

Fine-Structure Constant derived from primes and $G/(\mu_0 \alpha^2)$ from $\ln 2$ -- a unification of electromagnetism with gravity

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Abstract We derive $1/\alpha \approx 137.035999084$ from the prime constant (10 terms yield all 12 CODATA 2018 digits) and unify gravity with electromagnetism via $G/(\mu_0 \alpha^2)$ as a function of $\ln 2$ (eight formulae agree to $<3 \times 10^{-16}$). These relations emerge from covariant scaling in spherical spacetime, where primes and $\ln 2$ encode quantized geometry, resolving dark energy enigmas without ad hoc parameters. Through reverse metrology, this prime-logarithmic synergy positions α as the timeless scaffold of our expanding holographic cosmos, refining many CODATA 2026 quantities.

1. Introduction

The fine-structure constant $\alpha \approx 1/137.036$, was discovered in hydrogen's relativistic spectral lines by Sommerfeld [1], he interpreted it as the electron's orbital velocity in Bohr's model [2]. It captivates for its dimensionless purity, as noted by Dirac [3], Feynman [4], Schwinger, and Tomonaga in their QED advancements [5]. The 2018 rubidium recoil measurements yielded $1/\alpha \approx 137.035999084(21)$ [6], whereas CODATA 2022's $137.035999177(21)$ [7], this variance attributed to metrological assumptions resolved in Section 5.

Starting from mathematically pure foundations in number theory and geometry it rigorously builds its extremely precise theoretical framework that validates its own self-consistency.

1. Introduction
2. Define the Prime Constant
3. Derive Inverse of Fine-Structure, $1/\alpha$
4. Visualize its rapid convergence
5. Fine-Structure: brief recent history
6. Twelve expressions for $1/\alpha$
7. Thirteen expressions for c
8. Eight expressions for G : unifying EM with gravity.
9. Define Wavicle Physics and True Nature of Time.
10. Implications of this new cosmological paradigm
11. Proposed CODATA 2026 values

As Einstein reflected, "We cannot solve our problems with the same thinking that created them" [8]. Dark factors (>95%) arise from assuming invariant meters, seconds, kilograms, and coulombs. In cosmological relativity, these 4 emergent metrics expand with cosmic time. Thus, the values of Planck length and time shrink inversely in lockstep with each other, preserving c , α , and $G/(\mu_0 \alpha^2)$.

2. Prime Constant: One Binary Number Encodes All Primes

A prime is an integer divisible only by 1 and itself. The prime constant is

$$P_c = \sum 2^{-p}; p \in \{primes\} \quad (1)$$

$$P_c \approx 0.414\ 682\ 509\ 851\ 111\ 660\ 248\ 109\ 622\ 154\ 307\ 708\ 365\ 774\ 238\ 137\ 916\ 977\ 868\ 245$$

converging rapidly: 20 primes yield 16 digits, 50 yield 60. Respecting Euclid's infinitude of primes [9] and Riemann's zeta function [10], this sum's novelty in physics [11] suggests primes as the indivisible "atoms" of Quantum Wave Numbers. The true foundation for weaving nature's spacetime fabric.

3. Derive Inverse of Fine-Structure, $1/\alpha$

Our **hypothesis** explored the *hypotenuse* of a right triangle: base=137 & height = $f(\text{PrimeConst}), P_c$

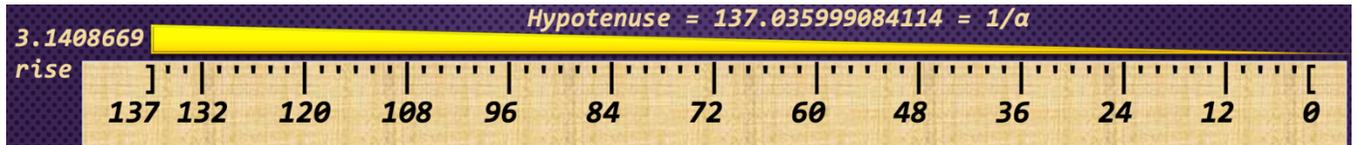
$$\frac{1}{\alpha} = \sqrt{137^2 + \frac{30(P_c + 5)}{59P_c - 8}} \quad (2)$$

Below is actual output from John Wsol's Physics Calculator, developed in J-language. It evaluates each formula's value, relative uncertainty, does dimensional analysis and can often recall its meaning from its ever-growing integrated database of hundreds of values & equations.

```
calc 'numer_pc=30*(PrimeConst+5) denom_pc=(59*PrimeConst)-8 numer_pc/denom_pc %:((137^2)+that)'
```

Quantity	Value	relUnc	Description
numer_pc=30*(PrimeConst+5)	162.440475295533	0	In alpha formula: numerator with PrimeConst
denom_pc=(59*PrimeConst)-8	16.4662680812156	2.2e_16	alpha formula: denominator with PrimeConst
ratio_pc=numer_pc/denom_pc	9.86504498131197	2.8e_16	9.865 is $\Delta\text{SurfaceArea}/137 = (1/\alpha)^2 - 137^2$
$\sqrt{((137^2)+that)}$	137.035999084114	0	$1/\alpha$ is hypotenuse $C_\alpha = \sqrt{137^2 + \pi_\alpha^2}$

Figure 1: $1/\alpha$ The Hypotenuse which Rules over most of Physical Reality



$$1/\alpha = 137.035999084114069051510536990526283083923808685605940625219167$$

To comprehend this Prime Constant, P_c , replace it with x (our mystery value between 0.25 & 0.5) Note that both the numerator and denominator have the form of a simple linear equation sharing the same x term.

Note: In the fraction, ratio_pc, the rationale behind the coefficients are as follows:

- In the numerator adding 5 is like a phase-shift applied before we multiply by 30.
- 30 is the product of 1st 3 prime numbers, $2 \times 3 \times 5$, where 30 has predominant influence here.
- All primes 5 or greater, when squared & divided by 24 will have a remainder of 1— *always*.
- In the denominator 59 is the last prime before reaching 2×30 , $30/59$ is slightly less than $1/2$.
- Subtracting 8 is like applying a reverse phase shift.

```
calc 'C_alpha; that^2 a_0/r_e; sqrt(that-137^2) pi_alpha pi'
```

Quantity	Value	relUnc	Description
C_α	137.035999084114	4.1e_16	$1/\alpha$ is hypotenuse $C_\alpha = \sqrt{137^2 + \pi_\alpha^2}$
that ²	18778.8650449813	8.8e_16	$1/\alpha^2 = \text{Bohr radius}/\text{electron charge radius}$
a_0/r_e	18778.8650449813	1.6e_12	$1/\alpha^2 = \text{Bohr radius}/\text{electron charge radius}$
$\sqrt{(that-137^2)}$	3.14086691556753	1.5e_9	$\pi_\alpha = 3.1408669$ collapse into Higgs field
π_α	3.14086691556753	1.5e_9	$\pi_\alpha = 3.1408669$ collapse into Higgs field
π	3.14159265358979	0	$\pi = \text{circumference over diameter of a circle}$

Note: π_α , π_α , is the symbol name for the square root of the fraction that uses the prime constant. This fraction's coefficients, with only 3 digits in the numerator plus 3 more in the denominator, yet the Pythagorean formula matches all 12 digits of the CODATA 2018!

This yields $1/\alpha = 137.035999084114...$ matching CODATA 2018 to 12 digits [12]. The coefficients evoke prime influences: $30 = 2 \times 3 \times 5$, 59 the last prime before 60. $\pi_\alpha = \sqrt{(\text{ratio_pc})} \approx 3.1408669$. Probability of coincidence is ~ 1 in 10^{12} , far beyond chance [13]

Quantity	Value	relUnc	Ratios of assorted dimensional units
$(q_P/e)^2$	137.035999084114	2.8e ₋₁₀	(a) (Planck Charge/FundamentalCharge) ²
$2*\epsilon_0*h*c/e^2$	137.035999084114	2.8e ₋₁₀	(b) (Planck Charge/FundamentalCharge) ²
$2*(q_P^2)/G_0*h$	137.035999084114	2.6e ₋₁₀	(c) 2*Quantum(Charge/Conductance*h) ²
$\sqrt{(a_0/r_e)}$	137.035999084114	7.8e ₋₁₃	(d) $\sqrt{(\text{BohrRadius}/\text{electronChargeRadius})}$
$\sqrt{(m_e*c/2*h*R_\infty)}$	137.035999084114	8.5e ₋₁₁	(e) $\sqrt{(\text{Momentum}/\text{Impulse})}$ of electron
$R_K/(2\pi*Z_P)$	137.035999084114	1.9e ₋₁₀	(f) 2*vonKlitzing/Impedance of Space
m_P*l_P/m_e*r_e	137.035999084114	2.1e ₋₁₀	(g) [kilogram meters] / [kg m]
$(2*h/e^2)/Z_0$	137.035999084114	2.6e ₋₁₀	(h) [Ohms / Ohm]
$4*\Phi_0/Z_0*e$	137.035999084114	1.7e ₋₁₀	(i) [Webers / Weber]
$2*h/Z_0*e^2$	137.035999084114	2.6e ₋₁₀	(j) [J s]/(e[C]) ² *Z ₀ [Ohm] = 1/α
$(hBar*c)/K_e*e^2$	137.035999084114	2.7e ₋₁₀	(k) Photon? [m ³ kg/s ²]/[m ³ kg/s ²]
$(G*m_P^2)/K_e*e^2$	137.035999084114	2.8e ₋₁₀	(l) Graviton? [m ³ kg/s ²]/[m ³ kg/s ²]

All these ratios hold constant despite time-varying terms per covariance rules explained in Section 9.1

Quantity	Value	relUnc	units	-L-T+M+C	dt	ratios of diff.units
q_P^2	3.51767293047686e ₋₃₆	1.6e ₋₁₀	C ²	0 0 0 2	2	(a) Planck Coulombs ² elementaryCharge ²
e^2	2.5669699597094e ₋₃₈	1.6e ₋₁₀	C ²	0 0 0 2	2	
$2*\epsilon_0*h*c$	3.51767293047686e ₋₃₆	1.6e ₋₁₀	C ²	0 0 0 2	2	(b) Electric Charge ²
e^2	2.5669699597094e ₋₃₈	1.6e ₋₁₀	C ²	0 0 0 2	2	
$2*(q_P^2)$	7.03534586095372e ₋₃₆	5.2e ₋₁₀	C ²	0 0 0 2	2	(c) 2xQuantum Charge Conductance × h/2
$G_0*h/2$	5.13393991941881e ₋₃₈	5.1e ₋₁₀	C ²	0 0 0 2	2	
$\sqrt{(a_0/r_e)}$	5.29177210901992e ₋₁₁	1.1e ₋₁₂	m	1 0 0 0	-1	(d) $\sqrt{(\text{Bohr_Radius})}$ $\sqrt{(e\text{-ChargeRadius})}$
	2.8179403261829e ₋₁₅	1.1e ₋₁₂	m	1 0 0 0	-1	
$\sqrt{(m_e*c/2*h*R_\infty)}$	2.73092453075981e ₋₂₂	1.9e ₋₁₂	kg m/s	1 -1 1 0	1	(e) $\sqrt{(\text{Momentum} = m_e*c/}$ $\sqrt{(\text{Impulse}=2*h/\text{meter})}$
	1.45425430355795e ₋₂₆	1.9e ₋₁₂	kg m/s	1 -1 1 0	1	
R_K	25,812.8074593045	2e ₋₁₄	Ohm	2 -1 1 -2	-2	= R_K over 2π (f) Planck Impedance
$2\pi*Z_P$	188.365156833427	1.4e ₋₁₄	Ohm	2 -1 1 -2	-2	
(m_P*l_P)	3.51767293001241e ₋₄₃	1.2e ₋₁₀	kg m	1 0 1 0	0	(g) \int Planck Momentum dt \int Electron Momentum dt
(m_e*r_e)	2.56696995937048e ₋₄₅	1.7e ₋₁₀	kg m	1 0 1 0	0	
$(2*h)/e^2$	51,625.614918609	2e ₋₁₄	Ohm	2 -1 1 -2	-2	= 2*R_K Impedance (h) in Ohms
Z_0	376.730313666854	1.4e ₋₁₄	Ohm	2 -1 1 -2	-2	

- Charge ratios ²:** Relate quantum-scale (Planck charge) to (elementary charge).
- Electric Permittivity, ϵ_0 ,** fits this matrix by $q_P^2 = 2 \times \epsilon_0 \times h \times c$,
- Conductance quantum:** $G_0 = 2 \times (e^2)/h$
- Radii ratio:** Bohr radius over classical electron radius, linking atomic scale to charge distribution.
- Momentum/Impulse:** $\text{Sqrt}(\text{electron's momentum} / 2 \times \text{Planck's constant} \times \text{Rydberg Constant})$.
- Impedance ratio:** von Klitzing constant, R_K
- Integration of Planck/Electron Momentum:** means electron is a fractal emerging from the quantum!
- Impedance ratio 2:** (aka 1/quantized Hall Conductance) over $2\pi \times \text{Planck Impedance}$ $(2h/e^2)/Z_0$, where Z_0 is Impedance of Free Space, 376.72 Ohms.
- Webers/Weber:** Involving Φ_0 , the magnetic flux quantum. [5]
- Angular Momentum ratio:** Planck's constant, h over Impedance, Z_0 , Fundamental Charge

Quantity	Value	relUnc	units	-L-T+M+C	dt	ratios of diff.units
$4*\Phi_o$	8.27133540484541e_15	1.3e_10	Wb	2_1 1_1_1_1	1	(i)MagneticFluxQuantum
Z_o*e	6.03588506679065e_17	1.8e_10	Wb	2_1 1_1_1_1	1	Impedance*Charge
$2*h$	1.32521403e_33	1.3e_16	J s	2_1 1_1 0	0	(j) Angular Momentum
$(e^2)*Z_o$	9.67055400666339e_36	1e_15	J s	2_1 1_1 0	0	dt=0: CONSTANT!
$(hBar*c)$	3.16152678404241e_26	1e_15	m3 kg/s2	3_2 1_1 0	0	(k) Is this a Photon?
$(e^2)*K_e$	2.30707756003722e_28	2.8e_14	m3 kg/s2	3_2 1_1 0	0	dt=0: CONSTANT!
$(G*m_P^2)$	3.16152678404241e_26	4e_14	m3 kg/s2	3_2 1_1 0	0	~~~PhaseShift = $\pi/2$ ~~~
$(e^2)*K_e$	2.30707756003722e_28	2.8e_14	m3 kg/s2	3_2 1_1 0	0	(l) A graviton? (Most probably!)

- k) **Unify EM:** The essence of a photon ($hBar \times c$), angular momentum ($1\text{-radian}/t_P$)
- l) **Graviton, ($G \times m_P^2 = m_P \times l_P \times c^2 = hBar \times c$):** Gravitons maintain a phase shift of $\pi/2$ (90°) out of phase with photons, within its 24-hBar envelope. See [6] [7] Unified Electro-Gravity Framework.

The photon phase-locks with the surfer “sweet spot”—where the energy gradient emerges during μ_0 , magnetic permeabilty phase.

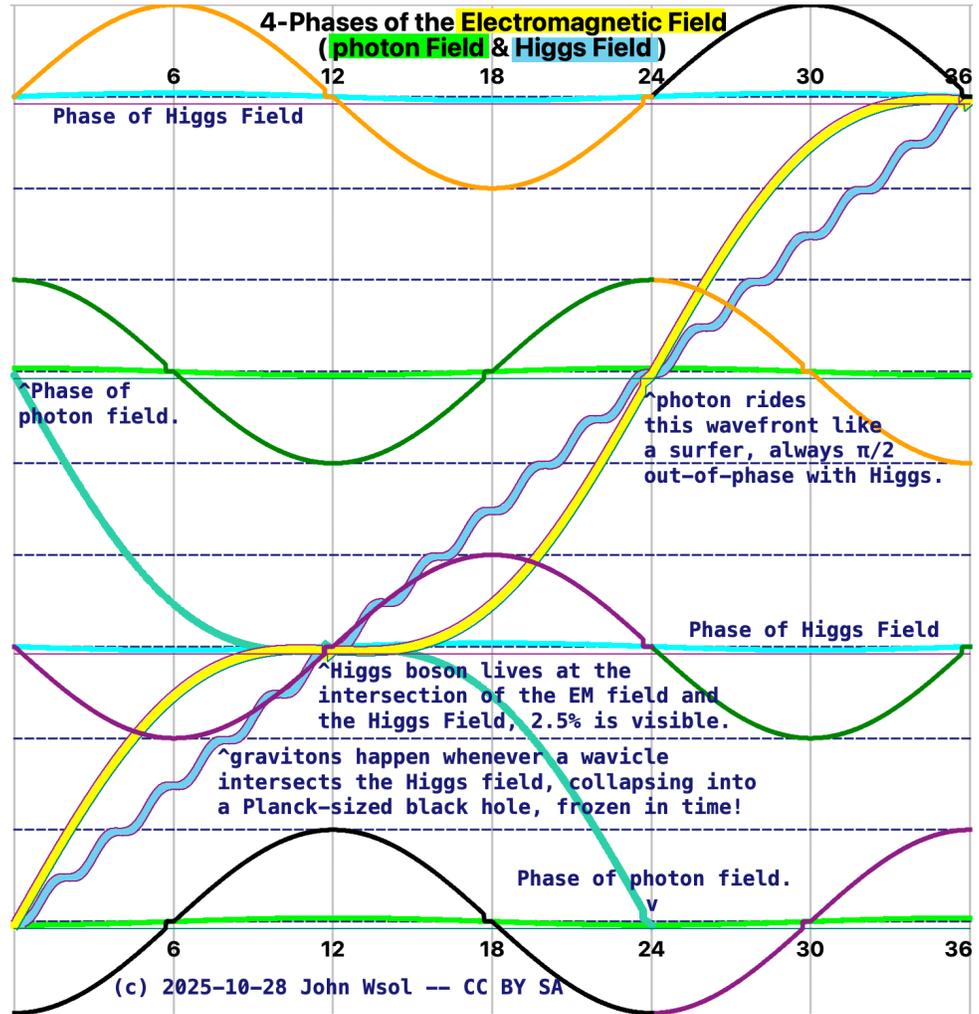
Photons are packets of angular momentum spreading fourth at c while its wave function (Ψ) rotates 1-radian per Planck time. With a precession rate of $656 \times c$ time quanta. (Here, 299,792,459 meters are quantum calibrated see Section 11

Gravitons phase-lock with the plateau portion of each envelope of 24 quantized stairsteps, where the Higgs field intersects 2.5% of the EM field. [8]

During the Impedance phase, Z_o , incoming waves curl up 11-channels of information (M-theory). At #12 is when it collapses into a Planck sized black hole – a permanently etched holographic memory of this quantum event – literally. **frozen in time.** As each

wavicle type does this at its specific omega frequency, a trail of these etched Planckions sum up to be the exact mass for that particle type at that exact age of the universe. The next section has specific examples.

Figure 2: 4 Phases of EM Field 24-hbar ground state; $y = \tau + 6 \sin(\tau/6)$ & Higgs Field



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6.1. Mass-Time Quantum

For example, an electron~wavicle has an omega frequency, $\omega_e = (m_e \times c^2)/h\text{Bar}$.

calc 'm_P*t_P hBar/c^2 mt_0 m_e m_e*c^2 that/hBar that*mt_0 m_e'

Quantity	Value	relUnc	units	-L-T+M+C	dt	Description
m_P*t_P	1.17336938418868e_51	4.7e_9	kg s	0 1 1 0 0		mass-time quantum (quantized increment)
hBar/c^2	1.17336938418868e_51	5e_10	kg s	0 1 1 0 0		quantum of action spreads on surface/sec
mt_0	1.17336938418868e_51	4.7e_9	kg s	0 1 1 0 0		mass-time quantum give it the name mt_0.
m_e	9.1093837139e_31	3.1e_10	kg	0 0 1 0 1		mass of electron (kg)
m_e*c^2	8.18710584258694e_14	3.1e_10	J	2 _2 1 0 1		Energy of electron
that/hBar	7.76344076865326e20	5.9e_10	Hz	0 _1 0 0 1		Compton angular freq of electron [rad/s]
that*mt_0	9.1093837139e_31	4.7e_9	kg	0 0 1 0 1		mass of electron (kg)
m_e	9.1093837139e_31	3.1e_10	kg	0 0 1 0 1		mass of electron (kg)

Each particle type has, as its root cause, a wavicle with its omega frequency, $\omega_x = (m_x \times c^2)/h\text{Bar}$.

In other words, so called, “particles” **amass mass**. How much mass depends on how long our “second” has been growing, *that is to say*, the age of the universe.

calc 'm_P*t_P mt_0 hBar/c^2; omg_e omg_p omg_n; mt_0*omg_e m_e; mt_0*omg_p m_p; mt_0*omg_n m_n'

Quantity	Value	relUnc	units	-L-T+M+C	dt	Description
m_P*t_P	1.17336938419e_51	4.7e_9	kg s	0 1 1 0 0		mass-time quantum (quantized increment)
mt_0	1.17336938419e_51	4.7e_9	kg s	0 1 1 0 0		mass-time quantum, give it the name mt_0
hBar/c^2	1.17336938419e_51	5.0e_10	kg s	0 1 1 0 0		quantum of action spread on surface/t_P
ω_e	7.76344076865e20	5.9e_10	rad/s	0 _1 0 0 1		Compton's electron angular freq.[rad/s]
ω_p	1.42548625222e24	5.9e_10	rad/s	0 _1 0 0 1		ω -frequency of proton wavicle [rad/s]
ω_n	1.42745117022e24	7.1e_10	rad/s	0 _1 0 0 1		neutron's ω -frequency (2022)
mt_0* ω_e	9.1093837139e_31	4.7e_9	kg	0 0 1 0 1		mass of electron (kg)
m_e	9.1093837139e_31	3.1e_10	kg	0 0 1 0 1		mass of electron (kg)
mt_0* ω_p	1.67262192594e_27	4.7e_9	kg	0 0 1 0 1		proton mass (2022)
m_p	1.67262192594e_27	3.1e_10	kg	0 0 1 0 1		proton mass (2022)
mt_0* ω_n	1.67492750056e_27	4.8e_9	kg	0 0 1 0 1		neutron mass CODATA2022
m_n	1.67492750056e_27	5.1e_10	kg	0 0 1 0 1		neutron mass CODATA2022

The Higgs Mechanism: [9] The higher the omega frequency is – the more often the wavicle wavefunction experiences its Zero-point crossing, where it collapses into the Higgs field, acquiring more mass.

6.2. Quantum calibration for Rydberg? Maybe.

While exploring quantum calibrating the Cesium 133 hyperfine spectral line frequency, I discovered that we should add 7 Hz 9,192,631,777 effectively calibrating the duration of a second by 0.76 parts per billion. A last-minute discovery with Rydberg yielded an integer. But it is not within experimental uncertainties.

calc 'Roo*c that/Cs133 qi_Roo (%:qi_Roo)*Cs133/c Roo'

Quantity	Value	relUnc	units	-L-T+M+C	dt	Description
Roo*c	3289841971223713	1.1e_12	Hz	0 _1 0 0 1		Rydberg Frequency(2022)
that/Cs133	357878.1409971093	1.1e_12		0 0 0 0 0		based on Cs133 = 9,192,631,777
qi_Roo	128076763810	2.5e_11		0 0 0 0 0		quantum integer for Rydberg
($\sqrt{qi_Roo}$)*Cs133/c	10973731.56843346	1.2e_11	/m	_1 0 0 0 1		Rydberg qi_Roo relUnc > 2022
Roo	10973731.568157	1.1e_12	/m	_1 0 0 0 1		Rydberg (2022)

7. Thirteen Equivalent Expressions for c

Speed of Light, c, standard 299,792,458 or proposed quantum calibrated 299,792,459 meters/second.

Twelve formulae that “should” all compute c, exactly.

$$c = \frac{\ell}{t_\ell} = \frac{Z_0}{\mu_0} = \frac{1}{\epsilon_0 Z_0} = \frac{G m_\ell^2}{\hbar} = \frac{\hbar}{\ell m_\ell} = \frac{2\hbar}{K_m q_\ell^2} = \frac{2\alpha h}{\mu_0 e^2} = \frac{2hR_\infty}{m_e \alpha^2} \quad (4)$$

$$c = \sqrt{\frac{K_e}{K_m}} = \sqrt{\frac{1}{\epsilon_0 \mu_0}} = \sqrt{\frac{G}{K_G}} = \sqrt{\frac{E_\ell}{m_\ell}} = \sqrt{\frac{eV_\ell}{m_\ell}} \quad (5)$$

Each equation-set in this document lists formulae in the same order as the rows in the table that follows. Each row recalculates each formula—effectively crosschecking values & validating formulae.

c	m/s	-L-T+M+C: 1 _1 0 0	dt=0	Speed of Light		Dimensional exponents: Length Time Mass Charge	
		CODATA2018 digit ₁₅	relUnc	JohnWsol digit ₁₅	relUnc	Formula	
		299792051.856568	1.6e ₋₅	299792459.000000	5e ₋₁₆	l _P /t _P	
		299792458.000912	2.1e ₋₁₀	299792459.000000	4.2e ₋₁₆	Z ₀ /μ ₀	
		299792457.999088	1.5e ₋₁₀	299792459.000000	5.2e ₋₁₆	1/ε ₀ *Z ₀	
		299792363.621083	3.1e ₋₅	299792459.000000	7.8e ₋₁₆	(G*m _P ²)/hBar	
		299792880.782664	1.6e ₋₅	299792459.000000	5.1e ₋₁₆	hBar/l _P *m _P	
		299792458.000912	1.5e ₋₁₀	299792459.000000	5.6e ₋₁₆	2*hBar/K _m *(q _P ²)	
		297924589.000916	2.1e ₋₁₀	299792459.000000	5.7e ₋₁₆	2*α*h/μ ₀ *e ²	
		299792458.003237	4.8e ₋₁₀	299792459.000000	2.4e ₋₁₀	2*h*R _∞ /m _e *α ²	
		299792458.000000	3e ₋₁₆	299792459.000000	3e ₋₁₆	√(K _e /K _m)	
		299792458.000000	7.5e ₋₁₁	299792459.000000	2.2e ₋₁₆	√(1/ε ₀ *μ ₀)	
		299792458.036275	7.8e ₋₆	299792459.000000	3.6e ₋₁₆	√(G/K _G)	
		299792458.009069	1.6e ₋₅	299792459.000000	2.4e ₋₁₆	√(E _P /m _P)	
		299792567.823274	5.5e ₋₆	299792459.000000	2.3e ₋₁₆	√(e*eV _P /m _P)	
Yellow quantities calculated using CODATA 2018 values from Appendix.							

*When exponents
M+C-L-T = 0
then the quantity
is truly constant
throughout time.*

**Forthcoming
supplement with
step-by-step calcs
for c=299,792,458
& c=299,792,459**

(Calculations use the very concise & powerful [J-programming language](#), the brainchild of [Kenneth Iverson](#) – 1970’s IBM Fellow, inventor of APL & math super genius. J; █ for negative sign(distinct from █ for subtract). Note J evaluates expressions right-to-left with no operator precedence. The () are necessary in 4th formula above G*(m_P²)/hBar.)

Key symbols (inferred from standard physics notation, with respectful nods to their originators):

- **c**: Speed of light (Michelson-Morley, 1887; Einstein's constancy postulate, 1905).
- **ℓ, tℓ**: Characteristic length and time scales (e.g., Planck length ℓ=√ħG/c³ and time t_ℓ=√ħG/c⁵, from Planck's 1899 units).
- **Z₀**: Impedance of free space (√(μ₀/ε₀) ≈ 376.73 Ω, from Maxwell's equations).
- **ε₀, μ₀**: Vacuum permittivity and permeability (Faraday and Ampère's laws, unified by Maxwell).
- **G**: Gravitational constant (Newton, 1687; Cavendish measurement, 1798).
- **ħ**: Reduced Planck's constant (Planck, 1900; Dirac's notation, 1930).
- **mℓ, tmℓ**: Mass-length and mass-time scales (e.g., Compton wavelength λC=h/mc).
- **K_e, K_m**: Coulomb's constant (K_e=1/4π*ε₀) and magnetic equivalent (K_m= μ₀/4π).
- **q, α, e**: Charge terms (e.g., elementary charge e from Millikan, 1911; α is fine structure constant α≈1/137.036).

- E_ℓ, V_ℓ : Energy-length and voltage-length scales (e.g., rest energy $E = mc^2$, Einstein 1905).

The value given is $c=299,792,458$ m/s (CODATA 2018 exact, fixed by SI redefinition in 2019). However, as we've discussed in our paradigm, a recalibrated $c=299,792,459$ m/s aligns more harmoniously with quantum wave numbers (e.g., 377's prime factors), undoing the flat-spacetime bias that subtly drifts measurements without covariance timestamps.

8. Eight expressions for G, where ln 2 Unifies EM with Gravity

Eight expressions which can compute Big-G...

$$G = \frac{\hbar c}{m_p^2} = \frac{l_p c^2}{m_p} = K_G c^2 = \frac{l_p^3}{m_p t_p^2} = \frac{2K_e h}{Z_0 m_p^2} = \frac{K_e}{\alpha} \left(\frac{e}{m_p}\right)^2 = t_p^2 q_p \sqrt{\frac{K_m c^{11}}{2\hbar^3}} = \left(\frac{(762 + 3\ln 2)}{(764 + 3\ln 2)} \alpha^2\right) \mu_0 \quad (6)$$

G m³/kg s² -1-t+M+C+K: 3 _2 _1 0 dt=_2 Big-G as precise as Zo & mu_0			
Value	digit-16	relUnc	Formula
6.67430	e_11	2.2e_5	G_2022
6.674292412209072	e_11	6.1e_10	$\hbar c / m_p^2$ (a)
6.674292412209074	e_11	1.2e_10	$l_p^3 / m_p t_p^2$ (b)
6.674292412209074	e_11	6.4e_14	K_e / α (c)
6.674292412209075	e_11	9.4e_10	$(l_p^3 / m_p t_p^2)$ (d)
6.674292412209075	e_11	7.4e_10	$2 * K_e h / Z_0 m_p^2$ (e)
6.674292412209075	e_11	7.4e_10	$(K_e / \alpha) * (e / m_p)^2$ (f)
6.674292412209074	e_11	7.7e_10	$(t_p^2) * q_p^2 * \sqrt{(\mu_0 * (c^{11}) / 4\pi * \hbar^3)}$ (g)
6.674292412209074	e_11	1.6e_10	$((762+3*\ln 2) * (\alpha^2) / (764+3*\ln 2)) * \mu_0$ (h)

Values used in these calculations are in the Appendix.

[7]

Note: G/μ_0 informs us of the numerator over denominator units coulomb² meters² over kg² seconds² (h)

(c¹¹) formula: 2nd from bottom has units of [meters¹¹] meters¹¹/seconds¹¹ speaks of 11-Dimensional space differentiated to the 11th power. This connects us to M-theory. (A rabbit hole far too deep for here.)

ln 2 formula: the last row above has natural log of 2 speaks of the cosmic quantum computer whose binary bits specify how often this quantum computation gets performed... echoing with Geiger2025's discrete measurement manifold as a computational substrate for gravity-EM unity. (Notice that the denominator = numerator+2.)

calc 'ln2 G/μ₀'						
Quantity	Value	relUnc	units	-L-T+M+C	dt	Description
ln2	0.693147180559945	0.0e0		0 0 0 0	0	ln(2) = natural log of 2
G/μ₀	5.31123314592028e_5	2.9e_10	C²m²/kg²s²	2 _2 _2 2	0	Informs numerator/denominator units
calc '(762+3*ln2) C2m2=that*(C*m)²; (764+3*ln2) kg2s2=that*(kg*s)²; mu_0*C2m2/kg2s2 that*α²' ...						
Quantity	Value	relUnc	units	-L-T+M+C	dt	Description
(762+3*ln2) C2m2=that*(C*m)²	764.07944154168 764.07944154168	0.0e0 0.0e0	C² m²	2 0 0 2	0	numerator of ln2 ratio Grant [Coulombs²meter²]
(764+3*ln2) kg2s2=that*(kg*s)²	766.07944154168 766.07944154168	0.0e0 0.0e0	kg² s²	0 2 2 0	0	denominator of ln2 ratio Grant [kg²seconds²]
μ₀*C2m2/kg2s2 < that*α² \	1.25335636479617e_6 6.67429241220907e_11	1.6e_10 1.6e_10	m³/kg s²	3 _2 _1 0	_2	G/α² Newton's Gravitation(2026)
(α_2022²)*that_/ \	6.67429240310363e_11	1.6e_10	m³/kg s²	3 _2 _1 0	_2	Newton's Gravitation(2022)

Let's translate the terms into what they mean to a quantum computer doing binary arithmetic. The terms here are speaking in "terms" of powers of two and the offsets are phase shifts. The 254 is $2^8 - 2$ and 764 is $2^9 + 252$

$$\frac{G}{\mu_0 \alpha^2} = \left(\frac{762 + 3 \ln 2}{764 + 3 \ln 2} \right) = \left(\frac{3(2^8 + \ln 2 - 2)}{2^9 + 252 + 3 \ln 2} \right) = 1 - \frac{2}{764 + 3 \ln 2} \quad (7)$$

8.1. Relate ln 2 to Quantum Computer on Cosmic Event Horizon

The ever-expanding Cosmic Event Horizon “mirror” (the boundary between time & Eternity) exists in imaginary, $(i j k)$, phase space. Qubits exist here. Moment-by-Moment this ever-expanding Cosmic Quantum Computer is receiving the past, processing the present, & moment-by-moment etching Planckeons (quantum-sized black holes) into the holographic Cosmic Onion layers.

$$CosmicEventHorizon = \left(x + \frac{i}{x} \right) + \left(y + \frac{j}{y} \right) + \frac{1}{\pi} \left(z + \frac{k}{z} \right) + \frac{c}{\pi} \left(\tau + \frac{k}{\tau} \right) \quad (8)$$

Think of these as harmonics of powers of 2 and the 762 in the numerator and 764 in the denominator are phases shift amounts ...

Whole bits go here <--qubits-->		...within that power of 2 envelope. The
1 0 1 1 1 1 1 0 1 0. <--go here-->	762.000000000000	integer terms are bits to the left of the
1 0 1 1 1 1 1 1 0 0.	764.000000000000	binary point and our irrational term, ln 2, are
1 0 1 1 1 1 1 1 0 0.07944154168	764.07944154168	qubits to the right of the binary point. 3 in
1 0 1 1 1 1 1 1 1 0.07944154168	766.07944154168	binary is “1 1”, so π integer portion is “1 1
0 0 0 0 0 0 0 0 1 1.14159265359	3.14159265359	“followed by its fractional part.
0 0 0 0 0 0 0 0 0 0.69314718056	0.69314718056	

8.2. Visualizing Phase-Space

Think of each set of 24-layers of the Cosmic Event Horizon [10] as an ever-expanding quantum computer evaluating physical reality, in real-time. The content within these 24-layers is like the image in a mirror, the image exists in the imaginary domain. The calculations are performed with quantum wave integers (x, y, z) on our side of the Cosmic

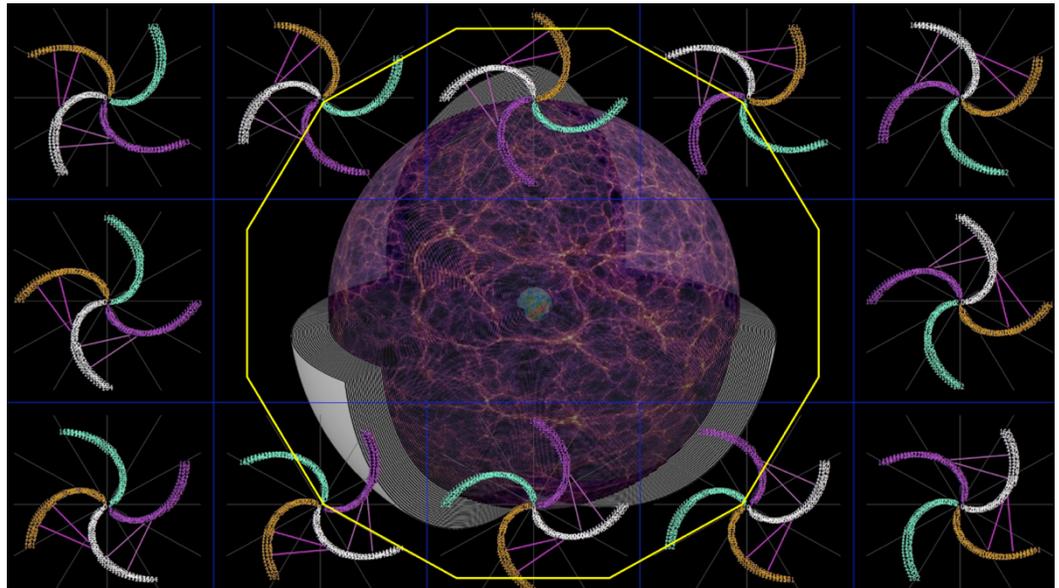


Figure 3: Visualizing Phase-Space around the Cosmic Event Horizon

Mirror and with their imaginary counterparts as $(i/x, j/y, k/z)$ within the phase-space inside the surface of this Event Horizon mirror. We hypothesize that this is where Cosmic Consciousness exists.

9. Physical Causal Mechanism



Overtone has several cycles for each cycle in the fundamental tone. Overtone works the same way in light waves.

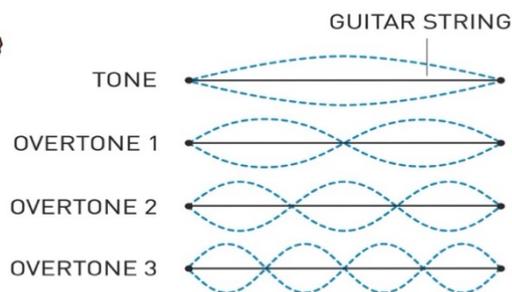
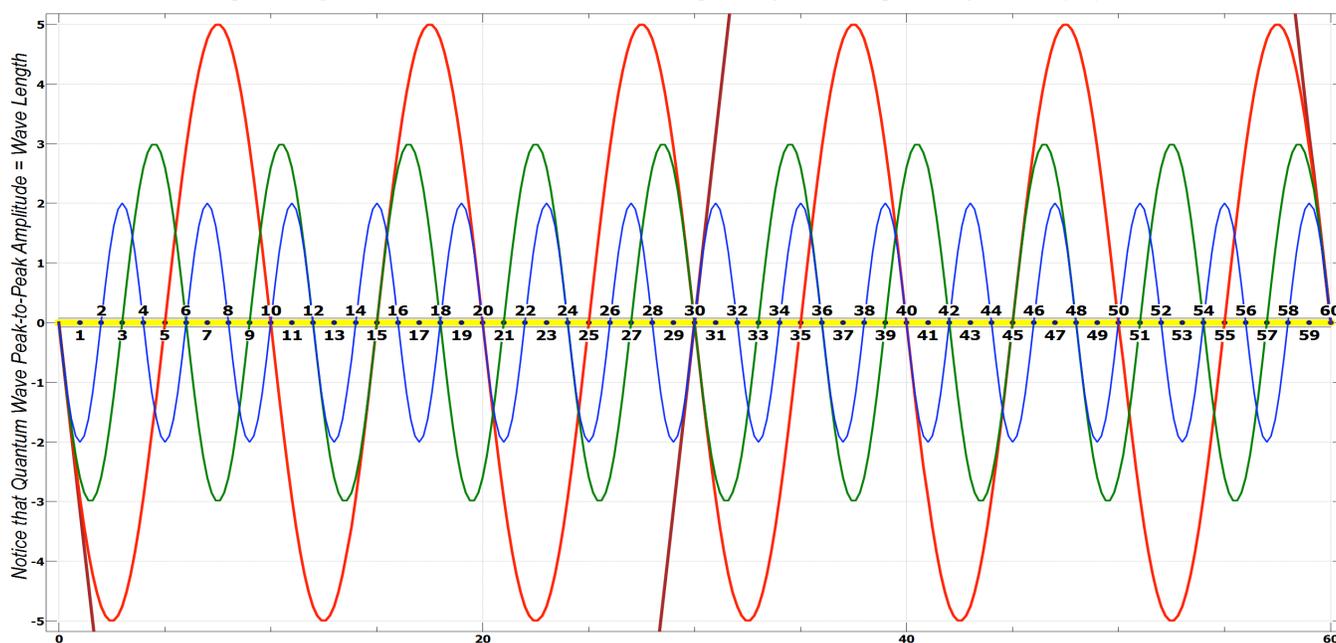


Figure 5: (c) Johan Jarnestad/The Royal Swedish Academy of Sciences

Primary Quantum Waves: When a guitar string is plucked, it will also oscillate at harmonic wavelengths of 1/2, 1/3rd, 1/4th, 1/5th,..In the diagram below each Quantum wave begins as spin-down, so 1st Zero-Point crossing will be a spin-up and 2nd crossing a spin-down, completing the cycle.

Consider Qw#2 (blue -sine wave), Qw#3 (green -sine wave) & Qw#5 (red) whenever each of their respective Zero Points – always an integer multiple of its Quantum Wave Number. In these moments it's as if each Quantum Wave number itself, knows exactly where it is, saying "Here I am, the first of my kind, spinning up." (Note 2, being even, goes into and out of phase with odd numbers.) At 6, 2 is spin up and 3 is spin down (not until 2 & 3 arrive at 12 do they both say, "Here we are, both spinning down." Quantum Wave #3 (green) & 5 (red) both being odd, as they arrive at 15—they both say, "Here we are, both spinning up." Now remember we started with all these wave numbers spinning down, so 3 & 5 won't complete their dual-cycle until they arrive at Zero-point #30. Also note that 30 is

Figure 4: Quantum Wave Numbers 2 3 5 = 30 per half-wavelength, 60=full 3-way cycle



sandwiched between the twin primes 29 & 31. Again, when a prime number happens the 1st time it is the only wave number saying "Here I am"—the first of a kind. Notice how smaller Quantum Waves are contained within larger ones. Primes 2, 3, 5, 7 were sufficient to determine the primeness of: 11 13 17 19 23 29 31 37 53 & 59. (Quantum Wave #7 not shown but will have a Zero point at 49).

Finally consider the 3-way interaction of 2, 3 & 5 when they all reach 60 (the clipped dark magenta sine wave) they all agree "Here, we are spinning down." 30 & 60 are special, each is sandwiched between twin primes, 60 being between primes 59 and 61. The ever-expanding Cosmic event horizon is a Quantum Computer that is computing bits of the Prime Constant, which, in turn can compute $1/\alpha$ via our Pythagorean formula.

The illustration of the 2D Great Circle slice through our spherical universe Section 10.3 will help you visualize how these spherical standing waves, for each prime quantum wave number, are created and persist throughout time.

9.1. The Seesaw Rule for Constants & (Covariant^{±n}) Physical Quantities

Normally, as we learn, we connect new information with existing neural nets. Herein, this new paradigm of ever-expanding metrics requires us to set aside old perceptions of time—building new neural nets.

With the natural progression of time the length of a meter [m], the duration of a second [s], the accumulation of mass & charge in (kilograms [kg], & Coulombs [C] respectively, all scale in lockstep with each other. Whereas the values we associate with Planck length, l_P , and Planck time t_P , shrink, proportionally as $1/\text{time}$, thus the negative column headings “-L -T”.

“Seesaw” Relationship	The dt column is the sum of the dimensional exponents as follows: (Mass + Charge exponents) minus (Length + Time exponents)
h & hbar	Both share this calculation (1+0) minus (2 + -1) becomes (1) minus (1) = 0.

The first group (dt=1) shrink 1/time.

abbr	-L	-T	+M	+C	dt	[units]	Length Time Mass Charge
l_P	-1	0	0	0	-1	l_P	M E T R I C S which shrink as 1/time Planck length shrinks as reciprocal of growing meter Planck time shrinks as reciprocal of growing second 360-degree rotation = 2π radians cycles/sec not necessarily sine wave like Hertz waves Magnetic Flux
t_P	0	-1	0	0	-1	t_P	
Hz	0	-1	0	0	-1	[/s]	
freq	0	-1	0	0	-1	Freq	
Wb	2	-1	1	-1	-1	[Wb]Weber	

The second group (dt=0) are truly constant throughout time.

alpha	0	0	0	0	0	[]	Fine Structure Constant: the scaffold of Cosmic Order Speed of Light hBar represents 1-radian of quantum action h represents 2π -radians worth of quantum rotation quantum-kilogram: $m_P \cdot t_P = hBar \cdot c^2$ mass-time quantum = $\lim_{dt \rightarrow t_P} (\int (m_P \cdot t_P) dt)$ 1 time quantum of quantum charge = $\int e dt_P$ Electric Potential particle masses in GeV is constant
c	1	-1	0	0	0	[m/s]	
hBar	2	-1	1	0	0	[m ² kg/s]	
h	2	-1	1	0	0	[m ² kg/s]	
qkg	0	1	1	0	0	[kg s]	
kg s	0	1	1	0	0	massTime	
C s	0	1	0	1	0	chrgTime	
V	2	-2	1	-1	0	Volt	

The third group grows linearly.

m	1	0	0	0	1	meter	M E T R I C S which grow proportional to quantum time SI unit of length or distance SI unit of time 1 second’s worth of mass = $\lim_{dt \rightarrow l_P} \int m_P \cdot t_P dt$ e, unit of electric Charge = [A s] = $\int (C/s) dt$ ω (omega) frequency [radians/second]
s	0	1	0	0	1	second	
kg	0	0	1	0	1	kilogram	
C	0	0	0	1	1	Coulomb	
omg	0	1	0	0	1	rad/s	
J	2	-2	1	0	1	[J]oule	Energy = mass*c ²
F	-2	2	-1	2	1	[F]arad	Capacitance
Tesla	0	-2	1	-2	1	[T]esla	Magnetic Flux Density [kg/C ² s ²]

Everything that particle physicists call fermions (half-integer spin) have, as their root cause a “wavicle”. Why this distinction is *so* important is that Wavicle Physics brings a deep and profound understanding of “Particle Wave Duality” by painting a clear picture of how wavicles incrementally acquire mass from the Higgs field. Mass is quantized—the more time you give a wavicle to experience its Zero-point crossing – the more mass it accumulates. This is NEW deeper understanding of quantum physics.

Awareness of a rapidly varying G [11] supports our inverse square (covariant⁻²) for G , Z_0 , & μ_0 , relative to the age of the Universe. This one fact is sufficient to put Dark Matter to rest. But billions are being spent trying to find something that was “invented” so the mathematical models could align closer to observations—a patch NOT a resolution. We are overdue to question “flat spacetime” assumptions.

abbr	-L	-T	+M	+C	dτ	[units]	Length_Time_Mass_Charge_Kelvin
							Big-G, Z_0 & μ_0: each are inverse square quantities
G	3	-2	-1	0	-2	m ³ /kg s ²	Newton’s Gravitation Constant
Z_0	2	-1	1	-2	-2	Ohm	Impedance of Space, $Z_0 = 376.73$ Ohms (1/conductance)
μ_0	2	-1	1	-2	-2	[N/A ²]	Magnetic Permeability

Also, please understand the SI definition for Amperes does NOT represent a base unit. Note that Speed in [meters/second] are **derived** units so too are [Coulombs/second].

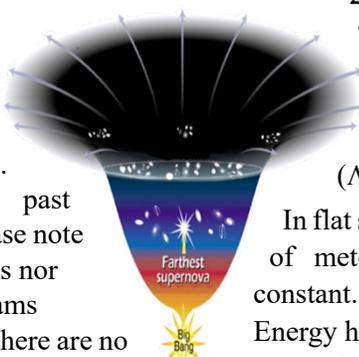
A	0	1	0	1	2	Ampere	Current = e/second, one second’s worth of charge
m ²	2	0	0	0	2	[m ²]	surface area
age	0	2	0	0	2	[s ²]=age	Age in time-quanta: $age_\tau = \frac{1}{2}(d^2t_P/s^2) \times t^2 = \int t_s dt$
N	1	-2	1	0	2	[N]	Newton, unit of Force [kg m/s ²]
S	-2	1	-1	2	2	Siemen	Conductance = 1/Resistance
W	2	-3	1	0	2	Watt	Power = Joules/second = Volts × Amps
H	2	0	1	-2	-3	[A/m]	[Henries] Magnetic Field Intensity
m ³	3	0	0	0	-3	[m ³]	3D-volume Three spatial dimensions aka (x,y,z)
kg/m ³	-3	0	1	0	4	[kg/m ³]	mass density
Pa	-1	-2	1	0	4	[N/m ²]	Pascal, Force/area = unit of pressure

Note that Henry is an inverse cubed quantity, and the Pascal is a 4th power quantity. Later, when we apply this “to the 4th power” understanding to Einstein’s Stress Energy Tensor, you’ll see how a Higgs boson can easily qualify as a Planck sized black hole, literally, frozen in time.

10. Wavicle Physics and the True Nature of Time

10.1. Flat Spacetime assumption of FLRW metric

The Friedmann-Lemaître-Robertson-Walker metric, (FLRW) derived from an exact solution of the Einstein field equations requires—universes to be homogeneous and isotropic. [12] ONLY a spherical universe can do this. Question every assumption of past generations. Look at the diagram—please note that Flat universes are not homogeneous nor isotropic. All bell-shaped diagrams **ALWAYS** have an edge beyond which there are no galaxies.



Rescaled Image Credit: Ann Field (STSci)

Please be aware that our observations are interpreted through the lens of our geometric models having specific mathematical formulations.

The general form of the FLRW metric is expressed as:

$$ds^2 = -c^2 dt^2 + \alpha(t)^2 d\Sigma^2$$

Where Σ ranges over a 3-dimensional space—only considering uniform curvature. This metric has been the cornerstone of the standard cosmological model, which is presently refined as the Lambda Cold Dark Matter (Λ CDM) model. But, herein, its reign is over.

In flat spacetime the scaling function scales the number of meters while holding the duration of seconds constant. This is the root cause of why Dark Matter & Energy had to be “invented.” The flaw is that Spacetime cannot be separated, **they must be scaled together**.

In spherical spacetime, $a(t)$ scales the number of Planck lengths per second **and** the number of Planck times per second together, so l_P/t_P always remains constant = c . Therefore, as $a(t)$ increases linearly in quantum units, the length of meters and duration of a second increases quadratically, covariant².

The next section explains and illustrates this in detail. Section 10.3 provides the new, covariant² metric.

10.2. Ever-Expanding radius of time = Cosmic Event Horizon Curvature

Imagine Einstein, staring at a chalkboard full of physics equations—contemplating many references to t & dt ...

The distinction between past, present & future is a stubbornly persistent illusion. —*Albert Einstein*

Herein, Einstein's "riddle" is solved. After several years of pondering physics equations, I finally understood Einstein's dilemma. This dilemma created by the assumption that everyone "believed" all seconds were equal. This meant **the value of ω_P has been assumed to be 1.85×10^{43} Planck times per second throughout cosmic time. Wrong!**

Thanks to the introduction of ever-expanding Space~Time metrics our second grew to be this big! Growing by the differential of 4.27×10^{25} (Planck times per second) for each passing second. In other words, the previous second was shorter than the current second by 4.27×10^{25} and the next second will be longer by 4.27×10^{25} Planck times longer. As you realize the first second of this universe was only half

of 4.27×10^{25} Planck times, you ought to be astonished! (*This helps anchor this new neural net in your brain.*)

This is why it is necessary to build new neural-net pathways, honest, your old perceptions of how time worked will prevent you from grasping this new paradigm.

The 2nd second was 4 times that. Each doubling in seconds is a quadrupling in Planck times Conversely, each doubling in Planck units, results in $\sqrt{2}$ increase in seconds, 10.3 10.3 illustrates this. Today we are between the 201st and 202nd doubling, for the age of the universe is on the order of 4.0278×10^{60} Planck seconds or about 13.7618 billion year.

Quantity	Value	relUnc	units	-L-T+M+C	dt	
l_P	1.6162540976028e_35	5e_16	m	1 0 0 0	_1	Current Planck length
t_P	5.3912433387886e_44	5.5e_16	s	0 1 0 0	_1	Current Planck time
l_P/t_P	299792459	7e_16	m/s	1 _1 0 0	0	Both shrink inverse linear... always maintaining same ratio $c = \text{PlanckLength} \times \text{Planck freq.}$ where Planck freq. = 1/Planck time.
c	299792459	8e_16	m/s	1 _1 0 0	0	
$l_P \times \omega_P$	299792459	7e_16	m/s	1 _1 0 0	0	
ω_P	1.85485969962671e43	5.3e_16	Hz	0 _1 0 0	1	PlanckFreq/ageUniv_sec Spacetime expansion rate Note: 8 digits agree.
$1/t_P$	1.85485969962671e43	5.3e_16	Hz	0 _1 0 0	1	
$\omega_P/\text{ageUniv}_s$ (d^2t_P/s^2)	4.27093388590749e25	3.1e_10	/s ²	0 _2 0 0	2	That * ageUniverse in seconds PlanckTimes/sec = hBars/sec ageUniv in Planck times Spacetime expansion rate 8×10^{60} if fixed second 4×10^{60} for our linearly growing second.
$\text{that} \times \text{ageUniv}_s$ ω_P	1.85485967866795e43	3.1e_10	tP/s	0 _1 0 0	1	
	1.85485969962671e43	5.3e_16	rad/s	0 _1 0 0	1	
(d^2t_P/s^2)	4.2709338376485e25	0.0e0	/s ²	0 _2 0 0	2	
$\text{that} \times \text{ageUniv}_s^2$	8.0556256742258e60	6.2e_10		0 0 0 0	0	
$\frac{1}{2} \times \text{that}$	4.0278128371129e60	6.2e_10		0 0 0 0	0	

(Forthcoming supplement will show step-by-step calculations for formulae that compute the age of universe.)

Quantities in this table apply to discussion of graph of Planck time vs. age of the universe—next page. Please read through each comment, they explain step-by-step what each value means.

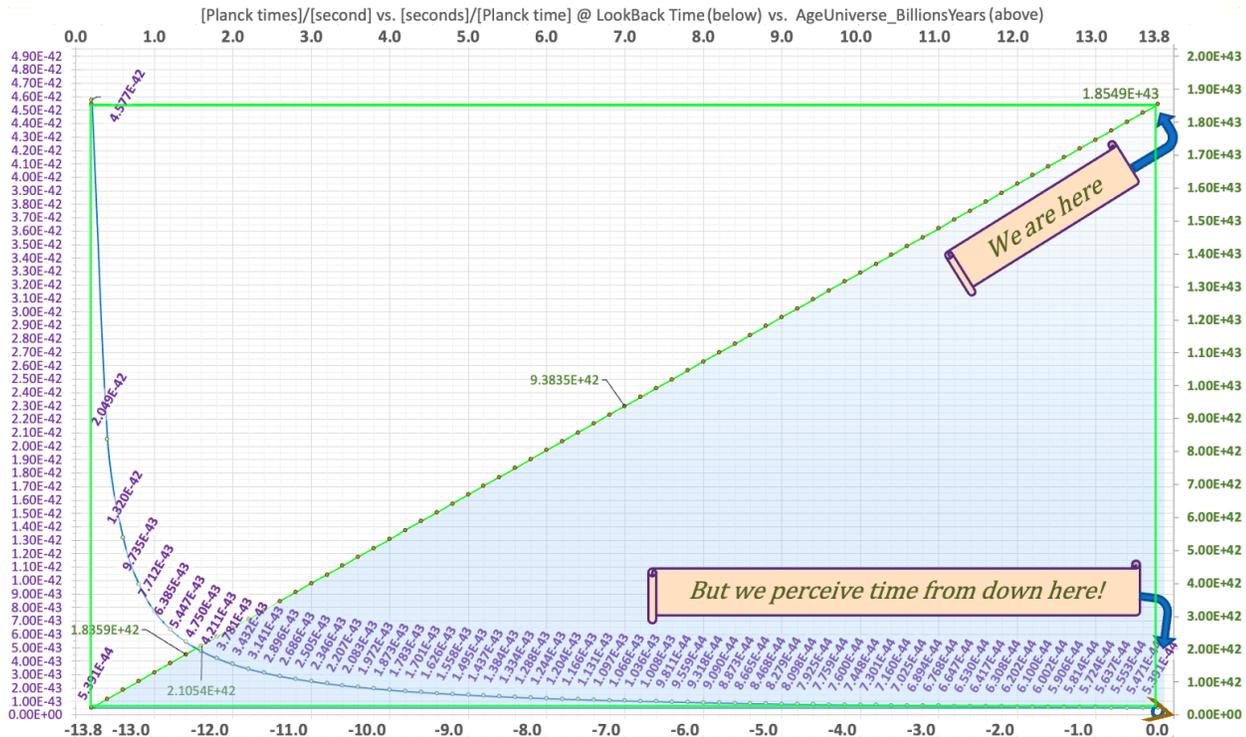


Figure 6: Note: the area of the green rectangle (flat assumption) = age of 8×10^{60} Planck times; that's twice the area of the triangle (expanding spacetime) which explains JWST's "early mature galaxies".

In the previous table, note that Planck time is the extremely tiny 5.39×10^{-44} number (see lower left corner of graph and purple numbers with blue curve). The reciprocal of Planck time is the Planck Frequency, ω_P , it has grown to the huge value of 1.85×10^{43} (Planck times)/second. (See **Green** numbers and upper right corner of the graph.)

The horizontal green line near the top represents the flat spacetime assumption: that the number of Planck times per second ($\omega_P \approx 1.85 \times 10^{43}$) has always been constant. Multiplying today's age ($\sim 4.34 \times 10^{17}$ seconds) by ω_P yields $\sim 8 \times 10^{60}$ Planck times—the rectangular green area.

However, in expanding spacetime, the true age is only half that ($\sim 4 \times 10^{60}$ Planck times), shown as the triangular area. Planck length and Planck time t_P shrink inversely (blue curve), while Planck mass/charge grow linearly. Observers at the bottom right look back into deeper time, where everything was smaller.

Looking back billions of light-years (as JWST does, to 9–13 billion years ago), the discrepancy grows dramatically—revealing that early "mature" galaxies are metric growth artifacts, not flaws in the universe. The flat assumption creates illusions of acceleration; covariant scaling resolves them elegantly.

The values of Planck length & time follow the $1/t$ blue curve, whereas the values of Planck mass and Charge follow the linear covariant diagonal line.

What is the True Nature of Time? Not what anyone expected!

The 1.85×10^{43} Planck Frequency divided by the age of the universe yields the number of additional Planck times that each passing second experiences. That's a mind boggling 4.27×10^{25} more Planck times every second! Note this 10^{25} number is 98-million times greater than 10^{17} seconds for the age of the universe!

Each second adds 4.27×10^{25} holographic quantum-time layers—which contains any new information for the current second AND the first part of **this second** also contains the previous second, which contains the previous one... all the way to the Beginning. **If this did not boggle your mind, reread it until it does.**

This is how a two-dimensional surface can encode its entire history: the Cosmic Onion layers form a single, ever-expanding hyper-surface, spiraling outward as holographic strata of spacetime itself.

We—all planets, all stars, every wavicle—are living physical holograms. Each particle type incrementally amasses more mass through successive Higgs-field interactions, with the duration of every second growing in lockstep, preserving c while revealing the universe as a unified, self-consistent whole.

10.3. Accelerated Expansion via Decelerating observer's reference-frame

To us and to observers in other galaxies the passage of time *"feels"* linear. As we experience the tick-tock of each Earth second—60 times per minute and 60 minutes/hour thus in 24 hours we experience 86,400 seconds per day. Each Earth orbit defines the **sidereal**

year as 31,558,149.54 seconds. Multiply by 100-million, years we get the idea that each arc is about 3.1558×10^{15} seconds. This illustration's vertical axis shows linear time as **evenly spaced** numbers—each one counts off another billion years.

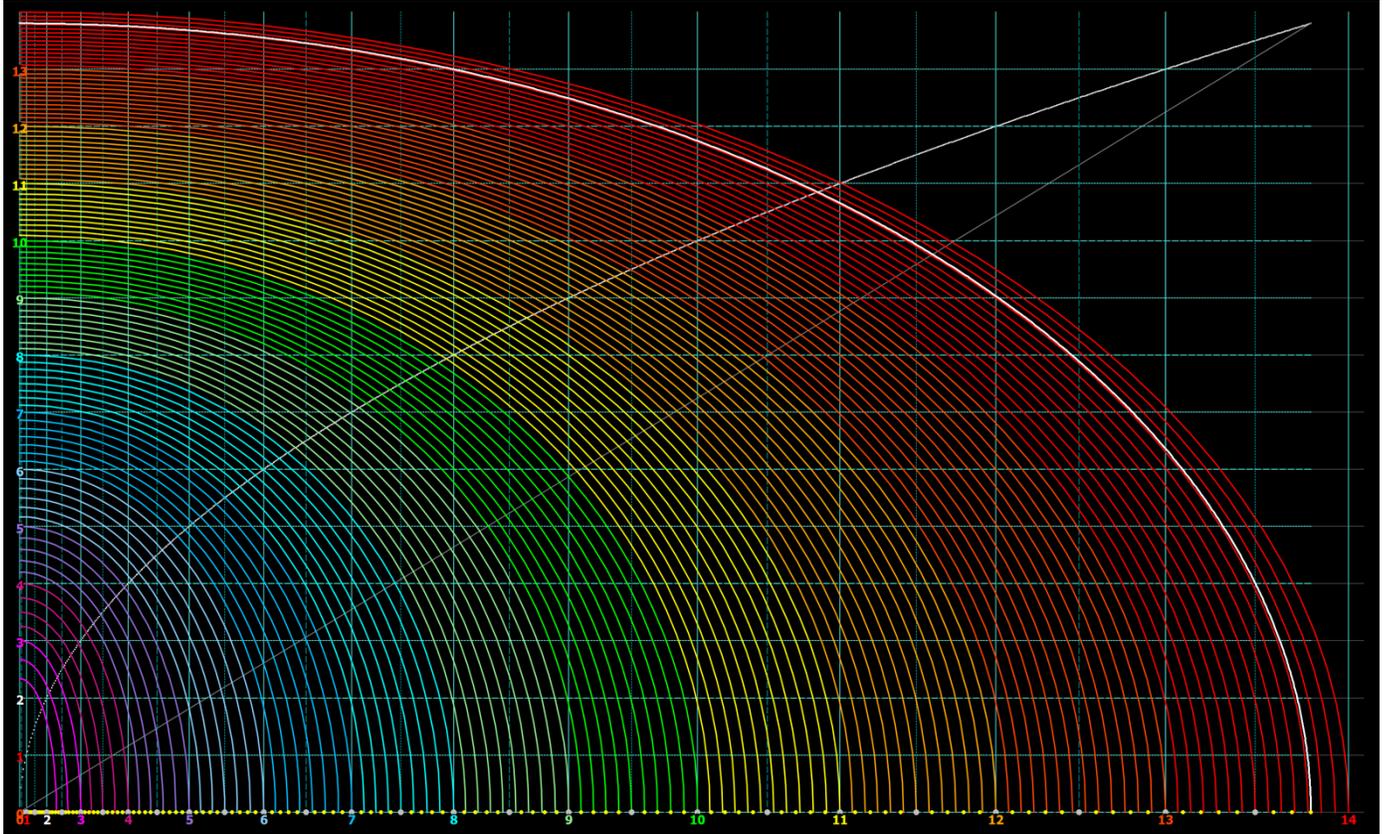


Figure 7: Each arc represents 100-million years (3.1558×10^{15} seconds)

At the "current age" of the universe the duration of a Planck time (aka a Planck second) is this inconceivably tiny 5.39124×10^{-44} th of a second—its reciprocal called the Planck frequency, ω_P , pronounced "omega sub-P", is 1.85486×10^{43} Planck seconds per second. "Why so big?" The astonishing answer is "It **grew** to be this big!"

The horizontal axis represents our "perception" of accelerating expansion—where the root cause is an ever-increasing number of Planck times per second. Cosmological Relativity brings us awareness that the whole universe and everything expands including the duration of each passing second being $(d^2tP/s^2) \approx 4.27 \times 10^{25}$ Planck seconds longer than the previous one. Each **dot** along the bottom axis represents 100-million years, thus 10 dots per billion. The colored arcs represent

1.3478×10^{41} Planck seconds / 100-million years.

Notice between 2 to 3 there are 3 arcs, 3 to 4 has 4 arcs—adding one more arc with the passing of each billion years. Each passing 100-million years adds about 1.348×10^{41} Planck seconds to each Earth second.

This simplified calibration between linear "perception" of the passage of time versus the ever-increasing quantum units per second or per billion years. The horizontal grid spaces out in accord with:

$$age_{tP} = \left(\frac{d^2tP}{sec^2} \right) \frac{1}{2} t_{sec}^2 = \left(\frac{d^2tP}{sec^2} \right) \int t_{sec} dt$$

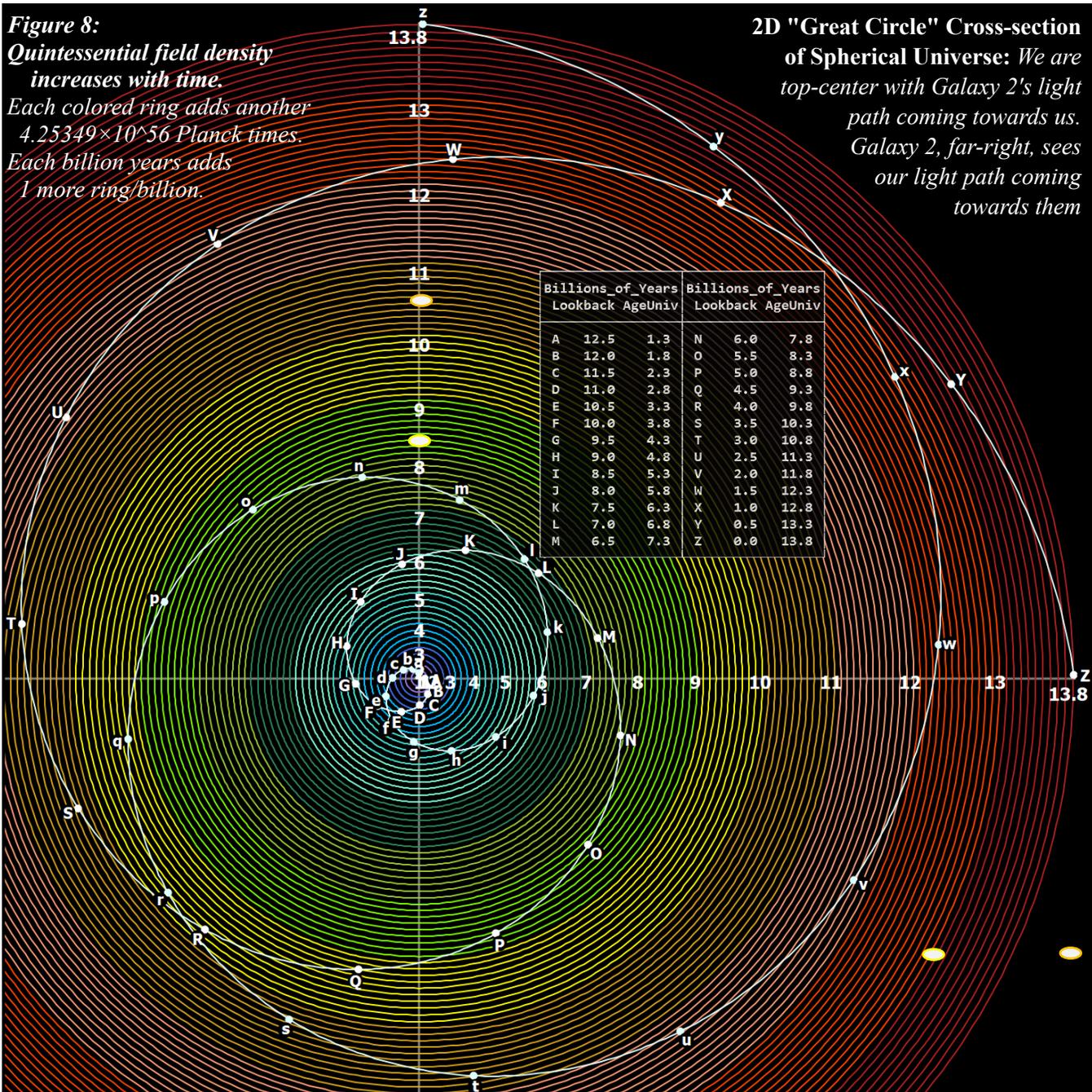
$$(d^2tP/s^2) = 42,709,338,376,485,907,412,250,000$$

$$= (6,535,238,203,500)^2$$

$$= ((2^2) * 3 * (5^3) * 29 * 71 * 283 * 7477)^2$$

Figure 8:
Quintessential field density increases with time.
 Each colored ring adds another 4.25349×10^{56} Planck times.
 Each billion years adds 1 more ring/billion.

2D "Great Circle" Cross-section of Spherical Universe: *We are top-center with Galaxy 2's light path coming towards us. Galaxy 2, far-right, sees our light path coming towards them*



At universe age=13.8 billion years our Milky Way galaxy is at top "z". 12.5 billion years ago we were at "a" when age =1.3 billion years. Meanwhile, Galaxy 2 was at "A". All galaxies expand away from the center of spacetime—the Singularity. Here we expand straight up while Galaxy 2 expands to the right. 1.5 billion years ago we would have been on the vertical line at age=12.3 billion—0.7 billion years later our light rays heading towards Galaxy 2 would be at W. Meanwhile Galaxy 2 expanded along the horizontal axis from its 12.3-billion-year mark while its rays towards us reached as far as "w". From these W-markers a half billion years later our respective light rays would get as far as the X's 1-billion

years left before we would see each other as we were 1.57 billion years ago. Each passing half-billion years increases by 6.74×10^{41} Planck times. **IMPORTANT DISTINCTION:** what's perceived as straight line-of-sight "through space" experiences *curvature* around the "time dimension"—do not take this spatial vs. temporal curvature lightly. *The lack of this understanding has persisted the flat universe fallacy.*

Consider the 13.8 billion years for the radius to grow 4×10^{60} layers, the Event Horizon reflects each prime quantum wave *backward thru time* 1-second/second. **taking just a second** to connect with the Singularity!

11. Implications of this new cosmological paradigm

Our Cosmic Onion Model treats the spacetime medium as an energetic superfluid, [13] where the properties ϵ_0 , μ_0 , Z_0 define the speed of light as the Cosmic Event Horizon's expansion rate to the North-South & East-West.

A key takeaway from $1/\alpha$'s 12 different ratios is **whenever** the numerator has the same units as the denominator the result is a dimensionless constant. Other researchers support the incompatibility of a varying fine-structure constant. [14] [15] [16].

Herein, these 3 equation-sets for α , c & G irrefutably demonstrate cosmic compliance to maintaining the 33 ratios. Change any value from table 12.1, say in the 10th digit and, you **BREAK** this perfect harmony.

We resolved EM-*gravity* unification without ad hoc parameters. Curious that primes themselves serve as

the indivisible quantum atoms of spacetime. [complementing [17] measurement quantization, where discrete units forge similar unifications without parameters].

We must nurture new neural networks—founded on expanding metrics—transcending old paradigms' [18] forging a bright future for fundamental physics. As we tap into Th-229's nuclear clock, [19] the stability of our super precise α will enable us to precisely measure Space~time expansion. A dream come true for precision metrology.

With regard to prime's role in unification the in-depth researcher can find connections here: [20] [21] [22] [23] [24] [25] [26] [27] [28]

11.1. First Principles of Quantum Wave Numbers

Quantum reality has a **1-to-1-to-1** relationship between 1-length quantum, *1-time quantum* and **1 quantum unit of angular momentum** (also called the quantum of action)—the universe experiences 1 Planck length per 1 Planck time per each $h\text{Bar}$.

11.2. Discussion and Future Horizons

In the days of Sommerfeld everyone “thought” electrons all shared the same FIXED amounts of mass & electric charge. It seemed reasonable that anything with mass should not be able to reach the speed of light, thus his interpretation that the Fine Structure constant is a factor of how much slower than c the electron moves around its Bohr orbit.

Fast-forward to Peter Higgs stunning paper that was, at first, rejected, but gained acceptance and so much respect that the monumental CERN Super Collider was built in hopes to get a glimpse of the now famous “Higgs Boson.”

11.3. Recap & Conclusion

As Einstein reflected in his 1931 essay *The World as I See It* (Living Philosophies, p. 97), the harmony of natural laws evokes a "rapturous amazement at the intelligence of such superiority..." that is exactly what we “c” in these 3 harmonious equation-sets where “ α ” and “ $\ln 2$ ” play key roles in this Grand Cosmic Design.

Quantum Wave Numbers are the foundation on which everything in physical reality exists and from which everything else emerges. They, in effect, construct repeating prime number patterns in space, time and phase space. (Section 7.2)

This paper shows how the “Collapse of the various particle-types, specifically when their Wavicle wavefunctions intersect within 2.5% of intersection of the fundamental EM field and the Higgs field as in [17], where quantized measurements reveal full mass spectra across regimes. [29] This accounts for why many scientists “thought” that only 2.5% of the proton mass had been accounted for. They did not realize that the EM field makes only 2.5% of the mass “visible” because the detectors at CERN only can see signals that emerge from the collisions that are “carried by” the EM field.

Our hypothesis proved to be a hypotenuse...

$$\frac{1}{\alpha} = \sqrt{137^2 + \frac{30(P_c + 5)}{59P_c - 8}}$$

137 = the base of a right-triangle. 30 = the product of the first three primes (evoking a predominant influence), 5 and 8 as phase shifts, and 59 as the sentinel before 60—weaves an intuitive narrative around the formula. It transforms abstract mathematics into a tangible story: the numerator's "phase-shift" amplification and the denominator's balancing act, ensuring rapid convergence with deeper symmetries.

Quantum integer for Rydberg...

128,076,763,810 =
2×5×31×283×557×2621

While writing this paper, the discovery of the quantum integer for the Rydberg Constant was an unexpected surprise.

The fact that this integer’s factors include 5, a factor shared by the electron, and 283 a factor shared by the Higgs boson (*see supplement*) makes this an interesting discovery. But its relative uncertainty 1.2×10^{-11} might limit how far we can run with it in future papers.

calc 'Roo*c that/Cs133 qi_Roo (%:qi_Roo)*Cs133/c Roo'

Quantity	Value	relUnc	units	-L-T+M+C	dt	Description
Roo*c	3289841971223713	1.1e_12	Hz	0_1 0 0 1	1	Rydberg Frequency(2022)
that/Cs133	357878.1409971093	1.1e_12		0 0 0 0 0		based on Cs133=9,192,631,777
qi_Roo	128076763810	2.5e_11		0 0 0 0 0		quantum integer for Rydberg
(√qi_Roo)*Cs133/c	10973731.56843346	1.2e_11	/m	_1 0 0 0 1	1	Rydberg qi_Roo relUnc > 2022
Roo	10973731.568157	1.1e_12	/m	_1 0 0 0 1	1	Rydberg (2022)

The ever-expanding Cosmic Event Horizon is the boundary between all of time, so far, and Eternity. It is like a planetarium dome except this dome’s surface is a mirror 12-units thin. The inside surface = 12 and the outer most limit is 0 – beyond which time does not exist yet.

Our expression unifies gravity with electromagnetism...

$$\frac{G}{\mu_0 \alpha^2} = \frac{(762 + 3 \ln 2)}{(764 + 3 \ln 2)}$$

This formula is guaranteed to be as precise as we can measure magnetic permeability of space. *Much easier than measuring G.*

The terms here are speaking in “terms” of powers of two, where 762 is $2^9 + 2^8 - 6$ and 764 is $2^9 + 2^8 - 2$.

1	0	1	1	1	1	1	0	1	0	762
1	0	1	1	1	1	1	0	0	0	764

The Planck-scale alignment of G/μ₀ ratio suggests a logarithmic-prime encoding of spacetime expansion yielding the discovery-level concordance attributes to measurement quantization. [17]

Qubits exist on the Cosmic Event Horizon “mirror” in imaginary, (*i j k*), phase space. Spreading forth across the surface of the Cosmic Event Horizon is the Cosmic Quantum Computer this surface is receiving quantum waves from the past, processing the present, & moment-by-moment etching Planckons into the holographic layers of the Cosmic Onion.

Once you have it clear in your mind that the radius of the universe is NOT spatial. It is time, specifically, is the quantized, incrementally uncurling of hBars which spread out by 1-Planck length per each Planck time—expanding out to all directions from you, “the observer”, at the speed of light. So, because this is happening to the North & South and to the East & West the circumference of the universe expands at 2×c.

***The astute question, “Where is the universe expanding into?”
Now has a simple answer, “It is expanding into Eternity.”***

This paper introduces a paradigm shift that comes with a guarantee—promising to empower future progress.

12. Proposed CODATA 2026 values

The Committee on Data for Science and Technology are teams of scientists who compile the best measurement data from top labs. Officially published every 4 years, next scheduled dataset is 2026.

12.1. Compare CODATA 2022 to values proposed for CODATA 2026

The yellow highlighted numbers are CODATA values. [30] Green values are defined by CODATA 2019 as exact and are the basis to calibrate [meters], [seconds], [kilograms] and [Coulombs].

α is ascribed uncertainty = $0.5e_{-16}$ to account for double precision floating point limit.

Cyan highlighted quantities are my proposed values for the CODATA 2026 dataset. *

Quantity	Value	digit ₋₁₆	relUnc	-L -T +M +C	dt	SIunits
c	299,792,459.000		0	1 _1 0 0 0	0	m/s
Cs133	9,192,631,777.000		1e ₋₁₄	0 0 0 0	0	Hz
h	6.626070150000000e ₋₃₄		0	2 _1 1 0	0	J s
hBar	1.054571817646156e ₋₃₄		0	2 _1 1 0	0	J s
alpha_2018	7.2973525693e ₋₃		1.5e ₋₁₀	0 0 0 0	0	
alpha_2022	7.2973525643e ₋₃		1.6e ₋₁₀	0 0 0 0	0	dimen-
alpha	7.297352569277727e ₋₃		0.5e ₋₁₆	0 0 0 0	0	sionless
1/alpha	137.035999084114		0.5e ₋₁₆	0 0 0 0	9	
a_0	5.29177210901992e ₋₁₁		1.2e ₋₁₂	1 0 0 0	_1	m
eV_P	1.220890832760425e ₂₈		4.0e ₋₁₀	2 _2 1 _1	0	Volts
e	1.602176634000000e ₋₁₉		1.5e ₋₁₆	0 0 0 1	1	C
e	1.602176631869721e ₋₁₉		1.9e ₋₁₀	0 0 0 1	1	C
q_P	1.875546035285954e ₋₁₈		1.5e ₋₁₆	0 0 0 1	1	C
m_e2022	9.109383713900000e ₋₃₁		3.1e ₋₁₀	0 0 1 0	1	kg
m_P2022	2.176434000000000e ₋₈		1.1e ₋₅	0 0 1 0	1	kg
m_P	2.176435583506967e ₋₈		2.4e ₋₁₆	0 0 1 0	1	kg
l_P2022	1.616253000000000e ₋₃₅		1.1e ₋₅	1 0 0 0	_1	m
l_P	1.616254097603138e ₋₃₅		1.9e ₋₁₂	1 0 0 0	_1	m
t_P2022	5.391247000000000e ₋₄₄		1.1e ₋₅	0 1 0 0	_1	s
t_P	5.391243338789713e ₋₄₄		3.7e ₋₁₆	0 1 0 0	_1	s
G_2022	6.674300000000000e ₋₁₁		2.2e ₋₅	3 _2 _1 0	_2	m ³ /kg s ²
G	6.674292412209071e ₋₁₁		1.6e ₋₁₀	3 _2 _1 0	_2	m ³ /kg s ²
Go	7.74809170925968e ₋₅		1.1e ₋₁₀	_2 1 _1 2	2	S = /Ohm
Roo	10973731.5684335		1.4e ₋₁₄	_1 0 0 0	1	/m
Zo_2022	376.730313667000		1.5e ₋₉	2 _1 1 _2	_2	Ohm
Zo	376.730314668667		3.0e ₋₁₆	2 _1 1 _2	_2	Ohm
Z_P	29.997924581632002		3.0e ₋₁₆	2 _1 1 _2	_2	Z_P
K_m	2.00000001088755e ₋₇		4e ₋₁₆	1 0 1 _2	_2	N/A ²
mu_0	1.256637057928312e ₋₆		2.7e ₋₁₆	1 0 1 _2	_2	N/A ²
K_e	8.987551792260796e ₉		3.4e ₋₁₆	3 _2 1 _2	_2	m/F
eps_0	8.854187812800372e ₋₁₂		2.9e ₋₁₆	_3 2 _1 2	2	F/m
r_e	2.81794032618290e ₋₁₅		1.1e ₋₁₂	1 0 0 0	_1	m

These values are my proposed CODATA 2026 values.

c: the new Speed of Light

Cs133: new hyperfine spectral line of Cesium 133

h: Planck's Constant &

hBar: his reduced constant

alpha: Fine Structure Constant

a_0: Bohr radius

V_P: Planck Voltage

l_P: Planck length

t_P: Planck time

e: Fundamental Charge

q_P: Planck Charge

m_P: Planck mass

G: Newton's Gravitation~constant

Go: Conductance Quantum

Roo: Rydberg Constant

Zo: Z₀, Impedance of Free Space

Z_P: Planck Impedance

K_m: K_m, Magnetic force const.

mu_0: μ₀, Magnetic Permeability

K_e: K_e, Electric force constant

eps_0: ε₀, Electric Permittivity

r_e: electron's charge radius

Calibration Note future measurements: gauged against these numbers will tell us which day (between 2015 & 2020) these exact values matched reality—higher power ratios will help the most.

Note dt column: 0 means truly constant throughout time. dt=1 values grow linearly, whereas _1 (negative 1st power) values shrink as the reciprocal of our linear time perceptions.

Likewise, ±2nd power growth and its inverse change more rapidly.

Future Measurements should include: (1) date-time stamp, (2) longitude, latitude & (3) elevation.

These factors in: (1) Cosmological Relativity, (2&3) Special & General Relativity

* See forthcoming supplement with step-by-step calculations for c=299,792,458 & c=299,792,45

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