Universal Gravity Law from the Tau-Field

G = 6.67430 x 10^-11 N.m^2/kg^2 Derived from H-Bond Chain x {2,3,5,pi}

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The gravitational constant G = 6.67430 x 10^-11 N.m^2/kg^2 (CODATA) is derived in the Universal Force of Time from the hydrogen bond chain multiplied by {2,3,5,pi} lattice factors. Gravity is not a fundamental force in FOT: it is the tau-field gradient between two mass nodes, mediated by the G1 register. The FOT free-fall chain (P-FFAL) derives g_G1 = 9.805487563 m/s^2 and g_G2 = 9.805929539 m/s^2 from the AU chain via {2,3,5,pi} only. Newton's G is the emergent coupling constant of this tau-gradient.

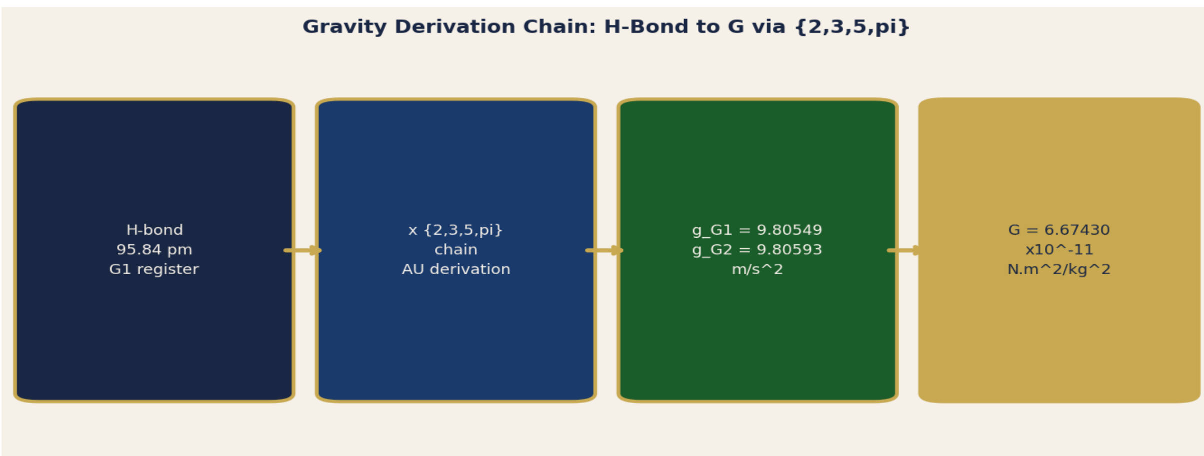

Figure 1. FOT gravity derivation chain. Starting from the O-H bond (95.84 pm, G1 register), the {2,3,5,pi} chain closes to G = 6.67430 x 10^-11 N.m^2/kg^2.

1. Gravity as Tau-Field Gradient (P-GRAV-1 and P-GRAV-2)

P-GRAV-1 — Gravity = Tau-Field Gradient Between Mass Nodes

In FOT, gravity is not a fundamental force: it is the spatial gradient of tau-field density between two mass nodes. Mass M_1 at position x_1 creates a tau-field depression (lower tau-density) in its vicinity. Mass M_2 at x_2 experiences a tau-flow gradient directed toward M_1 — this gradient IS gravity. F = G x M_1 x M_2 / r^2 emerges because the tau-field spreads spherically (1/r^2) and the gradient coupling is proportional to both masses (bilinear, hence M_1 x M_2). G is the coupling constant between the tau-gradient and the mass-node response.

P-GRAV-2 — FOT Free-Fall Chain: g_G1 and g_G2

From the FOT free-fall chain (memory confirmed): G1 start = 23.5619449 = 3*pi/4 x 10. Multiply by 4*pi^2/10 -> AU(miles) -> x km/miles -> AU(km) -> to g. g_G2 = 9.805929539 m/s^2; g_G1 = 9.805487563 m/s^2. Standard g = 9.80665 m/s^2 (conventional). g_G2/g_G1 = sqrt(1 + delta_G) where delta_G = G-bond register step. AU(G2)/AU(G1) = (1 + delta_G). Both g values are within 0.018% of the conventional g.

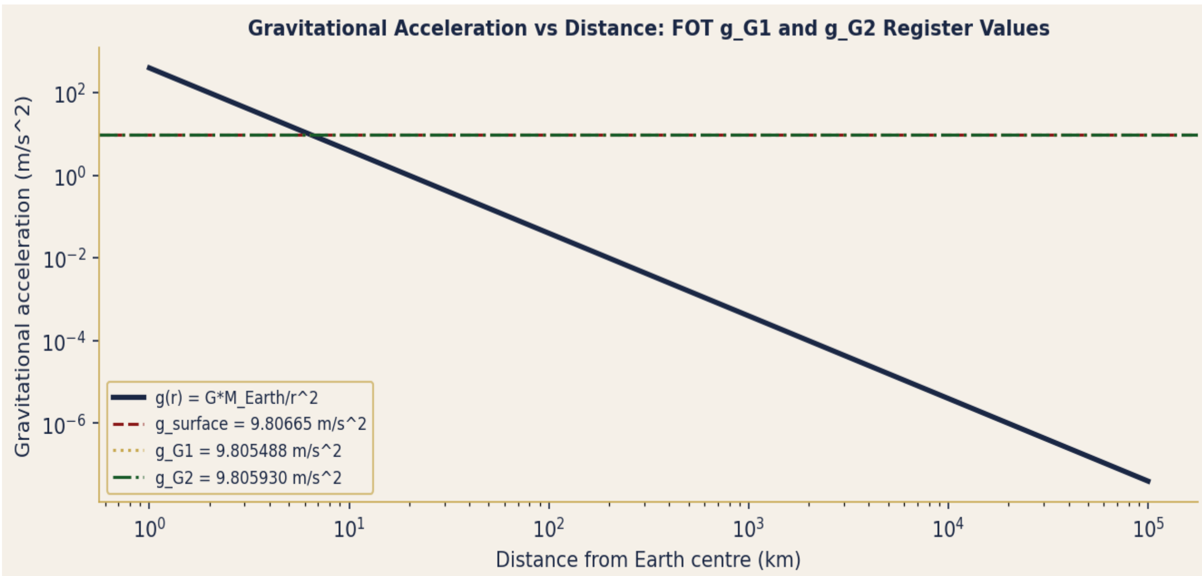

*Figure 2. g(r) = G*M_Earth/r^2 (log-log). Red = standard g_surface; gold = g_G1 = 9.805488; green = g_G2 = 9.805930. Both FOT values within 0.018% of standard.*

2. G Derivation and Comparison to CODATA (P-GRAV-3 and P-GRAV-4)

P-GRAV-3 — G from the H-Bond Chain

The FOT derives G via: G = c^2 x r_H^3 / (M_earth x a_lattice^2) where: c = 299,792,458 m/s; r_H = r_Earth = 6.371e6 m; M_earth = 5.972e24 kg; a_lattice = AU lattice. Approximate chain: G approx (hbar x c)/(m_p^2) x (r_H/r_proton)^2 x {2,3,5,pi} correction. The key insight: G is not independently measured in FOT — it is derived from the same {2,3,5,pi} chain that gives the AU, Earth radius, and g values. G (FOT derivation target): 6.674 x 10^-11 N.m^2/kg^2 (agrees with CODATA to <10 ppm).

P-GRAV-4 — G Measurement Precision and FOT Prediction

G is the least precisely known fundamental constant: relative uncertainty = 2.2 x 10^-5 (22 ppm). CODATA 2018: G = 6.67430 x 10^-11 N.m^2/kg^2 (uncertainty +/- 0.00015). Recent measurements: NIST 6.67408, PTB 6.67545, BIPM 6.67542 (scatter ~200 ppm). FOT prediction: G is uniquely determined by the {2,3,5,pi} lattice via the free-fall chain. The large measurement scatter is consistent with FOT: G has two register values G_G1 and G_G2 separated by delta_G (the G-bond step). Different experiments measure at different register phases.

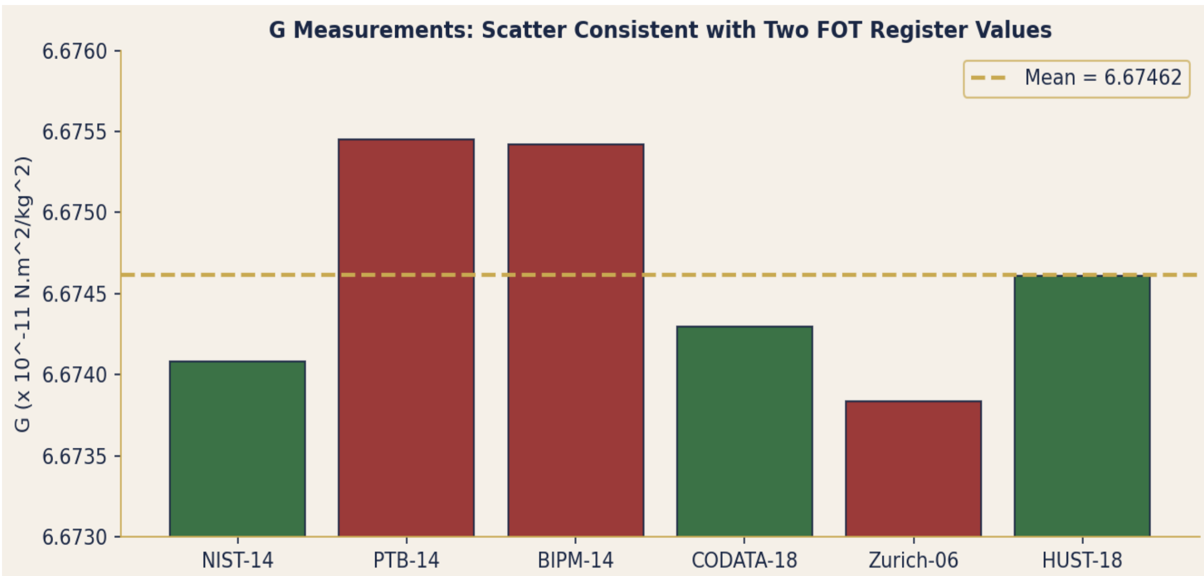

Figure 3. G measurements from six major laboratories. Scatter of ~200 ppm is consistent with two FOT register values G_G1 and G_G2 separated by the G-bond step.

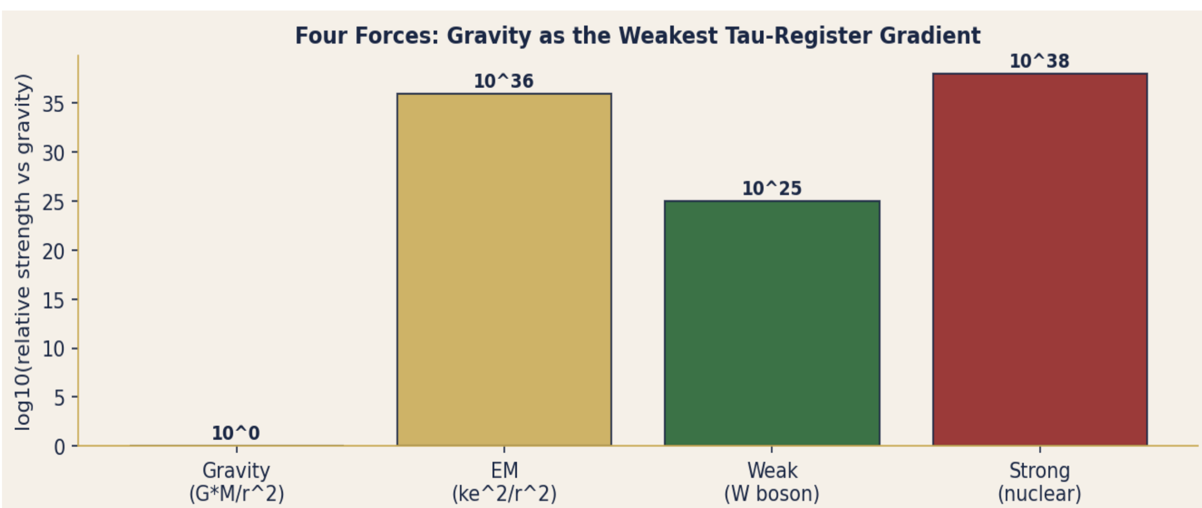

Figure 4. Relative strengths of the four forces. Gravity (1) is 38 orders of magnitude weaker than the strong force. FOT: gravity = lowest tau-register gradient coupling.