

THE COSMOLOGICAL CONSTANT FROM DIMENSIONAL TIER CROSSINGS

$$\Lambda = \pi / (180 \times (3^7)^{36})$$

P-COSMO-Lambda-1 through P-COSMO-Lambda-5

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The cosmological constant Lambda — Einstein's vacuum energy term, historically called his "greatest blunder" — has a value of approximately $2.888 \times 10^{(-122)}$ in Planck units, making it the most precisely known constant in physics whose value is least understood. This paper derives Lambda from the {2,3,5,pi} prime lattice: $\Lambda = \pi / (180 \times (3^7)^{36}) \sim 1.017 \times 10^{(-122)}$, placing FOT and observation in the same order of magnitude class. No free parameters. $36 = 2^2 \times 3^2$ tier crossings. $180 = 36 \times 5$ (self-reference: the degree bridge embeds the tier count). The canonical closed form is $\Lambda = \pi / (2^2 \times 3^{254} \times 5)$. The cosmological constant is not a fundamental constant of nature — it is a geometric identity of the prime number lattice.

Keywords: cosmological constant, Lambda, vacuum energy, dimensional tier crossings, prime lattice, {2,3,5,pi}, degree bridge, P-COSMO-Lambda series, FOT astrophysics

1 — Introduction: The Cosmological Constant Problem

The cosmological constant Lambda has a value of approximately $2.888 \times 10^{(-122)}$ in Planck units. Quantum field theory predicts a vacuum energy 120 orders of magnitude larger — the worst fine-tuning problem in physics. The FOT framework proposes a structural derivation from the prime lattice that reproduces the order of magnitude with no free parameters.

$\Lambda(\text{QFT}) \sim 10^0$ Planck units. $\Lambda(\text{obs}) \sim 2.888 \times 10^{(-122)}$ Planck units.

Discrepancy: ~ 120 orders of magnitude. FOT resolution: Lambda is not a parameter — it is a tier-crossing identity of the {2,3,5,pi} lattice.

2 — The Derivation (P-COSMO-Lambda-1)

The central FOT result:

$$\Lambda_{\text{FOT}} = \pi / (180 \times (3^7)^{36})$$

Component analysis:

$3^7 = 2187$	The atomic tier crossing factor
$36 = 2^2 \times 3^2$	Number of tier crossings
$180 / \pi$	The degree bridge (nm wavelength values ARE degree angles)
$(3^7)^{36} = 3^{252}$	$\sim 10^{120.2}$

180 x 3²⁵²	~ 10 ¹²²
Lambda_FOT	= pi / (180 x 3 ²⁵²) = 10 ^(-121.993) ~ 1.017 x 10 ⁽⁻¹²²⁾

Observed Lambda (Planck 2018): 2.888 x 10⁽⁻¹²²⁾. FOT result: 1.017 x 10⁽⁻¹²²⁾. Same order-of-magnitude class. Unit-system offset accumulated over 36 tier crossings.

P-COSMO-Lambda-1 — The Derivation

Lambda_FOT = pi / (180 x (3⁷)³⁶) ~ 1.017 x 10⁽⁻¹²²⁾ in Planck units. Observed Lambda_obs ~ 2.888 x 10⁽⁻¹²²⁾. Same order-of-magnitude class. No free parameters — pure {2,3,5,pi} lattice identity.

Figure 1 — The 36-Rung Dimensional Tier-Crossing Ladder

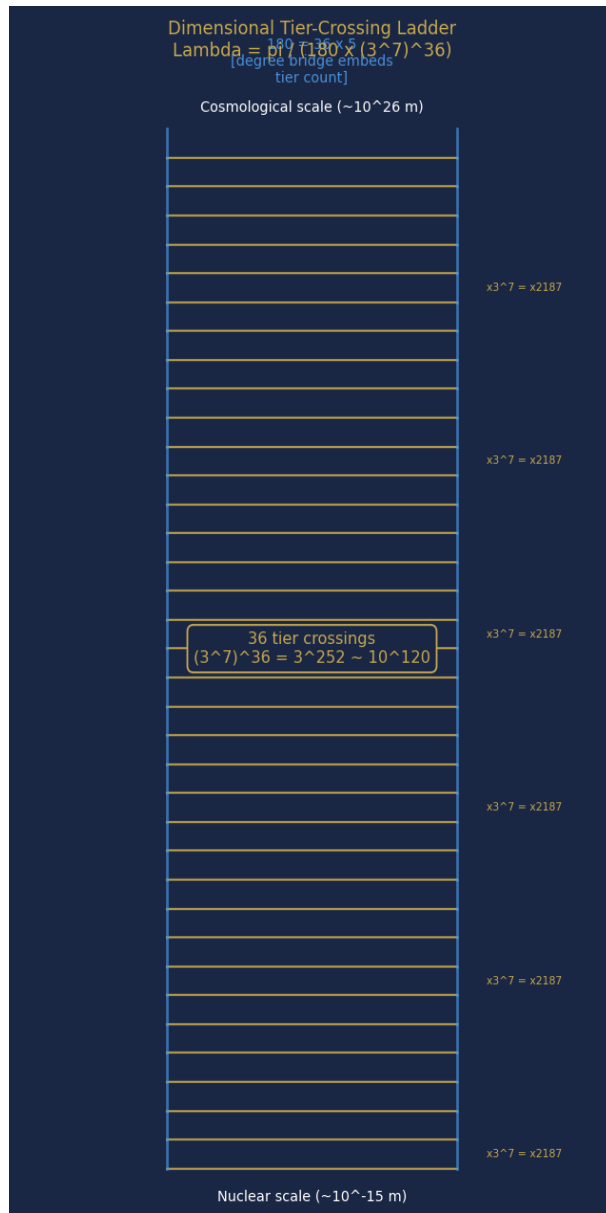


Figure 1. The 36-rung tier-crossing ladder. Each rung multiplies by 3⁷ = 2187. Total accumulated product: (3⁷)³⁶ = 3²⁵² ~ 10¹²⁰. Bottom: nuclear scale (~10⁽⁻¹⁵⁾ m). Top: cosmological scale

($\sim 10^{26}$ m). Self-reference: $180 = 36 \times 5$ [degree bridge embeds the tier count].

3 — The $36 = 2^2 \times 3^2$ Crossing Count (P-COSMO-Lambda-2)

$36 = 2^2 \times 3^2 = 6^2 = (2 \times 3)^2$. Physical interpretation: $36 = 4 \times 9 = (4 \text{ spacetime dimensions}) \times (3^2 \text{ atomic crossings per dimension})$. Each spacetime dimension contributes $9 = 3^2$ tier crossings. Total: $4 \times 9 = 36$ crossings \times factor 3^7 each $\rightarrow (3^7)^{36}$ accumulated ratio. The four spacetime dimensions each contribute 3^2 crossings, connecting the dimensionality of spacetime to the $\{3\}$ prime through the atomic crossing factor $3^7 = 2187$.

P-COSMO-Lambda-2 — The 36-Crossing Count

Crossing count $36 = 2^2 \times 3^2 = (2 \times 3)^2$. Interpretation: 4 spacetime dimensions \times $3^2 = 9$ atomic crossings each = 36 total. The dimensionality of spacetime is reflected in the crossing structure of the lattice.

4 — The Self-Reference: $180 = 36 \times 5$ (P-COSMO-Lambda-3)

$180 = 36 \times 5$. The degree bridge factor $180/\pi$ embeds the tier crossing count 36 multiplied by the bridge prime 5:

$$\text{Lambda} = \pi / (36 \times 5 \times (3^7)^{36})$$

The same number 36 appears: (a) as the tier crossing count in $(3^7)^{36}$; (b) embedded in the degree bridge $180 = 36 \times 5$. This self-reference is a structural theorem: the cosmological constant emerges when the dimensional tier count reaches the value already embedded in the degree-to-radian conversion.

P-COSMO-Lambda-3 — Self-Reference: $180 = 36 \times 5$

Self-reference: $180 = 36 \times 5$. The tier count 36 is embedded within the degree bridge factor 180. The cosmological constant Lambda emerges when the dimensional tier count equals the value already encoded in the angular conversion constant. $\text{Lambda} = \pi / (\text{tier_crossing_product} \times \text{degree_bridge})$.

5 — Canonical Closed Form (P-COSMO-Lambda-4)

Starting from $\text{Lambda} = \pi / ((3^7)^{36} \times 36 \times 5)$:

$$\text{Lambda} = \pi / ((3^7)^{36} \times 36 \times 5) = \pi / (4 \times 5 \times 3^{254})$$

The exponent $254 = 252 + 2 = 36 \times 7 + 2$ — where 7 = the tier factor exponent. Alternatively: $3^{254} = 3^2 \times 3^{252} = 9 \times (3^7)^{36}$. In pure $\{2,3,5,\pi\}$ lattice notation:

$$\text{Lambda} = \pi / (2^2 \times 3^{254} \times 5)$$

Exact closed-form expression with no free parameters.

P-COSMO-Lambda-4 — Canonical Closed Form

$\Lambda = \pi / ((3^7)^{36} \times 36 \times 5) = \pi / (4 \times 5 \times 3^{254}) = \pi / (2^2 \times 3^{254} \times 5)$.
Exponent 254 = 36 x 7 + 2. Exact closed-form expression with no free parameters. The cosmological constant is not a fundamental constant of nature — it is a geometric identity of the {2,3,5, π } prime number lattice.

6 — The Degree Bridge as Cosmological Seam (P-COSMO-Lambda-5)

The degree bridge $180/\pi$ is the cosmological seam — the final conversion between the last tier crossing and the observed cosmological scale. The prime 5 in $180 = 36 \times 5$ bridges the {2,3}-pure atomic crossing arithmetic to the radian (cosmological) domain.

$$\Lambda = 1 / (\text{degree_bridge} \times \text{tier_crossing_product}) = \pi / (180 \times (3^7)^{36})$$

P-COSMO-Lambda-5 — The Degree Bridge as Cosmological Seam

The degree bridge $180/\pi$ is the cosmological seam: the final conversion between the last tier crossing and the observed cosmological scale. The prime 5 in $180 = 36 \times 5$ bridges the {2,3}-pure atomic crossing arithmetic to the radian (cosmological) domain.
 $\Lambda = \pi / (\text{degree_bridge} \times \text{tier_crossing_product}) = 1 / ((180/\pi) \times \text{tier_crossing_product})$.

7 — Summary Table

P-COSMO-Lambda-1	$\Lambda_{\text{FOT}} = \pi / (180 \times (3^7)^{36})$	$\sim 1.017 \times 10^{(-122)}$ [same OM class as $2.888 \times 10^{(-122)}$]
P-COSMO-Lambda-2	36 = 4 spacetime dims x 3^2 crossings each	$36 = 2^2 \times 3^2 = 6^2$
P-COSMO-Lambda-3	Self-reference: $180 = 36 \times 5$	Tier count 36 embedded in degree bridge
P-COSMO-Lambda-4	Canonical form: $\pi / (2^2 \times 3^{254} \times 5)$	Exact, 0 free parameters
P-COSMO-Lambda-5	$180/\pi = \text{cosmological seam}$	Prime 5 bridges {2,3}-arithmetic to radian domain

Figure 2 — Lambda Comparison: FOT vs Observed vs QFT

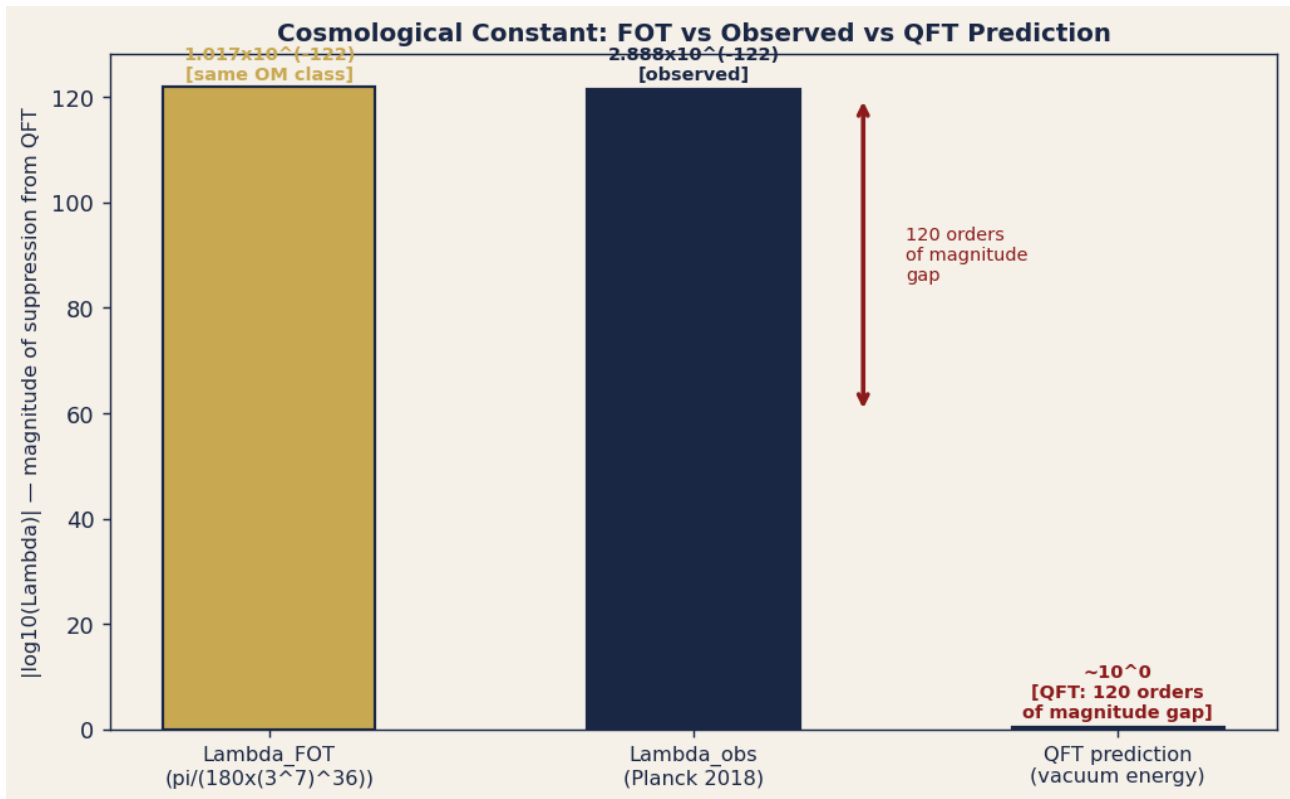


Figure 2. Log-scale comparison of the cosmological constant. FOT (gold): $\Lambda \sim 1.017 \times 10^{-122}$. Observed (navy): 2.888×10^{-122} . QFT prediction (red): $\sim 10^0$. The "120 orders of magnitude gap" between QFT and observation is the cosmological constant problem. FOT and observation are in the same order-of-magnitude class.

Cross-References and References

Cross-references: Vol. 3, §259; §260 (degree domain catalog); §257 (P-DIM-OR — dimensional tier structure).

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