Evan Wesley, Ledger 2.2 — Unified Locks & Predictions

Version: v2.2 (frozen)

What this is. A single, versioned ledger of *simple rational locks* (fractions) for precision constants across sectors. Each lock is an exact fraction p/q. We keep it simple and falsifiable.

Acceptance rule (for locking). Prefer tiny denominators ("low-bit") and values hugging current centrals. Predictions are tagged separately.

A. Core electroweak & QCD locks (frozen)

Quantity	Fraction p/q	Decimal
Effective weak mixing ($\sin^2\theta_W$, at M_Z)	$\frac{25}{108}$	0.231481481...
Strong coupling ($\alpha_s(M_Z)$)	$\frac{23}{195}$	0.117948718...
Wolfenstein λ	$\frac{9}{40}$	0.225
Wolfenstein A	$\frac{21}{25}$	0.84

B. CKM shape (extras, frozen)

Quantity	Fraction	Decimal
$\bar{\rho}$	$\frac{3}{20}$	0.15
$\bar{\eta}$	$\frac{7}{20}$	0.35
$\sin 2\beta$	$\frac{7}{10}$	0.7
$\lvert V_{ud}\rvert$	$\frac{37}{38}$	0.9736842105...
$\lvert V_{us}\rvert$	$\frac{11}{49}$	0.2244897959...
$\lvert V_{us}\rvert/\lvert V_{ud}\rvert$	$\frac{3}{13}$	0.2307692308...
$\lvert\varepsilon_K\rvert$	$\frac{2}{897}$ $(\times 10^{-3})$	0.0022296544...
$f_K^{\pm}/f_\pi^{\pm}$	$\frac{31}{26}$	1.192307692...

C. Neutrino mixing (3ν, NO reference, frozen)

Quantity	Fraction	Decimal
$\sin^2\theta_{12}$	$\frac{31}{101}$	0.306930693...
$\sin^2\theta_{13}$	$\frac{1}{45}$	0.022222222...
$\sin^2\theta_{23}$	$\frac{5}{9}$	0.555555555...
Ratio $r \equiv \Delta m^2_{21}/\lvert\Delta m^2_{3\ell}\rvert$	$\frac{13}{440}$	0.0295454545...

D. Cosmology (Planck-like ridge, frozen)

Quantity	Fraction	Decimal
Matter density Ω_m	$\frac{63}{200}$	0.315
Vacuum density Ω_Λ (flat)	$\frac{137}{200}$	0.685
Spectral index n_s	$\frac{28}{29}$	0.965517241...
σ_8	$\frac{73}{90}$	0.811111111...
$\Omega_b h^2$	$\frac{14}{625}$	0.0224
$\Omega_c h^2$	$\frac{3}{25}$	0.12
Hubble fraction $h \equiv H_0/100$	$\frac{31}{46}$	0.673913043...
Baryon fraction $f_b = \Omega_b/\Omega_m$	$\frac{5}{32}$	0.15625

E. Rare-decay add-ons (observables we track)

Channel	Lock	Meaning
$\mathcal{B}(K^+ \to \pi^+\nu\bar{\nu})$ (exp.)	13×10^{-11}	Central-as-lock (combined style)
$\mathcal{B}(K^+ \to \pi^+\nu\bar{\nu})$ (SM)	$\frac{89}{10} \times 10^{-11}$	8.9×10^{-11} (Fibonacci 89)
$\mathcal{B}(B_s \to \mu^+\mu^-)$ (exp.)	$\frac{10}{3} \times 10^{-9}$	$3.333\ldots \times 10^{-9}$
$\mathcal{B}(B_s \to \mu^+\mu^-)$ (SM)	$\frac{91}{25} \times 10^{-10}$	3.64×10^{-9}
Ratio $R = \text{exp/SM}$ (for $B_s \to \mu\mu$)	$\frac{11}{12}$	$0.9167\ldots$

F. Definitions used by predictions

We *do not* use α as input when predicting α.

$$R_1 \equiv \frac{\lambda}{\sin^2\theta_{13}} = \frac{9/40}{1/45} = \frac{81}{8} = 10.125, \qquad R_2 \equiv \frac{1}{\alpha_s\,\sin^2\theta_W} = \frac{195}{23}\cdot\frac{108}{25} = \frac{4212}{115} \approx 36.6260869565.$$

G. Predictions (frozen with Ledger v2.2)

G.1 α from other locks — primary (simple, 4 terms)

$$\boxed{\alpha^{-1}_{\text{simple-4}} = 10\,R_1 \;+\; R_2 \;-\; A \;-\; \frac{1}{8\,R_2^2}}$$

Inputs: $A = 21/25$, $R_1 = 81/8$, $R_2 = 4212/115$.
Exact value:

$$\alpha^{-1}_{\text{simple-4}} = \frac{11183280301129}{81608342400} = 137.0359937752\ldots$$

(This already beats a ± 0.002 target by $\sim 370\times$.)

G.2 α from other locks — precision (10 terms)

$$\boxed{\alpha^{-1}_{\text{precision-10}} = 10R_1 + R_2 - \tfrac{5}{6} - \tfrac{1}{R_1} + \tfrac{3}{R_2} + \tfrac{4}{R_1R_2} - \tfrac{1}{R_2^2} + \tfrac{3}{R_2^3} + \tfrac{13}{R_2^5} + \tfrac{25}{R_2^7}}$$

Exact value:

$$\alpha^{-1}_{\text{precision-10}} = \frac{370638943017318088595145540361}{2704683041268417903431761920} = 137.0359991770049232\ldots$$

This lands within a few parts in 10^{12} of the CODATA-22 central ($\alpha^{-1} \approx 137.035999177$), using only our other frozen fractions (no α as input).

Comment. These are empirical algebraic predictions combining quantities at different renormalization scales; not derived from the SM Lagrangian. They are frozen for out-of-sample testing as λ, $\sin^2\theta_{13}$, α_s, $\sin^2\theta_W$ and CODATA α update.

H. Electron Yukawa y_e (added in v2.2)

Ledger lock (definition).

$$\boxed{y_e \;=\; \sqrt{2}\cdot\frac{43}{20{,}719{,}113}}$$

Decimal: $y_e = 2.9350283085015795 \times 10^{-6}$.

Compact relation to α (approximate, no y_e input). Using the precision-10 α from Section G.2:

$$\boxed{y_e \;\approx\; \frac{7}{127}\,\alpha^2}$$

Numerics (with the exact rational α of G.2):

$$\frac{7}{127}\,\alpha^2 = 2.9351140247012141 \times 10^{-6}, \qquad \Delta = +8.5716 \times 10^{-11} \;\; (\text{relative } \; + 2.92 \times 10^{-5}).$$

This is deliberately *minimal* (two small primes, one power). Shorter corrections in powers of R_2^{-1} can reduce the miss further; we keep the shortest useful expression here.

I. Version & philosophy

Version. This document is frozen as **v2.2**. Any change (new lock or edit) becomes v2.3, v2.4, ...

Freeze & score. We never overwrite history; we publish a new version when promoting better locks. Keep integers tiny; keep predictions falsifiable.

Vein primes. We deliberately reuse the small-prime threads $\{5, 7, 11, 13, 23, 29, 89\}$ and clean power structures (e.g., $2^a 5^b$), echoing modular/partition "Ramanujan" patterns.

J. Scoring and bit-cost (how we judge locks)

Let a lock be an exact reduced fraction p/q. Define the *bit-cost*

$$L(p/q) \equiv \lceil \log_2 p \rceil + \lceil \log_2 q \rceil.$$

Given a world value $x_0 \pm \sigma$, define the *z-score*

$$z(p/q) \equiv \frac{|\, p/q - x_0 \,|}{\sigma}.$$

A simple MDL-like objective:

$$\mathcal{S} = -\tfrac{1}{2} \sum_i z_i^2 - \kappa \sum_i L_i,$$

with small tunable penalty κ. Hard-lock rule used here: $z \le 2$ and $\log_2 q \le 10$.

K. CP violation invariants (quark & lepton)

K.1 Quark Jarlskog J_q (add-on lock)

Tiny-code lock consistent with global fits:

$$\boxed{J_q = \frac{3}{100{,}000} = 3.0 \times 10^{-5}}$$

(We track it as a convenience lock; world averages hover near 3.1×10^{-5}.)

K.2 Leptonic Jarlskog J_ℓ (prediction)

With our frozen angles $(\sin^2\theta_{12}, \sin^2\theta_{13}, \sin^2\theta_{23})$ and $J_\ell = c_{12}c_{13}^2c_{23}s_{12}s_{13}s_{23}\sin\delta$, taking $\delta \approx -\frac{\pi}{2}$ yields $|J_\ell| \approx 0.033$. We propose the vein lock

$$\boxed{J_\ell = -\frac{1}{30} = -0.033\overline{3}}$$

matching that magnitude at $\mathcal{O}(10^{-3})$.

L. δ_{CP} (lepton sector) — phase lock

Motivated by current preferences and minimalism, we freeze the phase prediction

$$\boxed{\delta_{CP} = -\frac{\pi}{2}}$$

—a discrete, falsifiable target for Hyper-K and DUNE.

M. Vein-prime factor map (illustrative)

Prime-factor threads appearing across locks:

$$\begin{array}{lcl}
\text{for } \sin^2\theta_W: & 108 = 2^2\cdot 3^3, & \text{(modular powers)}\\
\text{for } \alpha_s: & 195 = 3\cdot 5\cdot 13, & (\{5,13\}\text{ vein})\\
\text{for } n_s: & 29 \text{ (prime)}, & \text{(29 thread)}\\
\text{for } \sigma_8: & 90 = 2\cdot 3^2\cdot 5, & \text{(low primes)}\\
\text{for } \sin 2\beta: & 10 = 2\cdot 5, & \text{(clean powers)}\\
\text{for } r: & 440 = 2^3\cdot 5\cdot 11, & (\{2,5,11\})
\end{array}$$

These threads are reused to minimize code length and emphasize shared arithmetic structure.