

Correction to Addendum 87: Exponent Errors in the Second Spectral Moment

Addendum 162 to the TOE Corpus

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Abstract

Addendum 87, Proposition 2.1 states the second spectral moment of the sector density as $M_2 = (\pi^3 + \pi^5 + 16\pi^7)/\mu_0 \approx 354$. Two exponent errors are present: the term $x_2^2 w_2$ should be π^6/μ_0 (written as π^5/μ_0) and the term $x_3^2 w_3$ should be $64\pi^9/\mu_0$ (written as $16\pi^7/\mu_0$). The correct second moment is $M_2 = (\pi^3 + \pi^6 + 64\pi^9)/\mu_0 \approx 13\,929$, a factor of ≈ 39 larger. Downstream results in P87 that depend on $\sqrt{M_2}$ as a spectral energy are correspondingly corrected. The near-identity $E_H \approx \sqrt{\pi \operatorname{Tr}(X^2)/\mu_0}$ established in P87 Section 5 is unaffected: it involves the separate functional $\pi M_1^{(\text{disc})}$, not M_2 .

1 P87 setup and the erroneous Proposition 2.1

Addendum 87 defines the sector operator $X_{\text{sector}} = \operatorname{diag}(\pi, \pi^2, 4\pi^3) \in J_3(\mathbb{O})$ with eigenvalues $x_1 = \pi$, $x_2 = \pi^2$, $x_3 = 4\pi^3$, trace $\mu_0 = \pi + \pi^2 + 4\pi^3 = \alpha^{-1} \approx 137.036$, and spectral weights

$$w_i = \frac{x_i}{\mu_0}, \quad w_1 = \frac{\pi}{\mu_0}, \quad w_2 = \frac{\pi^2}{\mu_0}, \quad w_3 = \frac{4\pi^3}{\mu_0}. \quad (1)$$

The k -th moment is $M_k = \sum_{i=1}^3 x_i^k w_i$. For $k = 2$ the three terms are $x_1^2 w_1$, $x_2^2 w_2$, $x_3^2 w_3$. P87 Proposition 2.1 states

$$M_2^{(\text{P87})} = \frac{\pi^3 + \pi^5 + 16\pi^7}{\mu_0} \approx 354. \quad (\text{incorrect}) \quad (2)$$

2 Identification of the two errors

Proposition 2.1 (Error in $x_2^2 w_2$). *With $x_2 = \pi^2$ and $w_2 = \pi^2/\mu_0$:*

$$x_2^2 w_2 = (\pi^2)^2 \cdot \frac{\pi^2}{\mu_0} = \frac{\pi^4 \cdot \pi^2}{\mu_0} = \frac{\pi^6}{\mu_0}.$$

P87 Proposition 2.1 writes π^5/μ_0 . The exponent is 6, not 5.

Proposition 2.2 (Error in $x_3^2 w_3$). *With $x_3 = 4\pi^3$ and $w_3 = 4\pi^3/\mu_0$:*

$$x_3^2 w_3 = (4\pi^3)^2 \cdot \frac{4\pi^3}{\mu_0} = \frac{16\pi^6 \cdot 4\pi^3}{\mu_0} = \frac{64\pi^9}{\mu_0}.$$

P87 Proposition 2.1 writes $16\pi^7/\mu_0$. The correct coefficient is 64 (not 16) and the correct exponent is 9 (not 7). The error conflates the factor of $16\pi^6$ from x_3^2 with the weight $w_3 = 4\pi^3/\mu_0$, effectively using $w_3^ = \pi^3/\mu_0$ instead of $4\pi^3/\mu_0$.*

3 Corrected second moment

Theorem 3.1 (Correct M_2). *The second spectral moment of the sector density is*

$$M_2 = x_1^2 w_1 + x_2^2 w_2 + x_3^2 w_3 = \frac{\pi^3 + \pi^6 + 64\pi^9}{\mu_0}. \quad (3)$$

Numerically ($\pi^3 = 31.006$, $\pi^6 = 961.39$, $64\pi^9 = 64 \times 29\,809.1 = 1\,907\,780$, $\mu_0 = 137.036$):

$$M_2 = \frac{31.006 + 961.39 + 1\,907\,780}{137.036} \approx \frac{1\,908\,772}{137.036} \approx \mathbf{13\,929}.$$

The standard deviation of the sector measure is $\sigma = \sqrt{M_2 - (M_1^{(\text{disc})})^2} \approx \sqrt{13\,929 - 12\,769} = \sqrt{1\,160} \approx 34.1$ spectral units.

Corollary 3.2 (Factor-of-39 error). *The ratio of the correct value to the value claimed in P87 Proposition 2.1 is*

$$\frac{M_2}{M_2^{(\text{P87})}} = \frac{13\,929}{354} \approx 39.3.$$

The P87 abstract and Proposition 2.1 understate M_2 by a factor of ≈ 39 .

$$M_2 = \frac{\pi^3 + \pi^6 + 64\pi^9}{\mu_0} \approx 13\,929$$

4 Downstream consequences

$\sqrt{M_2}$ as a spectral energy. P87 Section 4 uses $\sqrt{M_2^{(\text{P87})}} \approx 18.84$ as a spectral coordinate in the mass formula and finds a $\approx 0.33\%$ near-coincidence with the Higgs coordinate $E_H \approx 18.78$. With the correct $M_2 \approx 13\,929$, the square root is $\sqrt{13\,929} \approx 118.0$, which inserted into the mass formula yields a mass far above the Planck scale (P87 Proposition 4.1). No near-identification of $\sqrt{M_2}$ with a Standard Model scale survives.

Higgs near-identity (unaffected). The near-identity established in P87 Theorem 4.10,

$$E_H \approx \sqrt{\frac{\pi \operatorname{Tr}(X_{\text{sector}}^2)}{\mu_0}} = \sqrt{\pi M_1^{(\text{disc})}}, \quad \text{residual } 0.33\%,$$

involves the quantity $\pi M_1^{(\text{disc})} = (\pi^3 + \pi^5 + 16\pi^7)/\mu_0 \approx 355$, which P87 Section 5 correctly identifies as $\pi \operatorname{Tr}(X^2)/\mu_0$ — not the second moment M_2 . This near-identity is structurally correct and is unchanged by the present correction.

Variance. The corrected variance is $\sigma^2 = M_2 - (M_1^{(\text{disc})})^2 \approx 13\,929 - 12\,769 = 1\,160$, replacing the value ≈ 354.5 stated in P87 Proposition 2.4 (which used the erroneous M_2).

References

- [1] L. F. Vlegels, *Addendum 87: The Second Spectral Moment and $\operatorname{Tr}(X_{\text{sector}}^2)$* , TOE Corpus Addendum, May 2026.
- [2] L. F. Vlegels, *Addendum 80: MU as the Spectral Mean*, TOE Corpus Addendum, May 2026.