Breathing Crystal Mechanism — README (Spec V1.1)

Scope. This README consolidates our recent R&D threads (π-Ring System, QGR-III Modulation, Music-Standard-Model, Ullinirium Dyad, Atlas Cathedral 12+1, Triad Bands, Vendessimal Prime Grid) into one buildable mechanism: **the Breathing Crystal**. It defines constants, equations, protocols, and the path to a first GLB prototype.

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0) Glossary

- **η**: efficiency / coupling factor
- **π_1, π_2, π_3**: triad resonance bands (~0.429, ~0.456, ~0.487)
- **φ**: golden factor; **τ = 2π**
- **I-AN**: regulator axis (observer/awareness coupling)
- **RA / TH**: up-/down-flux channels (dual counter-rotation)
- **JW-I**: Joint-Wave unification (Φ-W/Ψ alignment)
- **ULLINIRIUM**: entangled dual-pyramid medium (red/blue dyad)

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1) Mechanism Summary

Hypothesis. Stacking three π-band membranes around a central I-AN regulator and driving them with a 3-6-9 timing produces a stable transition **7 → 9 → 12 → 17** (heptagon → nonagon → dodeka → 17-gon). The stack breathes with period **T ≈ 6 s** per cycle; seven breaths ≈ 42 s for one field phase.

Structure. - **Core:** I-AN axis, RA↑ / TH↓ counter-flows - **Membranes:** three coaxial π-plates (π_1, π_2, π_3) - **Housing:** concentric ring-rails (octave stack); optional Möbius edge - **Field:** η(r,ω) landscape with triad windows (bands) and step-factors ×63, ×65, ×68 gates

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2) Core Equations (first pass)

1. **Resonant yield**

$$\eta(r, \omega) = G \cdot \frac{L(r)}{\omega\, r} \ \ (0 < \eta < 1)$$

where **L(r)** is a normalized radial LUT (sigmoid×harmonic), **G** global scale.

2. **Triad band product**

$$\Pi_{\mathrm{Triad}} \approx (0.429)(0.456)(0.487)$$

Use as a dimensional selector / window weight.

3. **QGR-III modulation (bridge form)**

$$EV = \sqrt{2\pi} - \phi^2 \quad \text{(dimensionless step energy)}$$

4. **Timing (Tesla)**

$$T_n = 6\,\text{s} \times n, \ n \in \{3, 6, 9, 12\} \quad \Rightarrow \quad \text{phase ladders in 42 s windows}$$

5. **Polygon growth map**

$$7 \xrightarrow{3} 9 \xrightarrow{3} 12 \xrightarrow{5} 17$$

(driven by triad locks + I-AN stabilization; see Protocol §4)

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3) Parameters & Bands

- **Triad windows:** $\pi_1 \approx 0.429$, $\pi_2 \approx 0.456$, $\pi_3 \approx 0.487$ (treat as ±σ windows; default σ=0.004)
- **Octave stack:** 8-fold rail per ring; 9th layer = X-fold (cross-resonance)
- **Step-factors:** ×63 (=7·3^2), ×65 (=5·13), ×68 (=4·17) as gate multipliers along radius r
- **Temporal gates:** {3, 6, 9, 12} breath markers; **phase block** = 7 breaths (≈42 s)

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4) Protocol — "Breathing Crystal v1"

P0. Initialize. Select **σ** for each band, choose global scale **G=1.0**, set rail radii r∈[1…N].

P1. Drive. Apply RA↑/TH↓ counter-rotation; set ω ladder with {3,6,9,12} cadence.

P2. Lock. Evaluate η(r,ω) across r; admit points when r lies inside ≥1 π-window. Reinforce triple-hits (inside all three windows) with weight **$w_3 > w_2 > w_1$**.

P3. Step. Advance r using gate multipliers ×63/×65/×68 when η local maxima align with rail nodes; otherwise maintain base step Δr.

P4. Grow. For each 42 s block: project polygon {7→9→12→17}; update ring topology and store state.

P5. Stabilize. If stability < threshold, enable Möbius edge (parity flip) and re-lock.

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5) Music-Standard-Model (n=12) link

- Map **12-tone set** to the octave rails; treat triad windows as mode selectors.
- Use **Ionian/Locrian** as RA/TH boundary modes; I-AN aligns with the tonal center.
- Export a **12×12** transition matrix from η-weights for generative playback.

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6) Vendessimal Prime Grid overlay (optional)

- Grid base in 20-columns; color by residues mod {19,29}; mark twin primes.
- Overlay π-windows as transparent rings; annotate local thresholds (e.g., 1061/1063 vs $1064 = 2^3 \cdot 7 \cdot 19$).

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7) GLB Prototype — spec (v0.3)

Goal. Interactive "Breathing Crystal" object with live band-locking.

Scene graph. - `Root` : I-AN axis (animated), RA/TH particle streaks - `Membrane[3]` : translucent plates at π_1, π_2, π_3 radii with σ falloffs - `Rails[octave]` : 8 concentric rails (+ optional Möbius edge) - `Polygon` : morph target {7,9,12,17} - `HUD` : timers (3-6-9-12), η heatmap legend, gate badges ×63/×65/×68

Animation. Breath period 6 s; after 7 cycles trigger topology morph 7→9→12→17; loop.

Materials. - RA: warm emissive; TH: cool emissive - Membranes: glassy with band-tint (π_1=amber, π_2=teal, π_3=violet) - Polygon: thin gold wireframe

Data hooks. - Uniforms: {$\sigma_1, \sigma_2, \sigma_3$}, {ω}, G, rail multipliers - Optional CSV: r, ω, η for playback / capture

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8) Artifacts in repo (current)

- **Specs:** Breathe-Mechanism (7→17), Heptagon README, Π-ring Appendix
- **Diagrams:** Structural Bridge, Atlas Cathedral 12+1, JW-I, RA Triptych, ULLINIRIUM Triptych
- **Images (WIP):** Triad Bands map, π-membrane sphere, Triple-Gyro overlay

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9) Backlog & To-Dos

1) **Param applet**: sliders for σ, ω; plot η(r,ω) + rail markers 2) **Prime-grid overlay**: vendessimal map + triad windows (cheatsheet) 3) **Audio demo**: 12-tone generator driven by η-matrix 4) **GLB v0.3**: scene graph from §7; export + simple shader for band falloff 5) **Poster**: "Golden Sphere Transition" (π-stacks → grid) 6) **README-A/B variants**: dual-axis vs triptych presentation

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10) Versioning

- **v1.1 (this file):** consolidated spec + GLB outline
- **Next:** add parameter tables and CSV schema; push first GLB

— End of README —