangent to layer 0, and in general define layer n as the set of spheres tangent to layer n−1. The centers of the spheres in the first layer lie on a sphere of radius 2r. In the subsequent layers, the shape of each layer, namely the distribution of sphere centers, deviates slightly from an ideal sphere. However, with the exception of one and two dimensions, the shapes of sufficiently large layers converge again toward an ideal sphere. The number of spheres in layer n is given by:

(18.1) $L(n,d) = \sum \{k=0 \text{ to } d\}\{(-1)^k . C(d,k) . C(n(d-2k)+d-1, d-1)\}$

The Intersection of Ramionics Physics and Kissing Geometry: The higher probability of three-dimensional universes, and the fact that our own universe is three-dimensional, is not an intrinsic or preassigned property of Ramions. Rather, it is the consequence of a collective pressure-driven process. Under the intense pressure generated by mutual contacts, Ramions evolve toward a configuration in which the number of contacts is maximized and the parameter x is minimized. This optimum occurs precisely in three-dimensional space. Therefore, the three-dimensionality of the universe is not a fundamental assumption, but rather an emergent consequence of the dynamics and interactions among Ramions.

Two-dimensional space is unique in two respects. First, its fundamental cells are triangular rather than square. Second, beginning with the second layer, the layer geometry remains hexagonal.

One-dimensional space is also unique because the spheres of each layer, namely the two line segments on opposite sides of the central line segment, are disconnected from one another, whereas in higher dimensions the spheres within each layer form a connected structure

Theorem 19: Face-Centered Cubic (FCC) Calculations

The Face-Centered Cubic (FCC) crystal is one of the most important geometric arrangements for packing identical spheres in three-dimensional space. FCC stands for **Face-Centered Cubic**.

In this model, a cube is considered as the fundamental unit cell. The centers of 12 spheres are located exactly at the midpoints of the 12 edges of the cube. Therefore, one sphere lies on each edge, and every sphere is in direct contact with several neighboring spheres.

If we examine one square face of the cube, four spheres are located on its four edges. These four spheres touch one another in sequence, so the diagonal of the square face is exactly equal to four sphere radii.

Let the radius of each sphere be r.

(19.1) Face diagonal = 4r

On the other hand, the diagonal of a square is √2 times its side length. If the cube side length is denoted by a:

(2) $\sqrt{2} . a = 4r$

Therefore:

(3) $a = 2\sqrt{2} . r$

The volume of the cubic unit cell is:

(4) $V_{(cube)} = a^3$

(5) $V_{(cube)} = (2\sqrt{2} \,.\, r)^3$

(6) $V_{(cube)} = 16\sqrt{2} \,.\, r^3$

Next, we calculate the effective number of spheres contained in the unit cell.

There are 12 spheres located on the 12 edges of the cube. Each edge is shared by four neighboring cubes; therefore, the contribution of each edge sphere to a single unit cell is:

(7) Edge sphere contribution = ¼

Hence, the total contribution of all edge spheres is:

(8) $N_{(edge)} = 12 \,.\, \frac{1}{4}$

(9) $N_{(edge)} = 3$

In addition, one complete sphere is located at the center of the unit cell and belongs entirely to that cell:

(10) $N_{(center)} = 1$

Therefore, the total effective number of spheres per FCC unit cell is:

(11) $N = N_{(edge)} + N_{(center)}$

(19.12) $N = 4$

The total volume occupied by these four spheres is:

(13) $V_{(spheres)} = 4 \,.\, \frac{4}{3} \pi r^3$

(14) $V_{(spheres)} = \frac{16}{3} \pi r^3$

The FCC packing fraction φ is defined as the ratio of the sphere volume to the unit-cell volume:

(15) $\varphi = V_{(spheres)} / V_{(cube)}$

(16) $\varphi = (\frac{16}{3} \pi r^3)/(16\sqrt{2} \,.\, r^3)$

(17) $\varphi = \pi/(3 \,.\, \sqrt{2})$

(19.18) $\varphi = 0.740480489693061$

Thus, approximately 74% of space is occupied by spheres.

Now consider a large sphere of radius R containing a very large number of FCC spheres.

Its volume is:

(19) $V = \frac{4}{3} \pi R^3$

Since the packing fraction is φ, the volume actually occupied by FCC spheres is:

(20) $V_{(FCC)} = \varphi \cdot \frac{4}{3} \pi R^3$

The volume of each small sphere is:

(21) $v = \frac{4}{3} \pi r^3$

Therefore, the approximate number of spheres inside the large sphere is:

(22) $N = V_{(FCC)} / v$

(23) $N = \varphi \cdot (R/r)^3$

Next, consider the FCC shells.

For large values of n, the number of spheres in shell n is approximately:

(24) $L(n) = 10n^2 + 2$

For sufficiently large n, the constant term becomes negligible:

(25) $L(n) \approx 10n^2$

Therefore, the total number of spheres up to shell n is approximately:

(26) $N(n) \approx \int 10n^2 \, dn$

(27) $N(n) \approx \frac{10}{3} n^3$

If the effective shell radius is

(28) $R = 2\gamma r n$

then

(29) $n = R/(2\gamma r)$

Equating the shell-counting expression with the volumetric expression gives

(30) $\varphi \cdot (R/r)^3 = \frac{10}{3} (R/(2\gamma r))^3$

Hence,

(31) $\varphi = 10/(24\gamma^3)$

Therefore,

(32) $\gamma^3 = 10/(24 \cdot \varphi)$

(33) $\gamma = (10/(24 \cdot \varphi))^{1/3}$

(19.34) $\gamma = 0.825578509501465$

Now consider the surface of the large sphere.

Its surface area is

(35) $A = 4\pi R^2$

Since each FCC shell contains approximately $10n^2$ spheres, and $R = 2\gamma r n$,

(36) $A_{(FCC)} = 4\pi(2\gamma r n)^2$

(37) $A_{(FCC)} = 16\pi\gamma^2 r^2 n^2$

The effective surface coverage coefficient is defined as

(38) $\beta = (10n^2)/(16\gamma^2 n^2)$

(39) $\beta = 10/(16 \cdot \gamma^2)$

(19.40) $\beta = 0.916987168493568$

Therefore, the three fundamental geometric parameters of the FCC structure are

(41) $\varphi = \pi/(3 \cdot \sqrt{2})$

(42) $\gamma = (10/(24 \cdot \varphi))^{1/3}$

(19.43) $\beta = 10/(16 \cdot \gamma^2)$

In Ramionics, φ is the volumetric packing factor, γ is the effective radial shell factor, and β is the effective surface coverage factor of the FCC structure. These three parameters form the geometric foundation for many Ramionics calculations and the derivation of fundamental physical constants.

Theorem 20: Gravitational and Electrical Potentials, Relativity

Based on the previous theorems, for a Ramion, the total energy is defined as the sum of two rotational and linear components:

(20.1) $\mathring{E}_r = \hat{E} + \breve{E} = 2\hat{E} = 2\breve{E}$

where $\breve{E}$ denotes rotational energy and $\hat{E}$ denotes linear energy.

The linear and rotational velocity of all components of a Ramion's energy is equal to $\mathring{c}$, which is the effective speed of energy inside the Ramion. Since each component of energy has linear energy corresponding to this velocity for its equivalent mass:

(2) $\hat{E} = \frac{1}{2}\mathring{m}.\mathring{c}^2$

The energy stored under constant pressure P over the Ramion, namely over volume V, is expressed as follows:

(3) $\hat{E} = \int_0^r\{F.dr\} = \int_0^r\{P.A.dr\} = P.\int_0^r\{A.dr\} = P.V$

In the relation between linear energy and linear force, the number 3, as in the Friedmann relation, is the number of dimensions of the universe. Here r, A, and V are respectively the radius, surface area, and volume of the Ramion.

The letter F is used by default for the linear–radial–pressure–gravitational force:

(4) $\hat{E} = P.V = P.(4/3\pi r^3) = P.(4\pi r^2).r/3 = (P.A).(r/3) = (r/3).\hat{F} = (r/3).F$

Definition of Gravitational Potential

The energy used to overcome the repulsion between m_1 and m_2 and bring them from an infinite distance to r, which is stored as potential in their energy arrangement, is also denoted by U as the structural gravitational or electrical potential. Here, we denote the structural gravitational potential by $\hat{E}$ and the structural electrical potential by $\breve{E}$.

(5) $\hat{E} = G_r.m_1.m_2/r$

For the repulsion between the components of energy, or their equivalent mass, analogous to a uniformly charged sphere, we calculate the volume potential as follows:

(6) $\rho = \mathring{m}/(4/3\pi r^3)$

(7) $m(x) = 4/3\pi x^3\rho$

(8) $dm = 4\pi x^2\rho.dx$

(9) $d\hat{E} = G_r.m(x).dm/x$

(10) $d\hat{E} = G_r.(4/3\pi x^3\rho).(4\pi x^2\rho.dx)/x$

(11) $d\hat{E} = (16/3)\pi^2.G_r.\rho^2.x^4.dx$

(12) $\hat{E} = \int_0^r\{(16/3)\pi^2.G_r.\rho^2.x^4.dx\}$

(13) $\hat{E} = (16/3)\pi^2.G_r.\rho^2.(r^5/5)$

(14) $\rho^2 = 9\mathring{m}^2/(16\pi^2r^6)$

(15) $\hat{E} = 3/5.G_r.\mathring{m}^2/r$

The relation above applies to volume mass density. If the density is assumed to lie on the surface of the Ramion, then:

(16) $\hat{E} = \frac{1}{2}G_r.\mathring{m}^2/r$

(17) $6/5$ = ratio of volume gravitational potential energy to surface gravitational potential energy

We shall soon see that this same repulsion, outside the Ramion, appears as attraction because of relativistic effects.

Now we write the dual analogue of the above relations for rotational energy:

(18) $E_{(Rotational)} = \check{E} = ½I\omega^2 = ½(\mathring{m}.r^2)\omega^2 = ½\mathring{m}.(r^2\omega^2) = ½\mathring{m}.\mathring{c}^2 = \hat{E} = E_{(Linear)}$

(19) $\tau = d\check{E}/d\theta$

(20) $\check{E} = \theta.\tau = \theta.r.F_t$

Definition of Electrical Potential

For a sphere with charge q:

The energy used to overcome the repulsion between q_1 and q_2 and bring them from an infinite distance to r, which is stored as potential in their energy arrangement, is:

(21) $\check{E} = K_r.q_1.q_2/r$

Thus, to build the charge from zero to q_r, we have:

(22) $d\check{E} = (K_r/r).Q.dQ$

(23) $\check{E} = \int\{0 \text{ to } q_r\}\{(K_r/r).Q.dQ\}$

(24) $\check{E} = ½K_r.q_r^2/r$

Given the existence of two hemispheres, the total energy will be as follows:

(25) $\check{E} = K_r.q_r^2/r$

For an object that has both positive and negative charge, the repulsion among positive charges and the repulsion among negative charges must be added together, and the attraction between positive and negative charges must be subtracted from them. However, for a Ramion, the charge that models torque on each hemisphere has only positive potential. Moreover, since the Ramion creates spacetime, as we saw in the case of angular velocity, all charges see a radius equal to r.

Therefore, we consider the electrical charge $\pm q_r$ of the Ramion as two positive and negative discs on the two sides of the equatorial circle.

Each differential charge sees the whole previous charge as a point charge at the centre of a disc of radius r. Therefore, relations 23 to 25, which applied to a charged sphere with charge q_r, also apply to a Ramion with charge $\pm q_r$.

Summary of Ramion Relations

The summary of the relations inside the Ramion-world, which at least for us is completely Newtonian, is as follows:

(26) $\mathring{E}_r = \mathring{m}.\mathring{c}^2 = I\omega^2 = 2\hat{E} = 2\check{E} = \rho.V = 2P.V = 2r.F/3 = 6/5.G_r.\mathring{m}^2/r = 2.K_r.q_r^2/r$

All parameters in the above relations belong to a single Ramion and all have the index r, which was omitted for simplicity:

(27) $\mathring{E}_r = \mathring{m}_r.\mathring{c}_r^2 = I_r.\omega_r^2 = 2\hat{E}_r = 2\breve{E}_r = \rho_r.V_r = 2P_r.V_r = 2r_r.F_r/3 = 6/5.G_r.\mathring{m}_r^2/r_r = 2.K_r.q_r^2/r_r$

In the original names of the parameters, r denotes the radius of the Ramion, and R denotes the distance of any point in the universe from the centre of the Ramion that is assumed to be the centre of the SuperSpace coordinate system.

In the indices of parameter names, R and L mean Rotational and Linear, while r and s refer respectively to any arbitrary Ramion E_r or to the Ramion E_s, meaning the resting reference Ramion with the lowest E_r in the universe and radius r_s.

The volume energy density is ρ, so:

(28) $P = \rho/2$

(29) $\mathring{E}_r = 2r.\hat{F}/3$

To maintain force equilibrium throughout the lattice network of Ramions that constitutes the universe, each Ramion keeps its radius, that is, the radius of the space it creates, proportional to its energy:

(30) $r_r = (\mathring{E}_r/\mathring{E}_s).r_s$

(31) $N = \mathring{E}_r/\mathring{E}_s$, $N \geq 1$

(32) $r_r = N.r_s$

The components of Ramions, or the differentials of energy, are either truly continuous or discrete. If they are discrete, it is entirely possible that even each Ramion is a universe, and that our universe is itself a Ramion of another universe. Perhaps this chain is unlimited, closed, or tangled, since it is not bound by spacetime such that circularity or infinite regress would be invalid for it.

In any case, even if the components of Ramions are discrete, their number, that is, the number of particles within each Ramion, is so large that for our ordinary calculations they are treated as continuous.

(33) $A_r = N^2.A_s$

(34) $V_r = N^3.V_s$

Given that the total energy has increased by a factor of N while the volume has increased by a factor of N^3, the volume energy density decreases:

(35) $\rho_r = \rho_s/N^2$

On the other hand, given the relation between pressure and density:

(36) $P = \rho/2$

the local-relativistic pressure also decreases as follows:

(37) $P_r = P_s/N^2$

It is remarkable that the energy of the Ramion increases, yet its local-relativistic pressure decreases. This change of sign is precisely the moment at which gravity is transformed from repulsion inside the Ramion into attraction outside it, and it is the same luminous moment at which quantum gravity occurs.

Since all dynamic processes inside the Ramion, including energy propagation and information transfer, depend on pressure, a reduction in pressure leads to a reduction in the characteristic speed of these processes. Consequently, the effective speed of light inside the Ramion scales as follows:

(38) $\mathring{c}_r = \mathring{c}_s/N^2$

(39) $\mathring{c}_r = \mathring{c}_s/N^2$, $r_r = N.r_s \Rightarrow t_r = t_s/N \Rightarrow$ TIME DILATION

Time dilation:

The increase in radius as $r_r = N.r_s$ means an increase in the length scale, which is equivalent to the unit of length becoming smaller in the local measurement frame. At the same time, the relation $t_r = t_s/N$ indicates that the unit of time becomes larger, and therefore that time dilation occurs. In this framework, the effective speed of light also scales as $\mathring{c}_r = \mathring{c}_s/N^2$, which is the direct result of the simultaneous change in spatial and temporal scales.

Explanation:

When a Ramion receives more energy, its effective rotational speed decreases. This reduction in rotational speed means an increase in the local time scale; in other words, the passage of time becomes slower. As a result, distances or the spatial scale appear larger from the viewpoint of the local observer, and in this way space effectively opens up to accommodate more energy.

Now, using the fundamental energy relation:

(40) $\mathring{E}_r = \mathring{m}.\mathring{c}^2$

and applying the scalings:

(41) $\mathring{E}_r = N.\mathring{E}_s$

(42) $\mathring{c}_r^2 = \mathring{c}_s^2/N^4$

the speed of light decreases when passing through higher-energy Ramions.

(43) $\mathring{m}_r = N^5.\mathring{m}_s$

When the energy of the Ramion doubles, $\mathring{m}_r$, its local or relative mass, becomes 32 times larger, whereas the absolute mass m in the relation E/c^2 only doubles.

For electrical charge as well, given the potential relation:

(44) $\mathring{E} \propto q^2/r$

(45) $q_r = N.q_s$

That is, electrical charge increases in proportion to N. This equation connects the conservation of charge with the conservation of energy.

(46) $K_r = K_s$

(20.47) $G_r = G_s/N^8$

Theorem 21: Proof of the Principle of the Constancy of the Speed of Light

The principle of the constancy of the speed of light states that the speed of light has the same constant value for all observers under all conditions, regardless of the state of motion of either the source or the observer.

Within the Ramionics framework, this principle is a direct consequence of the simultaneous scaling of space and time with energy. If the energy of a Ramion is N times the reference energy, its spatial dimensions become N times larger, while time within that Ramion passes N times more slowly. Consequently, the effective speed of light inside that Ramion decreases by a factor of $1/N^2$.

However, when an observer measures the speed of the reference light, the observer either measures the contracted distance of the reference frame using the observer's slower clock, or compares the expanded distance of the observer's own frame with the faster clock of the reference frame. In both cases, the spatial and temporal scaling effects exactly cancel each other, and the measured speed of light remains the same universal constant.

Likewise, if two Ramions with different energies observe one another, each measures the other's speed of light to be the same universal constant. Therefore, in Ramionics, the constancy of the speed of light is not an independent postulate but a direct consequence of the simultaneous scaling of space and time with energy.

Theorem 22: Derivation of the Speed of Light and the Planck Constant

The relationship between **c**, the linear speed of light in the FCC structure for propagation through Ramions (or Wings) of energy $\mathbf{N.E_s}$, and $\mathring{\mathbf{c}}$, the internal energy velocity (rotational or linear) inside those same Ramions, is as follows.

The speed of light in Superspace (or Non-Space), namely the regions of Superspace not occupied by the space generated by Ramions, is infinite. Therefore, **c** is greater than $\mathring{\mathbf{c}}$. To calculate their ratio, consider a narrow column in Superspace representing the path of light propagation. If this column is sufficiently thin, the volume fraction occupied by Ramions, namely **φ**, becomes equal to the fraction of the path length that passes through Ramion space. Therefore:

(22.1) $c_s = c$

(2) $\mathring{c}_s = \varphi.c_s$

(3) $\mathring{c}_s = \varphi.c$, for the Ramion E_s

For Ramions or Wings:

(4) $E_r = N.E_s$

we have:

(5) $\mathring{c}_r = \varphi.c_r$

Since:

(6) $\mathring{c}_s/N^2 = \varphi.c_s/N^2$

(7) $\mathring{c}_r = \mathring{c}_s/N^2$

(8) $c_r = c_s/N^2$

If a large amount of energy is exchanged with a Ramion network, meaning that energy is either supplied to or extracted from the network, the neighboring Ramions collectively change their radii and redistribute the force until equilibrium is restored.

However, if only a small amount of energy reaches isolated Ramions, the receiving Ramions cannot increase their radii sufficiently to create the required storage volume. Consequently, they are forced to transfer this energy to the next Ramions ahead. This transport process appears as the propagation of a photon.

If a Ramion were not a spacetime source but instead an ordinary rigid body, its rotational energy would be given by:

(9) $\check{E} = ½I.\omega^2$

In such a system, if the body rotated simultaneously about another independent axis, the total energy would simply be the sum of the quadratic rotational energies, and the additional energy would always remain proportional to ω^2.

This fundamental difference demonstrates that a Ramion cannot be modeled as a classical rigid body.

In a Ramion, however, when a small amount of energy is received, the internal structure changes in such a way that a new rotation axis is created. The first axis corresponds to the energy rotation and represents the electric field. The second axis, perpendicular to the first, corresponds to the magnetic field. These two mutually perpendicular rotations together form the structure of an electromagnetic wave, while the additional energy is carried as a photon toward the next Ramion.

The essential point is that, instead of having only one temporal dimension represented by a single time parameter, the evolution of the rotation angle is described by two independent components corresponding to two rotational axes, that is, two time dimensions. Consequently, the angular derivative becomes the sum of two independent components.

The reason is that only two higher-level laws—conservation of energy throughout the universe and equilibrium between linear and rotational energy—are more fundamental than spacetime itself. A Ramion never experiences an imbalance when positive or negative energy is received. If rotational energy increases, corresponding to a smaller radius, the number of time dimensions increases from one, similar to the Planck-constant regime. Conversely, when rotational energy decreases, the number of spatial dimensions increases from three. Since energy injection is continuous, the effective spatial and temporal dimensions become fractional over sufficiently short intervals. Because of the nature of energy, Ramions tend toward higher spatial dimensions, whereas energy density constrains them to lower dimensions. Spatial dimensions lower than three are unfavorable because, in one dimension, layers become disconnected, and in two dimensions, layers become hexagonal rather than spherical. On the other hand, a single time dimension is preferred because it corresponds to lower entropy.

Therefore, with two time dimensions:

(10) $d\theta/dt = d\theta/dt_1 + d\theta/dt_2$

which can be written in terms of angular velocities as:

(11) $\omega_{(total)} = \omega + \omega_m$

Hence, the new rotational energy becomes:

(12) $E_{(total)} = ½I.(\omega + \omega_m)^2$

The additional energy relative to the initial state is:

(13) $E_m = ½I.((\omega + \omega_m)^2 - \omega^2)$

Expanding the expression:

(14) $(\omega + \omega_m)^2 = \omega^2 + 2.\omega.\omega_m + \omega_m^2$

Therefore:

(15) $E_m = ½I.(2.\omega.\omega_m + \omega_m^2)$

Factoring gives:

(16) $E_m = I.\omega.\omega_m.(1 + \omega_m/(2.\omega))$

Now define the fundamental Planck constant:

(17) $\hbar_r = I.\omega$

Multiplying both sides by ω gives:

(18) $\hbar_r.\omega = I.\omega^2$

From the definition of the Ramion rotational energy:

(19) $I.\omega^2 = E_r$

Therefore:

(20) $\hbar_r.\omega = E_r$

Using the geometric relation:

(21) $\omega = \mathring{c}_r/r$

we obtain:

(22) $E_r.r = \hbar_r.\mathring{c}_r$

Substituting this into the additional-energy expression yields:

(23) $E_m = \hbar_r.\omega_m.(1 + \omega_m/(2.\omega))$

When ω_m is much smaller than ω, the ω_m^2 term becomes higher order, and the dominant contribution is the linear term. Thus,

(24) $E_m \propto \hbar_r.\omega_m$

This result shows that, unlike an ordinary rigid body, the additional energy in a Ramion is effectively proportional to ω_m rather than ω_m^2. This is precisely the linear behavior observed in quantum phenomena.

The final physical interpretation is:

The rotation about the first axis defines the electric field.

The rotation about the second axis generates the magnetic field.

The combination of these two rotations forms an electromagnetic wave.

The additional energy transported by this structure is the photon.

Within this framework, the Planck constant is not an independent empirical parameter but rather a direct consequence of the geometric structure, rotational dynamics, and energy-transfer mechanism of the Ramion.

From the definition of the Planck constant and the relation

(22.25) $E_r.r = \hbar_r.\mathring{c}_r$

it follows that when the Ramion energy increases by a factor of **N** relative to $\mathbf{E_s}$, the local (or relative) Planck constant increases by $\mathbf{N^4}$, because both $\mathbf{E_r}$ and **r** increase by a factor of **N**, while the local speed of light decreases by a factor of $\mathbf{1/N^2}$.

Theorem 23: The Nature of Mass and Gravity

For the phenomenon of gravity to exist, energy must be distributed non-uniformly among the Ramions. If the source of this energy distribution is considered to be a center of mass, then the Ramions located closer to this center receive a greater amount of energy.

As a consequence, according to the previously established relations, the local pressure in these regions decreases. More precisely, the closer one moves toward the center of mass, the lower the effective, or relative, pressure becomes. This pressure reduction creates a pressure gradient throughout space, giving rise to a force equivalent to gravitational attraction. Therefore, within the Ramionics framework, gravity is interpreted as the direct consequence of the pressure gradient in the Ramionic lattice, representing the concept of quantum gravity in this model.

The fundamental question is: What is the origin of this energy, and how is it supplied?

The only mechanism consistent with this framework is the release of energy from the Ramions themselves. This process occurs through the decay or explosion of Ramions. Contrary to conventional interpretations, which associate the conversion of matter into energy with decay and the conversion of energy into matter with accumulation, this model proposes the opposite conclusion: the transformation of energy into matter occurs through the release of energy generated by Ramion decay.

In the FCC lattice, where every Ramion is in contact with twelve neighboring Ramions and the structure represents the maximum possible packing density in three-dimensional space, a group of Ramions may undergo spherical decay and release their energy into the surrounding medium.

As an idealized model, let us assume that the Ramions from layer 0 through layer N have undergone spherical decay. In this case, layer N+1 contains an enormous number of Ramions that receive the released energy. However, these Ramions cannot absorb the entire amount of incoming energy, because an increase in energy requires an increase in their radius, and this radial expansion is limited by geometric constraints.

Consequently, each Ramion absorbs only a portion of the incoming energy and transfers the remaining part to the next layer. This transfer process continues successively from one layer to the next. As a result, the energy is gradually attenuated at larger distances while propagating over extremely long distances throughout space.

This energy distribution leaves behind a central vacuum region, or black hole, at the location where the Ramions have decayed. Therefore, within this framework, a black hole is not interpreted as a geometric singularity but rather as the result of a particular energy distribution within the Ramionic lattice.

Accordingly, every particle possessing mass contains, at its center, a region with properties analogous to those of a black hole. From the Ramionics perspective, there is therefore no fundamental distinction between elementary particles such as quarks and electrons and massive astrophysical black holes. The differences arise solely from their scale and from the amount of energy distributed around them.

Mass can therefore be regarded as the direct consequence of a non-uniform energy distribution and the resulting pressure gradient within the Ramionic lattice. In this picture, every massive system corresponds to a central black-hole-like structure surrounded by an extended energy field.

Another important question concerns the stability of the Ramions surrounding the central cavity, or black hole, of a massive object. A simple explanation is that these Ramions support one another in a manner analogous to a masonry arch, thereby producing geometric stability through mutual interaction.

A more complete description, however, requires the introduction of a more fundamental structure. The Ramions that generate what we perceive as space are themselves embedded in a framework that is not necessarily identical to ordinary space, but instead exists within a broader domain referred to as superspace. In this picture, a portion of superspace is transformed into space by the Ramions, while the remaining portion persists as non-space.

Within the lattice arrangement, where each Ramion is in contact with twelve neighboring Ramions, the regions between adjacent Ramions are not completely filled with space. Instead, portions of non-space remain between them. Similarly, during the formation of a massive object, the central region that appears as a cavity or black hole may also be interpreted as consisting of non-space.

Ramions transfer forces and information through extremely small column-like structures operating at extremely high velocities.

This mechanism suggests that the opposing Ramions surrounding the black-hole cavity of a particle are mutually entangled, thereby maintaining the equilibrium of their forces and torques. Furthermore, if a Ramion becomes entangled with a

Ramion located on the surface of the cavity of another particle, the phenomenon known as entanglement naturally arises.

Theorem 24: The Nature of Electric Charge and the Electric Field

Electric charge is the very nature and intelligence of energy, and electric field lines are the spatial distribution of the same change in indentation and the alignment of Ramions.

Each Ramion may be considered analogous to a rotating sphere with two hemispheres and two poles. These two regions are conventionally defined as positive and negative charge. The direction of rotation is the criterion for determining the sign of charge, and every Ramion is intrinsically an electric dipole whose total charge is zero.

This definition transforms complex torque equations into electrical relations, just as, in the case of gravity, the pressure gradient is interpreted as a gravitational field. Here too, the rotational structure of energy is rewritten as an electric field.

Now we calculate the rotational and electrical interaction of two Ramions. If two Ramions are opposite or unlike at the point of contact, that is, from the viewpoint of the contact region, their directions of rotation are opposite, then from a distance their rotations are seen as aligned and assisting one another. They can therefore slightly increase their indentation in order to resist the pressure they receive from neighbouring Ramions. This means sharing a larger volume and releasing the corresponding amount of energy, which can even supply the electrical potential energy for a mass at the centre of the coordinate system.

By contrast, two Ramions that approach one another from like poles are in fact rotating against one another in the indentation region, and therefore repel one another.

This entire set of processes is the electrical attraction of two unlike charges and the electrical repulsion of two like charges.

In other words, the attractive and repulsive behaviour of electric charges is a reflection of the relative orientation of local rotations within the Ramionic structure.

Within this framework, a static electric field also has a definite geometric interpretation. The electric field is the propagating effect of these structural unevennesses or indentations, extending from each Ramion into the surrounding space. This propagation is such that it drives neighbouring Ramions towards rotational alignment without the direct expenditure of energy.

In other words, each Ramion tends to adjust the rotational arrangement of the surrounding Ramions in such a way that a more stable condition is established in the contact region. This process spreads through the network in a chain-like manner, and in this way the static electric field propagates through space.

Therefore, the electric field may be considered an effective field arising from the propagation of geometric and rotational structures in the Ramionic network, transmitting orientation and interaction information through space without requiring the transfer of net energy.

Consequently, both electric charge and the electric field are defined not as independent quantities, but as manifestations of the rotation of energy within the Ramion.

Common Volume of Two Ramions: Two Spheres with Penetration d

Consider two spheres with radii r_1 and r_2 and centre-to-centre distance dist.

Depth of penetration:

(24.1) $d = r_1 + r_2 - dist$

(2) $dist = r_1 + r_2 - d$

Geometric Definition of the Common Plane

The common plane of the two spheres is located at a distance x from the centre of the first sphere:

(3) $x = (dist^2 + r_1^2 - r_2^2)/(2.dist)$

The cap heights are:

(4) $h_1 = r_1 - x$

(5) $h_2 = r_2 - (dist - x)$

Integral Formula for the Common Volume

The common volume is equal to the sum of two spherical caps:

(6) $V_c = \int \{r_1 - h_1 \text{ to } r_1\}\{\pi.(r_1^2 - z^2).dz\} + \int \{r_2 - h_2 \text{ to } r_2\}\{\pi.(r_2^2 - z^2).dz\}$

Or, in a more symmetric form using a local change of variable:

(7) $V_c = \int_{0(}h_{1)}\{\pi.(2.r_1.z - z^2).dz\} + \int_{0(}h_{2)}\{\pi.(2.r_2.z - z^2).dz\}$

Closed Result of the Integrals

(8) $V_c = \pi.(h_1^2.(r_1 - h_1/3) + h_2^2.(r_2 - h_2/3))$

Radius of the circle of intersection:

(9) $a = \sqrt{(r_1^2 - x^2)}$

The distance of the common plane from the first sphere is x.

Area of the circle of the common plane:

(10) $A_c = \pi.(r_1^2 - ((dist^2 + r_1^2 - r_2^2)/(2.dist))^2)$

Special Case: $r_1 = r_2 = r$

In this case, we have:

(11) $x = dist/2$

(12) $h = r - dist/2 = d/2$

Area of the circle of the common plane:

(13) $A_c = \pi.(r.d - d^2/4)$

Common volume:

(14) $V_c = 2.\int_0^h \{\pi.(2.r.z - z^2).dz\}$

Result:

(15) $V_c = 2.\pi.(h^2.(r - h/3))$

Substituting h = d/2:

(16) $V_c = 2.\pi.((d/2)^2.(r - d/6))$

Simplified form:

(17) $V_c = (\pi.d^2.(3.r - d))/6$

Physical Interpretation in the Ramion Model

In this framework, d is the indentation depth, and the common volume V_c represents the amount of spatial sharing and consequently the amount of released energy or change in potential between two Ramions.

An increase in d causes an increase in V_c and therefore a decrease in potential.

A decrease in d causes a decrease in V_c and therefore an increase in potential.

If the volume energy density of these two Ramions is equal to ρ, the energy of the common region is obtained directly from the common volume:

(18) $E_{(Common)} = E_c = \rho.V_c$

Using relation (17):

(19) $V_c = (\pi.d^2.(3.r - d))/6$

Therefore:

(20) $E_c(d) = \rho.(\pi.d^2.(3.r - d))/6$

Derivative of Energy with Respect to d

Force is equal to the negative derivative of energy with respect to distance.

(21) $dE_c/dd = \rho.(\pi/6).d/dd[d^2.(3.r - d)]$

(22) $dE_c/dd = \rho.\pi.(r.d - d^2/2) = -F$

For small penetration values:

(23) $V_c = (\pi.d^2.(3.r - d))/6 \approx \pi.r.d^2/2$

(24) $A_c = \pi.(r.d - d^2/4) \approx \pi.r.d$

(25) $V_c/A_c = d/2$

(26) $F = -\rho.\pi.(r.d - d^2/2) \approx -\rho.\pi.r.d$

(27) $-F/A_c = \rho = E/V$

That is, the surface density of the electric force becomes equal to the volume energy density.

Physical Interpretation

This force arises directly from the increase or decrease of the common volume.

For small d, the term r.d is dominant and the force grows approximately linearly with d.

For larger d, the term d^2 reduces the rate of growth of the force, and nonlinear behaviour appears.

This is exactly the behaviour expected from an interaction arising from volumetric sharing, where increasing penetration initially causes a rapid increase in released energy, but as penetration increases further, the effect of geometric saturation appears.

In Ramionics, the electric force depends directly on the geometric structure of the common volume of two Ramions and is extracted from the geometry of the universe itself, without any need to define an independent field.

Theorem 25: The Twelve-Wing Model

The conversion of energy into matter occurs as follows: one or more Ramions, as a result of fluctuations or turbulence stronger than they can tolerate — for example, as a consequence of gravitational, electromagnetic, and neutrino waves and radiations accompanied by resonance, and even rupture in the fabric of spacetime, which is the FCC network of Ramions — undergo a burst and disappear. However, their energy is distributed throughout the entire universe, although the nearer Ramions receive a larger share of the total energy of that region. The reverse of this process is the conversion of matter into energy. These matter–energy exchanges are a subset of Ramionic processes.

To preserve force equilibrium as well as torque equilibrium, the region of the FCC network whose Ramions collapse must possess spherical or nearly spherical symmetry. In this description, FCC layers behave discretely; that is, each layer either collapses completely or remains stable. Therefore, the first stable layer surrounding the collapse region forms a spherical shell of Ramions around a central cavity. This cavity may be regarded as a black hole, or as a region empty of Ramions, whose initial energy has been distributed through space.

In this model, charged elementary particles are also regarded as a kind of black-hole structure on a microscopic scale, while cosmic black holes are merely large-scale versions of the same structure. From the viewpoint of the fundamental equations, there is no essential difference between cosmic black holes and particle structures; the difference appears only in the scale of energy and size.

For simplicity in calculations, one may assume that the energy corresponding to mass remains concentrated at the centre of the cavity, and that only its effective fields, such as the gravitational and electromagnetic fields, are distributed through space. However, this is only a mathematical approximation. In reality, there is no such thing as a mass concentrated at the centre; rather, only a cavity remains in the Ramionic structure of spacetime, and it is the energy distributed through space itself that produces gravitational and electromagnetic effects.

In this framework, gravity and electromagnetism are not defined as forces independent of energy, but appear as structures or behaviours superimposed upon the linear and rotational components of energy and distributed through space together with them.

For simpler modelling, the effective energy may be considered as a radial distribution on the surface of the central cavity. This distribution should not be assumed to be volumetric, because a volumetric description would imply that energy and a spacetime structure also exist inside the cavity, whereas in this model the central cavity is devoid of Ramions. Therefore, the most suitable approximation is to consider the energy distribution as a surface distribution.

Nevertheless, the single-centre model cannot fully explain torque equilibrium and the structure of the electric charge of particles. Therefore, the more complete model is presented on the basis of the “twelve-wing” structure. In this description, the total energy of the particle is distributed over twelve hypothetical spheres whose radius is of the same order as the radius of the central cavity. These spheres surround the cavity, and each carries part of the linear and rotational energy of the system.

The distribution of rotational or electrical energy over the surface of these wings is modelled cosinusoidally. The reason for this choice is that, within this framework, electric charge represents moment or torque, and a torque distribution is intrinsically maximal near the poles and minimal in the equatorial region. Therefore, the electric charge density may be considered as a function proportional to cos(θ), such that it has a maximum positive value near the north pole, is zero at the equator, and has a maximum negative value at the south pole. As a result, both in the single-Ramion model and in the wing model, the distribution of electric charge has a cosinusoidal nature.

By contrast, because of its pressure-like nature, the distribution of gravitational energy is considered to be uniform over the surface and, unlike electric charge, has no cosinusoidal dependence.

In this model, the distribution of rotational energy may not be completely symmetric, and as a result the particle may have a net positive or negative charge. If the particle is uncharged, the twelve wings are organised as symmetric pairs with opposite directions of rotation, and the total charge observed from outside will be zero. In other words, six wings have a direction of rotation corresponding to positive charge, and six wings have the opposite direction. In charged particles, however, this complete symmetry is broken, and the distribution of rotational energy appears asymmetrically.

Within this framework, the electric charge of a particle means the existence of a larger share of rotational energy compared with the symmetric state. This increase in rotational energy appears as electric potential and reduces the effective rest mass of the particle. Therefore, in mathematical modelling, this share is treated as a negative energy or negative mass. This does not, of course, mean that negative mass or negative energy really exists; it is merely a mathematical method for representing the contribution of electric potential to the reduction of the effective mass of the particle. The distribution of this contribution must also have a cosinusoidal nature.

If a particle is stable, all of the wings constituting it must be capable of remaining in complete equilibrium of forces and torques. Force equilibrium is established through relativistic relations and the simultaneous change of energy and radius, such that as energy increases, the radius also changes proportionally in order to preserve stability conditions. But for torque equilibrium, opposite wings, namely wings whose line connecting their centres passes through the centre of mass, must have opposite directions of rotation so that they cancel one another’s torque. Only in this way can the particle structure reach a stable state.

In the twelve-wing model, every two opposite wings lying on a common axis must be able to cancel one another's torque completely. From the viewpoint of an external observer, the directions of rotation of these two wings must be opposite in order for torque equilibrium to be established. However, if each wing is observed from the opposite side, its electric charge sign appears the same as that of the opposite wing. As a result, both wings on one axis have electrical contributions with the same sign.

If we denote the total charge of the particle by Q, then in the symmetric model, the contribution of each wing is Q/12, and the contribution of each axis is Q/6. Now, if one of the axes has a sign opposite to the other five axes, the effect of that axis is cancelled by one of the axes with the same sign as the others, and ultimately four axes with the same sign remain; therefore, the net charge of the particle becomes ±2Q/3. Similarly, if two axes have a sign opposite to the other four axes, only two axes with the same sign remain, and the net charge becomes ±Q/3.

Consequently, in this model, the condition of stability and torque equilibrium leads to the quantisation of electric charge, and the net charge of particles, relative to the full charge of their own family, can only take one of these seven values:

$0, \pm\frac{1}{3}, \pm\frac{2}{3}, \pm 1$

Theorem 26: Wing Equations and Quantum Coefficients

The energy equations for each wing are the same as those previously written for a Ramion and for the reference Ramions, $\mathring{E}_e$, namely the lowest-energy Ramions in the universe, with the difference that the quantum coefficient η^2 is multiplied by K_{w} and G_{w}.

(26.1) $\mathring{E}_{w} = \mathring{m}_{w} \,.\, \mathring{c}_{w}^2 = I_{w} \,.\, \omega^2 = 2\,\hat{E}_{w} = 2\,\check{E}_{w} = \frac{6}{5}\, G_{w} \,.\, \eta^2 \,.\, \mathring{m}_{w}^2 / r_{w} = 2 \,.\, K_{w} \,.\, \eta^2 \,.\, q_{w}^2 / r_{w}$

The wing model is an effective model for describing the propagation of energy through space. In this model, instead of the energy itself moving from the centre of mass throughout space while simultaneously carrying gravity and electromagnetism with it, it is assumed that, because of radial symmetry, the energy equivalently remains at the centre, while the gravitational and electromagnetic effects propagate as effective fields at the speed of light. In the more fundamental description, however, it is the energy itself that moves through space at the speed of light.

On this basis, if, for example, the Sun were destroyed, its gravitational and electromagnetic effects would not disappear immediately. Rather, the energy distributed through space would have to rearrange itself at the speed of light and return towards the structure of the Sun, so that the Ramions that had previously collapsed and whose energy had been scattered could be formed again. This process is one form of matter–energy conversion in the Ramionic model.

Each wing consists of a very large number of Ramions. From the viewpoint of observers within our universe, the exchange of energy among Ramions appears continuous. This continuity has two possible interpretations. Either the components of energy are truly continuous, in which case the components of energy, mass, and charge are fundamental differentials; or each Ramion is itself an independent universe, and its internal components also have a structure similar to that of our universe, but the number of those components is so large that discrete and continuous behaviour produce practically the same result in calculations.

From the Ramionic viewpoint, the second possibility is more probable: that is, each Ramion may itself be an independent universe, and our universe may likewise be a Ramion in another universe. In that case, two fundamental questions arise:

(2) Can the chain of universes and Ramions be infinite?

(3) Can this chain be circular and return to itself?

In this model, both possibilities are considered plausible. This does not conflict with the first theorem of Ramionics, because that theorem declared only logical circularity and logical infinite regress to be invalid, not physical circularity and regress dependent upon space and time. For example, in logic one cannot simultaneously assume:

(4) $A > B$

(4) ; $B > A$

But in space and time, concepts such as being ahead or being earlier may acquire different meanings in closed, curved, turbulent structures, or even before the full formation of space and time. Therefore, the possibility of circularity or regress in the structure of Ramionic universes is not physically ruled out.

In the wing model, because the wing is made of a countable number of Ramions, its energy must be calculated discretely. If N Ramions with charge q are arranged on a spherical surface of radius r, the first Ramion requires no energy to be placed on the surface, because it carries its initial energy with it. Therefore, the required energy arises only from the interactions of the subsequent Ramions, and instead of continuous integration, a discrete sum must be used:

(5) $\sum_{n=0}^{N-1} K \,.\, n \,.\, q \,.\, q \,/\, r$

If this sum is calculated, the result is:

(6) $E = K \,.\, N \,.\, (N - 1) \,.\, q^2 / r$

whereas the continuous or integral model gives the following result:

(7) $E = K \,.\, N^2 \,.\, q^2 / r$

Therefore, the ratio of the discrete model to the continuous model is:

(8) $\eta^2 = 1 - 1/N$

and consequently:

(9) $\eta = \sqrt{(1 - 1/N)}$

This coefficient follows directly from the conservation of energy. If the contribution of the first Ramion, which carries its own initial energy, is not removed, the total energy will be overestimated. Therefore, the real energy of the system is smaller than that of the integral model by the factor η^2.

For example, the fine-structure constant of the reference Ramion is defined as follows:

(10) $\alpha_s = K_s \,.\, q_s^2 / (\hbar_s \,.\, \mathring{c}_s)$

If N Ramions are placed on the surface of a wing, the total charge and total mass both increase in proportion to N, and in order to preserve force equilibrium, the radius also grows in proportion to N. Consequently, the continuous contribution of energy will be proportional to N^2. But in the discrete model, the real energy is:

(11) $E = K \,.\, N^2 \,.\, (1 - 1/N) \,.\, q^2 / r$

Thus, in relations where energy appears in the denominator, such as the fine-structure constant, the same coefficient appears in the denominator:

(12) $\alpha\mathcal{w} = \alpha_s / (1 - 1/N)$

That is:

(13) $\alpha\mathcal{w} = \alpha_s / \eta^2$

To clarify the role of the coefficient η, the distinction between two cases must be separated. In the standard Ramionic case, when both the constant K or G and q or m appear in a relation, the discrete counting coefficient is applied to the interaction constant, not to the charge or mass itself. Therefore, if the number of Ramions constituting the wing is N, the total mass and charge grow in proportion to N, but the effective interaction constants are redefined as follows:

(14) $K\mathcal{w} = K_s / \eta^2$

(15) $G\mathcal{w} = G_s / \eta^2$

where:

(16) $\eta^2 = 1 - 1/N$

Thus, in the standard case, the total charge of the wing is taken as:

(17) $q_{\mathcal{w}} = N \cdot q_s$

and the effect of the discreteness of the arrangement is placed on $K_{\mathcal{w}}$, rather than on $q_{\mathcal{w}}$. The reason for this choice is that, in many equations, K and q appear simultaneously, and the cleanest method is to preserve the real growth of charge with N and introduce the quantum correction of the arrangement into the interaction constant.

However, if the aim is to calculate energy from the constants G or K, the relation is reversed, and the energy must be multiplied by η^2. Therefore, depending on whether the unknown is energy or the interaction constant, η^2 may appear in the numerator or in the denominator.

If, in an equation, K or G has already been eliminated and is no longer explicitly present in the relation, then the discreteness correction can no longer be placed on K or G. In that case, the effect of the same coefficient must be introduced into q or m itself. Therefore, if K is not present in the equation, the effective definition of the wing charge must be written as follows:

(18) $q_{\mathcal{w}} = N \cdot q_s / \eta$

because in that case:

(19) $q_{\mathcal{w}}^2 = N^2 \cdot q_s^2 / \eta^2$

This relation is used only when $K_{\mathcal{w}}$ has not been separately corrected by the factor $1/\eta^2$. In other words, the same correction must not be introduced twice. Either the correction is applied to K and G, or, if K and G have been eliminated from the equation, the same effect is transferred to the effective q or m.

To generalise this structure to several wings, the coefficient η is defined with a subscript:

(20) $\eta_n = \sqrt{(1 - 1/(n \cdot N))}$

where n is the number of wings or sections participating in the interaction. Therefore, η without a subscript is the same as η_1:

(21) $\eta = \eta_1$

Thus, in calculations involving six wings or twelve wings, η_6 and η_{12} are used respectively. This is particularly important in calculations related to electric charge, because the sixfold and twelvefold symmetries of the wings enter the electrical structure of the particle.

In the mutual case, or interaction between two different families, the whole correction cannot be taken from a single family. In this case, each family contributes its own η. Thus, for two families 1 and 2, we have:

(22) $K_{(mutual)} = K_s / (\eta_1 . \eta_2)$

(23) $G_{(mutual)} = G_s / (\eta_1 . \eta_2)$

and if K or G has been eliminated from the relation, the corresponding effect appears on the effective charge or mass of each family as follows:

(24) $q_1 w = N_1 . q_{1s} / \eta_1$

(25) $q_2 w = N_2 . q_{2s} / \eta_2$

Therefore, in the mutual case, the total correction factor is formed from the product of η for the two families, not from η^2 for one family. This point is important because, in Ramionics, the electric charge of a particle is related to its mass and family and is not necessarily assumed to be equal to the electron charge for all families.

For the electron family, the value of N is not obtained by fitting $\alpha_{(EX)}$, but is extracted directly from the geometry of the three-dimensional universe. Then this same geometric value, independently of experimental data, appears in the relation for α and reproduces the experimental value.

The Ramionic relation for the fine-structure constant is:

(26) $\alpha = \beta / (40 . \pi . (1 - 1/N))$

For the electron family:

(27) N = 36390

and using:

(28) β = 0.91698716849356 77

the following value is obtained:

(29) $\alpha^{-1} = 137.035999207833$

whereas the experimental value is:

(30) $\alpha_{(EX)}{}^{-1} = 137.035999177$ (+- 0.000000021)

Therefore:

(31) Δ = +1.468251 σ

If N changes by even one unit, the error becomes larger:

(32) N = 36389

(32) ; Δ = -3.459800 σ

(33) N = 36391

(33) ; $\Delta = +6.396030\ \sigma$

Therefore, the value:

(26.34) $N = 36390$

is the point at which the Ramionic geometric model is minimised against the experimental value of α. What matters is that this value is extracted from geometry, not from a direct fit to $\alpha_{(EX)}$.

Theorem 27: Potential Energy Calculations for Related Particle Families

Consider a fully charged particle such as the electron, **e**, and suppose we wish to calculate the potential energy required to create this fully charged state. In other words, we seek to determine how much energy is required to transform the initial neutral configuration, whose wings alternate between positive and negative, into a configuration in which all outward charge orientations have the same sign.

In this model, producing a fully charged particle requires six positive wings—those whose positive pole points outward and negative pole inward—to rotate by **180°**. Clearly, such a rotation requires energy.

This energy may be calculated either by the electrodynamics of the rotational motion or by purely electrostatic methods. The simplest approximation is to define the zero-potential surface as a sphere of radius **2r** passing through the centers of the wings.

On this sphere of radius **2r**, twelve hemispheres with identical polarity are arranged. Since each wing consists of two charged hemispheres, the effective total charge becomes six times the charge of one wing. Therefore, according to the electrostatic potential relation,

(27.1) $P \propto kq^2 / r$

we obtain

(2) $P \propto 6^2 / 2^2$

and therefore

(3) $P \propto 36 / 4$

(4) $P \propto 9$

Hence, the energy required to generate a fully charged particle is equivalent to **nine times** the electrical energy of a single wing.

On the other hand, the total energy of the neutral particle equals **24** times the energy of one wing, since one-half of the total energy is rotational and the other half is gravitational. Therefore,

(5) $E_0 = 24N \,.\, E_s$

The fraction of the total energy consumed in producing the full charge is therefore

(6) 9 / 24

Thus, **9/24** of the total energy of the neutral particle is consumed in rotating the six wings and producing the net electric charge.

Furthermore, since the internal electrical energy of the structure already accounts for **12/24** of the total energy, part of the gravitational energy is converted into additional electrical potential energy. Consequently, the normalized potential of the charged particle relative to the neutral particle of the same family is

(7) $P_{30} = P_3 / E_0 = 12 + 9 \,.\, \eta^2$

where

(8) $\eta = \sqrt{(1 - 1 / N)}$

The neutral member of each particle family is called the **Narbon**, denoted by **y**. The name *Narbon* is derived from **Neutral Baryon**. Since it possesses no additional electric potential, its energy is exactly

(9) $E_0 = 24N \,.\, E_s$

For a fully charged particle such as the electron **e** or the positron **ẽ**, the remaining rest energy relative to the Narbon is

(10) $E_{30} = E_3 / E_0 = (24 - P_{30}) / 24$

For sufficiently large **N**, η approaches unity, yielding

(11) $E_{30} = 3 / 24$

Therefore, the electron possesses only **1/8** of the Narbon energy.

The same calculation may now be extended to partially charged particles.

If

(12) $x = 1$

represents particles with charge **±⅓**, and

(13) $x = 2$

represents particles with charge **±⅔**, then

(14) $P_{x0} = P_x / E_0$

(15) $P_{x0} = 12 \,.\, (x / 3) + 9 \,.\, \eta^2 \,.\, (x / 3)^2$

The remaining normalized energy becomes

(16) $E_{x0} = E_x / E_0$

(17) $E_{x0} = (24 - P_{x0}) / 24$

(18) $E_{x0} = (24 - 12 . (x / 3) + 9 . \eta^2 . (x / 3)^2) / 24$

For $\eta \approx 1$,

(19) $E_{30} = 3 / 24$

(20) $E_{20} = 14 / 24$

(21) $E_{10} = 19 / 24$

Therefore, the three principal energy levels of this family are

(22) $E_m = 12 / 24$

(23) $E_1 = 19 / 24$

(24) $E_3 = 3 / 24$

These results correspond exactly to the energy balance associated with the charge balance and the quark multiplicity derived in the previous chapter.

Total Packet Energy Calculation

We now examine the normalized average energy of different particle generations.

If the population of each energy state is defined as

(25) $N_m = 2^{p-1} - 1$

(26) $N_1 = 2^{p-2} + 1$

(27) $N_3 = 2^{p-2} - 1$

then the normalized average energy is given by

(28) $k = (N_m . E_m + N_1 . E_1 + N_3 . E_3) / (2^p - 1)$

or, equivalently,

(29) $k = ((2^{p-1} - 1) . (12 / 24) + (2^{p-2} + 1) . (19 / 24) + (2^{p-2} - 1) . (3 / 24)) / (2^p - 1)$

The corresponding numerical values are

(30) p = 3 ; k = 0.5714285714

(31) p = 4 ; k = 0.5222222222

(32) p = 5 ; k = 0.5

(33) p = 6 ; k = 0.4894179894

(34) p = 7 ; k = 0.4842519685

(35) p = 8 ; k = 0.4816993464

(36) p = 9 ; k = 0.4804305284

(37) p = 10 ; k = 0.4797979798

Therefore, for

(38) p = 5

we obtain

(39) k = 1 / 2

For large values of **p**, the limiting value becomes

(40) Lim {p → ∞} {k} = 23 / 48

(27.41) 23 / 48 = 0.4791666667

This result shows that the average structural energy naturally oscillates around **1/2**, reaching exact symmetry at **p = 5**.

Theorem 28: Factors of the Electron Genetic Code

In this section, the process of converting energy into matter, namely layered, geometric, and numerical particles, is examined. The aim is to show how the explosion of Ramions, the formation of a spherical cavity, the stopping of collapse at strong layers, the growth of particles based on binary combinations, the emergence of prime numbers and Mersenne numbers, and ultimately the genetic code of particles, lead to a coherent picture of the production of matter.

First, the fundamental difference between the conversion of energy into matter and the conversion of matter into energy must be clarified. Contrary to the common view, the conversion of energy into matter is accompanied by the explosion of Ramions. That is, in a region of the FCC network, Ramions are shattered, and their energy, according to the principle of energy conservation, is distributed through space. By contrast, the conversion of matter into energy is accompanied by collapse; that is, the distributed energy must return to the central cavity or central black hole of the body and gather there.

The region whose Ramions are shattered is spherical, because the sphere is the most complete and most symmetric geometric form. A sphere has the greatest volume-to-surface ratio and, in this respect, is the best structure for containing, concentrating, or discharging energy. On the other hand, if the same structure is considered as a cavity or absence of energy, that is, the presence of negative energy neutralising positive energy, then the spherical form is again the most stable state, because it has the fewest corners, the fewest edges, the least stress and pressure, and the least geometric information. Therefore, the spherical cavity carries the least geometric entropy, and just as it is the best form for an energy container, it is also the most natural form for a cavity empty of energy. That is, it is the best form for containing both positive and negative energy, although the latter is, of course, virtual and computational rather than real.

In other words, in the Ramionic process of converting energy into matter, FCC layers cannot disappear fractionally. Either an entire layer remains, or an entire layer collapses. Therefore, the cavity created after the departure of energy has a spherical shell. This shell is the resistant layer that prevents the continuation of collapse and forms the stable boundary of the system.

Now we must see what numerical property this resistant layer has.

If the layer number doubles, length doubles, surface area quadruples, and volume increases eightfold. Therefore, binary combinations are created in length, fourfold combinations on the surface, and eightfold combinations in volume. In fact, the energy of Ramions combines in pairs along length, in fours on the surface, and in eights in volume, producing temporary particles. To produce particles means the exit of energy from the central cavity, which is a natural reactor for matter–energy exchange. Figuratively, this means that in their empty place, their positive torque and force are injected with a negative coefficient. Now these hypothetical 2×2×2 cubes have a better balance of torque, and therefore of force, than any other cuboid, because the information, namely entropy, and energy of a cube are lower than those of a cuboid. At the same time, they are more balanced than 3×3×3 cubes because of evenness and symmetry.

In favouring the similarity ratio of 2, one must also point to the probability of binary combination compared with ternary combination. Fundamentally, the probability of the combination of n particles is greater than that of n+1 particles, because the probability of closer concentration and more suitable orientation is higher for them.

Therefore, the numbers of strong layers are integer powers of 2.

Of course, this strength and stability are relative; that is, they are a local extremum within the overall trend in which a larger layer is more stable because it is closer to a sphere. Naturally, layer one, which is in any case an ideal sphere, has its own separate status. In summary, layers whose numbers are integer powers of 2 are in fact better analogues of layer 1, which is a perfect sphere, while larger layers are better analogues of layer number infinity, which is also a perfect sphere.

So far, my discussion has concerned torque and torque force, namely rotational energy, in addition to linear force. Now I focus fully on linear energy and on the pressure of the central cavity, namely the natural reactor of matter–energy exchange.

At each stage, part of the energy exits the cavity as matter, that is, as produced particles, and part of it remains. In these calculations, we have no need at all for the energy E_s in joules; that is, we take E_s as the unit of energy.

The remaining energy in this unit is the number of Ramions whose energy has still remained in the cavity up to each stage. A stage also means the number of the layer that is the shell of the cavity, meaning that the layers before it have exploded.

(28.1) $E_{(Residual)} = E_{res} = T(n - 1) - \sum m$

The whole process probably began from the start with an influx of external energy $E_{(External)} = E_{ex}$ through gravitational, electromagnetic, neutrino, or even baryonic waves and radiations. This influx may have increased the energy of even a single Ramion so much that this energy bubble exploded and the whole process began.

Of course, another factor may be a rupture of the FCC network, especially during the earliest stages of cosmic inflation. In any case, we also consider the parameter E_{ex} and calculate the remaining energy in the cavity:

(2) $E_{rex} = E_{res} + E_{ex}$

In terms of the number of Ramions:

(3) $N_{rex} = N_{res} + N_{ex}$

(4) N_{res} = Residual Ramions Number

In the relations above, we assume the energy E_{ex} to be equivalent to $N_{ex} . E_s$, so N_{ex} need not be an integer.

The energy density and pressure of this remaining energy on the layer are:

(5) $\rho_{rex} = E_{rex}$ / Hole volume

(6) $P_{rex} = \rho_{rex}/2$

For simplicity of calculation and as a criterion of comparison, we take the unit of volume to be the same as the volume share of the Ramion E_s, namely V_s / φ:

(7) $P_{rex} = N_{rex} / (2T(n - 1))$

(8) $P_{rex} = (N_{res} + N_{ex}) / (2T(n - 1))$

Therefore, in addition to being an integer power of 2, the second factor in a layer's ability to create an interruption or a complete halt in the process is this P_{rex}. The smaller it is, the greater the layer's ability to stop the process; this means either that the layer number is larger, or that fewer Ramions remain.

The continuation of the calculations of the genetic code of particles is based only on this base-2 structure for the stable layer and on the kissing number for dimension 3:

(9) Kissing number(3) = $k_3 = 12$

The number of Ramions in layer n:

(10) $L(n) = (12 - 2) . n^2 + 2$, but $L(0) = 1$

(11) $L(n) = 10 . n^2 + 2$, but $L(0) = 1$

The total number of Ramions from layer 0 to n:

(12) $T(n) = \sum_0^n L(n)$

(13) $T(n) = (10 . n^3 + 15 . n^2 + 11 . n)/_3 + 1$

The following table shows L(n) and T(n) for the three-dimensional universe:

(14) n, L(n), T(n)

0, 1, 1

1, 12, 13

2, 42, 55

3, 92, 147

4, 162, 309

5, 252, 561

6, 362, 923

7, 492, 1415

15, 2252, 12431

31, 9612, 104223

63, 39692, 853567

127, 161292, 6909055

255, 650252, 55597311

511, 2611212, 446083583

1023, 10465292, 3573900287

The inverse function of T, namely finding the layer number that supplies a specified number of Ramions, or released energy, is based on the first integer greater than or equal to that value:

(15) IT(n) = ceil(inverse function of T(n))

The number of Ramions released for a demand of n Ramions:

(16) TIT(n) = T(IT(n))

Excess energy:

(17) EIT(n) = TIT(n) − n

Percentage of excess energy:

(18) EITP(n) = EIT(n) / TIT(n) . 100

The strong layer number s is an integer power of 2:

(19) Strong layer number = 2^s

The energy released up to the layer before strong layer number s, in units of E_s:

(20) E(s) = T(2^s − 1)

The following table shows the ratio of the energy released at each strong layer to that of the preceding strong layer, which very quickly converges from above to 8.

(21) s, Ts(s), Ts(s) / Ts(s − 1)

0, 1, -

1, 13, 13.000000000000

2, 147, 11.307692307692

3, 1415, 9.625850340136

4, 12431, 8.785159010600

5, 104223, 8.384120344301

6, 853567, 8.189814148508

7, 6909055, 8.094332372268

8, 55597311, 8.047021047017

9, 446083583, 8.023474066938

10, 3573900287, 8.011727898536

For lower energy, lower entropy, greater order, and greater symmetry, the particles produced at each stage of the process are the largest and most similar possible particles. We call this statement, in short, “largest–most-similar”.

At each increase of s, the available energy becomes more than 8 times larger. Here two cases occur.

If E_{ex} or the rupture of the FCC network is large, simple interruptions do not occur. Rather, the process advances very far until either the chaos and rupture in the surrounding space calm down, or a layer, probably one whose number is a power of 2, completely stops it. As a result, a superheavy particle is formed, which may be found in some types of ultradense stars, and primordial black holes are also formed; whereas black holes of the second type, namely secondary black holes, are formed from the joining of already-formed matter.

But if the energy influx is not very intense, then at each strong layer, or along the path from the preceding strong layer, there is an interruption until the particles undergo binary combination twice; that is, their energy or mass becomes 4 times larger. In other words, with each increase of s, the mass of particles becomes 4 times larger and their number becomes approximately 2 times larger.

Why is it less likely that with an increase of s the number of particles becomes 4 times larger and the energy or mass of the particles becomes 2 times larger? Because along one unit increase of s, that is, an eightfold increase in energy, there are two opportunities for particles to pair. However:

Theorem of Prime-Number Orientation:

The most probable particle packets contain a Mersenne-prime number of the heaviest and most similar particles, because the direction of entropy reduction requires the number of particles at each stage to be the largest possible prime number, meaning that infinity is the most symmetric non-zero number. On the other hand, the pressure of the network requires the heaviest particles to be formed, and the nature of energy tries to convert the greatest possible amount of energy into matter and escape. As a result, the number of particles stops at the greatest number smaller than a power of 2, namely the number of particles:

(22) $N_p = 2^p - 1$

For this reason, we say that under normal conditions, with each unit increase of s, the number of particles approximately doubles. The precise statement is this:

Theorem of the Factor 4:

Under normal conditions, with each 1-unit increase in the power of the strong layer, namely s, the power of the number of particles, p, also increases by 1 unit, and the factor 4 appears in the particle genetic code, namely N_0. In this statement, the shell number is the strong layer number, namely 2^s; the number of exploded layers is $2^s - 1$; and the number of particles or packet size is $N_p = 2^p - 1$.

So far, we have seen that the number of particles is a prime number of the form $2^p - 1$. This means a Mersenne prime, or, in short, a Mersenne number. It is interesting that the symbol p for a Mersenne number in mathematics comes from prime number, but in Ramionics it is also an abbreviation of packet.

Now suppose $N_p = 2^p - 1$ is not prime. In that case, particles, like a natural calculator, detect this and begin to combine until their number becomes prime. Clearly, they begin to combine from the smallest factors of N_p and continue until only the greatest factor remains from this number, and that too only to the first power. The remaining factors are collectively called the general coefficient. Therefore, relative to the expected one-unit increase in p, the number of particles or p retreats by one or more units. For example, when encountering the barrier of the factor 3 in the number $N_p = 2^4 - 1 = 15$, the particles begin with the factor 3 and combine.

The general coefficient 3, 5, or 7 means a one-unit retreat from the expected p+1. If the general combination coefficient were a number greater than 8 and less than or equal to 16, a two-unit retreat would occur, and so on.

Another point is that, in the case of the factor 3, since it is less than half of 8, after the combination of 3, one further binary combination is also possible. Therefore:

Theorem of the Factor 6:

When the factor 3 is encountered, the factor 6 appears in the genetic code without increasing p, namely with a one-unit retreat.

Of course, 6 is only a naming convention, and the theorem was explained in the general case, although up to the electron, muon, and tau families, no factor other than 3 occurs.

The number of exploded or released Ramions comes from the formula T(n), and the number of particles comes from N_p. Therefore, the energy of some number of Ramions always remains in the cavity, which we denoted by N_{rem} in the pressure calculation. This same parameter N_{rem} increases greatly whenever Theorem 6 applies, because the energy has increased 8 times, the number of particles has remained constant, and the energy or mass of each has increased 6 times; therefore, one quarter of the energy remains unassigned.

Theorem of the Leftover Factor 2:

In any case, during the process, whenever N_{rem} is so large that particles can double their energy or mass, a factor 2 appears in the genetic code of the particle.

The leftover-2, 4, and 6 factors described above are the same for both the baryon packet and the neutrino packet. But from the point at which particles become charged, the paths of the baryon packet and the neutrino packet separate. That is, their genetic limit is identical up to a certain point and then becomes different.

Theorem of the Electrical Factor 2:

Baryons that have not yet become charged, either really or virtually for calculation, are called naryons y. Likewise, if the electric charge of a baryon is neutralised by any method, we call it a naryon. Thus, a naryon is like a neutrino, but belongs to the same family, is its twin, and has a geometry similar to several baryons and leptons, all of which are called a family. For example, the electron family e includes the up quark u and down quark d, their antiparticles ẽ, ũ, d̃, and the naryon y, which is the neutral state of all six particles.

If the $2^p - 1$ produced naryons become baryons, that is, charged particles, then to preserve electric-charge balance:

(23) $(2^{p-1} + 1) \,.\, (+\tfrac{2}{3}) + (2^{p-2} + 1) \,.\, (-\tfrac{1}{3}) + (2^{p-2} - 1) \,.\, (-\tfrac{3}{3}) = 0$

In number theory, equations whose correct solutions must be integers are called Diophantine equations.

Now we solve the problem of how many ways $2^p - 1$ naryons become charged, given that we have already proved that the stable charges are 0, ±1, ±⅓, ±⅔.

Quarks with charges ⅓ and ⅔ are unstable because of asymmetry and form hadronic combinations, namely the proton and neutron, with charges +1 and 0. Of course, in the antimatter state their charges are −1 and 0.

(24) Proton = 2Up + 1Down

(25) Neutron = 1Up + 2Down

The naryon y and neutrinos v are their own antiparticles, while although the neutron n has zero electric charge, it is different in the antimatter state ñ because it is made of the antiparticles of the up quark ũ and down quark d̃.

We want to find all possible combinations of u, d, and e that have electric-charge balance.

Condition on the total number of particles:

(26) $N_u + N_d + N_e = 2^p - 1$

Condition of charge neutrality:

(27) $(+\tfrac{2}{3}) \,.\, N_u + (-\tfrac{1}{3}) \,.\, N_d + (-1) \,.\, N_e = 0$

Therefore:

(28) $2N_u - N_d - 3N_e = 0$

From the charge equation:

(29) $N_d = 2N_u - 3N_e$

Substitution into the number equation:

(30) $N_u + (2N_u - 3N_e) + N_e = 2^p - 1$

(31) $3N_u - 2N_e = 2^p - 1$

Thus:

(32) $N_u = (2^p - 1 + 2N_e)/3$

For N_u to be an integer, we must have:

(33) $2^p - 1 + 2N_e \equiv 0 \bmod 3$

Now:

(34) $2 \equiv -1 \bmod 3$

Thus:

(35) $2^p \equiv (-1)^p \bmod 3$

Therefore:

If p is odd:

(36) $2^p - 1 \equiv 1 \bmod 3$

and if p is even:

(37) $2^p - 1 \equiv 0 \bmod 3$

The main physical case in your model is that p is an odd prime. Therefore:

(38) $N_e \equiv 1 \bmod 3$

So:

(39) $N_e = 1 + 3k$

Now:

(40) $N_u = (2^p + 1)/3 + 2k$

and:

(41) $N_d = (2^{p+1} - 7)/3 - 5k$

Thus, the general solution is:

(42) $N_e = 1 + 3k$

(43) $N_u = (2^p + 1)/3 + 2k$

(44) $N_d = (2^{p+1} - 7)/3 - 5k$

where k must be such that:

(45) $N_e \geq 0$

(46) $N_u \geq 0$

(47) $N_d \geq 0$

At later stages, these may become N_e electron–proton pairs and N_n neutrons:

(48) $N_n = (2^p - 5)/3 - 4k$

For example, for p = 5, we have these solutions:

(49) k = 0, 11u + 19d + 1e

→ 9n + 1(p,e)

;k = 1, 13u + 14d + 4e

→ 5n + 4(p,e)

;k = 2, 15u + 9d + 7e

→ 1n + 7(p,e)

;k = 3, 17u + 4d + 10e

→ (−3)n + 10(p,e)

The electron is more symmetric than the up and down quarks and is therefore preferred. Consequently, the most probable form is the one with the largest number of electrons. However, the number of electrons being 10 has another problem: it cannot hadronise all quarks, whereas the hadron is preferred over the free quark because of symmetry. Thus, the most probable solution realised in nature for p = 5 is:

(50) 15Up + 9Down + 7Electron

After these baryons are born and hadronic combinations form, this produces seven electron–proton pairs and one neutron. This is the cause of the proton-to-neutron ratio on the cosmic scale.

The matter of the universe is approximately ¾ hydrogen, with one proton, and ¼ helium, with two protons and two neutrons. That is, the proton-to-neutron ratio of the universe is 7. Of course, about $\frac{2}{3}$ of the mass of Earth consists of oxygen and silicon, and $\frac{1}{3}$ of iron, and the proton-to-neutron ratios for these three elements are respectively $\frac{8}{8}$, $\frac{14}{14}$, and $\frac{26}{30}$. Thus, for the entire planet Earth, the proton-to-neutron ratio is about 0.91, and these have no effect on the cosmic ratio of 7.

Theorem 29: Calculation of the Electron Genetic Code

At s:0, we have a neutrino u_1, that is, the equivalent of one Ramion. This particle has zero total charge, but it has two charges $\pm q_r$ and therefore has polarity. A quantum of energy may be light in the particle state or in the wave state. The additional energy of each Ramion was previously explained through the Planck constant; it may be the distributed energy of this same u_1, or simply free wandering energy in space until it is absorbed into matter.

At s:1, the energy of 13 Ramions is released. If it exits the cavity, this is equivalent to one neutrino u_{12} and one additional product, namely a neutrino u_1 or a baryon b_1. Although this same neutrino u_{12} has zero total charge, from close range its wings are seen as 6 charges $+q_r$ and 6 charges $-q_r$. Up to this stage, s and p are both equal to one, and p has not yet fallen behind s. Relative to the previous stage, this stage has coefficient one. The genetic code up to this point is 1, because the genetic code shows the number of Ramions in one wing out of the 12 wings. To represent ordinary growth, namely the factor 4, which is equivalent to a one-degree simultaneous increase in s and p, we denote this 1 by 4^o.

At s:2, the energy of 147 Ramions is released, equivalent to packet p:2, namely 3 neutrinos u_{48}, with 15 Ramions of residual energy remaining. This is equivalent to one u_{12} and three u_1. The genetic code of the particles up to this point is:

(29.1) $GC = 4^o . 4$

At s:3, the energy of 1415 Ramions is released, equivalent to packet p:3, namely 7 neutrinos $4 . u_{48}$, that is, u_{192}. A residual energy of 71 Ramions remains, equivalent to 5 Ramions u_{12} and 11 Ramions u_1. In these early stages, the particles have not yet become charged, because becoming charged means halving the energy of each one and doubling their number, which contradicts the primality of the number of particles. On each wing, we have 16 Ramions:

(2) $GC = 4^o . 4 . 4$

At s:4, we finally encounter the Mersenne barrier because the number of particles reaches 15. The general coefficient is this same number 15, from which only one unit is removed from the power of its greatest prime factor; that is, the general coefficient is 3. Therefore, GC is multiplied by 6, and p retreats by one unit relative to s. This means regrouping and fattening the army of particles for the next attack. Suppose this retreat occurs twice. GC is multiplied by 6 twice. p remains at 3, while s reaches 5. This retreat is repeated until the energy required to be thrown towards the next Mersenne number, namely $2^5 = 31$, is provided. Therefore, two further jumps are needed: one to reach 4 and one to pass rapidly through it until reaching 5. This means two further units of increase in s together with an increase in p, namely the addition of 4 . 4 to GC:

(3) $GC = 4^0 . 4 . 4 . 6 . 6 . 4 . 4$

In these two retreats, each time ¼ of the total energy of that stage remains, which can create a leftover factor 2 along this path. On the other hand, along this path the particles also become charged, which creates an electrical factor 2 as well. I add these two factors 2 in the form 2 . 2 so that they are not seen as identical to 4 and 6.

(4) $GC = 4^0 . 4 . 4 . 6 . 6 . 4 . 4 . 2 . 2$

This is the genetic code of the electron, which, like other Ramionic calculations, has been written by philosophising through the self-evident principles of logic, number theory, geometry, and physics. This code contains five 4s, which means p:5 and the proton-to-neutron ratio in the universe:

(5) $N_p / N_n = 2^{p-2} - 1 = 7$

This code also contains a total of 7 numbers equal to 4 or greater than 4, which signifies strong layer $2^7 = 128$ as the terminator of the production process of the electron packet and, altogether, of 31 baryonic sisters and brothers. The 2 numbers greater than 6 mean two pulses beyond the main pulse in the womb of Mother Nature, offering her particles' life as matter to her children.

But Nature's magician's hat is always full of rabbits. These twin and sibling baryons, which in a kind of Ramionic evolution imposed their size upon their counterparts, still have their umbilical cord attached. To separate, each releases part of its share of energy in order to reach this energy for each wing:

(6) $N = \mathrm{ceil10}(\pi^2 / 10 . GC)$

Ceil10 means the smallest multiple of 10 that is equal to or greater than the input number.

(7) $N_e = \mathrm{ceil10}(\pi^2 / 10 . 4^5 . 6^2)$

(8) $N_e = \mathrm{ceil10}(\pi^2 / 10 . 36864)$

(9) $N_e = \mathrm{ceil10}(36383.3096641758)$

(10) $N_e = 36390$

(11) $E_{\beta\gamma} = 0.5000024377655099$

This value is indeed very close to ½.

In the potential formula:

(12) $P = 15 \cdot (12 \cdot \frac{2}{3} + \eta \cdot 9 \cdot (\frac{2}{3})^2) - 9 \cdot (12 \cdot \frac{1}{3} + \eta \cdot 9 \cdot (\frac{1}{3})^2) - 7 \cdot (12 + \eta \cdot 9)$

the three parentheses are respectively the potentials of the up quark u, the down quark d, and the electron e.

The total energy capacity of the packet is:

(13) $N_{(total)} = 31 \cdot 12 \cdot 36390$

(14) $N_{(total)} = 13537080$

The total energy released up to layer s:7 is:

(15) $E(7) = 6909055$

In the simple approximation:

(16) $E_{\beta\gamma} \approx \frac{1}{2}$

(17) $N_{(used,\frac{1}{2})} = 13537080 \cdot \frac{1}{2}$

(18) $N_{(used,\frac{1}{2})} = 6768540$

Thus:

(19) $N_{(rem,\frac{1}{2})} = 6909055 - 6768540$

(20) $N_{(rem,\frac{1}{2})} = 140515$

Now we perform the same calculation using the exact value:

(21) $E_{\beta\gamma} = 0.5000024377655099$

(22) $N_{(used,exact)} = 13537080 \cdot 0.5000024377655099$

(23) $N_{(used,exact)} = 6768573.002793882$

Thus:

(24) $N_{(rem,exact)} = 6909055 - 6768573.002793882$

(25) $N_{(rem,exact)} = 140481.9972061189$

The difference between the two cases is:

(26) $\Delta N_{(rem)} = 140515 - 140481.9972061189$

(29.27) $\Delta N_{(rem)} = 33.00279388111085$

That is, the exact value of $E_{\beta\gamma}$ produces a difference of only about 33 Ramions relative to the perfect ½ approximation. This shows that the coefficient ½ in this model is a very accurate approximation of the real behaviour of the baryonic packet.

Theorem 31: Calculation of the Gyromagnetic Factor

The Twelve-Wing Potential with a Cosinusoidal Distribution of Electric Charge

In the twelve-wing model, a structure consisting of 12 equal-sized spheres of radius r is considered. Their centres lie on a sphere of radius 2r, and each sphere is tangent to its neighbouring spheres. Each sphere represents one wing.

On the surface of each wing, the electric charge is distributed cosinusoidally, such that the inner hemisphere has negative charge and the outer hemisphere has positive charge, or all signs may be reversed. Therefore, each wing contains two charge regions in total: an outer charge equal to +Q and an inner charge equal to −Q.

Surface Charge Density

If the charge distribution is of the same sign and uniform, then, considering the surface area of the sphere:

(31.1) $\sigma = Q/(4\pi r^2)$

But in the case of ±Q with uniform charge distribution, considering the surface area of each hemisphere:

(2) $\sigma_{(\text{Uniform})} = \sigma_{u\oint} = \pm Q/(2\pi r^2)$

In the cosinusoidal case for a Ramion or wing:

(3) $\sigma(\theta) = Q/(2\pi r^2).2\cos(\theta)$

The relation above in fact shows the effective value of $\cos(\theta)$ to be 1/2. The explanation is that the coefficient of the relation is obtained by integrating over the surface of one hemisphere; for example, the charge of the outer hemisphere is:

(4) $Q_+ = \int \{\varphi = 0 \text{ to } 2\pi\}\{\int \{\theta = 0 \text{ to } \pi/2\}\{\sigma(\theta)dA\}\}$

The surface element on the sphere is:

(5) $dA = r^2\sin(\theta)d\theta d\varphi$

The angle $\theta = 0$ denotes the north pole of the Ramion or wing, which in this problem is the farthest point from the centre of the body, and $\theta = \pi$ denotes the south pole, which here is the nearest point of each sphere to the centre of the body.

Structural Potential Energy

The exact integral of electrostatic potential energy is:

(6) $U = ½\iint K.dq_1dq_2/|\vec{r}_1 - \vec{r}_2|$

For a spherical shell with uniform charge Q:

(7) $U = KQ^2/r$

For ±Q, as a replacement for rotational energy and torque:

(8) $U_{(\pm Q)} = 2(½)KQ^2/r$

For a spherical shell consisting of two hemispheres with charges +Q and −Q:

(9) $U_{u\oiint} = 8/(3\pi).KQ^2/r \approx 0.848826363156775.KQ^2/r$

(10) $U_{cos} = 8/9.KQ^2/r \approx 0.888888888888889.KQ^2/r$

The explanation is that, in the cosinusoidal distribution, charges are more concentrated near the poles. Therefore, the average distance between like charges becomes smaller, and the structural repulsive energy increases.

First Approximation: Numerical Calculations

The energy must be calculated directly for the real surface of the 12 spheres.

Surface density of each wing:

(11) $\sigma(\theta) = Q/(\pi r^2).\cos(\theta)$

Charge element:

(12) $dq = \sigma(\theta)dA$

Surface element:

(13) $dA = r^2\sin(\theta)d\theta d\varphi$

(14) $dq = Q/\pi.\cos(\theta)\sin(\theta)d\theta d\varphi$

Now the exact surface energy is:

(15) $U = ½\Sigma_i\Sigma_j\iint K.dq_idq_j/|\vec{r}_i - \vec{r}_j|$

Second Approximation: Torque Calculations

Torque calculations, which are the basis for the definition of charge and electric force.

Third Approximation: Radial Integral

For each point on the surface of a wing, we denote its distance from the centre of the whole body by x. The geometry of the spheres gives the following relation:

(16) $x^2 = 5r^2 + 4r^2\cos(\theta)$

Thus:

(17) $\cos(\theta) = (x^2 - 5r^2)/(4r^2)$

Now the differential charge on one wing is:

(18) $dq = \sigma dA$

and since:

(19) $dA = 2\pi r^2 \sin(\theta)d\theta$

we have:

(20) $dq = 2Q\cos(\theta)\sin(\theta)d\theta$

Now, from the geometric relation:

(21) $2xdx = -4r^2\sin(\theta)d\theta$

(22) $\sin(\theta)d\theta = -xdx/(2r^2)$

Substituting into dq:

(23) $dq = -Qx\cos(\theta)dx/r^2$

and by substituting $\cos(\theta)$:

(24) $dq = Qx(5r^2 - x^2)dx/(4r^4)$

For 12 wings:

(25) $dq_{12} = 3Qx(5r^2 - x^2)dx/r^4$

Therefore, the total cumulative charge function up to radius x is:

(26) $Q_{-+}(x) = -\int \{r \text{ to } x\}\{3Qu(5r^2 - u^2)du/r^4\}$

The result of the integral is:

(27) $Q_{-+}(x) = 3Q/(4r^4).(x^4 - 10r^2x^2 + 9r^4)$

In the normalised case:

(28) $r = 1$

(29) $Q = 1$

we have:

(30) $Q_{-+}(x) = \frac{3}{4}.(x^4 - 10x^2 + 9)$

This function starts from zero at $x = r$, then decreases as the inner negative charges accumulate. At:

(31) $x = \sqrt{5}r$

it reaches its minimum, and after that, with the addition of the outer positive charges, it increases again until, at:

(32) $x = 3r$

it returns to zero.

The derivative of the function is:

(33) $Q'_{-+}(x) = 3Qx(5r^2 - x^2)/r^4$

and therefore:

(34) $Q'_{-+}(\sqrt{5}r) = 0$

The differential energy of the structure is defined as follows:

(35) $dU = K.Q_{-+}(x)dQ_{-+}/x$

and therefore:

(36) $U = \int \{r \text{ to } 3r\}\{K.Q_{-+}(x)dQ_{-+}/x\}$

By substituting $Q_{-+}(x)$ and $dQ_{-+}(x)$, the result of the radial integral becomes:

(37) $U = 20/7.KQ^2/r \approx 2.857142857142857.KQ^2/r$

The value above is the sum of the potential of the inner and outer half-shells together.

From the integral of the original cumulative function $Q_{-+}(x)$ over the interval:

(38) $r \le x \le \sqrt{5}r$

the potential energy of only the inner half-shells is:

(39) $U_{(Inner)} = 6.KQ^2/r$

From the cumulative function without considering the inner shells:

(40) $Q_+(x) = 12Q.(1 - (x^2 - 5r^2)^2/(16r^4))$

(41) $\sqrt{5}r \le x \le 3r$

the potential energy of the outer half-shells is:

(42) $U_{(Outer)} = 144/35.KQ^2/r \approx 4.114285714285714.KQ^2/r$

The values above collect charges only in terms of the radial distance x and do not calculate the real angular distribution over the surfaces of the spheres; therefore, they must be added to 12Ĕ𝓌.

Fourth Approximation: Dipole Approximation

In this model, because the distribution:

(43) $\sigma(\theta) \propto \cos(\theta)$

makes each wing act approximately like a dipole.

The dipole moment of each wing is:

(44) $p = 4Qr/3$

The self-energy of each wing from the surface integral is:

(45) $U_{(Self1)} = 8/9.KQ^2/r$

Thus, for 12 wings:

(46) $U_{(Self12)} = 32/3.KQ^2/r$

The mutual energy of the pairs is calculated using the exact formula for dipoles:

(47) $U_{ij} = K/d_{ij}^3.[\vec{p}_i.\vec{p}_j - 3(\vec{p}_i.\hat{n}_{ij})(\vec{p}_j.\hat{n}_{ij})]$

For the FCC geometry of the 12 wings, the sum over the 66 pairs becomes:

(48) $U_{(pair)} = (20/3 + \sqrt{2} + 22\sqrt{3}/9 + 1/3).KQ^2/r$

(49) $U_{(pair)} = (7 + \sqrt{2} + 22\sqrt{3}/9).KQ^2/r$

(50) $U = U_{(Self12)} + (7 + \sqrt{2} + 22\sqrt{3}/9).KQ^2/r$

; $U \approx 20.87708106651860.KQ^2/r$

Fifth Model: Exact Calculation of Charge Discreteness, the 12+9 Model

The four previous approximations still contain the inaccuracy of ignoring the discreteness of charge and the discreteness of spacetime geometry. This model, which calculates the potential based on Ramionic geometry, is more accurate.

When the 12 wings are placed in the FCC structure and six alternating wings are inverted, the surface of the central cavity is the zero-potential surface. To fully charge the particle, six electrical half-wings are needed, namely the equivalent of three wings of charge. Since the radius of the cavity is equal to the wing radius, 9 times the rotational energy of one wing is required:

(51) $U_9 \approx 9.$Ĕ𝓌

From another viewpoint, the spherical surface with radius:

(52) $R_0 = 2R\mathcal{w}$

plays the role of the zero-potential surface.

To charge this zero-potential surface, 12 charged hemispheres are required.

Each wing contains two charged hemispheres: +Q and −Q.

Therefore, compared with one wing, the number of effective hemispheres becomes 6 times larger:

(53) $Q_{e\mathcal{ff}} = 6Q$

and since the potential energy scales as:

(54) $U \propto KQ^2/R$

we have:

(55) $Q_{e\mathcal{ff}}^2 = 36Q^2$

and the radius has doubled, so the energy contribution related to wing orientation becomes:

(56) $U_{18} \approx 36/2\breve{E}\mathcal{w}$

But the value above must be halved so that only the half-shells outside the cavity or the black hole at the centre of mass are counted:

(57) $U_9 \approx 9.\breve{E}\mathcal{w}$

However, after obtaining this similar result by both methods, we must note that to neutralise the electric charge around the zero-potential surface, the base energy of the 12 wings themselves was also required:

(58) $U_{12} = 12\breve{E}\mathcal{w}$

Therefore, the total energy of the structure, for example for the electron e or positron ẽ, which has charge ±3/3, is:

(59) $U_3 \approx 12\breve{E}\mathcal{w} + 9\breve{E}\mathcal{w}$

; $U_3 \approx 21\breve{E}\mathcal{w}$

Since the rest energy of the similar and neutral particle, namely the naryon, is 12 times the total energy of the wing, that is, 24 times the rotational-electrical energy of the wing, or $24\breve{E}\mathcal{w}$, the remaining rest energy for the particle with full charge ±3/3, which we denote by the index 3, is:

(60) $E_3 \approx E_0.3/24$

The 0 denotes the similar particle with zero charge, which is called the naryon. This means Neutral Baryon, namely a baryon in the neutral state. It is a hypothetical or unstable particle used for simplicity of calculation.

(61) $E_{30} = E_3/E_0 \approx 3/24 = 1/8$

(62) $E_{03} = 1/E_{30} \approx 8$

(63) $U_{30} = U_3/E_0 \approx 21/24 = 7/8$

Based on the explanations above, for particles with partial charge, namely 1/3 and 2/3, the value U_9 is quadratic, but U_{12} is linear. Thus, for charges ±2/3, such as the up quark u:

(64) $U_2 \approx 12.(2/3).\check{E}w + 9.(2/3)^2.\check{E}w = 12.\check{E}w$

(65) $E_{20} = E_2/E_0 \approx 12/24 = 1/2$

(66) $U_{20} = U_2/E_0 \approx 12/24 = 1/2$

For charges ±1/3, such as the down quark d:

(67) $U_1 \approx 12.(1/3).\check{E}w + 9.(1/3)^2.\check{E}w = 5.\check{E}w$

(68) $E_{10} = E_1/E_0 \approx 19/24$

(69) $U_{10} = U_1/E_0 \approx 5/24$

The naryon particle itself:

(70) $U_0 = 0$; $E_0 = 12.N.E_s$

Since a complete packet of 31 members of the electron family, namely electron-like particles, is produced together:

(71) Packet = 15up + 9down + 7electron

(72) $E_{(packet)} \approx (15.12/24 + 9.19/24 + 7.3/24).E_0$

(73) $E_{(packet)} \approx 372/24.E_0 = 31/2.E_0$

That is, by becoming charged, the energy of each packet of particles is approximately halved. This is the reason for the same electrical factor 2 in the genetic code of the electron; that is, N̊ doubles in comparison.

Definition of the Gyromagnetic Factor

If a mass m with charge q rotates on a closed path with period T = 2π/ω, the equivalent electric current is:

(74) $I = q/T = q.\omega/(2\pi)$

Each rotating charge creates a magnetic dipole. If $\vec{A}$ is the area vector of the loop, the magnetic dipole moment, torque, and potential energy in a magnetic field are:

(75) $\vec{\mu} = I.\vec{A}$

(76) $\vec{\tau} = \vec{\mu} \times \vec{B}$

(77) $U = -\vec{\mu}.\vec{B}$

Each particle of charge q contributes to μ:

(78) $d\mu = (dq.\omega/(2\pi)).A = dq.\omega r^2/2$

Electrical momentum:

(79) $\mu = ½.\omega.\int r^2.dq$

Rotational momentum of mass:

(80) $J = I_m.\omega = \omega.\int r^2.dm$

The ratio of electrical rotational momentum to mass rotational momentum, or briefly electrical to mass rotational momentum, is:

(81) $\mu/J = (½.\omega.\int r^2.dq)/(\omega.\int r^2.dm)$

By simplifying the angular velocity:

(82) $\mu/J = [½\int r^2.dq]/(\int r^2.dm)$

From the relation between energy and momentum:

(83) $E = ½I\omega^2$

it follows that g is also the ratio of magnetic energy to mass rotation:

(84) $g = E_{r-c}/E_{r-m}$

To calculate g, we normalise the integrals in terms of the total charge and mass:

(85) $\int r^2.dq = q.r_{eff-c}^2$

(86) $\int r^2.dm = m.r_{eff-m}^2$

(87) $g = r_{eff-c}^2/r_{eff-m}^2$

(88) $\mu/J = g.(q/2)/m$

If we call the mean-square radius with respect to an axis the effective radius, then the gyromagnetic factor is exactly the ratio of the average effective electrical radius to the average effective mass radius.

In this way, calculating g becomes simple. For example, if mass and charge both have uniform volume density, or both have uniform surface density, or are even merely similar to one another:

(89) $g = 1$

Thus, for homogeneous bodies whose mass and charge are fundamentally located in their molecules, g is equal to 1.

If we assume a spherical body with uniform volume density of mass and uniform surface density of charge, then from the rotational moment of mass, which in the volumetric case is:

(90) $I_m = \frac{2}{5}mr^2$

and in the surface case is:

(91) $I_c = \frac{2}{3}mr^2$

it follows that:

(92) $r_{eff-m}^2 = \frac{2}{5}r^2$

(93) $r_{eff-c}^2 = \frac{2}{3}r^2$

(94) $g = (\frac{2}{3})/(\frac{2}{5}) = 1.666$

whereas g for the electron is even greater than this, namely 2 in the simple Dirac approximation and slightly greater in more precise measurement:

(95) $g_e = 2.00231930436256$ (+- 3.50E-13)

Ramionics extracts g_e from the geometry of the 12 wings of radius r around a cavity or black hole of radius r:

(96) $g_e = IhwCosD/(E_{03}.Iws - (E_{03} - 1).IhwCosD)$

Moment of electric charge on the 12 wings with cosinusoidal surface distribution:

(97) IhwCosD = 32/9

Mass rotational moment of the 12 wings with uniform surface distribution:

(98) Iws = 10/3

The parameter E_{03} is the ratio of the energy of the electron in the neutral state, that is, before becoming charged, which is called the naryon, to its rest energy after becoming charged.

The total contribution of the mass moment from the rest energy of the naryon is:

(99) $J_{(naryon)} = E_{03}.Iws$

The compensation of the potential required to rotate the wings relative to the neutral state appears as virtual negative energy or mass in the denominator of the fraction, but with the cosinusoidal distribution, which is related to electric charge and also appears in the numerator of the fraction:

(100) $J_{(WingOrientation)} = -(E_{03} - 1).IhwCosD$

Stage 0: Dirac Mode

The Ramionic formulae simply produce Dirac's approximation, namely 2, for g_e:

(101) $E_{03} = 24/(24 - 9 - 12)$

(102) $E_{03} = 8$

(103) $g_e = (32/9)/(E_{03} . (10/3) - (E_{03} - 1) . (32/9))$

(104) $g_e = 2$

(105) $\Delta g_e = -6.626584E+09\sigma$

Precise calculations based on the quantisation of spacetime, energy, and potential:

Potential Quantisation Factors

$\eta_w = \sqrt{(1 - 1/(wN))}$

w : wing number

Default:

$\eta = \eta_1$

Relative η_w for one particle:

$\eta_{12/9}, \eta_{12/4}, \eta_{12/1}, \eta_{6/1}, \eta_{4/1}, \eta_{2/1}$

Relative η_w for two particles:

$\eta_{6/1me} = \eta_{6/1m}/\eta_{6/1e} = \eta_{6/1m}/\eta_{6/1}$

$\eta_{6/1m} = \eta_{6m}/\eta_{1m}$

m : muon, t : tau

Particle Potentials

c = 3, 2, 1 and 0 correspond respectively to the ±3/3, ±2/3, ±1/3 and neutral particles such as the electron, up quark, down quark, and naryons.

Parabolic Part of the Particle Potential

$n_{9\infty} = Ceil_9((c/3)^2 . 9N/2)$

$n_9 = \mathrm{Ceil}_9(R_9^{-2}((c/3)^2 \,.\, 9(N/2-\Delta N)-c\Delta\mathring{N}))$

Reserved Model

$[n_9 = \mathrm{Ceil}_9(R_9^{2}((c/3)^2 \,.\, 9(N/2-\Delta N)-c\Delta\mathring{N}))]$

Electrical Charge and Radius Quantisation Effects

$R_9 = \eta_{12/9}, \eta_{12/4}, \eta_{12/1}$

For the electron (c = 3):

$n_9 = \mathrm{Ceil}_9(R_9^{-2}(162270)) = 162279$ OK

$[n_9 = \mathrm{Ceil}_9(R_9^{2}(162270)) = 162279]$

Linear Part of the Particle Potential

$n_{12} = \mathrm{Ceil}_2(R_{12}^{-2}((c/3) \,.\, 12(N/2+\Delta N+1)+c(\Delta\mathring{N}+\Delta N)))$

$[n_{12} = \mathrm{Ceil}_2(R_{12}^{2}((c/3) \,.\, 12(N/2+\Delta N)+c(\Delta\mathring{N}+\Delta N)))]$

$R_{12} = \eta_{6/1}, \eta_{4/1}, \eta_{2/1}$

For the electron (c = 3):

$n_9 = 162279$ OK

$n_{12} = 219874$ OK

$U_{es} = n_9 + n_{12} = 382153$

$E_{es} = 12N - U_{es} = 54527$ OK

Simple Formula: Dirac’s Mode

x = 3, 2, 1, 0

for the electron, up quark, down quark, and neutral particles

$E_{0x} = 24/(24 - 9(x/3)^2 - 12(x/3))$

$E_{0x} = 1/(1 - (9/24)(x/3)^2 - (1/2)(x/3))$

Electron g-factor

$g_e = \mathrm{IhwCosD}/(E_{03} \,.\, \mathrm{Iws} - (E_{03} - 1) \,.\, \mathrm{IhwCosD})$

IhwCosD = 32/9

Iws = 10/3

Inertia

Quantised Formula Forms

Form 1

$g_e^{-1} = R_\beta . E_{03} . 15/16 - R_a . (E_{03} - 1)$

Form 2

$g_e^{-1} = R_a - R_\beta . E_{03}/16$

Form 3

$g_e^{-1} = (12N . 15/16 - R_a . n_9 - R_\beta . n_{12})/E_{es}$

Gyromagnetic Factor Coefficient

$g_e^{-1}=(12N.15/16-\eta_{12,9}n_9-\eta_{6,1}n_{12})/E_{es}$

$g_e = 2.00231930436348549$

$\Delta g_e = +2.6\sigma$

Theorem 32-33: The Hubble Constant

The Conventional History of the Acceleration of the Expansion of the Universe

In the ΛCDM cosmological model, lambda is the mathematical symbol for the cosmological constant in Einstein's equations and is today taken to represent dark energy, while CDM stands for cold dark matter.

In this cosmological model, the expansion of the universe has had three main stages.

At the beginning of the universe, there was a very rapid stage called cosmic inflation, during which the expansion of the universe had a very large positive acceleration.

After the end of inflation, with the dominance of matter and radiation density, gravity caused the expansion to slow down, and therefore the acceleration of expansion became negative. This period continued for several billion years.

Then, as the density of matter decreased in the expanding universe, the effect of dark energy, or the effective vacuum component, became dominant, and the expansion of the universe once again entered an accelerated stage. The present universe is in this same stage of positive acceleration.

The Hubble Constant, the Hubble Radius, and the Observable Radius of the Universe

The Hubble constant indicates the current rate of expansion of the universe and expresses the speed v with which galaxies recede from one another for every distance R.

(33.1) $v = H_0R$

The Hubble radius is the distance at which the expansion speed becomes equal to the speed of light:

(2) $R_h = c/H_0$

Near estimates, based on direct observation of the redshift of the light spectra of nearby stars using the Hubble and James Webb telescopes:

(3) $H_0 \approx 73$ km/s/Mpc

; $R_h \approx 13.39$ gly: billion light years

Distant estimates, not by direct observation but by calculations based on the cosmic microwave background radiation, CMB, using the Planck satellite, estimate H_0 to be 67.4. This discrepancy is known as the Hubble tension. From the Ramionic viewpoint, it arises from neglecting the discreteness of the surface of space, namely the coefficient β. Dividing by this geometric coefficient gives 73.5, which falls within the range of near observations:

(4) $H_0 = 73.5$ km/s/Mpc

; $R_h \approx 13.30$ gly

However, the observable radius of the universe is larger than the Hubble radius, because the light from galaxies was emitted in the past, at a time when the universe was smaller. In ΛCDM, this radius is estimated to be approximately 46.5 gly.

Expansion of the Universe in Ramionics

In Ramionics, the entire universe consists of an approximately constant number of Ramions:

(5) $N\mathscr{w}$ = constant

and the energy of each Ramion also remains approximately constant:

(6) E_s = constant

because only a very small part of the energy of the universe is converted into matter. This too means the distribution of that energy among other Ramions, more strongly among the nearer ones, and the remaining of a cavity or black hole empty of Ramions, energy, space, and time. In small dimensions, this cavity is at the centre of particles, and in large dimensions it is the same as galactic black holes.

Also, from every point and at every time, the universe is seen as containing a constant number of FCC layers:

(7) $L\mathit{w}$ = constant

At every moment, the whole universe has a uniform Ramion radius:

(8) $r_s = r_s(t)$

Therefore, energy density and pressure will be uniform throughout the universe.

If the total volume of the universe is equal to the effective FCC volume:

(9) $V\mathit{w} = (4\pi/3)R\mathit{w}^3\varphi$

and the total volume of the Ramions is:

(10) $V_r = N\mathit{w}(4\pi/3)r_s^3$

then:

(11) $N\mathit{w}(4\pi/3)r_s^3 = (4\pi/3)R\mathit{w}^3\varphi$

Therefore:

(12) $N\mathit{w}r_s^3 = \varphi R\mathit{w}^3$

and:

(13) $r_s = (\varphi/N\mathit{w})^{1/3}R\mathit{w}$

That is, the Ramion radius grows in proportion to the radius of the universe:

(14) $r_s \propto R\mathit{w}$

Now, since the energy of each Ramion is constant:

(15) $\rho_s = E_s/((4/3)\pi r_s^3)$

therefore:

(16) $\rho_s \propto 1/R\mathit{w}^3$

The energy density of space is:

(17) $\rho_{(space)} = \varphi\rho_s$

and the pressure of space is:

(18) $P_{(space)} = \rho_{(space)}/2$

and therefore:

(19) $P_{(space)} \propto 1/R\mathit{w}^3$

In Ramionics, the internal speed of light of the Ramions is proportional to energy density and pressure:

(20) $c_s \propto \rho_s \propto P_{(space)}$

Thus:

(21) $c_s \propto 1/R\mathcal{w}^3$

If we call the present value of the speed of light c_0:

(22) $c(t) = c_0(R_0/R(t))^3$

The Coefficient 19.02 and the Radial Pressure of FCC

In FCC geometry, for large layers, the thickness of the shell becomes very small relative to its radius:

(23) $\Delta R/R_n \approx 1/n$

As a result, the shell is locally almost flat, and the tangential components of force almost cancel one another. However, because of the curvature of the shell, small radial components remain.

For the force arising from the internal pressure of the Ramions:

(24) $F_0 \approx P\pi r^2$

and for the FCC shell:

(25) $F_{(net)} \approx (5\pi/\gamma)Pr^2n$

; $F_{(net)} \approx 19.02Pr^2n$

This coefficient 19.02 is a completely geometric coefficient arising from the curvature of the FCC network, and it shows that the geometry of the universe itself naturally creates an outward radial pressure component.

The Ramionic Expansion Rate

In FCC geometry, the radial thickness of each layer is approximately:

(26) $\Delta R \approx 2\gamma r_s$

Therefore, the effective growth rate of the radius of the universe will be:

(27) $dR/dt \approx \gamma c(t)$

Now, substituting c(t):

(28) $dR/dt = \gamma c_0(R_0/R)^3$

Thus:

(29) $R^3 dR = \gamma c_0 R_0^3 dt$

Integration gives:

(30) $R^4/4 = \gamma c_0 R_0^3 t$

and therefore:

(31) $R^4 = 4\gamma c_0 R_0^3 t$

At the present time:

(32) $R = R_0$

(33) $R_{(obs)} = 4\gamma c_0/H_0 = 4\gamma R_h$

(34) $R_{(obs)} \approx 43.94$ billion light years

; if $H_0 \approx 73.50$ km/s/Mpc

(35) $R_{(obs)} \approx 44.22$ billion light years

; if $H_0 \approx 73.04$ km/s/Mpc

Both values are very close to one another and are about five per cent lower than the estimated observable radius of the universe in ΛCDM theory.

The Age of the Universe in Ramionics

Light passes through FCC layers along its path, and the effective thickness of each layer is:

(36) $\Delta R \approx 2\gamma r_s$

Therefore, the total optical path of the universe is:

(37) $R_{(obs)} = 4\gamma \int c(t)dt$

Since:

(38) $c(t) = c_0(R_0/R(t))^3$

(39) $R(t)^4 = 4\gamma c_0 R_0^3 t$

therefore:

(40) $R(t) = R_0(t/t_0)^{1/4}$

(41) $c(t) = c_0(t_0/t)^{3/4}$

Substituting into the light-path integral:

(42) $R_{(obs)} = 4\gamma \int_0^{t_0} c_0(t_0/t)^{3/4} dt$

and since:

(43) $\int t^{-3/4}dt = 4t^{1/4}$

therefore:

(44) $R_{(obs)} = 16\gamma c_0 t_0$

But from:

(45) $R_{(obs)} = 4\gamma c_0/H_0$

we have:

(46) $16\gamma c_0 t_0 = 4\gamma c_0/H_0$

Thus:

(47) $t_0 = 1/H_0$

(48) $t_0 \approx 13.31$ billion years

; if $H_0 = 73.50$ km/s/Mpc

(49) $t_0 \approx 13.39$ billion years

; if $H_0 = 73.04$ km/s/Mpc

The Hubble Tension in Ramionics

In Ramionics, the correct value of the expansion rate of the universe is the local Hubble value:

(50) $H_0Local \approx 73$ km/s/Mpc

The value:

(51) H_0CMB/β

also gives approximately the same value.

(33.52) $H_0(corrected) \approx H_0CMB/\beta \approx 73.5$ km/s/Mpc

which becomes consistent with local measurements and explains the Hubble tension.

The approximately five per cent lower Ramionic estimate of the age and radius of the universe is probably due to the five per cent matter component considered in classical physics, whereas in Ramionics the total matter energy of the universe, namely 10^{53} kg, fits into 1.17 km^3 of Ramion E_s. Even that amount has no independent effect on the expansion energy of the universe, meaning the energy of Ramions, or so-called dark energy, because matter is a rearrangement and slight change in the distribution pattern of Ramion energy, not separate energy. The five per cent itself is also probably the effect of 19+1 in gravity over galactic distances. Likewise, 26 per cent dark matter is in fact 1 − φ, meaning the volumetric effect of non-space in the calculations of space and the neglect of the quantisation of the volume of space. Otherwise, in Ramionics there is no dark matter; rather, there is what is called the dark effect. The Hubble tension is also due to the fact that in calculating the Hubble constant from the CMB using the Planck satellite, the coefficient β, namely the quantisation of the surface of space, has been neglected. The catastrophe of physics is also explained in this way: the gravitational constant of electrons has no effect on the expansion of space, which is related to the energy of Ramions.

Definition of Parameters

R𝓌 : radius of the universe

$R_{(obs)}$: observable radius of the universe; in Ramionics, probably the same as R𝓌

R_h : Hubble radius

r_s : Ramion radius

N𝓌 : total number of Ramions in the universe

L𝓌 : number of layers of the universe

ρ_s : Ramion energy density

$\rho_{(space)}$: energy density of space

$P_{(space)}$: pressure of space

c_s : internal speed of light of the Ramion

γ : FCC radial freedom coefficient

φ : FCC filling coefficient

β : FCC surface coverage coefficient

H_0 : present Hubble constant

t_0 : age of the universe

Theorem 34: Gravity, Relativity, and Dark Matter

Introduction

In the standard model of cosmology, in order to explain galactic rotation curves, the stability of clusters, and the acceleration of the expansion of the universe, the existence of two independent components called dark matter and dark energy is assumed.

In Ramionics, no such independent components exist.

In this picture, the only real fundamental quantity is the energy of Ramions, and even baryonic matter is not an independent fundamental quantity, but rather expresses a specific pattern of redistribution of Ramion energy around a central cavity empty of energy.

Consequently, what is observed as mass, matter, particle, and field is, in essence, stable structures of energy density in the FCC network of Ramions.

Within this framework, real dark matter does not exist, and the effects that in classical physics are attributed to dark matter arise from the redistribution of Ramion energy density, the pressure of FCC space, and the Hubble displacement of the gravitational-potential pattern.

Dark energy is likewise not an independent component, but rather the background energy of Ramions and the geometric expansion of the FCC network of the universe.

The aim of this section is to show how, from a single fundamental function:

(34.1) $f(R)$

one can obtain the Newtonian limit, the MOND limit, the fundamental MOND acceleration coefficient, MOG-like amplification on cluster scales, and also the relation among gravity, relativity, dark matter, and dark energy.

FCC Geometry and the Fundamental Expansion Relation

In FCC, the number of Ramions in layer n is:

(2) $L(n)=10n^2+2$

The difference in the number of Ramions between two successive layers is:

(3) $\Delta L(n)=L(n)-L(n-1)$

Thus:

(4) $\Delta L(n)=(10n^2+2)-(10(n-1)^2+2)$

Therefore:

(5) $\Delta L(n)=20n-10$

For $n \gg 1$:

(6) $\Delta L(n) \approx 20n$

and:

(7) $L(n) \approx 10n^2$

Thus, the relative geometric growth rate of the FCC network is:

(8) $\Delta L(n)/L(n) \approx 2/n$

The effective radius of layer n is:

(9) $R_n \approx 2\gamma r_s n$

Consequently:

(10) $n \approx R_n/(2\gamma r_s)$

The fundamental time for light to cross the Ramion scale is:

(11) $t_s = r_s/c$

In every time interval t_s, the geometric structure of the universe grows by $\Delta L/L$. Therefore, the geometric expansion rate is:

(12) $H(n) \approx (1/t_s)\Delta L(n)/L(n)$

Now, substituting:

(13) $H(n) \approx c/r_s \cdot 2/n$

and using relation (10):

(14) $H(R) \approx c/r_s \cdot 2 \cdot 2\gamma r_s/R$

Thus:

(15) $H(R) \approx 4\gamma c/R$

Therefore:

(16) $R \approx 4\gamma c/H$

and since:

(17) $R_h = c/H$

we have:

(18) $R/R_h = 4\gamma$

With:

(19) $\gamma \approx 0.82557850950146436$

it follows that:

(20) $4\gamma \approx 3.3023140380058574$

Therefore, the radius of the universe in Ramionics is approximately 3.30 times the Hubble radius.

Ramionics is consistent with the value:

(21) $H_0 \approx H_0 CMB/\beta \approx 73$ km/s/Mpc

Within this framework, the Hubble tension arises because, in the standard analysis of the CMB, the geometric discreteness of the FCC network and the filling coefficient β have not been included.

The Coefficient 19.02 in FCC Geometry

For large FCC layers, the thickness of the shell is very small relative to its radius:

(22) $\Delta R/R_n \approx 1/n$

As a result, the shell is locally almost flat, but its overall curvature leaves a small radial component of the tangential forces.

If the base force arising from Ramion pressure is:

(23) $F_0 \approx P\pi r^2$

then the net radial force of the FCC shell will be:

(24) $F_{(net)} \approx (5\pi/\gamma)Pr^2 n$

Consequently, the geometric coefficient is:

(25) $C_{(FCC)} = 5\pi/\gamma$

and with the value of γ we have:

(26) $C_{(FCC)} \approx 19.02$

This coefficient is the geometric origin of MOG-like amplification on the cluster scale.

Energy Density and the Function f

In the presence of mass M, the energy density of space changes relative to the free state.

The energy density of space is:

(27) $\rho(R) = \rho_s \varphi(1 + f(R))$

where:

ρ_s : reference energy density of Ramions

φ : FCC filling coefficient

f(R) : dimensionless function of energy-density redistribution

The density difference relative to free space will therefore be:

(28) $\Delta\rho(R)=\rho(R)-\rho_s\varphi$

Consequently:

(29) $\Delta\rho(R)=\rho_s\varphi f(R)$

The conservation condition for gravitational-field energy requires that the total additional energy stored in the space around the mass be equal to the rest energy of that same mass.

Therefore:

(30) $4\pi\int_{(R_s)}^{\infty}\Delta\rho(R)R^2dR=Mc^2$

and by substituting relation (29):

(31) $4\pi\rho_s\varphi\int_{(R_s)}^{\infty}f(R)R^2dR=Mc^2$

This relation is the fundamental condition determining the function f(R), and it guarantees that the total energy of the gravitational field remains finite.

The Time Function, Expansion of Space, and Dimensionless Potential

In Ramionics, the function f(R) is not merely a gravitational potential; rather, it simultaneously determines the state of energy density, pressure, the speed of light, time, and the length scale of space.

The time-dilation factor is:

(32) $\tau(R)=1/\sqrt{(1-f(R))}$

In addition to time dilation, this quantity is also the coefficient of local expansion of space.

If the reference distance and time in free space are respectively:

(33) r_0,t_0

then in the gravitational field we will have:

(34) $r(R)=\tau(R)r_0$

(35) $t(R)=\tau(R)t_0$

Therefore, the more:

(36) $f(R)\to 1$

the more slowly time passes, and the more the length scale of space increases.

Consequently, in Ramionics, general relativity arises directly from the change in the energy density of Ramions, not from an independent geometric curvature.

If the local energy of each Ramion increases by a factor N, we will have:

(37) $r \to Nr$

and since the total energy of each Ramion remains constant:

(38) $\rho \to \rho/N^2$

(39) $P \to P/N^2$

(40) $c \to c/N^2$

Consequently:

(41) $t \to Nt$

In the limit of general relativity:

(42) $f(R)=2GM/(Rc^2)$

and by defining the Schwarzschild radius:

(43) $R_s=2GM/c^2$

we have:

(44) $f(R)=R_s/R$

Therefore:

(45) $\tau(R)=1/\sqrt{(1-2GM/(Rc^2))}$

which is the same Schwarzschild factor for time dilation and change of the spatial scale.

In Ramionics, gravity is fundamentally a fluidic–Archimedean phenomenon.

Mass creates a low-pressure region in the sea of Ramions, and the resulting pressure gradient drives bodies towards this low-pressure region.

In this view, gravity is not an independent fundamental force, but rather a fluidic–Archimedean effect arising from the gradient of pressure and energy density of Ramions.

In other words, bodies, like particles immersed in a fluid, are driven by pressure difference towards the low-pressure region, and what is described in general relativity as the curvature of spacetime is, in Ramionics, the direct result of this energy and pressure gradient.

In ordinary Archimedes, higher pressure below a body creates an upward force, but in Ramionics, higher pressure in distant regions drives bodies towards the low-pressure centre.

Therefore:

(46) gravity = inverse Archimedean pressure effect

In this picture, spacetime curvature, relativity, MOND, MOG-like behaviour, dark matter, and dark energy are all different manifestations of Ramionic fluid dynamics.

The Complete Ramionic Function for Newton and MOND

In order for both the Newtonian limit and the MOND limit to be obtained from a single fundamental function, f(R) is defined as follows:

(47) $f(R)=R_s/R+AE_1(k\ R/R_d)$

where:

(48) $E_1(x)=\int_x^\infty \mathrm{Exp}(-u)/u\ du$

is the exponential integral function.

The MOND transition radius is:

(49) $R_m=\sqrt{(GM/a_0)}$

Also:

R_d

is the cosmic cutoff radius of the gravitational field, and:

k

is the geometric cutoff coefficient.

In what follows, we shall show that:

(50) $A=R_s/R_m=\sqrt{(R_s/R_d)}$

Deriving the Gravitational Field from the Function f

Gravitational acceleration is obtained from the gradient of the function f:

(51) $g(R)=-(c^2/2)df/dR$

The derivative of the first term is:

(52) $d(R_s/R)/dR=-R_s/R^2$

Also, since:

(53) $dE_1(x)/dx=-\mathrm{Exp}(-x)/x$

we will have:

(54) $dE_1(k\ R/R_d)/dR=-\mathrm{Exp}(-k\ R/R_d)/R$

Consequently:

(55) $f'(R)=-R_s/R^2-A\ \mathrm{Exp}(-k\ R/R_d)/R$

and therefore:

(56) $g(R)=(c^2/2)[R_s/R^2+A\ \mathrm{Exp}(-k\ R/R_d)/R]$

Now, using:

(57) $R_s=2GM/c^2$

we have:

(58) $c^2R_s/(2R^2)=GM/R^2$

and from the relation:

(59) $A=R_s/R_m$

it follows that:

(60) $(c^2/2)A=(c^2R_s)/(2R_m)=GM/R_m=\sqrt{(GMa_0)}$

Therefore, the complete Ramionic gravitational field will be:

(61) $g(R)=GM/R^2+\sqrt{(GMa_0)}\ \mathrm{Exp}(-k\ R/R_d)/R$

The Newtonian Limit

At short distances:

(62) $R\ll R_m$

the Newtonian term is dominant:

(63) $GM/R^2\gg\sqrt{(GMa_0)}/R$

Consequently:

(64) $g(R)\approx GM/R^2$

Therefore, on the scale of the Solar System, Ramionics reduces to Newton's law.

The MOND Limit

At galactic distances:

(65) $R_m\ll R\ll R_d/k$

we have:

(66) $\mathrm{Exp}(-k\ R/R_{d}) \approx 1$

This approximation does not mean eliminating the exponential term; it only states that on galactic scales the distance R is still small relative to the cosmic cutoff radius R_{d}, and therefore the exponential term remains approximately equal to one. On much larger scales, this term gradually decreases and limits the gravitational field.

Consequently:

(67) $g(R) \approx GM/R^2 + \sqrt{(GMa_0)}/R$

and since in this region the second term becomes dominant:

(68) $g(R) \approx \sqrt{(GMa_0)}/R$

which is the same MOND relation.

Therefore, in Ramionics, MOND is not an independent empirical law, but the galactic limit of the redistribution of Ramion energy density.

Deriving a_0 from the Cosmic Cutoff

In Ramionics, the fundamental MOND acceleration is extracted directly from the cosmic scale of the gravitational field.

On the one hand:

(69) $A = R_s/R_m$

and on the other hand, from the conservation condition of the gravitational-field energy, it follows that:

(70) $A = \sqrt{(R_s/R_{d})}$

Therefore:

(71) $R_s/R_m = \sqrt{(R_s/R_{d})}$

Squaring both sides:

(72) $R_s^2/R_m^2 = R_s/R_{d}$

Thus:

(73) $R_m^2 = R_s R_{d}$

But:

(74) $R_m^2 = GM/a_0$

and:

(75) $R_s=2GM/c^2$

Consequently:

(76) $a_0=c^2/(2R\mathit{d})$

which shows that the fundamental MOND acceleration has a completely cosmic origin.

If:

(77) $a_0 \approx 1.2\times10^{-10}$ m/s²

then:

(78) $R\mathit{d}=c^2/(2a_0)$

and therefore:

(79) $R\mathit{d} \approx 3.74\times10^{26}$ m

that is:

(80) $R\mathit{d} \approx 39.5$ billion light years

which is very close to the observed radius of the universe.

Cluster Amplification and the MOG-like Effect

MOND works well on galactic scales, but on cluster scales it requires additional amplification.

In Ramionics, this amplification arises from the coupling between the potential pattern f and the Hubble expansion of FCC space.

The MOND limit of the field is:

(81) $g_m(R)=\sqrt{(GMa_0)}/R$

The Hubble velocity at radius R is:

(82) $v_h(R)=H_0R$

Over the time interval Δt, the Hubble displacement of the potential pattern is:

(83) $\Delta R_h=H_0R\Delta t$

and the displacement due to gravity is:

(84) $\Delta R_{\mathit{g}}=\frac{1}{2}g_m\Delta t^2$

The ratio of these two displacements, taking into account the FCC geometric coefficient, will be:

(85) $\varepsilon(R)=C_{(FCC)}g_m(R)/(H_0^2R)$

Consequently, the effective cluster field is obtained from the Pythagorean sum of the MOND component and the Hubble-drift component:

(86) $g_{(eff)}(R)=g_m(R)\sqrt{(1+\varepsilon(R)^2)}$

or explicitly:

(87) $g_{(eff)}(R)=g_m(R)\sqrt{(1+(C_{(FCC)}g_m(R)/(H_0^2R))^2)}$

Now, with:

(88) $C_{(FCC)}=5\pi/\gamma\approx 19.02$

and:

(89) $g_m(R)=\sqrt{(GMa_0)}/R$

we have:

(90) $g_{(eff)}(R)=\sqrt{(GMa_0)}/R \cdot \sqrt{(1+(19.02\sqrt{(GMa_0)}/(H_0^2R^2))^2)}$

This relation shows that, without assuming dark matter, MOG-like amplification on the cluster scale follows directly from FCC geometry and the coupling of Hubble expansion with the gravitational-potential pattern.

Physical Interpretation

On the galactic scale, the dominant effect arises from the redistribution of Ramion energy density, and the MOND limit is obtained naturally.

On the cluster scale, the potential pattern f slowly drifts outward together with the Hubble expansion of the universe. Moving masses in the cluster, relative to this drifting pattern, are deflected towards the centre of the potential. This deflection is amplified by the geometric coefficient:

(91) $C_{(FCC)}\approx 19.02$

and creates MOG-like behaviour.

Consequently:

(92) Newton → local limit

(93) MOND → galactic Ramionic density redistribution

(94) MOG-like amplification → FCC Hubble-drift coupling

Summary

In Ramionics, real dark matter does not exist.

What is attributed to dark matter consists of two independent effects.

First, the galactic MOND effect, which arises from the redistribution of Ramion energy density.

Second, the cluster-scale MOG-like effect, which arises from the coupling of FCC geometry with Hubble expansion and the displacement of the potential pattern f.

The fundamental MOND acceleration:

(95) $a_0 = c^2/(2R\mathcal{d})$

is extracted from the cosmic cutoff of the gravitational field.

The cluster amplification coefficient:

(96) $C_{(FCC)} = 5\pi/\gamma \approx 19.02$

is obtained directly from FCC geometry.

Within this framework, gravity, relativity, time dilation, local expansion of space, MOND, MOG, dark matter, dark energy, and the Hubble tension are all different manifestations of a single fundamental function:

(97) f(R)

which describes the redistribution of Ramion energy density in the FCC network. Therefore, all gravitational phenomena arise from a single principle, namely the dynamics of Ramion energy, and there is no need to assume independent fundamental components such as dark matter or dark energy.

Theorem 35: Electromagnetism

Electric flux density, or electric displacement field:

(33.1) $\vec{D}$ (Coulomb/m² or C/m²) = $Q/(4\pi r^2)$

Electric field intensity, or electric field, which produces the electric force $\vec{F}_e$ on charge q:

(2) $\vec{E}$ (Volt/m) = $\vec{D}/\varepsilon$, $\vec{F}_e = q \cdot \vec{E}$

Magnetic flux density, or magnetic induction field, which produces the magnetic force $\vec{F}_m$ on charge q with velocity $\vec{V}$:

(3) $\vec{B}$ (Tesla) = $\mu \cdot \vec{H}$, $\vec{F}_m = q \cdot \vec{V} \times \vec{B}$

Magnetic field intensity, or magnetising field:

(4) $\vec{H}$ (Amp/m) = $Q/t/(2\pi r) = I/(2\pi r)$

The direction of the magnetic field produced by the electric current in the relation above follows the right-hand rule: if the right thumb points in the positive direction of the current, or in the direction of motion of positive charge, the curl of the four fingers gives the direction of the magnetic field, whose lines emerge from the north pole outside the body.

Voltage, electrical pressure, or electrical potential difference V_{az} is the difference in the energy of unit positive charge between two points, where z is usually chosen as the zero point or ground, namely Zero, Ground, or Earth:

(5) V_{az} (Volt or V or Joule/Coulomb) = $V_a - V_z = (E_a - E_z)/Q$

Electric current, or the flow of electric charge:

(6) I (Ampere or Coulomb/Second) = Q/t

Electric current density:

(7) $\vec{J}$ (Ampere/m² or A/m²)= I/S

Lorentz law:

(8) $\vec{F} = \vec{F}_e + \vec{F}_m = q \cdot (\vec{E} + \vec{V} \times \vec{B})$

(9) $\vec{F}_m = q \cdot \vec{V} \times \vec{B}$

In general, the vector product $\vec{X} \times \vec{Y}$ is a vector such as $\vec{Z}$ whose magnitude is the product of the magnitude of $\vec{X}$, the magnitude of $\vec{Y}$, and the sine of the angle between them, and whose direction is like the direction of the z-axis in the standard xyz coordinate system, namely right-handed. Therefore, for a positive charge: the middle finger of the left hand is $\vec{X}$ or $\vec{V}$, the index finger is $\vec{Y}$ or $\vec{B}$, and the thumb is $\vec{Z}$ or $\vec{F}_m$:

(10) $|\vec{X} \times \vec{Y}| = |\vec{X}| \cdot |\vec{Y}| \cdot \sin(\theta)$

Maxwell's four equations:

(11) $\nabla \cdot \vec{D} = \rho$: Electric Gauss Law

; $\nabla \cdot \vec{B} = 0$: No Magnetic Monopole

; $\nabla \times \vec{E} = -\partial\vec{B}/\partial t$: Faraday Law

; $\nabla \times \vec{H} = \vec{J} + \partial\vec{D}/\partial t$: Ampere-Maxwell Law

Electric Dipole

If two equal and opposite charges ±q are located at a distance $\vec{d}$ from each other, with the vector direction from negative to positive, an electric dipole is formed. Its electric dipole moment, torque, and potential energy in an electric field are:

(12) $\vec{p} = q \cdot \vec{d}$

(13) $\vec{\tau} = \vec{p} \times \vec{E}$

(14) $U = -\vec{p} \cdot \vec{E}$

Magnetic Dipole

A current loop, or any rotating charge, creates a magnetic dipole. If $\vec{A}$ is the area vector of the loop, its magnetic dipole moment, torque, and potential energy in a magnetic field are:

(15) $\vec{\mu} = I \cdot \vec{A}$

(16) $\vec{\tau} = \vec{\mu} \times \vec{B}$

(17) $U = -\vec{\mu} \cdot \vec{B}$

Permeability and Permittivity of the Medium

The electric and magnetic dipoles belonging to the propagation medium align respectively with the electric and magnetic fields. As a result of this alignment, electric dipoles, for a given $\vec{D}$ or Q, reduce the electric field intensity $\vec{E}$, whereas magnetic dipoles, for a given $\vec{H}$ or electric current I, increase the magnetic flux density $\vec{B}$.

The electric polarisation of the propagation medium of the electric field is the volume density of the electric dipole moment:

(18) $\vec{P} = d\vec{p}/dV$

(19) $\vec{D} = \varepsilon_0 \cdot \vec{E} + \vec{P}$

(20) $\varepsilon = \varepsilon_0 + \vec{P}/\vec{E}$

(21) $\varepsilon = \varepsilon_r \varepsilon_0$

The magnetisation of the propagation medium of the magnetic field is likewise the volume density of the magnetic dipole moment:

(22) $\vec{M} = d\vec{\mu}/dV$

(23) $\vec{B} = \mu_0 \cdot (\vec{H} + \vec{M})$

(24) $\mu = \mu_0 \cdot (1 + \vec{M}/\vec{H})$

(25) $\mu=\mu_r \mu_0$

Relative permeability and permittivity: relative to vacuum; relative to the Ramion E_s:

(26) $\varepsilon_r > 1$

(27) $\mu_r > 1$

The Ramionic equivalent of these relations is the relative energy of Ramions with respect to the relaxed state E_s:

(28) $E_r/E_s>1$

The speed of light and the impedance of vacuum based on the magnetic permeability and electric permittivity of vacuum, namely the relaxed Ramions E_s:

(29) $c = 1/\sqrt{(\mu_0 . \varepsilon_0)}$

(33.30) $Z_0 = \sqrt{(\mu_0/\varepsilon_0)}$

Theorem 36: Muon and Tau

FCC Structure

Number of Ramions in layer n:

(1) $L(n) = 10n^2 + 2$

Cumulative number of Ramions up to layer n:

(2) $T(n) = (10n^3 + 15n^2 + 11n + 3)/3$

Packet Structure

For each stable packet, the number of baryons is:

(3) $n_p = 2^p - 1$

Number of particles with charge 2/3:

(4) $n_{2/3} = 2^{p-1} - 1$

Number of particles with charge 1/3:

(5) $n_{1/3} = 2^{p-2} + 1$

Number of particles with full charge 3/3, namely leptons:

(6) $n_{3/3} = 2^{p-2} - 1$

Energy of each particle in terms of N, disregarding the difference between E_{03} and 8:

(7) $E_{1/3} = 12N . 19/24$

; $E_{1/3} = 9.5N$

; $E_{2/3} = 12N . 12/24$

; $E_{2/3}$ = 6N

; $E_{3/3}$ = 12N . 3/24

; $E_{3/3}$ = 1.5N

Total energy of the baryonic packet in units of E_s:

(8) $E_{pk}/N = 23 \cdot 2^{p-2} + 2$

Total energy of the packet before becoming baryonic:

(9) $E_{pk0}/N = 12 \cdot (2^p - 1)$

Ratio of the energy of the baryonised packet to the hypothetical neutral or naryon state of the same packet:

(10) $E_k = E_{pk}/E_{pk0}$

(11) $E_k = (23 \cdot 2^{p-2} + 2)/(12 \cdot (2^p - 1))$

Table of the Ratio of Baryonic Energy to Naryonic Energy

(12) Table(p, E_k)

2: 2/3 = 0.666666666666667

3: 0.571428571428571

4: 0.522222222222222

5: 0.500000000000000

6: 0.489417989417989

7: 0.484251968503937

8: 0.481700980392157

9: 0.480430528375734

10: 0.479797979797980

∞: 23/48 = 0.479166666666667

Only for p equal to 5, as in the electron family, is E_k a very good approximation to 0.5:

(13) $p_e = 5$

; $n_{pe} = 31$

; $E_k = 0.5$

The Electron Family

Genetic code:

(14) $\mathring{N}_e = 4^0 . 4 . 4 . 6 . 6 . 4 . 4 . 2 . 2$

; $\mathring{N}_e = 2^{12} . 3^2$

; $\mathring{N}_e = 36864$

Number of Ramions in each wing out of the twelve hypothetical wings:

(15) $N_e = \text{Ceil10}((\pi^2/10) . \mathring{N}_e)$

; $N_e = 36390$

(16) $p_e = 5$

; $n_{pe} = 31 \in \text{Prime}$

Baryonic packet energy:

(17) $E_{pke}/N_e = 186$

; $E_{pke} = 6768540$

To determine the boundary layer:

(18) $T(LL_e) \geq E_{pke}$

; $T(126) = 6747763$

; $T(127) = 6909055$

; $LL_e = 127$

Number of the strong layer that completes the conversion of Ramions into baryons:

(19) $SL_e = LL_e + 1$

; $SL_e = 128$

Final representation:

(20) Electron = 127 // 31

Mersenne representation:

(21) Electron = 7 / 5

; $127 = 2^7 - 1$

; $31 = 2^5 - 1$

Introduction to the Muon and Tau Families

Based on the electron model, which was argued from the viewpoint of entropy in the previous theorems, the real mass of the muon and tau generations is proportional to N and therefore to their $\mathring{N}$, because the Ceil10 difference is negligible, the factor $\pi^2/10$ cancels in ratios, and the value of E_{03} for these families is also approximately the same and close to 8.

On the other hand, the genetic code of the electron is:

(22) $\mathring{N}_e = 2^{12} . 3^2$

If the observed mass ratios of the muon and tau to the electron are taken directly as the basis, the denominator of these ratios contains the factor 3^4, which is greater than the power of the factor 3 present in the electron genetic code, namely 3^2, and consequently leads to non-integer genetic codes.

However, the square root of these ratios contains the factor 3^2, and by completely cancelling the factor 3^2 present in the electron genetic code, the genetic codes of the muon and tau are obtained directly.

Therefore, the structure of the muon and tau generations is extracted from within the genetic code of the electron and is transformed into a pure sequence of powers of 2.

The squared appearance of mass in classical QED and QCD calculations and measurements arises from ignoring the dependence of electric charge and the Coulomb constant on N, which itself is proportional to the mass of particles.

Precise E_{03} Calculations

Genetic code, the number of initial Ramions in each wing:

(23) $\mathring{N}$

Final number of Ramions in each wing:

(24) $N = \text{Ceil10}((\pi^2/10) . \mathring{N})$

Quantum difference:

(25) $\text{DeltaN} = N - (\pi^2/10) . \mathring{N}$

Radius-ratio correction coefficient:

(26) $z = 1 + 6 . (\beta\gamma/\varphi . \eta_1/\eta_6)^2 . \text{DeltaN}/N$

Ratio of naryon energy to lepton energy:

(27) $E_{03} = 24/(24 - 9 . (\eta_6/\eta_{12}^2) . z^{-1} - 12 . (\eta_{1/2}^{-1}/\eta_1^{-2}) . z)$

Electron

(28) $\mathring{N}_e = 36864$

(29) N_e = 36390

(30) $DeltaN_e$ = 6.6903358241906972

(31) z_e = 1.0011529837934436

(32) E_{03e} = 8.0092664715760264

Muon

(33) $\mathring{N}_m = 2^{19}$

; $\mathring{N}_m$ = 524288

(34) N_m = 517460

(35) $DeltaN_m$ = 8.4847761662676930

(36) z_m = 1.0001028324521839

(37) E_{03m} = 8.0008229980961705

Tau

(38) $\mathring{N}_t = 2^{21}$

; $\mathring{N}_t$ = 2097152

(39) N_t = 2069810

(40) $DeltaN_t$ = 3.9391046650707722

(41) z_t = 1.0000119353222914

(42) E_{03t} = 8.0000954871405643

Second Case: $N = \mathring{N}$

Muon

(43) $\mathring{N}_m$ = 524288

(44) N_m = 524288

(45) $DeltaN_m$ = 0

(46) z_m = 1

(47) E_{03m} = 8.0000000000579039

Tau

(48) $\mathring{N}_t$ = 2097152

(49) N_t = 2097152

(50) $DeltaN_t = 0$

(51) $z_t = 1$

(52) $E_{03t} = 8.0000000000036149$

Muon

Experimental apparent mass:

(53) $E_{mxx} = 105.6583755$ MeV

Ratio of apparent mass to the electron:

(54) $E_{mxxe} = E_{mxx}/E_e$

; $E_{mxxe} = 206.76828270846718$

Ratio of real mass to the electron:

(55) $E_{mxe} = \sqrt{E_{mxxe}}$

; $E_{mxe} = 14.379439582559092$

Comparison with the genetic approximation:

(56) $E_{mxe} \approx 128/9$

; $128/9 = 14.222222222222222$

; $\Delta = +1.10571737893280$ %

Corresponding real mass:

(57) $E_{mx} = E_e \,.\, E_{mxe}$

; $E_{mx} = 7.34730792175932$ MeV

Genetic code:

(58) $\mathring{N}_m = 2^{19}$

; $\mathring{N}_m = 524288$

(59) $\mathring{N}_m = 4^0 \,.\, 4^6 \,.\, 8^2 \,.\, 2$

(60) $N_m = Ceil10((\pi^2/10) \,.\, \mathring{N}_m)$

; $N_m = 517460$

(61) $P = 7$

(62) $n_p = 127$

(63) $LL = 511$

; Muon = 511 // 127

Mersenne representation:

; Muon = 9 / 7

(64) $T(511) = 446083583$

; $T(511)/N_m = 862.064183374904$

(65) $E_{pkm} = 381885480$

; $E_{pkm}/N_m = 738$

(66) $\Delta E_m = T(511) - E_{pkm}$

; $\Delta E_m = 64298103$

; $\Delta E_m/N_m = 124.256210258382$

(67) Extra = +16.8108258528185 %

First model:

(68) $E_{mcc} \approx E_e \, . \, (N_m/N_e)^2$

; $E_{mcc} \approx 103.325963790264$ MeV

; $\Delta = -2.20750290613317$ %

Second model:

(69) $E_{mcc} \approx E_e \, . \, (\mathring{N}_m/N_e)^2$

; $E_{mcc} \approx 106.070772507766$ MeV

; $\Delta = +0.390311705830040$ %

Third model:

(70) $E_{mcc} \approx E_e \, . \, (N_m/N_e) \, . \, (\mathring{N}_m/N_e)$

; $E_{mcc} \approx 104.689372905481$ MeV

; $\Delta = -0.917109116937997$ %

Tau

Experimental apparent mass:

(71) $E_{txx} = 1776.86$ MeV

Ratio of apparent mass to the electron:

(72) $E_{txxe} = E_{txx}/E_e$

; $E_{txxe} = 3477.48488477800$

Ratio of real mass to the electron:

(73) $E_{txe} = \sqrt{E_{txxe}}$

; $E_{txe} = 58.9702042075693$

Comparison with the genetic approximation:

(74) $E_{txe} \approx 512/9$

; $512/9 = 56.8888888888889$

; $\Delta = +3.65871948978339$ %

Corresponding real mass:

(75) $E_{tx} = E_e \,.\, E_{txe}$

; $E_{tx} = 30.1338721565190$ MeV

Genetic code:

(76) $\mathring{N}_t = 2^{21}$

; $\mathring{N}_t = 2097152$

(77) $\mathring{N}_t = 4^0 \,.\, 4^4 \,.\, 8^4 \,.\, 2$

(78) $N_t = \mathrm{Ceil10}((\pi^2/10) \,.\, \mathring{N}_t)$

; $N_t = 2069810$

(79) $P = 5$

(80) $n_p = 31$

(81) $LL = 511$

; Tau = 511 // 31

Mersenne representation:

; Tau = 9 / 5

(82) $T(511) = 446083583$

; $T(511)/N_t = 215.518636109980$

(83) $E_{pkt} = 384984660$

; $E_{pkt}/N_t = 186$

(84) $\Delta E_t = T(511) - E_{pkt}$

; ΔE_t = 61098923

; $\Delta E_t/N_t$ = 29.5191454277958

(85) Extra = +15.8704824758472 %

First model:

(86) $E_{tcc} \approx E_e \,.\, (N_t/N_e)^2$

; $E_{tcc} \approx$ 1653.16749799978 MeV

; Δ = -69612.9700709239 ppm

Second model:

(87) $E_{tcc} \approx E_e \,.\, (\mathring{N}_t/N_e)^2$

; $E_{tcc} \approx$ 1697.13236012426 MeV

; Δ = -44869.9615477517 ppm

Third model:

(88) $E_{tcc} \approx E_e \,.\, (N_t/N_e) \,.\, (\mathring{N}_t/N_e)$

; $E_{tcc} \approx$ 1675.00568881454 MeV

; Δ = -57322.6428561935 ppm

The best results, without adding rotational and magnetic energy to the particles, that is, under the assumption that all additional energy is converted into electromagnetic and neutrino radiation, and also disregarding the E_{03} and ETA coefficients, are those of the second model.

Theorem 37: Relativistic Dynamics

The Origin of Inertia and Relativistic Kinetic Energy in Ramionics

In Ramionics, a particle is not an independent geometric point, but a stable pattern of energy distribution in the FCC network of Ramions.

In this picture, the mass of a body arises from the spatial distribution of its equivalent energy, and inertia is also the result of the self-interaction of that same energy distribution. In other words, mass is under the influence of its own gravitational and pressure field, and in order to change its motion, this same energy pattern must be rearranged together with it.

Therefore, without needing the Higgs field or Higgs particle, Ramionics explains the origin of mass inertia from the spatial structure of energy itself.

The Ramionic Principle of Acceleration and Equivalence

If a body moves with acceleration a, in Ramionics this acceleration is seen as an effective gravitational field:

(37.1) $g = a$

Therefore, inertial force is the internal gravitational–pressure reaction of the body's energy distribution against a change in its state of motion.

In this view:

(2) $F = ma$

is not an independent principle, but the effective expression of the pressure and self-gravity of the body's energy distribution against acceleration.

Limited Propagation of the Field

When a body moves with velocity v, its energy pattern cannot instantly become coordinated with the body's new position, because propagation of the energy field is limited to the speed c.

If, during the time interval dt, the body is displaced by dx:

(3) $dx = vdt$

then, during the same time, the field has the opportunity to propagate only up to the following radius:

(4) $R_i = cdt$

Therefore, field propagation and the motion of the body form a fundamental right-angled triangle.

The Propagation Triangle and the Lorentz Factor

During the time dt:

the field propagates with speed c,

the body is displaced with speed v,

and the effective part of the field propagation is R.

Thus:

(5) cdt

is the hypotenuse of the propagation triangle.

(6) vdt

is the displacement of the body in the direction of motion.

And:

(7) Rdt

is the effective part of the field propagation.

Therefore, from Pythagoras' relation:

(8) $(cdt)^2 = (vdt)^2 + (Rdt)^2$

Dividing by:

(9) $(cdt)^2$

we have:

(10) $1 = v^2/c^2 + R^2/c^2$

Thus:

(11) $R/c = \sqrt{(1 - v^2/c^2)}$

and consequently:

(12) $R = c\sqrt{(1 - v^2/c^2)}$

Therefore, the effective radius of field propagation in the direction of motion is reduced by the following factor:

(13) $\lambda = \sqrt{(1 - v^2/c^2)}$

Amplification of the Moving Field

In the Newtonian approximation of Ramionics, the field function of a body is:

(14) $f_0(R) = R_s/R$

where:

(15) $R_s = 2Gm/c^2$

is the effective Schwarzschild radius of the body.

When the effective propagation radius decreases from R to:

(16) $R\sqrt{(1 - v^2/c^2)}$

the field density is amplified by the inverse of this same factor:

(17) $f_v/f_0 = 1/\sqrt{(1 - v^2/c^2)}$

Thus:

(18) $f_v(R) = f_0(R)/\sqrt{(1 - v^2/c^2)}$

or:

(19) $f_v(R) = R_s/(R\sqrt{(1 - v^2/c^2)})$

Therefore, the Lorentz factor is obtained directly from the geometry of the limited propagation of the field.

Field-Energy Integral

In Ramionics, f itself is the coefficient of Ramion energy density. Therefore, the field energy is obtained from the following relation:

(20) $E = 4\pi\rho_s\varphi\int f(R)R^2dR$

For the rest state:

(21) $E_0 = 4\pi\rho_s\varphi\int_{(R_s)}^{R_i} f_0(R)R^2dR$

and for the state of motion:

(22) $E_v = 4\pi\rho_s\varphi\int_{(R_s)}^{R_i} f_v(R)R^2dR$

Substituting the relation for f_v:

(23) $E_v = 1/\sqrt{(1 - v^2/c^2)} \,.\, 4\pi\rho_s\varphi\int_{(R_s)}^{R_i} f_0(R)R^2dR$

Thus:

(24) $E_v = E_0/\sqrt{(1 - v^2/c^2)}$

If the effective rest energy of the body is:

(25) $E_0 = mc^2$

then the total energy of the moving body will be:

(26) $E_v = mc^2/\sqrt{(1 - v^2/c^2)}$

Relativistic Kinetic Energy

Kinetic energy is the difference between the moving-field energy and the rest energy:

(27) $K(v) = E_v - E_0$

Therefore:

(28) $K(v) = mc^2(1/\sqrt{(1 - v^2/c^2)} - 1)$

This is the same formula for relativistic kinetic energy.

The Newtonian Limit

For small velocities:

(29) $v \ll c$

the expansion of the relativistic factor is:

(30) $1/\sqrt{(1 - v^2/c^2)}$

;

(31) $\approx 1 + \frac{1}{2}v^2/c^2 + 3v^4/(8c^4) + \ldots$

Thus:

(32) $K(v)$

;

(33) $\approx \frac{1}{2}mv^2 + 3mv^4/(8c^2) + \ldots$

Consequently:

(34) $K(v \ll c) \approx \frac{1}{2}mv^2$

which is the Newtonian limit.

Rotational Motion and the Return of the Field

In linear motion, the field shells constantly lag behind the body, and the energy pattern moves as an open drift. As a result, field coherence decreases and the Lorentz factor appears.

In rotational motion, however, after one full revolution the field shells return again to the same region, and the front and tail of the field overlap.

As a result, field coherence is preserved much more strongly in rotational motion than in linear motion.

Therefore, relativistic deformation in rotational motion is weaker than in linear motion.

The Ramionic Rotational Factor

In rotational motion, the field constantly overlaps with itself. Therefore, field accumulation is limited and Lorentz divergence does not occur.

In the simplest rotational-overlap model, the overlap contribution is:

(35) $q_{(rot)} = v^2/(2c^2)$

Therefore, the rotational field factor is:

(36) $\gamma_{(rot)} = 1/(1 - v^2/(2c^2))$

This factor, unlike the linear factor:

(37) $\gamma = 1/\sqrt{(1 - v^2/c^2)}$

does not diverge as:

(38) $v \to c$

but instead gives:

(39) $\gamma_{(rot,max)} = 2$

Ramionic Rotational Energy

For a mass element:

(40) dm

at radius:

(41) r

we have:

(42) $v = \omega r$

Therefore, the total energy of that same mass element is:

(43) $dE_{(rot)} = dm\, c^2/(1 - \omega^2 r^2/(2c^2))$

and the kinetic energy of that same element is:

(44) $dK_{(rot)} = dE_{(rot)} - dm\, c^2$

Thus:

(45) $dK_{(rot)} = dm\omega^2 r^2/(2 - \omega^2 r^2/c^2)$

For the whole rotating body:

(46) $E_{(rot,total)} = \int dE_{(rot)}$

Therefore:

(47) $E_{(rot,total)} = c^2\int dm/(1 - \omega^2 r^2/(2c^2))$

and the total kinetic energy is:

(48) $K_{(rot,total)} = E_{(rot,total)} - Mc^2$

where:

(49) $M = \int dm$

Thus:

(50) $K_{(rot,total)} = c^2\int dm/(1 - \omega^2 r^2/(2c^2)) - Mc^2$

The Classical Limit of Rotation

For:

(51) $\omega r \ll c$

we have:

(52) $1/(1 - x) \approx 1 + x$

Thus:

(53) $E_{(rot,total)}$

;

(54) $\approx c^2 \int (1 + \omega^2 r^2/(2c^2))dm$

That is:

(55) $E_{(rot,total)} \approx Mc^2 + \frac{1}{2}\omega^2 \int r^2 dm$

Therefore:

(56) $K_{(rot,total)} \approx \frac{1}{2} I\omega^2$

which is the classical formula for rotational kinetic energy.

The Ehrenfest Paradox

In standard special relativity, the same linear factor is used for every point of a rotating disc:

(57) $\gamma = 1/\sqrt{(1 - v^2/c^2)}$

where:

(58) $v = \omega R$

is the tangential velocity of the point on the disc.

As a result, the circumference of the disc must undergo Lorentz contraction, whereas the radius, being perpendicular to the motion, does not contract.

Thus, in standard relativity:

(59) $C < 2\pi R$

whereas Euclidean geometry says:

(60) $C = 2\pi R$

This problem is known as the Ehrenfest paradox.

In Ramionics, this paradox is the result of directly applying the contraction of linear motion to rotational motion.

This is because, in rotation, the energy field recirculates and different parts of the shell overlap again. Therefore, the real deformation of the field will be much smaller than in the case of linear drift.

In this picture, the circumference of the disc does not experience full Lorentz contraction, and the geometric relation is approximately preserved:

(61) $C \approx 2\pi R$

Consequently, in Ramionics, rotational motion and linear motion are not completely equivalent in terms of relativistic dynamics.

Linear motion is an open drift of the field, whereas rotational motion is a closed recirculation of the field.

Therefore, the Ehrenfest paradox is the result of directly using linear contraction for rotational systems.

The Energy Limit of Rotational Motion

In linear motion, the field shells constantly move away from the body, and field coherence decreases. Therefore, as the velocity approaches c, field overlap disappears and the Lorentz factor diverges:

(62) $\gamma = 1/\sqrt{(1 - v^2/c^2)}$

and consequently:

(63) $E \rightarrow \infty$

But in rotational motion, the field shells return onto themselves, and the front and tail of the field constantly overlap.

Therefore, field coherence is preserved, and field accumulation remains limited.

In the simplest rotational-overlap model, the moving field cannot become more than twice the rest field:

(64) $f_{(max)} = 2f_0$

Thus, the total energy will also be at most twice the rest energy:

(65) $E_{(max)} = 2mc^2$

Therefore, the maximum rotational kinetic energy is:

(66) $K_{(max)} = mc^2$

In this picture, rotational motion, unlike linear motion, does not lead to Lorentz divergence, because the field shells overlap with themselves again and field coherence is preserved.

Consequently:

linear motion → open field drift → relativistic divergence,

rotational motion → field recirculation → energy saturation.

Thus, in Ramionics, relativistic divergence occurs only for open field propagation, and systems with field recirculation have a finite energy limit.

This result shows that relativistic dynamics is not only a function of the magnitude of velocity, but that the topology of field propagation also plays a fundamental role in it.

Galactic and Cluster Generalisation of Relativistic Energy

At very large displacements, the complete Ramionic field function, namely the MOND-like and MOG-like forms, also enters relativistic energy. In this case, the general relativistic kinetic energy is written as follows:

(67) $K = (\gamma - 1) \,.\, 4\pi\rho_s\varphi\int \{R_s \text{ to } R_i\}\{f(R)R^2 dR\}$

where f(R) is the complete Ramionic field function at local, galactic, and cluster scales.

Complete Ramionic Generalisation

In this paper, only the Newtonian approximation of the field was used:

(68) $f_0(R) = R_s/R$

But in the more complete version of Ramionics, the full function of Theorem 34 must be introduced:

(69) $f(R) = R_s/R + (R_s/R_m)E_1(kR/R\_d)$

In that case, relativistic dynamics will also have MOND-like and MOG-like corrections, and special relativity will be the local limit of Ramionic field propagation.

Summary

In Ramionics, inertia and relativistic kinetic energy arise from a common origin: the limited propagation of the body’s energy pattern.

Mass carries its own energy field with it. When the body moves, this field cannot instantly coordinate with the body. The geometry of limited propagation causes an effective compression of the field profile, and this same compression produces the Lorentz factor.

Therefore:

(70) $K(v) = mc^2(1/\sqrt{1 - v^2/c^2} - 1)$

Within this framework, relativistic kinetic energy is the energy required to preserve the coherence of the body's energy pattern during motion.

In linear motion, field coherence decreases and full relativistic deformation appears, but in rotational motion, because the field shells return and overlap again, coherence is preserved much more strongly and relativistic deformation is weaker.

Theorem 38: Deflection of Light in Gravity

Light and the Ramionic Field

In Ramionics, light is not a structureless particle, but a wave-particle propagation of Ramion energy through the FCC network of the universe.

Therefore, the path of light, like any other propagation, is affected by the energy field of the universe.

In this picture, gravity does not arise from an independent geometric curvature of spacetime, but from changes in the energy density and pressure of the Ramionic field around mass.

The Ramionic field function is:

(38.1) $f(R) = R_s/R$

where:

(2) $R_s = 2GM/c^2$

In the more complete version of Ramionics, the complete form of the field is:

(3) $f(R) = R_s/R + (R_s/R_m)E_1(kR/R\_d)$

However, for the deflection of light on the local scale, the Newtonian approximation is sufficient.

Reduction of the Effective Propagation Speed

In Ramionics, an increase in field density causes a reduction in the effective propagation speed of energy.

If:

(4) $\tau(R) = 1/\sqrt{1 - f(R)}$

then:

(5) $c_{(eff)}(R) = c/\tau(R)^2$

Thus:

(6) $c_{(eff)}(R) = c(1 - f(R))$

In the weak approximation:

(7) $f(R) \ll 1$

we have:

(8) $c_{(eff)}(R) \approx c(1 - R_s/R)$

Therefore, the propagation of light slows down near mass.

Gravitational Refractive Index

In this picture, the gravitational field behaves like a medium with a variable refractive index.

The effective refractive index is:

(9) $n(R) = c/c_{(eff)}(R)$

Thus:

(10) $n(R) = 1/(1 - R_s/R)$

In the weak approximation:

(11) $n(R) \approx 1 + R_s/R$

Therefore, the closer light comes to mass, the larger the refractive index becomes, and the path of light bends.

Field Gradient and Deflection of the Light Path

If light passes a mass with a minimum distance b, the field gradient perpendicular to the direction of propagation is:

(12) $\partial f/\partial y = -R_s y/R^3$

At the point of closest approach:

(13) $y \approx b$

and:

(14) $R^2 = x^2 + b^2$

Therefore:

(15) $\partial f/\partial y = -R_s b/(x^2 + b^2)^{3/2}$

This gradient causes the gradual deflection of the propagation of light.

Integral of the Deflection Angle

The total deflection angle is equal to the integral of the change in propagation direction along the path of light:

(16) $\alpha = \int\{-\infty \text{ to } +\infty\}\{\partial f/\partial y\, dx\}$

Thus:

(17) $\alpha = R_s b\int\{-\infty \text{ to } +\infty\}\{dx/(x^2 + b^2)^{3/2}\}$

and since:

(18) $\int\{-\infty \text{ to } +\infty\}\{dx/(x^2 + b^2)^{3/2}\} = 2/b^2$

we have:

(19) $\alpha = 2R_s/b$

Substituting:

(20) $R_s = 2GM/c^2$

gives:

(21) $\alpha = 4GM/(bc^2)$

This is the well-known formula for gravitational light deflection.

Gravitational Lensing

Since light is deflected in the Ramionic field, large masses such as stars, galaxies, and clusters act as gravitational lenses.

In Ramionics, gravitational lensing is the direct result of the gradient of the energy field, not of an independent curvature of spacetime.

Therefore:

the deflection of light,

gravitational lensing,

and even the Einstein ring

all arise from the propagation of light through a variable Ramionic field medium.

Galactic and Cluster Version

On large scales, the complete field form enters the deflection of light:

(22) $f(R) = R_s/R + (R_s/R_m)E_1(kR/R\_d)$

and in clusters, the FCC-Hubble factor is also added.

Thus, the complete deflection of light will be:

(23) $\alpha = \int \{-\infty \text{ to } +\infty\}\{\partial f(R)/\partial b \, dx\}$

Therefore, the additional gravitational lensing that is attributed to dark matter in the standard model arises in Ramionics directly from the complete structure of the Ramionic field.

Summary

In Ramionics, light is a propagation of energy through the FCC network of the universe, and the gravitational field changes the effective propagation speed of light by changing energy density.

This change in speed acts like a gravitational refractive index and causes the path of light to bend.

In the local approximation:

(24) $\alpha = 4GM/(bc^2)$

is obtained, which is the same result as general relativity.

However, on galactic and cluster scales, the complete Ramionic field function also introduces MOND-like and MOG-like corrections into the deflection of light.

Therefore, in Ramionics, gravitational lensing, dark matter, and the propagation of light all arise from a single energy field.

Theorem 39: Strong and Weak Forces, Matter–Antimatter Asymmetry

Fundamental Interactions in Ramionics

In the standard model of physics, there are four independent fundamental interactions:

gravity,

electromagnetism,

the strong interaction,

and the weak interaction.

In this picture, each interaction has its own independent carrier particle.

But in Ramionics, independent fundamental interactions do not exist.

All interactions are different modes of propagation, overlap, compression, and projection of a single Ramionic field.

Therefore:

the strong interaction,

the weak interaction,

electromagnetism,

and gravity

are all different modes of one single fundamental field.

The Twelve-Wing Structure and Charge Quantisation

Each Ramion has 12 FCC wings, organised as 6 opposite pairs.

To preserve torque equilibrium, every two opposite wings must rotate in opposite directions from the viewpoint of the centre, so that:

(39.1) $\sum \tau = 0$

is preserved.

However, if the same two wings are observed from two opposite sides and from outside, their apparent directions of rotation are seen as having the same sign.

Therefore, every opposite pair acts as an effective contribution of charge.

As a result, the 12 wings become:

(2) 6

effective charge contributions.

If the contribution of each section is:

(3) q/6

then the total charge can take only seven states:

(4) 0

(5) ±1/3

(6) ±2/3

(7) ±3/3

and this produces exactly the observed charges of fundamental particles.

The Neutrino and Local Polarisation

In Ramionics, the neutrino is not a structureless particle.

The neutrino has local rotational polarisation:

(8) $6(+q/6) + 6(-q/6)$

Therefore:

(9) $q_{(net)} = 0$

but at short distance:

(10) $q_{(local)} \neq 0$

Consequently, the neutrino has a very weak short-range interaction, even though its net charge is zero.

Therefore, the weak interaction may arise from the local polarisation of this same rotational structure.

The Weak Interaction in Ramionics

In the standard model, the weak interaction is transmitted by weak carrier particles.

But in Ramionics, the weak interaction is not an independent fundamental interaction.

The weak interaction is a highly damped and highly localised mode of overlap of the rotational field.

In this picture:

beta decay,

neutrino interaction,

change of quark type,

and nuclear processes

are all local rearrangements of the Ramionic field.

Therefore, Ramionics does not require an independent carrier particle to explain the weak interaction.

The strength of the weak interaction relative to electromagnetism is approximately:

(11) 10^{-5}

Consequently:

(12) $F_{(weak)} \approx 10^{-5} F_{(EM)}$

and this weakness arises from the severe damping of field propagation in this mode.

The Strong Interaction in Ramionics

In standard physics, the strong interaction is about:

(13) 10^{38}

times stronger than Newtonian gravity.

In Ramionics, this difference arises from the distinction between the short-range field and the long-range field.

Newtonian gravity is a long-range and diluted projection of the Ramionic field:

(14) $G = G_s \,.\, K_{\mathcal{g}} \,.\, 144/(N^8 \,.\, (1 - 1/N))$

But the short-range quark interaction is controlled directly by the fundamental coefficient:

(15) G_s

At very short distances, FCC geometric dilution has not yet fully occurred, and therefore the interaction remains very strong.

Constituent Energy and the Strong Interaction

In Ramionics, the fundamental interaction depends on the real energy content of the constituent parts.

The up quark has the coefficient:

(16) 2

and the down quark has the coefficient:

(17) 24/19

Therefore, the interaction between them produces the following coefficient:

(18) $2 \,.\, 24/19 = 48/19$

Also, in the short-range interaction, the volumetric coefficient:

(19) φ^5

which is related to the internal part of the Ramion, is removed.

The initial ratio of the short-range field to long-range gravity is:

(20) $144G_s/G \approx 7.76 \times 10^{36}$

By removing the volumetric coefficient:

(21) $1/\varphi^5 \approx 4.50$

and applying the quark coefficient:

(22) $48/19 \approx 2.53$

we have:

(23) $7.76 \times 10^{36} . 4.50 . 2.53$

Thus:

(24) $F_{(strong)}/F_{(gravity)} \approx 8.8 \times 10^{37}$

which is practically the same known order:

(25) 10^{38}

for the ratio of the strong interaction to gravity.

Therefore, in Ramionics, the strong interaction is not an independent fundamental interaction, but the short-range and compressed mode of the Ramionic field, while Newtonian gravity is the long-range and diluted version of the same field.

Elimination of Carrier Particles and the Higgs Field

In Ramionics:

inertia arises from field self-interaction,

gravity arises from field projection,

the strong interaction arises from compressed overlap,

the weak interaction arises from damped overlap,

and electromagnetism arises from the rotational field.

Therefore, there is no need for:

a graviton,

the Higgs field,

a gluon,

or weak-interaction carrier particles.

All interactions are different modes of propagation of the Ramionic field.

Matter–Antimatter Asymmetry

In the standard model, the real origin of matter–antimatter asymmetry has not yet been fully explained.

But in Ramionics, this asymmetry arises from the polarisation and overall orientation of the field of the universe.

If the whole universe is a vast Ramionic structure, or if every supercluster has a net rotational orientation, the background field acquires a weak polarisation.

As a result, the effective vacuum will not be completely symmetric.

Therefore, the probabilities of matter and antimatter formation will not be exactly equal.

The direction of galactic rotation and the polarisation of particles will also become asymmetric.

In this picture:

baryonic asymmetry,

left–right asymmetry,

and the dominance of matter

all arise from the overall rotational polarisation of the field.

Entropy Balance and Matter–Energy Exchange

In Ramionics, the conversion of matter and energy is not an independent annihilation or creation, but a rearrangement of the Ramionic field.

Therefore, weak interactions and decay processes are also different modes of exchange and redistribution of energy in the FCC network.

Within this framework, entropy is also the result of the redistribution of field structures, not an independent increase in random disorder.

Summary

In Ramionics, the strong and weak interactions are not independent fundamental forces.

The strong interaction arises from compressed overlap of the short-range field, and the weak interaction arises from localised and damped overlap.

The twelve-wing FCC structure naturally produces the quantisation of charges:

(26) $0, \pm 1/3, \pm 2/3, \pm 1$

The neutrino has local polarisation, and its weak interaction arises from this same structure.

Matter–antimatter asymmetry is likewise the result of the polarisation and overall orientation of the Ramionic field of the universe.

Consequently, Ramionics explains:

interactions,

charge quantisation,

matter–antimatter asymmetry,

and the dominance of matter

all through the geometry and dynamics of a single field.

Theorem 40: Dimensions and Shape of the Universe and Entanglement

Superspace, Space, and Non-Space

In Ramionics, the three-dimensional space of the universe is not an independent fundamental substrate, but the result of the structure and field of Ramions.

Ramions are located in a very high-dimensional, or even infinite-dimensional, superspace.

The Ramions themselves, in proportion to their energy, produce:

space,

time,

and the local metric.

Therefore, the three-dimensional space of our universe is an emergent structure arising from the field of Ramions.

Each Ramion regulates the effective dimensions of space and time in proportion to its own energy.

In this picture:

superspace → the fundamental high-dimensional environment,

space → the region organised by Ramions,

non-space → the unoccupied parts of superspace between Ramions.

Fundamental Equilibrium of the Ramion

A Ramion has no independent fundamental constraint except two principles:

conservation of energy,

and equilibrium between linear and rotational energy.

The fundamental equilibrium of the Ramion is:

(40.1) $E^R = E_l$

and the linear energy is:

(2) $E_l = rF_l/3$

If the energy injected into a Ramion is asymmetric, meaning that the linear and rotational parts are not equal, the Ramion restores equilibrium again with absolutely zero delay.

The Ramion does this by changing the effective dimensions of space and time.

If linear energy increases, the Ramion enlarges the spatial dimensions.

And if rotational energy increases, it enlarges the temporal dimensions.

Therefore, relativity and changes in the metric arise directly from this same principle of fundamental equilibrium.

Continuous Dimensions of Space and Time

In Ramionics, the dimensions of space and time are not fixed and rigid quantities.

Dimensions may be:

continuous,

fractional,

and dependent on energy density.

Within this framework:

spatial dimensions are always greater than or equal to 3,

and temporal dimensions are greater than or equal to 1.

When the energy of a Ramion changes, the effective dimensions also change continuously.

Non-Space and Almost Instantaneous Propagation

Since the FCC network does not fill the entire volume:

(3) $\varphi \approx 0.74048$

only about 74 per cent of the volume is occupied by Ramions and the space constructed by them.

Therefore:

(4) $1 - \varphi \approx 0.25952$

of the volume still remains part of unoccupied superspace.

This unoccupied part is non-space.

Non-space is not the absence of space, but rather those parts of superspace that have not yet been transformed by the Ramion field into ordinary three-dimensional space.

In non-space:

energy density is approximately zero,

the ordinary limitations of space and time do not exist,

and propagation can be almost instantaneous.

Therefore, the real propagation of the field does not pass only through three-dimensional space; part of it passes through non-spatial columns between Ramions.

The Origin of the Speed of Light

In Ramionics, the speed of light is the result of the combination of propagation through Ramionic space and non-space.

The propagation speed inside the Ramion itself is:

(5) $\mathring{c}$

But part of the propagation passes through non-space, which has almost infinite propagation.

Therefore, the effective speed of light becomes:

(6) $c = \mathring{c}/\varphi$

In this picture, φ is the FCC geometric occupancy ratio.

Since the propagation path must be modelled as a narrow cylinder, the linear ratio of the occupied part will be the same as the FCC volume ratio.

Therefore, the factor:

(7) φ

and not:

(8) γ

appears in the speed of light.

Free Capacities of Ramions

In the FCC network, each Ramion has 12 connection capacities.

In the ordinary bulk of the network, these 12 capacities are almost completely filled, and therefore ordinary Ramions do not have significant free capacity to create non-spatial bridges.

This point is very important, because it shows that entanglement is not a general property of all Ramions, but occurs mainly in boundary and surface regions.

The Ramions on the surface of particle-scale and galactic black holes, as well as the Ramions in the final layer of the universe, have some of their connection capacities empty.

Each surface Ramion has approximately three free capacities.

These free capacities form bridges towards opposite Ramions in order to preserve force and torque equilibrium.

Therefore, entanglement arises directly from unfilled surface capacities.

Type-I Entanglement

In Type-I entanglement, the Ramions on the surface of black holes:

whether at the centre of particles,

or in galactic black holes,

connect through non-space to their opposite Ramions.

Each surface Ramion forms a non-spatial bridge with approximately three opposite Ramions.

These bridges establish:

force equilibrium,

torque equilibrium,

and field coherence.

In this case, entanglement occurs within a single structure.

Therefore, the real axes of the field are formed by these same non-spatial bridges.

Type-II Entanglement

In Type-II entanglement, the Ramions on the surface of one black hole or one particle form bridges to the surface Ramions of another structure.

In this case, the topology of the field becomes connected between two independent structures.

On the particle scale, this phenomenon is quantum entanglement.

And on the black-hole scale:

two black holes become truly connected,

and a wormhole is formed.

Therefore, entanglement and wormholes are two manifestations of one common topology.

Entanglement of Scattered Ramions

A third state of entanglement may also exist.

In this state, two pairs of neighbouring Ramions disconnect part of their local connection and instead form bridges to more distant pairs.

As a result, the topology of the FCC network is locally rearranged.

This state is a kind of entanglement of scattered Ramions.

In this picture, entanglement is not merely the complete connection of two structures, but a rearrangement of topology among different parts of the network.

A Flat but Closed Universe

In standard cosmology, a closed universe usually means positive curvature of spacetime.

But in Ramionics, the universe can be:

locally flat,

but globally closed.

This is because the closedness of the universe does not arise from the curvature of three-dimensional space itself, but from non-spatial connections in superspace.

This situation resembles a flat sheet whose edges, in higher dimensions, are connected to the opposite side by curved strands.

The sheet itself remains flat, but its topology becomes closed.

In the Ramionic universe as well:

the final layer of Ramions forms bridges towards the opposite side of the universe,

and the universe acquires a closed topology.

Therefore:

every point can be seen as the centre of the universe, and objects can disappear from one side and appear from the other.

In this picture, the closedness of the universe arises from the topology of superspace, not from the curvature of three-dimensional space.

The Radius of the Universe and the Hubble Radius

In Ramionics, the real radius of the universe is different from the Hubble radius.

The fundamental relation is:

(9) $R_{(obs)} = 4\gamma R_h$

Therefore:

(10) $R_h = R_{(obs)}/(4\gamma)$

where:

$R_{(obs)}$ is the real radius of the universe,

and R_h is the Hubble radius.

Consequently, the three-dimensional universe is:

finite,

flat,

and closed.

Non-Space and Dark Matter

Since the packing of the FCC network is not complete:

(11) $\varphi \approx 0.74048$

approximately:

(12) $1 - \varphi \approx 0.25952$

of the volume of the universe still remains non-space.

This value is approximately the same ratio observed in cosmology for dark matter.

In the standard model, dark energy is usually defined over the whole of space.

But in Ramionics, the non-spatial part of superspace has a real contribution to the topology and propagation of the field.

Therefore, a significant part of the effects attributed to dark matter may arise from non-space and the hidden topology of the Ramionic network.

In this picture, dark matter is not necessarily independent matter, but the geometric and topological manifestation of non-space in the FCC structure of the universe.

Multidimensional Universes

In Ramionics, the fundamental laws arise from the geometry and equilibrium of Ramions, not from random parameters.

Therefore, every stable three-dimensional universe will have:

the same constants,

the same electron family,

the same particles,

and the same elements.

The only difference among universes is their scale.

Consequently, for every three-dimensional universe:

(13) $R_h = R_{(obs)}/(4\gamma)$

will hold.

Ramionics can even predict the constants and formulae of four-dimensional universes and higher dimensions, because by changing the number of dimensions:

packing geometry,

the number of neighbours,

field equilibrium,

and particle structure

all change.

Therefore, Ramionics is not only a theory of our universe, but a theory of the family of possible universes.

Summary

In Ramionics, the three-dimensional space of the universe is the product of the field of Ramions, and Ramions are located in a high-dimensional superspace.

The unoccupied parts of superspace between Ramions are non-space, which make almost instantaneous field propagation possible.

Entanglement is the result of a real topological connection in superspace, and wormholes are the large-scale manifestations of these same connections.

The three-dimensional universe may be flat while still remaining closed because of the topology of superspace.

The fundamental laws of different three-dimensional universes will also be the same, and only their scale will change.

Consequently, Ramionics explains:

relativity,

the speed of light,

entanglement,

wormholes,

the topology of the universe,

dark matter,

and the multiverse structure

all through the geometry and dynamics of a single field.