Lean Certificate Excerpt (CKM + Neutrino Sector)

This page is a 1–to–1 mirror of the Lean certificate fields.

Lean sources:
`IndisputableMonolith/Verification/CKMCert.lean`
`IndisputableMonolith/Verification/NeutrinoSectorCert.lean`

CKM certificate (`CKMCert.Cert`)

- `vcb_geometric_origin`: $V_{cb}^{\text{geom}} = \dfrac{1}{2 \cdot \text{cube\_edges}(3)}$ (hence $= 1/24$).
- `vcb_match`: $\left|V_{cb}^{\text{pred}} - 0.04182\right| < 0.00085$.
- `alpha_lower_bound`: $0.00729 < \alpha$.
- `alpha_upper_bound`: $\alpha < 0.00731$.
- `phi_inv3_lower_bound`: $0.2360 < \phi^{-3}$.
- `phi_inv3_upper_bound`: $\phi^{-3} < 0.2361$.
- `vub_match`: $\left|V_{ub}^{\text{pred}} - 0.00369\right| < 0.00011$.
- `vus_match`: $\left|V_{us}^{\text{pred}} - 0.22500\right| < 0.00067$.

Neutrino sector certificate (`NeutrinoSectorCert.Cert`)

- `nu3_bounds`: $0.04987 < m_3^{\text{pred}} < 0.04993$ eV.
- `nu2_bounds`: $0.00924 < m_2^{\text{pred}} < 0.00928$ eV.
- `nu1_bounds`: $0.00352 < m_1^{\text{pred}} < 0.00355$ eV.
- `dm2_21_in_nufit_1sigma`: $7.21 \times 10^{-5} < {\Delta m^2_{21}}^{\text{pred}} < 7.62 \times 10^{-5}$ eV^2.
- `dm2_31_in_nufit_2sigma`: $2.455 \times 10^{-3} < {\Delta m^2_{31}}^{\text{pred}} < 2.567 \times 10^{-3}$ eV^2.
- `dm2_ratio_phi7`: $\dfrac{(\phi^{r_3})^2}{(\phi^{r_2})^2} = \phi^7$ (exact, structural).
- `theta13_match`: $\left|\sin^2\theta_{13}^{\text{pred}} - 0.022\right| < 0.002$.
- `theta12_match`: $\left|\sin^2\theta_{12}^{\text{pred}} - 0.307\right| < 0.01$.
- `theta23_match`: $\left|\sin^2\theta_{23}^{\text{pred}} - 0.546\right| < 0.01$.
- `jarlskog_match`: $\left|J^{\text{pred}} - 3.08 \times 10^{-5}\right| < 0.6 \times 10^{-5}$.
- `jarlskog_pos`: $J^{\text{pred}} > 0$.