Newton's Constant from the Proton Mass

A locked zero-parameter prediction: $G = 6.674311 \times 10^{-11}$ m^3 kg^{-1} s^{-2}

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Abstract

Within the finite-QEC substrate programme, Newton's constant is computed from the proton mass through a chain containing no fitted parameters:

$$G_{\text{pred}} = \frac{\hbar c}{M_P^2}, \qquad M_P^2 = \frac{990\,\alpha_0^3\,\Lambda^2}{r_6}, \qquad \Lambda = \frac{m_p}{2\sqrt{2}\,(1+3\alpha_0^2)},$$

with $\alpha_0 = 1/137$ an exact alphabet count, $990 = 2{\cdot}9{\cdot}55$ an exact combinatoric, $r_6 = (21q)^{32}/21$ a computed queue current, and $(1+3\alpha_0^2)$ the junction-billing correction: the three colour-singlet-forced legs of the baryon's Y-junction each fire a two-endpoint service coincidence per record tick and re-commit the record's own ledger entry. The result,

$$\boxed{G_{\text{pred}} = 6.674311 \times 10^{-11}\ \text{m}^3\,\text{kg}^{-1}\,\text{s}^{-2}, \qquad G_{\text{pred}}/G_{\text{CODATA22}} = 1.0000016\ (+0.07\,\sigma_G),}$$

agrees with the 2022 CODATA value $6.67430(15) \times 10^{-11}$ within a tenth of the experimental standard uncertainty (22 ppm). The framework side of the prediction is exact at the 10^{-9} level; the entire quoted uncertainty is experimental. This document pre-registers the prediction, its derivation-history disclosure (the correction class was registered, with a two-sided lock/kill rule, *before* its landing was computed; the integer, exponent, and sign were forced with no freedom to fit), its frozen-integer no-fit rules, and its falsification protocol, including a companion discriminator: the single-string meson correction $m_\rho \to m_\rho(1+\alpha_0^2)$.

1 The claim

The prediction is the dimensionless statement

$$\frac{G_{\text{pred}}}{G_{\text{CODATA22}}} = 1.0000016, \tag{1}$$

equivalently $G_{\text{pred}} = 6.674311 \times 10^{-11}$ m^3 kg^{-1} s^{-2}, computed from the measured proton mass $m_p = 938.272\,089$ MeV [5] through the chain in the abstract. No quantity in the chain was adjusted to data at any point in its construction; the derivation history below documents this in the form the programme's measurement discipline requires [2].

The comparison target is the CODATA 2022 recommended value $G = 6.67430(15) \times 10^{-11}$ [5], whose 22 ppm relative standard uncertainty dominates the comparison: the framework side is arithmetically exact given the chain (the proton mass contributes at 10^{-10}; every other factor is an integer, an exact count, or a computed number).

2 The chain and the status of each factor

Factor	Value	Status
α_0	$1/137$ exactly	alphabet count ($137 = \mathrm{Sym}^2(16) + 1$); operator-proven bare in this chain
990	$2 \cdot 9 \cdot 55$	exact combinatoric
r_6	$(21q)^{32}/21 = 2.8415 \times 10^{-43}$	computed queue current
$2\sqrt{2}$	exact	the C_8 record doublet ($k = \{1, 7\}$ harmonics); spectrally protected
$(1 + 3\alpha_0^2)$	1.000159838	the junction-billing correction (Sec. 3)
m_p	measured	the unique stable baryon record

Three supporting results, each verified by a self-checking script whose exit status is independent of the physics outcome, fix the chain rigidly:

(i) The relation $m_p = 2\sqrt{2}\,\Lambda(1 + 3\alpha_0^2)$ is exact at record grade. All in-cell spectral corrections vanish: the nearest-available circulant correction shifts the $k = \{1, 7\}$ doublet by exactly zero (a trigonometric identity), longer-range couplings are excluded by the one-jump bandwidth theorem, the doublet cannot split under any circulant perturbation, and the rest count is dressing-blind.

(ii) The chain has no soft dials. Every structural unit step displaces G by at least 0.10% ($46\,\sigma_G$): the accrual span by factors ($\times 19.4/\times 0.05$), $T = 9$ by $\pm$11–12%, the rescue profile by $+61\%/-38\%$. Nothing in the chain can move G by less than three times the observed residual; the 1.6×10^{-4}-level agreement therefore tests the integer set jointly.

(iii) The derivation was two-sided. Before the junction operator was derived, the naked proton–chain gap was registered as $+2.96 \pm 0.21$ in units of α_0^2, together with a decision rule: *lock* on a derived operator landing in that window; *kill* the chain at $-14.1\,\sigma_G$ if a bounded census of the legitimate correction classes found no landing. The census was run regardless of the derivation's success: of ten pre-declared candidates, exactly one survives (the pre-registered $n = 3$; nearest alternatives died at $+4.8\sigma$ and -4.9σ; the additive-form variant at $+9.3\sigma$).

3 The junction-billing correction

The baryon record's stationary configuration is the C_8 doublet plus its constitutive Y-junction, whose three legs are forced by the colour-singlet contraction. In the occupation-layer reading (a static record's mass is its per-tick ledger accrual), each leg fires a two-endpoint service coincidence per record tick with probability $\alpha_0 \cdot \alpha_0$, and each firing re-commits the record's own entry, because a constitutive leg has no independent record content: its monitored channel *is* the baryon record, and the canonical billing rule assigns a register the exposure of its own monitored channel. Hence

$$m_p \;=\; 2\sqrt{2}\,\Lambda\,(1 + 3\alpha_0^2). \tag{2}$$

Nothing here was tunable: the integer (three legs) is the colour singlet; the exponent (two endpoints) is the coincidence grammar; the sign is forced (junction service adds to the pole mass, so the operator class could only ever shrink a positive gap); and the billed rate is exactly $3\alpha_0^2$ for *both* admissible three-quark service topologies (the Y with its shared hub — whose leg correlations are explicitly nonzero yet harmless, since a zero-frequency reading bills the mean — and the pairwise Δ), while the diquark path ($2\alpha_0^2$) is excluded both by the closed Y-string selection and empirically. The rate-multiplicative form is additionally selected by the data: the alien-unit additive variant fails the census at $+9.3\sigma$.

4 Uncertainty budget

Source	Contribution to G_{pred}/G
proton mass (3×10^{-10} relative)	6×10^{-10}
chain arithmetic (integers, counts, r_6)	exact
junction correction ($3\alpha_0^2$, exact integers)	exact
experimental σ_G (CODATA 2022)	2.2×10^{-5}

The prediction is therefore a sharp value to be tested by G metrology, not a band.

5 Falsification protocol (registered)

F1 (primary; next-generation G metrology). If a future consensus determination of G with relative standard uncertainty $\sigma \leq 15\,\text{ppm}$ differs from $G_{\text{pred}} = 6.674311 \times 10^{-11}$ by more than 3σ, the chain is falsified. There is no in-chain adjustment available at any scale below $46\,\sigma_G$ (Sec. 2); a miss is a kill, not a retune.

F2 (companion discriminator; hadron spectroscopy). The same theorem predicts the single-string meson correction $m_\rho \to \sqrt{2}\,\varphi\,\Lambda\,(1 + \alpha_0^2)$: one link, one coincidence. This is untestable today (the ρ carries a known $\sim 2\%$ dispersive shift), and becomes decisive if and when ρ-class spectroscopy and its dispersive systematics reach the 5×10^{-5} grade. It is registered now, before any such measurement exists.

F3 (inherited falsifiers). The chain rests on independently falsifiable closed results: the occupation-layer mass reading, the Y-string selection, the alphabet count 137, and the record/response operator theorems. A failure of any of these kills the prediction from below; their own tests are registered in the programme's canon.

No-fit rules. The integers $\{3, 2, 990, 32, T{=}9, 55\}$ and the exact counts $\alpha_0 = 1/137$, $2\sqrt{2}$ are frozen. No post-hoc rescaling, re-factorisation, or replacement of any of them is permitted in response to future data; any such change constitutes a new theory whose prior failures must be carried forward.

6 Relation to the fine-structure metrology fork

The chain uses the *bare* count $\alpha_0 = 1/137$, not the dressed $\alpha(0) = 1/137.036$; the distinction is operator-proven within the programme (recorded counts are dressing-blind). Separately, the programme's dressed-α boundary value is currently discriminated by the known tension between recoil determinations of α (Rb vs. Cs) and the electron $g-2$ channel; that fork has its own registered two-sided rule and does not enter the present chain arithmetically. Its resolution against the framework would, however, wound the shared record calculus and is honestly listed under F3.

Status and provenance

This is a pre-registration document: the value in Eq. (1) was computed and committed to the programme's version-controlled canon before any G determination beyond CODATA 2022 was available, and the correction class, decision rule, and census were recorded before the operator's landing was known. Every numerical statement is reproduced by self-checking scripts in the public archive [4]; the programme context is given in [1, 3], and the measurement discipline governing count-to-observable promotion in [2].

References

[1] David Elliman. Foundations and methodology for a finite-QEC substrate: Code, crystallisation, ledgers, and audit protocol. https://doi.org/10.5281/zenodo.21111257, 2026.

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[4] David Elliman. It-from-bit public executable scripts. https://github.com/dgedge/itfrombit, 2026. Public script archive for selected finite-QEC substrate calculations.

[5] Eite Tiesinga, Peter J. Mohr, David B. Newell, and Barry N. Taylor. CODATA recommended values of the fundamental physical constants: 2022. *Reviews of Modern Physics*, 97(2):025002, 2025. doi: 10.1103/RevModPhys.97.025002.