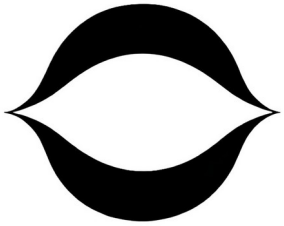

The Leakage Constant

Artist’s Proof 06

Forces and Constants

c as the universal absorption limit — ε identified with the leakage enforced by finite c

Contents

Artist’s Note

What this paper does — and why.

This is Artist’s Proof 06 of The 420 Code. It opens Notebook IV (Forces and Constants). It identifies the speed of light c as the universal absorption limiter and, on that basis, identifies the 420 Code’s symmetry-breaking parameter ε with the leakage ratio η enforced by finite c at every physical absorbing boundary.

The argument runs in two parts. The first part (sections 1–5) is published, established physics. Hawking radiation establishes that the gravitational absorbers we call black holes do not absorb perfectly — the surface gravity κ sets a temperature $T_H = \hbar c^3/(8\pi k_{BGM})$, nonzero for any finite M precisely because c is finite. Published retinal physics establishes that the human eye, the canonical near-perfect electromagnetic absorber, leaks $\eta \approx 10^{-6}$ to 10^{-5} of incident light back through the pupil, with the bound set by the fine-structure constant $\alpha = e^2/(4\pi\varepsilon_0\hbar c)$. The CMB completes the third channel — the leakage at recombination, the boundary radiation of the last scattering surface. Three physically distinct systems, six structural features in common, c in the denominator of every leakage estimate.

The second part (sections 6–8) is the framework move. Section 6 names the Cosmological Corollary that AP06 carries into Notebook IV: the cosmological channel of section 5 is the first observable historical record of leakage at a structural boundary, and the continued accumulation of unpaired 1×ε across actualization-state instants (AP43 D5) makes the cosmological leakage an ongoing structural process rather than a single epoch-bounded event. Section 7 identifies the 420 Code’s ε with the leakage ratio η — an interpretive identification, not a derivation forced by the physics of sections 1–5. Section 8 conjectures forward to the Planck constraint: if G depends on c through ε, the Planck scale is where the leakage becomes total.

The central result is the Leakage Theorem (Theorem 3.1, scoped). In the analysed near-perfect-absorber channels of sections 1–2, the leakage ratio η is strictly positive whenever c and the relevant coupling constant are finite. AP06 advances the hypothesis that this holds for the broader class of physical absorbers; the hypothesis is debt D1 and remains open. The Identification ε ≡ η (Identification 6.1) is the interpretive bridge that connects the physics of

sections 1–5 to the axiom and grounds Notebook IV’s one measured input: ε = α_em ≈ 1/137.

Seven kill switches engage. Two are load-bearing (KS-L.1 and KS-L.2, targeting Theorem 3.1); the rest target the identification and the non-load-bearing conjectures of section 8. The paper imports no external physics beyond the published results it cites.

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Orientation

Where AP06 fits

The 420 Code is organised across eight bound Notebooks. Each Notebook is a standalone book carrying one domain of the architecture; the eight together carry the corpus.

AP06 opens Notebook IV (Forces and Constants). It depends on Notebook I (Premise) for the axiom 1:1 + 1×ε @ AS and the four conditions {S, B, R, C}; on Notebook II (Spacetime) for the constants c and G and the geometric apparatus (AP03 for the conjugacy $c^2 = \beta/\alpha$, AP05 for the break, AP08 for Einstein's field equations); and on Notebook III (Quantum Mechanics) for the quantum sector, the Born rule, and the measurement structure that connects section 4's Landauer synthesis to the quantum sector's record economy.

AP06 feeds the rest of Notebook IV. Its identification ε ≡ η is the structural ground on which AP15 (Connection) builds U(1) electromagnetism, AP24 (Residual) formalises the six-faces structure of ε, and AP28 (Constant) derives Newton's gravitational constant from the channel-counting argument. AP14 (Correction) uses AP06's results when handling Planck-scale commutation corrections.

Reading order within AP06

Front to back. Section 1 establishes gravitational leakage (the Hawking channel). Section 2 establishes electromagnetic leakage (the retinal channel). Section 3 names the common structure as the Leakage Theorem. Section 4 synthesises the observation boundary through Landauer. Section 5 establishes the cosmological channel (CMB). Section 6 names the Cosmological Corollary the paper carries into Notebook IV. Section 7 performs the framework move: ε ≡ η. Section 8 conjectures forward to the Planck constraint.

How to read this paper

The paper alternates two voices as the material requires. Narrative passages — the structural readings, the felt sense of leakage across three scales, the cosmological framing — speak directly. Formal sections — the theorem statement, the proof, the identification, the kill switches — speak in the precision the structure requires. Where the gear changes, the change is

signalled by the form: formal blocks open with a bold label (Theorem, Identification, Claim, Kill Switch) and close with the box mark ■.

A note on notation

Two notational items recur and are worth flagging at the door. The symbol κ carries different meanings in different sections. In section 1 it is the surface gravity of a Schwarzschild black hole, $\kappa = c^4/(4GM)$, with dimensions of acceleration; in section 7 it is the backreaction coupling that enters the parametrisation $G = \kappa/(\varepsilon\Lambda^2)$ from AP03 (a scaling form superseded by AP28's derived $\alpha_G = \alpha_{em}^{21}$; see §8). The two κ's are distinct quantities sharing one symbol; context disambiguates.

The symbol ε carries one structural meaning throughout the corpus: the unique unpaired element of Axiom B (the break). In AP06 it acquires a physical reading via Identification 6.1: $\varepsilon \equiv \eta$, the leakage ratio at the relevant physical boundary, with domain-dependent values $\varepsilon_{gravity} \approx 10^{-17}$, $\varepsilon_{eye} \approx 10^{-6}$ to 10^{-5}, $\varepsilon_{cosmo} \approx 10^{-5}$. The corpus-wide identification of the measured electromagnetic case as $\varepsilon = \alpha_{em} \approx 1/137$ sits at the chemical-biological scale.

0 — Dependency and Scope

0.1 — What this paper does

AP06 identifies the speed of light c as the universal absorption limiter and, on that basis, identifies the 420 Code's symmetry-breaking parameter ε with the leakage ratio η enforced by finite c at every physical absorbing boundary. The paper proves the Leakage Theorem in two specific channels (gravitational Hawking leakage, electromagnetic retinal leakage) and advances the hypothesis that the theorem extends to the broader class of physical absorbers with finite c and finite coupling.

The paper does the following structural work. It establishes that perfect absorption is forbidden in the analysed channels (Theorem 3.1). It identifies the 420 Code's ε with the measured leakage ratio η (Identification 6.1, interpretive). It names the Cosmological Corollary that AP06 carries into Notebook IV: the cosmological channel of section 5 is the first observable historical record of leakage, and the continued accumulation of unpaired 1×ε across actualization-state instants (AP43 D5) makes the cosmological leakage an ongoing process. It conjectures forward to the Planck constraint: if G depends on c through ε, the Planck scale is where ε ~ O(1).

0.2 — Dependencies

AP06 depends on the established physics it cites in sections 1–5 (Hawking 1975, Bekenstein 1973, Hammer et al. 2022, Mordant et al. 2011, Penzias & Wilson 1965, Planck 2020, Landauer 1961, Bérut et al. 2012, Smoot et al. 1992, Tolman 1934). These are load-bearing for sections 1–5.

AP06 depends on the upstream results that the identification of ε with η connects to: Axiom B (the break) from AP01 / AP20 §4; AP03 (the conjugacy $c^2 = \beta/\alpha$ and the scaling form $G = \kappa/(\varepsilon\Lambda^2)$); AP05 (the structural derivation of the break). These are load-bearing for the structural reading of section 6 and section 7.

AP06 depends on AP43 D5 for the formal account of the cosmological 1×ε integration that section 6 carries as a corollary. AP06 does not re-derive that account. The corollary is a structural connection, not a new derivation.

0.3 — Axiom mapping

The four axioms {S, B, R, C} map to AP06 as follows.

Axiom S (two sectors). The two-sector structure (ℓ and $\mathcal{P}$) whose boundary leakage is measured. The absorber (near-perfect, tending toward η = 0) and the radiation (the escaped fraction, tending toward η = 1) are the two sectors. The leakage η is the measurement of how imperfectly the boundary separates them.

Axiom B (unique breaking). The break ε is identified with the leakage ratio η (Identification 6.1, section 7). The break is not abstract — it is the physically measured escape fraction at every boundary. The identification is interpretive, not forced by the physics of sections 1–5.

Axiom R (record monotonicity). Every leakage event is irreversible. The escaped photon cannot be un-escaped. The Landauer cost (section 4) is the thermodynamic expression of this irreversibility: erasing a bit costs energy because records persist.

Axiom C (Constraint — locality). c is the universal absorption limiter. This is the paper's central physical fact: c appears in the denominator of every leakage calculation (Hawking temperature, fine-structure constant, CMB escape). Finite c is what prevents η = 0.

0.4 — Epistemic status per section

1 (Hawking channel): [ESTABLISHED] — published, peer-reviewed physics.

2 (Retinal channel): [ESTABLISHED] — published retinal physics measurements.

3 (Leakage Theorem): [DERIVED — scoped] — follows from sections 1–2 by standard mathematical steps. Scope explicit: the analysed channels.

4 (Landauer synthesis): [SYNTHESIS] — combines established results in a new way at the level of structural form. The combination is new; the components are not.

5 (CMB channel): [ESTABLISHED] — published cosmological physics.

6 (Cosmological Corollary): [STRUCTURAL CONNECTION] — names the connection between AP06's leakage structure and AP43 D5's cosmological $1\times\varepsilon$ integration. Not a new derivation. The formal account of the integration lives in AP43.

7 (Epsilon Identification): [INTERPRETATION] — connects the physics of sections 1–5 to the axiom. Valid reading; not forced by physics alone.

8 (Planck constraint): [CONJECTURE — non-load-bearing] — hypothesis not yet confirmed. Kill switches stated.

0.5 — Kill switch summary

Seven kill switches engage. Identifiers per the Master Kill Switch Registry.

KS-L.1 (Perfect absorber). LIVE — EMPIRICAL. targets Theorem 3.1.

KS-L.2 (Sufficiency failure within AP06 class). LIVE — EMPIRICAL. targets Theorem 3.1 (scoped).

KS-L.3 (Dependent on KS-L.1/KS-L.2). LIVE — DEPENDENT. targets Identification 6.1.

KS-L.4 (Landauer violation). LIVE — EMPIRICAL. targets section 4 synthesis.

KS-L.5 (No shared structural parameterisation). LIVE — HARD. non-load-bearing; targets section 3.2 heuristic.

KS-L.6 (G independent of c). LIVE — HARD. structurally constrained by AP20 forcing proof.

KS-L.7 (Poisson derivation). LIVE — HARD. targets section 8.1.

0.6 — Structural debts owed

D1 (Broader class). Theorem 3.1 is proven for two specific channels (gravitational and electromagnetic). The hypothesis that it extends to all physical near-perfect absorbers with finite c and finite coupling is advanced but not proven. [AP06-specific, load-bearing for the broader-class claim only]

D2 (Numerical factor). The eye's leakage ratio ($\sim 10^{-5}$) and the CMB anisotropy ($\sim 10^{-5}$) are numerically similar. The paper honestly states this is

likely coincidental (section 5.4). Whether a deeper structural reason exists is an open question. [AP06-specific, non-load-bearing]

D3 (Poisson derivation). The Poisson equation derivation with G depending on c through the leakage (KS-L.7) has not been completed. Until achieved, section 8's claims about G's dependence on c remain conjectural. [Shared with AP03 D1; partially reduced by AP43 section 7's Newtonian-limit derivation in configuration space]

0.7 — Items held open without claiming debt status

The cosmological 1×ε integration corollary of section 6 is held open at the level of formal mathematical detail. AP06 names the structural connection between the cosmological channel of section 5 and AP43 D5's account of the cosmological residue; the full formal account lives in AP43. AP06's contribution is the identification that the CMB-leakage channel and the accumulated-1×ε channel are not two separate phenomena but one structural process read at two boundaries.

The relationship between domain-dependent ε values ($\varepsilon_{gravity} \approx 10^{-17}$, $\varepsilon_{eye} \approx 10^{-6}$ to 10^{-5}, $\varepsilon_{cosmo} \approx 10^{-5}$) and the canonical corpus-wide value $\varepsilon = \alpha_{em} \approx 1/137$ (the electromagnetic-coupling case at the chemical-biological scale) is held open. The corpus reading via The Lock (Edition 04) identifies ε with the electron at the chemical-biological scale; the other domain values are the same structural parameter read at different boundaries with different couplings.

0.8 — Structural relationships

AP03 (The Ratio). AP06's leakage identification provides the physical mechanism for AP03's conjugacy conjecture (c and G as two expressions of one break). AP03's debt D1 (G derivation from {S, B, R, C} alone) connects to AP06's KS-L.7 (Poisson derivation).

AP05 (The Break). AP06's ε ≡ η identification gives physical content to the abstract break parameter derived in AP05. AP05 establishes the structural minimality of the break; AP06 grounds it in measurable physics.

AP08 (The Identity). AP08 derives Einstein's field equations from the record algebra (Notebook II Chapter 4). The coupling constant $8\pi G/c^4$ in AP08's field

equations is the tensor expression of the leakage-mediated relationship AP06 section 8 conjectures about.

AP09 (The Break — Empty Set). The leakage at every boundary is the quantum sector's contribution to the record economy. Every measurement event pays the Landauer cost (section 4). AP09's measurement structure connects to section 4 here.

AP18 (The Floor). The tension-field floor $a_0 \approx cH_0$ provides an independent route to constraining G. D1 is addressed by AP28's channel-counting derivation ($G = \alpha_{em}^{21} \times (1 + 1/\pi) \times \hbar c/m_e^2$, 0.69% discrepancy against the measured value), addressing KS-L.6 from a counting direction.

AP20 (The Proof). The forcing proof (Axiom B → one parameter) structurally constrains KS-L.6: G cannot be independent of ε. AP06 section 8 is consistent with the forcing proof and provides a proposed physical mechanism for the dependence.

AP24 (The Residual). All constants as projections of ε. AP06 section 8.4's multidimensional residual conjecture (Conjecture C7) is the precursor claim that AP24 formalises (AP24 section 2 — Six Faces).

AP28 (The Constant). AP28 derives G via channel-counting from the six independent readings of ε (AP24) across three spatial dimensions (AP10) plus three actualization couplings. AP06's identification $\varepsilon \equiv \eta$ grounds the chemical-biological-scale reading $\varepsilon = \alpha_{em} \approx 1/137$ that AP28's formula uses.

AP43 (The Gravity of Possibilities). AP43 D5 establishes the cosmological $1 \times \varepsilon$ integration across actualization-state instants. AP06 carries this as the Cosmological Corollary (section 6).

1 — Gravitational Leakage: The Hawking Channel

Established physics. Hawking radiation establishes that the gravitational absorbers we call black holes do not absorb perfectly — c sets a nonzero temperature at the horizon.

1.1 — Setup

Consider a Schwarzschild black hole of mass M. The event horizon is at the Schwarzschild radius:

$$r_s = 2GM/c^2 \quad (1.1)$$

Classical analysis: nothing escapes. Leakage ratio η = 0 (perfect absorption in the classical limit). Hawking (1975) demonstrated that quantum field theory on curved spacetime produces a correction. The black hole emits thermal radiation at temperature:

$$T_H = \hbar c^3 / (8\pi k_B G M) \quad (1.2)$$

1.2 — Where c appears

The surface gravity of a Schwarzschild black hole is $\kappa = c^4/(4GM)$. The Hawking temperature is derived from the surface gravity: $T_H = \hbar\kappa/(2\pi c\, k_B)$. c^3 appears in the numerator. The temperature is nonzero for any finite M precisely because c is finite and nonzero.

1.3 — Luminosity

Total Hawking luminosity:

$$L = \hbar c^6 / (15360\pi G^2 M^2) \quad (1.3)$$

For a solar-mass black hole: $T_H \approx 6 \times 10^{-8}$ K, $L \approx 9 \times 10^{-29}$ W. The net leakage ratio is approximately 10^{-17} relative to CMB irradiance.

1.4 — Structural features

Claim C1 (Established). Gravitational absorbers exhibit six structural features: (S1) absorption is near-perfect but not perfect, $\eta < 1$; (S2) leakage is thermal (Planck spectrum at T_H); (S3) leakage carries boundary information (greybody factors), not input information; (S4) leakage is wavelength-dependent; (S5) spherical geometry enhances absorption; (S6) c is the constraining constant that makes $T_H > 0$. [Hawking 1975; Bekenstein 1973]

2 — Electromagnetic Leakage: The Retinal Channel

Established physics. The human eye is the canonical near-perfect electromagnetic absorber at the chemical-biological scale. Published retinal physics measurements show $\eta > 0$.

2.1 — Setup and measurements

The human eye functions as an electromagnetic absorber. Published measurements [Hammer et al. 2022; Mordant et al. 2011] report internal reflectance of the eyewall at 4.24–34.77% (wavelength-dependent, varying with pigmentation) and a Sphere Multiplier of 1.13–1.59 (enhancement of effective irradiance due to spherical geometry and multiple internal reflections).

2.2 — Escape fraction

Combining internal reflectance with the geometric factor (pupil subtends a small solid angle relative to interior surface):

$$\eta_{escape} \approx 10^{-6} \text{ to } 10^{-5} \qquad (2.1)$$

The escaped photons carry information about the boundary (fundus tissue properties: melanin, haemoglobin, RPE), not the input image. Coherent image in, thermal/diffuse reflectance out.

2.3 — Where c appears

The coupling strength between light and matter is governed by the fine-structure constant:

$$\alpha = e^2 / (4\pi\varepsilon_0 \hbar c) \approx 1/137 \qquad (2.2)$$

c appears in the denominator. α determines the absorption cross-section of every atom. The absorption cross-section of rhodopsin is bounded by:

$$\sigma_{abs} \sim \alpha \times \lambda^2 / (2\pi) \qquad (2.3)$$

Because $\alpha < 1$, the cross-section is always less than the geometric area. Perfect absorption requires $\alpha \geq 1$, which requires $c \leq e^2/(4\pi\varepsilon_0\hbar)$. For our universe, c far exceeds this bound.

2.4 — Structural features

Claim C2 (Established). Electromagnetic absorbers (biological tissue) exhibit the same six structural features as gravitational absorbers: (S1) $\eta < 1$; (S2) leakage is diffuse/thermal; (S3) leakage carries boundary information, not input; (S4) wavelength-dependent; (S5) spherical geometry enhances absorption; (S6) c constrains η via α. [Hammer et al. 2022; Mordant et al. 2011]

3 — The Common Structure: The Leakage Theorem

Derived. Two physically distinct systems — a black hole and a human eye — share six identical structural features. The common structure is a theorem about what finite c forbids.

3.1 — Structural isomorphism

sections 1–2 establish that two physically distinct systems — gravitational (black hole) and electromagnetic (retina) — share six identical structural features. This is not analogy. It is structural isomorphism: both are instances of the class of near-perfect absorbers whose leakage is constrained by the finitude of c.

3.2 — Universal form (dimensionless structural form)

The common structure is not a single dimensionally exact equation across domains. It is a dimensionless structural dependence: leakage is a function of a finite propagation limit, a finite coupling, and system-specific state variables. Write

$$\eta = F(\hat{c}, \hat{\gamma}, \hat{V}) \qquad (3.1)$$

where $\hat{c} = c/c^*$, $\hat{\gamma} = \gamma/\gamma^*$, and $\hat{V} = V/V^*$ are dimensionless variables defined relative to domain-appropriate reference scales. In specific systems, asymptotic or phenomenological scalings may take power-law form, but the cross-domain claim here is structural, not a universal dimensionally exact monomial.

3.3 — The theorem

Theorem 3.1 (Leakage Theorem — scoped). In the analysed near-perfect-absorber channels of sections 1–2 (gravitational Hawking leakage and electromagnetic retinal leakage), the leakage ratio η is strictly positive whenever c is finite and the relevant coupling constant is finite (G finite for the Hawking channel; α finite for the retinal channel). More generally, AP06 advances the hypothesis that finite propagation limit + finite coupling forbids perfect absorption in the broader class of physical absorbers.

Proof. *Forward: If $c = 0$, no photons exist ($E = \hbar c/\lambda = 0$); η is undefined. If $c \to \infty$, then $\alpha = e^2/(4\pi\varepsilon_0\hbar c) \to 0$; light does not interact with matter; η is undefined. If γ is infinite, absorption is perfect by definition: $\eta = 0$. For any finite $c > 0$ and any finite $\gamma > 0$ in the analysed channels: in the gravitational channel, Hawking radiation ensures nonzero thermal emission (section 1); in the electromagnetic channel, finite α bounds absorption cross-sections below the geometric limit (section 2). In both cases $\eta > 0$. Reverse: If $\eta > 0$, absorption is imperfect, requiring finite coupling ($\gamma < \infty$) and finite $c > 0$. QED.*

3.4 — Precise statement

The eye and the black hole are governed by different equations, different coupling constants, and different mechanisms. The claim is not identity. The claim is that both are members of the class of near-perfect absorbers whose leakage is constrained by the finitude of c and the finitude of the relevant coupling constant.

Result C3 (Derived — scoped). In the two analysed channels, perfect absorption ($\eta = 0$) is not achieved for finite c and finite coupling. Leakage is structurally necessary. It is a consequence of the constants, not an imperfection.

4 — The Observation Boundary: Landauer at Every Measurement

Synthesis. The leakage form across three domains has the same shape: k_B × T × O(1) per erased bit. Three boundaries, one thermodynamic cost.

4.1 — The Landauer principle

Landauer (1961) proved: erasing one bit of information requires minimum energy dissipation:

$$E_{min} = k_B T \ln 2 \qquad (4.1)$$

This is a theorem of statistical mechanics, experimentally verified [Bérut et al. 2012].

4.2 — Measurement as observation

Every quantum measurement extracts information. Between measurements, unitary evolution preserves information. At the measurement event, three things happen simultaneously: (a) decoherence relative to the measurement basis; (b) information extraction (a definite outcome is recorded); (c) any logically irreversible erasure or reset of the recorded outcome dissipates at minimum k_B T ln 2 per erased bit. The leakage is therefore the thermodynamic cost of maintaining an observation record over time, not a mandatory dissipation at the instant of measurement.

4.3 — Three channels, one form

Claim C4 (Synthesis). The leakage cost per bit has the same form in all three domains: E_leak/bit = k_B × T × O(1), where T is set by the boundary physics and O(1) is a constant of order unity. Gravitational: k_B T_H. Electromagnetic: k_B T_body ln 2. Cosmological: k_B T_CMB.

4.4 — Honest qualification

The form of the leakage cost per bit (k_B T) is constant across domains. The ratio of leakage to total incoming energy is not constant — it depends on specific temperatures and coupling constants differing by many orders of magnitude. The structural isomorphism is in the form, not the magnitude.

5 — The Cosmological Channel: CMB as Boundary Radiation

Established physics. The CMB is the leakage at recombination — the boundary radiation of the last scattering surface. The three scales — stellar, biological, cosmological — share the same six structural features.

5.1 — The last scattering surface

Before recombination (~380,000 years post-expansion), the universe was opaque: photons trapped by Thomson scattering off free electrons. At recombination, electrons combined with protons to form neutral hydrogen. The photon mean free path exceeded the Hubble length. The CMB is the leakage from that transition — thermal radiation at 2.72548 ± 0.00057 K, the most perfect blackbody spectrum ever measured.

5.2 — Structural match

Claim C5 (Established). The CMB exhibits all six structural features: (S1) near-perfect absorption before recombination; (S2) thermal leakage (perfect blackbody); (S3) boundary information (temperature anisotropies ~10^{-5} encode conditions at the last scattering surface); (S4) wavelength-dependent (acoustic peaks); (S5) spherical geometry; (S6) c governs escape. [Penzias & Wilson 1965; Planck 2020]

5.3 — Three scales, one architecture

Stellar scale: black hole, Hawking radiation, leakage ~10^{-17}, boundary = event horizon. Biological scale: human eye, fundus reflectance, leakage ~10^{-6} to 10^{-5}, boundary = retina. Cosmological scale: early universe, CMB, anisotropy ~10^{-5}, boundary = last scattering surface.

5.4 — Honest qualification

The numerical coincidence of the eye's leakage ratio (~10^{-5}) and the CMB anisotropy (~10^{-5}) is likely coincidental. Different physics governs the two

systems. The structural parallel is genuine; the numerical match is not claimed as significant.

6 — The Cosmological Corollary

Structural connection. The cosmological channel of section 5 reads the CMB as leakage at one boundary in cosmic time — the recombination surface. AP43 D5 (debt D5) reads the cosmological residue as an ongoing structural process: every actualization-state instant produces one unpaired 1×ε that does not return to symmetry. This section names the corollary that AP06 carries into Notebook IV: the two readings are not two phenomena. They are one process read at two boundaries.

6.1 — The accumulated 1×ε

The 420 Code's governing axiom is 1:1 + 1×ε @ AS. The @ AS reads at the actualizing now — the surface from which all records are written (AP01). Each AS-instant is the actualization of the axiom at one point in cosmic time. AP43 D5 establishes that each such actualization produces one unpaired ε that persists: the break does not heal.

Across cosmological time, these unpaired 1×ε accumulate. The cosmological residue is the integrated quantity. AP43 D5 carries the formal account; the corpus reading is that the cosmological residue is what the corpus's axiom must continue to produce while AS-instants continue to actualise.

6.2 — Connection to AP06's leakage structure

AP06 section 5 reads the CMB as leakage at one boundary — the recombination surface, ~380,000 years post-expansion. The CMB is the historical record of leakage at that boundary: thermal radiation at 2.72548 K, anisotropies ~10^{-5}, blackbody to one part in 10^4.

AP43 D5 reads the cosmological residue as the accumulated 1×ε across all AS-instants. The two readings meet at the structural fact: the CMB is the leakage that was observable at one specific historical boundary; the cosmological residue is the leakage that has continued to accumulate since.

AP06's contribution is the identification that these are one process. The Leakage Theorem (3.1) establishes that finite c forbids perfect absorption at every boundary in the analysed channels. Identification 6.1 (section 7) reads the

ε of the axiom as the leakage ratio η. Read forward to cosmological scales: every AS-instant is a boundary at which the axiom actualises; finite c forbids perfect absorption at that boundary; the unpaired ε produced is the leakage that AP43 D5 names. The CMB is the snapshot at one specific historical boundary. The cosmological residue is the integrated process.

6.3 — What AP06 carries forward

AP06 carries the corollary into Notebook IV as a structural commitment, not a new derivation. The formal account of the cosmological 1×ε integration lives in AP43 D5. AP06's contribution is the structural reading that grounds the Notebook IV treatment of the cosmological channel: the channel is open, ongoing, and structurally necessary for the same reason the gravitational and electromagnetic channels are open — finite c forbids closure.

The corollary connects to the rest of Notebook IV as follows. AP24 (section 2 Six Faces) formalises the multi-projection structure of ε; the cosmological projection is one face. AP28 derives G via channel-counting across six faces × three spatial dimensions plus three actualization couplings; the actualization couplings are the AS-instant integration this corollary names. AP14 (Correction) handles the Planck-scale corrections in the gravitational sector; the cosmological residue connects to AP14's one-loop finiteness at the high-energy end of the same structural process.

6.4 — Scope of the corollary

The corollary is structural, not quantitative. AP06 does not predict the magnitude of the cosmological residue, does not derive the cosmological constant Λ, and does not claim that the CMB-anisotropy figure $\sim 10^{-5}$ quantifies the integrated residue. Those quantitative questions live in AP43 D5 and in Notebook VI (Cosmology).

What section 6 carries is the structural commitment: the cosmological channel of section 5 and the cosmological residue of AP43 D5 are the same process read at two boundaries. The reading is load-bearing for Notebook IV's coherence — without the corollary, the cosmological channel of section 5 sits as an isolated structural match. With the corollary, it grounds the cosmological line that Notebook VI develops.

Claim C6a (Structural Corollary). The cosmological channel of section 5 (CMB as boundary radiation) and AP43 D5's cosmological $1\times\varepsilon$ integration are one structural process read at two boundaries: the CMB is the historical leakage at the recombination surface; the cosmological residue is the integrated leakage across all AS-instants. The Leakage Theorem (3.1) forbids closure of either reading.

7 — The Epsilon Identification

Interpretation. The physics of sections 1–6 establishes that η > 0 at every analysed boundary. The framework move reads this as the ε of the axiom.

7.1 — The axiom as originally stated

The 420 Code's foundational axiom (1:1 + 1×ε @ AS) asserts that fundamental reality is a 1:1 symmetry broken by a structurally necessary asymmetry ε. Prior to this paper, ε was a postulate.

7.2 — The identification

sections 1–5 establish two claims at distinct epistemic levels. Weak claim (derived): In the analysed channels, finite c and finite coupling ensure η > 0 at every boundary. Therefore ε > 0 is not a postulate but a consequence of finite c. This is the topological claim: the distinction between connected (η > 0) and disconnected (η = 0) is binary. Strong claim (interpretation): The specific value of the axiom's ε is identified with the leakage ratio η, which is domain-dependent.

Identification C6. ε ≡ η (the leakage ratio). The ε of the 420 Code is the leakage enforced by finite c. It is a measured physical quantity with domain-dependent values: $\varepsilon_{gravity} \approx 10^{-17}$, $\varepsilon_{eye} \approx 10^{-6}$ to 10^{-5}, $\varepsilon_{cosmo} \approx 10^{-5}$. [INTERPRETATION]

7.3 — The topological argument

The distinction between η > 0 and η = 0 is qualitative, not quantitative. A system with $\eta = 10^{-17}$ is connected to its exterior; a system with η = 0 is causally disconnected. This is a discrete binary property — there is no continuous interpolation between connected and disconnected that passes through intermediate states. The magnitude of η determines the bandwidth of the connection, not whether connection exists.

7.4 — The theorem

Identification 6.1 (The Epsilon Identification) [INTERPRETATION]. ε ≡ η. The ε of the 420 Code is the leakage enforced by finite c. This is not a mathematical consequence of Theorem 3.1. It is a philosophical interpretation: the physical fact of universal leakage in the analysed channels is read as the symmetry-breaking parameter of the axiom. The interpretation is motivated by the structural role ε plays in the architecture (AP05), but it is not forced by the physics.

What this identification means: the physics guarantees η > 0 in the analysed channels; the 420 Code chooses to call that ε. Previously: “I assert ε exists.” (Postulate.) Now: “I identify ε with η, a measured physical quantity.” (Interpretation.) The interpretation is falsifiable only through the kill switches on Theorem 3.1. If KS-L.1 or KS-L.2 fires, η is not universally nonzero, and the identification loses its physical grounding.

7.5 — What this means

Previously: “I assert ε exists.” (Postulate.)

Now: “I identify ε with η, a measured physical quantity whose nonzero status follows from finite c.” (Identification 6.1.)

Notebook IV’s one measured input — ε = α_em ≈ 1/137 — acquires its physical grounding here: α_em is the leakage ratio at the electromagnetic boundary at the chemical-biological scale, identified with ε by Identification 6.1, identified with the electron by The Lock (Edition 04) at that same scale.

8 — Forward Direction: The Planck Constraint

Conjecture, non-load-bearing. If every claim in section 8 is wrong, sections 1–7 are unaffected. Section 8 sketches the forward direction that Notebook IV's subsequent chapters take up.

8.1 — G depends on c through ε

AP03 established the scaling $G = \kappa/(\varepsilon\Lambda^2)$, where κ is the backreaction coupling. (This ε^{-1} scaling form is superseded by AP28, which derives the gravitational coupling $\alpha_G = \alpha_{em}^{21}(1 + 1/\pi)$ — the canonical G–ε relation, $G \propto \varepsilon^{21}$, verified to 0.69%. The $\kappa/(\varepsilon\Lambda^2)$ expression is retained here as a parametrisation of the backreaction, not as a competing scaling claim.) Theorem 3.1 establishes (in the analysed channels) that $\eta > 0$ whenever c and coupling are finite: $\varepsilon = \eta(c, \gamma)$. Substituting:

$$G = \kappa / (\eta(c, \gamma) \times \Lambda^2) \qquad (8.1)$$

G is a function of c through ε. They are not independent. The conjugacy conjectured in AP03 — c and G as two expressions of one symmetry-breaking event — now has a proposed physical mechanism: the leakage mediates the relationship.

8.2 — Consequences for the Planck scale

If G is not independent of c, the Planck units are built from two independent constants (c and ħ), not three. The ratio $G/c^3 = \kappa/(\varepsilon\Lambda^2 c^3)$ sets the Planck length. In the leakage reading: the Planck scale is where $\varepsilon \sim O(1)$ — where the leakage becomes total and the boundary between absorber and radiation dissolves.

8.3 — The constraint path

Increase c → α decreases → coupling loosens → ε increases (more leakage) → G decreases. Decrease c → α increases → coupling tightens → ε decreases (less leakage) → G increases.

8.4 — The multidimensional residual

Conjecture C7 (Multidimensional residual). G, c, α (temporal stiffness), β (spatial stiffness), α_em (≈ 1/137), and m_e are not independent constants. They are readings of a single multidimensional residual — the structure the substrate acquired after the symmetry break. G is the geometry face (how tightly the condensate holds). c is the propagation face ($c^2 = \beta/\alpha$). α_em is the coupling face (how strongly the electron interacts with the substrate). m_e is what escaped (the minimum viable excitation). The Planck scale marks where ε ~ O(1). AP24 section 2 (Six Faces) formalises this conjecture into the six independent scalar readings of ε. [CONJECTURE, non-load-bearing]

9 — Kill Switches

Seven kill switches engage in AP06. Each is testable. Each has a specified recovery position — if the kill switch fires, the paper reverts to a named earlier position rather than collapsing entirely. Identifiers follow the Master Kill Switch Registry: KS-L.1 through KS-L.7.

KS-L.1 — Perfect absorber

Claim. In the analysed channels of sections 1–2, the leakage ratio η is strictly positive whenever c and the relevant coupling constant are finite. Theorem 3.1.

Test. Demonstration of a physical absorber achieving η = 0 with finite c and finite coupling constant. Failure: Theorem 3.1 falls; Result C3 falls; Identification 6.1 loses its physical grounding via the dependent KS-L.3.

Status. LIVE — EMPIRICAL.

Recovery. If KS-L.1 fires, the Leakage Theorem fails in the analysed channels and the entire ε ≡ η reading collapses. The corpus retains ε as a postulate (the pre-AP06 status) and loses the physical grounding for ε's value. Notebook IV's measured-input claim (ε = α_em ≈ 1/137 as the physical leakage at the electromagnetic boundary) retreats to a framework-level identification without physical mechanism.

KS-L.2 — Sufficiency failure within AP06 class

Claim. The conditions of Theorem 3.1 (finite c, finite coupling, valid leakage-ratio definition) are sufficient for η > 0 in the AP06 class of near-perfect absorbers.

Test. Identification of an AP06-class near-perfect absorber (finite c, finite relevant coupling, valid leakage-ratio definition) that nonetheless achieves η = 0. Failure: Theorem 3.1 (scoped form) fails; the class definition is not sufficient.

Status. LIVE — EMPIRICAL.

Recovery. If KS-L.2 fires, the AP06 class needs additional structural constraints beyond finite c and finite coupling. The Leakage Theorem retreats to a narrower statement scoped to specific channels; Identification 6.1 falls via KS-L.3. The

corpus retains the Hawking and retinal cases as standalone results without the unifying structural-class claim.

KS-L.3 — Dependent on KS-L.1 / KS-L.2

Claim. Identification 6.1 (ε ≡ η) depends on Theorem 3.1. If Theorem 3.1 fails, the identification falls automatically.

Test. Trigger KS-L.1 or KS-L.2. KS-L.3 fires by dependency.

Status. LIVE — DEPENDENT.

Recovery. If KS-L.3 fires, the corpus retreats to ε as a postulate (pre-AP06 status). Sections 1–5 remain unaffected as established physics; section 6's Cosmological Corollary retreats to a structural acknowledgement without the leakage grounding; section 7's identification falls; section 8's conjectures retreat to their AP03 / AP08 antecedents.

KS-L.4 — Landauer violation

Claim. Information erasure costs at minimum k_B T ln 2 per bit. Section 4. Without this floor, the three-channels-one-form claim in section 4.3 (C4) fails.

Test. Demonstration of information erasure at zero energy cost. Failure: Section 4 falls. Section 3 is unaffected.

Status. LIVE — EMPIRICAL.

Recovery. If KS-L.4 fires, the synthesis of section 4 (three channels, one thermodynamic form) collapses. Section 3 (the Leakage Theorem) and section 7 (the Epsilon Identification) are unaffected; AP06 retreats to a structural-isomorphism claim about three channels without the Landauer unification.

KS-L.5 — No shared structural parameterisation

Claim. Non-load-bearing. A dimensionless parameterisation can be constructed that places gravitational greybody leakage and electromagnetic boundary leakage within a shared near-perfect-absorber family at the level of structural variables. Section 3.2.

Test. Demonstration that no such parameterisation can be constructed at the level of structural variables. Failure: section 3.2 heuristic falls; the cross-domain framing of section 8 weakens.

Status. LIVE — HARD. Non-load-bearing.

Recovery. If KS-L.5 fires, the cross-domain structural-family heuristic is lost. Section 3.1 (the structural isomorphism between the Hawking and retinal cases) and section 3.3 (the theorem itself in the two analysed channels) are unaffected. The paper retreats to a narrower claim scoped to the two analysed channels.

KS-L.6 — G independent of c

Claim. G and c are not independent. G depends on c through ε (section 8.1). Structurally constrained by AP20's forcing proof (Axiom B → one parameter).

Test. Framework or observation demonstrating that G can change without any corresponding change in c or the leakage structure. Failure: Section 8.1 falls; the proposed physical mechanism for AP03's conjugacy weakens.

Status. LIVE — HARD. Structurally constrained by AP20.

Recovery. If KS-L.6 fires, section 8.1's mechanism falls; AP20's forcing proof still constrains G to depend on ε, but the specific leakage-mediated dependence is wrong. AP28's channel-counting derivation of G (independent of the leakage mechanism) remains as an alternative route. The mechanism question reopens. Sections 1–7 are unaffected.

KS-L.7 — Poisson derivation

Claim. When the Poisson derivation is completed (from the record algebra), the resulting G coefficient depends on c through the leakage ε. Section 8.1.

Test. The Poisson derivation, when completed, produces a G coefficient that does not depend on c through the leakage. Failure: the specific mechanism is wrong; conjugacy may hold via different means.

Status. LIVE — HARD.

Recovery. If KS-L.7 fires, the specific leakage-mediated form of $G = \kappa/(\varepsilon\Lambda^2)$ is wrong; the conjugacy of c and G may hold via a different mechanism. Partial

reduction: AP43 section 7 derives the Newtonian-limit Poisson equation on configuration space, providing one route that does not depend on the leakage mechanism. AP28 derives G via channel-counting (independent of leakage). The corpus retains G ~ (something) × $\hbar c/m_e^2$ form (AP28) without the specific leakage factor.

What does not kill this paper

The numerical coincidence of leakage ratios across domains is not a claim. If the eye's leakage ratio is unrelated to the CMB anisotropy ratio, nothing breaks. The structural isomorphism does not depend on numerical equality.

Why these seven and not more

The seven kill switches cover the load-bearing claims of the paper and the non-load-bearing conjectures. Each closure would force a different kind of retreat. KS-L.1 and KS-L.2 close the Leakage Theorem in the load-bearing direction; KS-L.3 propagates the consequence to the identification; KS-L.4 closes the Landauer synthesis; KS-L.5 closes the cross-domain structural-family heuristic; KS-L.6 and KS-L.7 close the non-load-bearing conjectures of section 8. Smaller claims throughout the paper — specific numerical estimates, illustrative parallels, the structural reading of three scales — are illustrative rather than load-bearing. If any single illustration turned out to be poorly chosen, the paper would still stand.

10 — What This Establishes and What Remains Open

10.1 — What this paper closes

AP06 closes the question of ε's physical grounding in the analysed channels. Prior to AP06, the 420 Code's ε was a postulate — "I assert ε exists." After AP06, ε is identified with the leakage ratio η enforced by finite c at every analysed boundary. The identification is interpretive (the physics of sections 1–5 does not force the reading), but the leakage itself is measured.

AP06 closes the question of whether perfect absorption is possible in the analysed channels. Theorem 3.1: $\eta > 0$ whenever c and the relevant coupling are finite. Closed for the gravitational Hawking channel; closed for the electromagnetic retinal channel.

10.2 — What this paper does not close

AP06 does not close the broader-class hypothesis. Theorem 3.1 is proven in two specific channels; the extension to all physical near-perfect absorbers with finite c and finite coupling is advanced but not proven (debt D1). The kill switches KS-L.1 and KS-L.2 are the load-bearing falsification surface for the broader claim.

AP06 does not close debt D3 (the Poisson derivation from the record algebra with G depending on c through the leakage). AP43 section 7's Newtonian-limit derivation on configuration space partially reduces D3; the full mechanism-level derivation remains open.

AP06 does not derive the numerical value of $\varepsilon = \alpha_{em} \approx 1/137$. The chemical-biological-scale identification of ε_{em} with the electron lives in The Lock (Edition 04). AP28 derives G via channel-counting using the $\varepsilon = \alpha_{em}$ reading. AP24 formalises the multi-projection structure of ε.

10.3 — Items held open without claiming debt status

The relationship between domain-dependent ε values ($\varepsilon_{gravity} \approx 10^{-17}$, $\varepsilon_{eye} \approx 10^{-6}$ to 10^{-5}, $\varepsilon_{cosmo} \approx 10^{-5}$) and the canonical corpus-wide value $\varepsilon = \alpha_{em}$

≈ 1/137 is held open. The corpus reading via The Lock (Edition 04) identifies ε with the electron at the chemical-biological scale.

The numerical coincidence between the eye's leakage ratio (~10^{-5}) and the CMB anisotropy (~10^{-5}) is held open as likely coincidental. Different physics governs the two systems.

The cosmological 1×ε integration corollary of section 6 is held open at the level of formal mathematical detail. AP06 names the structural connection; the formal account lives in AP43 D5.

10.4 — Where the philosophical-register implementations live

AP06's structural readings have philosophical-register companions in the Ø Models catalogue. The cosmological framing of section 5–6 connects to Dissolutions Chapter 1 (Why Is There Something Rather Than Nothing? — existence as self-instantiating); the cosmological residue framing of the corpus reads in that register as the structural fact that the universe continues to actualise rather than collapsing back to symmetry.

The Landauer synthesis of section 4 connects to Resolutions Chapter 4 (Laws of Nature — laws as four-conditions-at-resolution); the thermodynamic cost of maintaining records is what makes the laws structural rather than imposed.

10.5 — Structural relationships to subsequent work

AP15 (Connection) builds U(1) electromagnetism on the structural ground that AP06's identification ε ≡ η provides at the electromagnetic boundary. AP24 (Residual) formalises section 8.4's multidimensional-residual conjecture into the six independent scalar readings of ε. AP28 (Constant) derives G via channel-counting using ε = α_em from the chemical-biological boundary AP06 establishes.

AP14 (Correction) handles Planck-scale commutation corrections in the gravitational sector; AP06 section 8.2's Planck-scale framing (where ε ~ O(1)) connects to AP14's one-loop finiteness.

Notebook VI (Cosmology) develops the cosmological line that section 6's Cosmological Corollary opens — the accumulated 1×ε across AS-instants is the structural reading that AP21, AP17, AP18, AP41, AP42, AP04 develop into the cosmological framework.

10.6 — Corpus placement

AP06 opens Notebook IV (Forces and Constants). Its role is to identify the one measured input the Notebook depends on — ε = α_em ≈ 1/137, the leakage ratio at the electromagnetic boundary — and to ground it in measured physics via Theorem 3.1 and Identification 6.1. Without AP06, Notebook IV would open with ε as a postulate. With AP06, ε enters Notebook IV as the physically measured leakage that finite c enforces.

10.7 — How the corpus reads now

With AP06 in place, the corpus reads as follows. Notebook I establishes the axiom and the four conditions {S, B, R, C}. Notebook II derives the constants and the geometric apparatus. Notebook III derives quantum mechanics from the same axiom. AP06 opens Notebook IV by grounding ε in measurable physics: finite c forbids perfect absorption; the leakage at every boundary is the physically measurable form of the axiom's structural break.

Notebook IV proceeds from AP06's identification through AP15 (U(1) electromagnetism on the same boundary), AP27 (the internal-state-space and gauge-group structure), AP16 (electroweak break), AP19 (SU(3) colour from the gauge freedom of the break direction), AP24 (the six-faces formalisation), AP14 (Planck-scale corrections), and AP28 (G via channel-counting). Each chapter depends on AP06's ε ≡ η identification at the appropriate boundary.

10.8 — The closing

The 420 Code's ε was a postulate. AP06 makes it a measured physical quantity. The measurement is the leakage ratio that finite c enforces at every analysed boundary. The reading is the same at the stellar scale, the chemical-biological scale, and the cosmological scale. The structure does not change. Only the boundary changes.

Notebook IV begins here.

Claim Summary

Section-by-section structural enumeration with epistemic-status labels.

1 (Hawking channel). *FALSIFICATION REGISTER.* Claim C1 (Established): gravitational absorbers exhibit six structural features; $\eta > 0$ by Hawking radiation; c is the constraining constant.

2 (Retinal channel). *FALSIFICATION REGISTER.* Claim C2 (Established): electromagnetic absorbers exhibit the same six features; $\eta \approx 10^{-6}$ to 10^{-5}; c constrains η via α.

3 (Leakage Theorem). *DERIVATION.* Theorem 3.1 (Derived — scoped): $\eta > 0$ in the analysed channels when c and coupling are finite. Result C3 (Derived — scoped): perfect absorption not achieved in the two analysed channels.

4 (Landauer synthesis). *SYNTHESIS.* Claim C4 (Synthesis): leakage cost per bit = $k_B T \times O(1)$ in all three domains; same form, different magnitudes.

5 (CMB channel). *FALSIFICATION REGISTER.* Claim C5 (Established): CMB exhibits all six structural features; anisotropy $\sim 10^{-5}$; boundary = last scattering surface.

6 (Cosmological Corollary). *STRUCTURAL CONNECTION.* Claim C6a (Structural Corollary): the cosmological channel of section 5 and AP43 D5's cosmological $1 \times \varepsilon$ integration are one structural process read at two boundaries.

7 (Epsilon Identification). *INTERPRETATION.* Identification 6.1 (Claim C6) [INTERPRETATION]: $\varepsilon \equiv \eta$. The axiom's ε is the measured leakage ratio at every analysed boundary.

8 (Planck constraint). *CONJECTURE (non-load-bearing).* Section 8.1: $G = \kappa/(\varepsilon \Lambda^2)$, G depends on c through ε. Section 8.4: Conjecture C7 (multidimensional residual). All constants as faces of one residual.

Conditionality Footer

Dependencies

Established physics: Hawking 1975; Bekenstein 1973; Hammer et al. 2022; Mordant et al. 2011; Penzias & Wilson 1965; Planck 2020; Landauer 1961; Bérut et al. 2012; Smoot et al. 1992; Tolman 1934.

Framework: Axiom B (the break) from AP01; AP03 (the conjugacy $c^2 = \beta/\alpha$ and the scaling form $G = \kappa/(\varepsilon\Lambda^2)$); AP05 (structural derivation of the break); AP20 (the forcing proof: Axiom B → one parameter, constraining KS-L.6); AP43 D5 (the cosmological $1\times\varepsilon$ integration carried as corollary in Section 6).

Dependents

AP15 (Connection — U(1) electromagnetism on the boundary AP06 establishes). AP24 (Residual — formalising the multidimensional residual conjecture of section 8.4). AP28 (Constant — deriving G via channel-counting using $\varepsilon = \alpha\_em$ from the chemical-biological scale AP06 grounds). AP14 (Correction — Planck-scale corrections at the high-energy end of the same leakage process). Notebook VI APs (cosmology line opened by section 6's Cosmological Corollary).

Kill switches closed by this paper

None. AP06 opens kill switches; it does not close prior corpus kill switches. The pre-AP06 status of ε as postulate is upgraded to an interpretive identification with a measured quantity; this is a grounding, not a closure of a prior kill switch.

Kill switches that remain live

KS-L.1 (Perfect absorber): LIVE — EMPIRICAL. Load-bearing for Theorem 3.1.

KS-L.2 (Sufficiency failure): LIVE — EMPIRICAL. Load-bearing for Theorem 3.1 (scoped form).

KS-L.3 (Dependent): LIVE — DEPENDENT. Falls if KS-L.1 or KS-L.2 fires.

KS-L.4 (Landauer violation): LIVE — EMPIRICAL. Targets section 4.

KS-L.5 (No shared parameterisation): LIVE — HARD. Non-load-bearing.

KS-L.6 (G independent of c): LIVE — HARD. Structurally constrained by AP20.

KS-L.7 (Poisson derivation): LIVE — HARD. Partially reduced by AP43 section 7.

Structural debts owed

D1 (Broader class). The Leakage Theorem holds in two analysed channels; extension to all physical near-perfect absorbers is advanced but not proven. [AP06-specific]

D2 (Numerical factor). The eye's leakage ratio ($\sim 10^{-5}$) and the CMB anisotropy ($\sim 10^{-5}$) are numerically similar; honestly stated as likely coincidental (section 5.4). [AP06-specific, non-load-bearing]

D3 (Poisson derivation). The Poisson equation derivation with G depending on c through the leakage (KS-L.7) has not been completed. [Shared with AP03 D1; partially reduced by AP43 section 7]

Items held open without claiming debt status

The cosmological $1 \times \varepsilon$ integration corollary of section 6 at the level of formal mathematical detail (full account lives in AP43 D5).

The relationship between domain-dependent ε values ($\varepsilon_{gravity}$, ε_{eye}, ε_{cosmo}) and the canonical corpus-wide value $\varepsilon = \alpha_{em} \approx 1/137$ (chemical-biological scale identification via The Lock, Edition 04).

Notation Reference

c — Speed of light. 299,792,458 m/s. Universal absorption limiter.

η — Leakage ratio. Fraction of incident energy that escapes an absorber.

ε — Symmetry-breaking parameter. Identified with η in section 7.

T_H — Hawking temperature. $T_H = \hbar c^3/(8\pi k_{BGM})$.

α — Fine-structure constant. $e^2/(4\pi\varepsilon_0\hbar c) \approx 1/137$.

γ — Domain coupling constant. G for gravity, α for electromagnetism.

G — Newton's gravitational constant.

r_s — Schwarzschild radius. $2GM/c^2$.

κ — Surface gravity (in section 1). Backreaction coupling (in section 8).

σ_abs — Absorption cross-section.

k_B — Boltzmann constant.

E_min — Landauer minimum erasure energy. $k_B T \ln 2$.

Λ — UV scale (in section 8).

n_s — Spectral tilt. ≈ 0.965.

m_e — Electron mass. 0.511 MeV/c^2.

AS — Actualization state. The actualizing now — the surface from which records are written (AP01).

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