Fraction Physics: Ledger v1.3

Minimal-Description-Length for the Constants

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Contents

Abstract

This is a fully static build of my Fraction Physics ledger: exact rational **Locks**, derived identities and predictions, compact CKM/PMNS geometry, a QED $g-2$ consistency block seeded by an exact α, rare-decay cores, EW/mass-ratio checks, flat ΛCDM fractions, and a small "structured absence" monitor. All decimals are precomputed (no runtime math), and we use $\overline{\text{MS}}$ notation (no '\=' macros).

1 Protocol (anti-numerology guardrails)

R1. Search space: primitive rationals p/q with small description length (qualitative here).

R2. Scheme/scale: each entry declares a scheme/scale; comparisons never mix schemes silently.

R3. Freeze & score: once published, integers are fixed. New data only update z-scores on the scoreboard.

R4. Out-of-sample digits: crisp identities (e.g. $\sin 2\beta = \frac{119}{169}$) are pre-announced and tracked.

2 Ledger (frozen integers with decimals)

All fractions are exact; decimals are for audit only.

QED / Electroweak

Quantity	Exact	Decimal	Scheme/Scale	Type
Fine structure (inverse)	$\alpha^{-1} = \frac{361638}{2639}$	137.035998484	on-shell ($\alpha(0)$)	Lock
Fine structure	$\alpha = \frac{2639}{361638}$	0.007297352601	on-shell ($\alpha(0)$)	Lock
Weak mixing	$\sin^2\theta_W = \frac{3}{13}$	0.2307692308	$\overline{\text{MS}}$ at M_Z	Fit/Toy
Strong coupling	$\alpha_s(M_Z) = \frac{9953}{84419}$	0.117900000	$\overline{\text{MS}}$ at M_Z	Lock

CKM (priors and identities)

Parameter/Observable	Exact	Decimal	Type
λ	$\frac{2}{9}$	0.222222222	Lock
A	$\frac{21}{25}$	0.84	Lock
$\bar{\rho}$	$\frac{3}{20}$	0.15	Lock
$\bar{\eta}$	$\frac{7}{20}$	0.35	Lock
$\sin 2\beta$	$\frac{119}{169}$	0.704142012	Prediction
J_{CKM}	$\frac{197,568}{6,643,012,500}$	2.97407×10^{-5}	Derived
$\frac{\lvert V_{td}\rvert^2}{\lvert V_{ts}\rvert^2}$	$\lambda^2[(1-\bar{\rho})^2 + \bar{\eta}^2]$	0.0417283951	Derived

PMNS (angles, phase, first row)

Lock	Exact	Decimal	Type
$\sin^2\theta_{12}$	$\frac{7}{23}$	0.304347826	Lock
$\sin^2\theta_{13}$	$\frac{2}{89}$	0.0224719101	Lock
$\sin^2\theta_{23}$	$\frac{9}{16}$	0.5625	Lock
δ_{PMNS}	$-\pi/2$	maximal	Lock
$\lvert U_{e1}\rvert^2$	$\frac{1392}{2047}$	0.680019541	Derived
$\lvert U_{e2}\rvert^2$	$\frac{609}{2047}$	0.297508549	Derived
$\lvert U_{e3}\rvert^2$	$\frac{2}{89}$	0.0224719101	Derived

Neutrino splittings (illustrative)

Quantity	Exact	Decimal
Δm^2_{31}	$\frac{1}{400}$ eV^2	2.500×10^{-3} eV^2
Δm^2_{21}	$\frac{1}{13600}$ eV^2	7.352941×10^{-5} eV^2

Cosmology (flat ΛCDM ledger)

Quantity	Exact	Decimal	Type
Matter fraction	$\Omega_m = \frac{63}{200}$	0.315	Lock
Dark energy	$\Omega_\Lambda = \frac{137}{200}$	0.685	Lock
Split	$\Omega_b{:}\Omega_c = 14{:}75$	—	Lock
Hubble constant	$H_0 = \frac{337}{5}\ \mathrm{km\,s^{-1}\,Mpc^{-1}}$	67.4	Lock
Implied Ω_b	$\dfrac{14}{89}\,\Omega_m$	0.04955	Derived
Implied Ω_c	$\dfrac{75}{89}\,\Omega_m$	0.26545	Derived

Electroweak / mass-ratio checks

Ratio	Exact	Decimal	Type
M_W/M_Z	$\frac{901479375}{1022701703}$	0.881468538	Lock
m_t/M_Z	$\frac{1219404375}{643896907}$	1.893788216	Lock
M_W/v	$\frac{17807}{54547}$	0.326452417	Lock
Custodial snapshot	$1-(M_W/M_Z)^2$	0.223013216	Derived

3 Scoring (single-line rule)

$$z(\mathcal{O}) \;=\; \frac{\left|\mathcal{O}_{\text{pred}} - \mathcal{O}_{\text{exp}}\right|}{\sigma}\,. \tag{1}$$

$$\chi^2_{\text{eff}} \;=\; \sum z^2 + \lambda_{\text{MDL}} \sum L\,. \tag{2}$$

4 Muon $g-2$ (QED block consistency)

Seed the 1–5 loop QED series with $\alpha = \dfrac{2639}{361638}$:

$0.001161409737969 + 0.000004132176294 + 0.000000301419027 + 0.000000003810037 + 0.000000000050783 =$

Using CODATA α instead shifts the total by only 5.917×10^{-12}; known hadronic terms dominate any residual tension.

5 CKM Geometry and Rare-Decay Cores

With $(\lambda, A, \bar\rho, \bar\eta) = (2/9,\ 21/25,\ 3/20,\ 7/20)$,

$$\tan\beta = \tfrac{7}{17}, \qquad \sin 2\beta = \tfrac{119}{169} = 0.704142012, \qquad J_{\text{CKM}} = 2.97407\times10^{-5}.$$

Golden kaons ($K\to\pi\nu\bar\nu$). Using compact short-distance placeholders $X_t = \frac{37}{25}$ and $P_c = \frac{2}{5}$,

$$\text{Core}(K_L) = (A^2\bar\eta X_t)^2 \approx 0.133590835, \quad \text{Core}(K^+) = \text{Core}(K_L) + [P_c + A^2(1-\bar\rho)X_t]^2 \approx 1.791619966.$$

Leptonic B decays.

$$\frac{\text{BR}(B_d\to\mu^+\mu^-)}{\text{BR}(B_s\to\mu^+\mu^-)} = \frac{\tau_{B_d}}{\tau_{B_s}}\frac{m_{B_d}}{m_{B_s}}\frac{f^2_{B_d}}{f^2_{B_s}} \times \frac{|V_{td}|^2}{|V_{ts}|^2}, \qquad \frac{|V_{td}|^2}{|V_{ts}|^2} = 0.0417283951.$$

6 PMNS / Neutrinos

Locks:

$$\sin^2\theta_{12} = \tfrac{7}{23}, \quad \sin^2\theta_{13} = \tfrac{2}{89}, \quad \sin^2\theta_{23} = \tfrac{9}{16}, \quad \delta_{\text{PMNS}} = -\pi/2.$$

Exact first row:

$$|U_{e1}|^2 = \tfrac{1392}{2047} = 0.680019541, \quad |U_{e2}|^2 = \tfrac{609}{2047} = 0.297508549, \quad |U_{e3}|^2 = \tfrac{2}{89} = 0.0224719101.$$

Quark–lepton complementarity (indicative): $\theta_C = \arcsin(2/9) \approx 12.78^\circ$ and $\theta_{12}^{(\nu)} \approx 33.4^\circ \Rightarrow \theta_C + \theta_{12}^{(\nu)} \approx 46^\circ$.

7 Quantum Gravity: Structured Absence (toy monitor)

Define

$$\left(\tfrac{v}{M_P}\right)^2 \approx K\,\alpha^\nu \left[J_{\text{CKM}} \sin\theta_{13}\,\lambda^{2k}\right] (J_{\text{PMNS}})^\epsilon.$$

With $(\nu, k, \epsilon) = (11, 2, 1)$, $\alpha = \tfrac{2639}{361638}$, $\lambda = \tfrac{2}{9}$, and maximal leptonic CP, the static monitor evaluates to

$$K \approx 0.3573, \qquad \text{and imposing } K = 1 \;\Rightarrow\; \nu_{\text{best}} \approx 11.209\,.$$

(This section is a *toy falsifier*: track whether K stays $\mathcal{O}(1)$ as mixing inputs sharpen.)

Scoreboard (drop in measurements)

Edit only the last two columns to update z.

Observable	**Prediction**	**Measured**	$\boldsymbol{\sigma}$	$\boldsymbol{z}$
α^{-1} (on-shell)	137.035998484	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
$\sin 2\beta$	0.704142012	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
$\lvert V_{us}\rvert$	0.222222222	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
J_{CKM}	2.97407×10^{-5}	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
$\lvert U_{e3}\rvert^2$	0.0224719101	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
Ω_m	0.315	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
H_0	$67.4\ \text{km}\,\text{s}^{-1}\,\text{Mpc}^{-1}$	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
M_W/M_Z	0.881468538	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
$\alpha_s(M_Z)$	0.117900000	`fill`	`fill`	$\lvert\cdot\rvert/\sigma$
K (struct. absence)	0.3573	`--`	`--`	`--`

Graveyard (near-misses; transparency)

- $\lambda = 1/4$ (too far from $|V_{us}|$ globally despite low complexity).
- $\sin^2\theta_{13} = 1/64$ ($|U_{e3}|^2$ too large vs reactor data).

Gauge and gravitational anomalies (per generation)

With standard hypercharges $(1/6, 2/3, -1/3, -1/2, -1)$ and optional $Y_{\nu_R} = 0$, the sums vanish:

Anomaly	Sum per generation
$[SU(3)_c]^2 U(1)_Y$	0
$[SU(2)_L]^2 U(1)_Y$	0
$U(1)_Y^3$	0
$\text{grav}^2 U(1)_Y$	0

Reproducibility

All decimals are hard-coded from the exact fractions above. If anyone wants to update the scoreboard, change only the "Measured" and "σ" cells.