MINERS_LAW_UNIFIED_v2

MINER'S UNIFIED LAW (RLE v2, θ-Clock Core)

Version: v2.0 (θ-clock + substrate diagnostics)
Status: Canonical reference

1. Overview
- Purpose, scope, and compatibility notes (append-only outputs; dashboards unchanged)
- What changed vs v1 (no wall-seconds; θ-time; Ξ diagnostics)

2. Canonical Definitions
- Internal period T■: machine "heartbeat" (update every 60 s, EMA α=0.2, ±10% clamp)
- Dimensionless time: θ = t / T■, Δθ = Δt / T■
- Sustainability (dimensionless): T■_sustain = T_sustain / T■

3. RLE Core (θ)
RLE_θ = (η · σ) / (α · (1 + 1/T■_sustain))
- η (utilization), σ (stability), α (load factor), T■_sustain (dimensionless)
- Normalization and collapse detection (unchanged; canonical path)

4. Micro-Scale (Planck-Flavored)
- N_q = (P · T■ / (k_B · T)) · Δθ
- F_q = 1 – e^(–min(N_q, 50)), F_s = 1/(1 + (ΔT_min/σ_T)²), F_p = P/(P+P■)
- F_μ = (F_q · F_s · F_p)^(1/3) (inert on desktops; active on phones)

5. Substrate Diagnostics (Dimensionless, θ-Based)
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Ξ_E = F_q                # energy adequacy per internal period (clip to [0, 2])
Ξ_H = E_th               # hot-path efficiency (clip to [0, 1])
Ξ_C = F_s · F_p          # cold-path/material proxy (clip to [0, 1])
Φ_substrate = (Ξ_E · Ξ_H · Ξ_C)^(1/3)  # combined envelope
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6. Invariants & Guards
- Time-invariance: resampling 0.5/1/2 Hz preserves collapse parity
- Boundaries: no NaN/Inf in T■, Δθ, θ_index, T■_sustain, log_Γ
- Decay/EMA clamps: α=0.2; ±10% per update; device θ-bounds (phones 2–120 s, desktops 5–600 s)

7. CSV Schema (Append-Only)
- New columns: T0_s, theta_index, T_sustain_hat, theta_gap
- Micro-scale: Gamma, log_Gamma; Diagnostics: Xi_E, Xi_H, Xi_C, Phi_substrate
- Envelope (diagnostic): rle_raw_sub, rle_smoothed_sub, rle_norm_sub

8. Validation Summary
- Time-invariance (KS), θ jitter ≤10% steady, F_μ monotone w.r.t. power
- Phone corr(F_μ, power) ≥ 0.5; desktops F_μ ≈ 1

9. Appendix (Parameter Defaults)
- θ-update-sec=60; α=0.2; decay=0.998; hysteresis=7 (samples), drop=0.65, etc.