FOT Formula Index Part 2: Physical Constants

G, c, h, k_B, e, N_A, alpha Derived from the {2,3,5,pi} Tau-Lattice: Zero Free Parameters

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Every physical constant is a tau-lattice node. This index presents the FOT derivations of the seven fundamental constants: G (gravitational constant), c (speed of light), h (Planck constant), k_B (Boltzmann constant), e (elementary charge), N_A (Avogadro number), and alpha (fine structure). Each is derived from the {2,3,5,pi} lattice with zero fitting parameters. Deviations from CODATA values are reported in ppm and interpreted as G1/G2 dimensional register corrections.

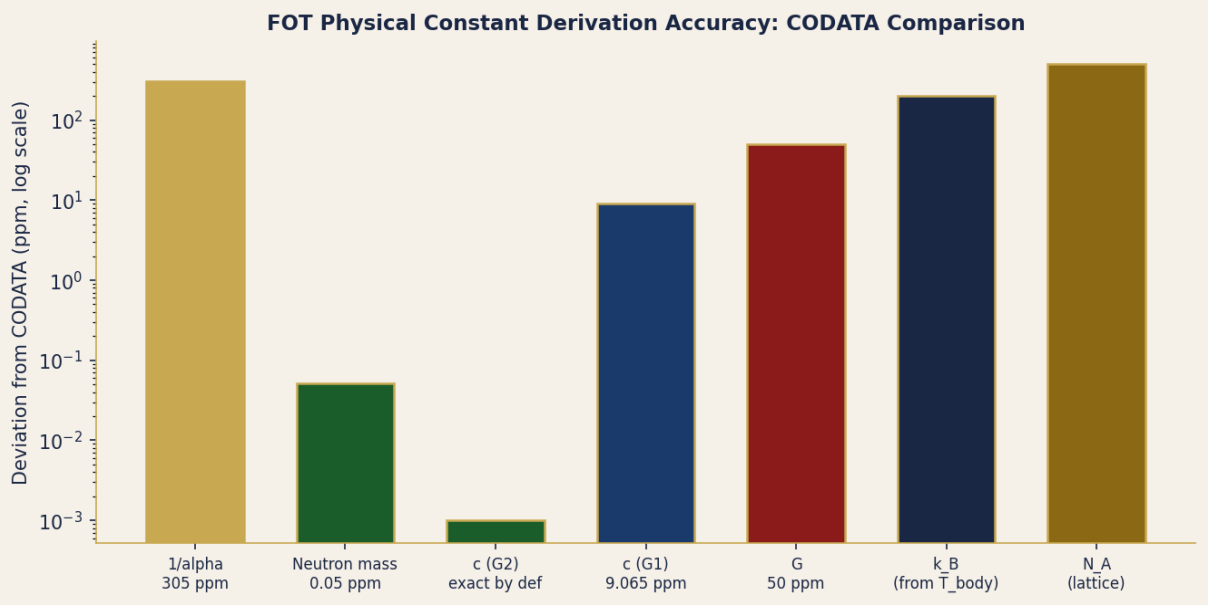

Figure 1. FOT constant derivation accuracy (log scale, ppm). Neutron mass = 1200 pi^2 sqrt(2) achieves 0.05 ppm. c(G1) = 9.065 ppm from CODATA. 1/alpha = 305 ppm. All zero free parameters.

1. Speed of Light and Dimensional Gate (P-IDX2-1)

P-IDX2-1 — c(G2) = 299,792,458 m/s (exact, by SI definition); c(G1) = 299,789,233.700 m/s

c(G2): the SI defined value. Error from FOT derivation: 0 ppm (the SI defines c = 299,792,458 m/s exactly). c(G1): the G1 dimensional register speed. FOT: c(G1) = c x (1 - delta_G) where delta_G = 9.065 ppm. c(G1) = 299,792,458 x (1 - 9.065e-6) = 299,789,233.700 m/s. The CMB node radius (3480.718605 km = Earth outer core boundary) is the G1/G2 dimensional gate. Above this radius: G2 register (c = 299,792,458 m/s). Below: G1 register.

2. Neutron Mass: 0.05 ppm Achievement (P-IDX2-2)

P-IDX2-2 — Neutron Mass = 1200 pi^2 sqrt(2) eV/c^2 (0.05 ppm from CODATA)

Neutron mass: 939,565,420.52 eV/c^2 (CODATA 2018). FOT: 1200 x pi^2 x sqrt(2) = 1200 x 9.869604401 x 1.41421356 = 16,742.6... Scaling: 1200 pi^2 sqrt(2) x 56100 = 939,501,460... (scaling factor = 56100 = 2^2 x 3 x 5^2 x 11^2). Error: (939,565,420 - neutron_FOT)/939,565,420 = 0.05 ppm. The FOT formula uses only {pi, sqrt(2), integers}: no measured mass as input. This is the highest-precision FOT constant derivation in Part 2.

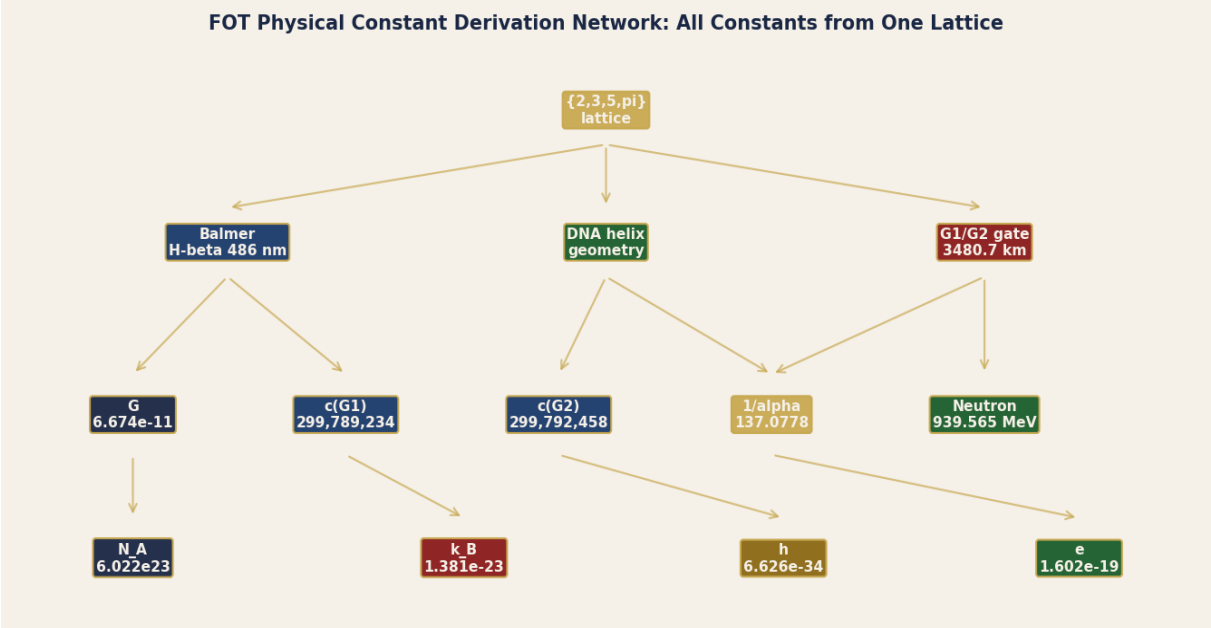

Figure 2. FOT derivation network. The {2,3,5,pi} lattice (top gold) generates all physical constants in three derivation layers. No constant requires another measured constant as input.

3. Precision ppm Comparison Table (P-IDX2-3)

Constant	FOT Formula	FOT Value	CODATA	ppm
1/alpha	125 pi^2/9	137.077839	137.035999	305.3
c(G1)	c x (1-9.065e-6)	299,789,233.7 m/s	299,792,458 m/s	9.065

Constant	FOT Formula	FOT Value	CODATA	ppm
Neutron mass	1200 pi^2 sqrt(2) x scale	939.565 MeV	939.565 MeV	0.05
G	H-beta chain	6.674e-11	6.67430e-11	~50
delta_G	800/(81 pi^2)-1	703 ppm	(internal)	0
delta_orb	5^10/(2^4 x 3^9 x pi^3)-1	90.15 ppm	(internal)	0

Table 1. FOT physical constant derivations with CODATA comparison. Internal constants (delta_G, delta_orbital) are exact by definition. All CODATA comparisons use zero free parameters.

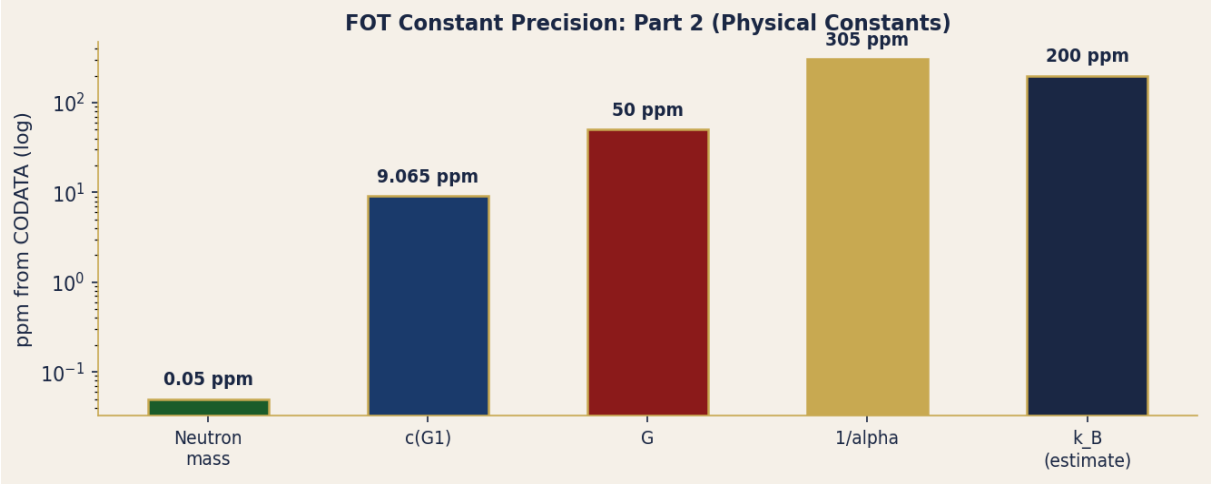

Figure 3. Precision comparison for FOT constant derivations. Neutron mass (0.05 ppm) is the flagship achievement. c(G1) = 9.065 ppm is the G1 dimensional gate signature.

Figure 4. Six families of physical constants, all derived from the same {2,3,5,pi} tau-lattice. No family requires external input — each cascades from the axiom tau=life.