

Addendum 283: The α -Comma Mechanism

The measured deficit as the oscillation average;
the first measurement of A ; the watchlist closes empty

TOE Corpus

2026-06-10

Skill: gap-closure v1.1 — **Outcome:** Case B+ (mechanism identified, sign and magnitude to 2.3%; amplitude measured, not derived; OI-283-1 filed) — **Addresses:** OI-279-1; retires the 35/4 watchlist item — **Verifier:** `verify_P283.py` — all PASS

Abstract

A279 named the α -comma — Ω exceeds the measured α^{-1} by 2.2234 ppm — and asked for its magnitude (OI-279-1). The corpus contains the mechanism. P03 predicts the coupling *oscillates* with amplitude $A \sim \kappa$ about its geometric value (the same oscillation whose frequency built A266–A274). A measurement that time-averages the coupling over the cycle does not return Ω^{-1} : for instantaneous $\alpha^{-1}(\theta) = \Omega(1 + A \cos \theta)$, the linear average is $\langle \alpha \rangle = \Omega^{-1}(1 - A^2)^{-1/2}$, so the measured inverse coupling sits *below* the geometric value,

$$\alpha_{\text{meas}}^{-1} = \Omega \sqrt{1 - A^2}, \quad \text{deficit} = 1 - \sqrt{1 - A^2} \approx A^2/2.$$

With $A = \kappa$: predicted deficit 2.2745 ppm versus observed 2.2234 ppm (CODATA-18) — **sign correct, mechanism corpus-native, magnitude high by 2.3%**. The reading inverts into the corpus’s first *measurement* of its own oscillation amplitude: $A = 0.98872 \kappa$ (CODATA-18) and 0.98857κ (CODATA-22) — *edition-stable* to 1.5×10^{-4} , in sharp contrast to the fragile $\kappa/7$ flag A279 declined. The averaging exponent is also data-selected: among moment averages $\langle \alpha^n \rangle^{1/n}$ (deficit $(n+1)A^2/4$ at $A = \kappa$), the observation picks $n = 0.955 \approx 1$ — the linear mean, the simplest member. P03 gave $A \sim \kappa$ as an order estimate only; deriving the exact amplitude (why 0.9887, whether $A = \kappa \sqrt{1 - \kappa}$ -class temperings are involved — the nearest such candidates are checked and none passes) is filed as **OI-283-1**. Separately, the last comma-watchlist item (T_{breath} vs $2^{35/4}$, 62 ppm) is retired: the only decomposition of the exponent, $35/4 = 7 \cdot (5/4)$, routes through P017.2’s underived factor of 7 — a flag built on an open gap is debt squared — and 62 ppm carries no force under the watchlist’s look-elsewhere budget. **The comma watchlist closes empty**: every previously flagged near-miss is now either derived (432, G_1), demoted (schisma, conversion residue), refuted (quarter-comma, reduced and retired), or typed with a mechanism (the α -comma, this addendum).

1 The Mechanism

Proposition 1.1 (Averaging dressing). *Let the instantaneous inverse coupling oscillate as $\alpha^{-1}(\theta) = \Omega(1 + A \cos \theta)$ (P03: amplitude $A \sim \kappa$, the oscillation of the self-lensing arena). The cycle-averaged coupling is $\langle \alpha \rangle = \frac{1}{2\pi} \oint \frac{d\theta}{\Omega(1 + A \cos \theta)} = \frac{1}{\Omega \sqrt{1 - A^2}}$, hence the operationally measured inverse coupling is $\alpha_{\text{meas}}^{-1} = \Omega \sqrt{1 - A^2} < \Omega$: the measured value must sit below the geometric one. The deficit $1 - \sqrt{1 - A^2} = A^2/2 + O(A^4)$.*

Proposition 1.2 (Confrontation and inversion). *With $A = \kappa = \alpha^{5/4}$: deficit = 2.27448×10^{-6} , versus observed 2.23344×10^{-6} (CODATA-18) and 2.23276×10^{-6} (CODATA-22) — ratio 0.9776, i.e. the κ -amplitude prediction is 2.3% high. Inverting,*

$$A_{\text{meas}} = \kappa \sqrt{\text{obs}/\text{pred}} = 0.988717 \kappa \text{ (CODATA-18)}, \quad 0.988566 \kappa \text{ (CODATA-22)}, \quad (1)$$

stable across editions to 1.5×10^{-4} . The α -comma is thereby a measurement of the P03 oscillation amplitude — the first the corpus possesses. The averaging-family exponent is data-selected at $n = 0.955 \approx 1$ (linear mean).

Remark 1.3 (What is not claimed — OI-283-1). *P03 predicts $A \sim \kappa$ as an order, not an identity; the 2.3% excess is real and unexplained. Checked and rejected as exact: $A = \kappa \sqrt{1 - \kappa}$ (0.99893 κ , off 10 $\times$), $A = \kappa(1 - \kappa)$, $A = \kappa \sqrt{1 - \kappa^2}$ — none reaches 0.9887. No candidate is promoted. **OI-283-1**: derive the oscillation amplitude exactly from the arena ($\Delta E \approx 23\kappa \cdot 4\pi$, P03) or the kernel; the target is now a measured number with an edition-stability pedigree, which is what a derivation needs to aim at. P000_1_c's registry note is updated: mechanism typed, amplitude measured, exact derivation open.*

2 The Watchlist Closes

Remark 2.1 (Retiring T_{breath} vs $2^{35/4}$). *The A277 reduction left one watchlist item: $\log_2 T_{\text{breath}} = 8.749910$ vs $35/4$ (62 ppm). The exponent's only available decomposition, $35/4 = 7 \cdot (5/4)$, requires P017_2's factor of 7 — itself an open registry item — so any meaning assigned to $2^{35/4}$ presently borrows from undischarged debt. A 62 ppm coincidence between a transcendental and a 2-power, under the watchlist's accumulated look-elsewhere budget, does not survive on its own. Retired as coincidence; revivable iff the factor 7 is derived and the product $7 \cdot (5/4)$ acquires independent meaning. With this, the comma watchlist is **empty**: derived (432, G_1), demoted (schisma), refuted-by-reduction (quarter-comma), mechanism-typed (α -comma). Every small gap the corpus once stared at now has a name, a type, or a tombstone.*

Consequences. OI-279-1 addressed (mechanism + measurement; exact amplitude = OI-283-1). Watchlist empty. The SPARC/external paper can now state the corpus's flagship number honestly in one sentence: *the geometric value exceeds the measured one by 2.2 ppm, the sign and size of the corpus's own predicted oscillation dressing, with the residual 2.3% an open measurement of the oscillation amplitude.*

Verifier. `verify_P283.py`: the exact average $\oint d\theta/(1 + A \cos \theta) = 2\pi/\sqrt{1 - A^2}$ (numeric quadrature); the deficit against both CODATA editions; the inversion and its edition stability; the exponent selection; the rejected amplitude candidates; the 35/4 retirement numbers; watchlist cardinality 0. All PASS.