

Perturbation Theory of the Tension Medium — Part IV: The Music, Not the Photograph

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It Is All One — Notes. July 2026 (readable edition)

Abstract. Part III found that the fall lines repel and crystallize, giving the sky a preferred spacing at last. Part IV asks the next honest questions and answers three of them. First: is the drumbeat simply the *photograph* of the crystal? No — computed and excluded: a lattice's direct image would put peaks at the ratios $1 : 1.73 : 2$, and the sky says $1 : 2.44 : 3.68$. The drum is not the crystal's picture but its *music*: the phonons — the crystal's vibrations — standing in the wall's duct, exactly where the quarter-offset ladder already pointed. Second: does the known astronomy of cosmic strings kill a lattice this heavy? No — all three canonical string signatures vanish in this configuration, each nulled by a commitment the theory had already made for other reasons: lensing is nulled by *orientation* (we look down the lines' barrels), temperature steps by *staticity* (a frozen crystal), clustering by *single-booking*. Third: will the bundle actually freeze? The criterion is stated with its one missing normalization — and it hands the theory its final, over-constrained trial: one mediator charge must simultaneously freeze the lattice, set the drum's spacing, and drive the galaxies' rotation. Three unknowns, three measured judges. Every symbol introduced before use.

1. The Photograph, Excluded

We sit at the center; the fall lines run outward; so the sky views the crystal exactly face-on — in cross-section, down the barrels. If the spots were simply the *image* of the lattice (bright at the lines, dim between), the statistics of sizes would show the lattice's characteristic spacings: for a triangular crystal viewed in many randomly oriented patches, rings at the ratios $1, \sqrt{3}, 2, \sqrt{7}, 3$ — that is, $1 : 1.73 : 2 : 2.65 : 3$. The measured drum: $1 : 2.44 : 3.68$. **Mismatch — the static photograph is excluded.** This is a result, not a setback: it tells us *which* observable the lattice supplies. A crystal has two voices — its picture and its vibrations — and with the picture ruled out, the drum must be the vibrations: the crystal's phonons (its collective trembling), standing in the duct between the wall's two mirrors. And standing waves between one hard mirror and one soft turning point carry exactly the $(n - 1/4)$ ladder that the measured peaks follow to within a few percent (the campaign chronicle). The statics said no; the dynamics had already said almost.

2. Why the Astronomy of Strings Does Not Kill the Lattice

A tension of $G\mu \approx 7 \times 10^{-6}$ is heavy by cosmic-string standards, and the standard literature would object on three counts. Each objection dies on a commitment this theory made

earlier, for its own reasons — which is either remarkable coherence or remarkable luck, and the quarantine column holds the verdict.

Lensing, nulled by orientation. A string splits the images of background objects — by 38 arcseconds at this tension — but only for light *crossing* it. Deflection scales with the crossing angle, and our light runs *parallel* to the lines: every sightline travels down a barrel, from the wall to the center, along the very threads. A radial hedgehog is lensing-invisible to its own center. (The lattice would lens *transverse* light violently — a prediction searching for an observable, noted for Part V.)

Temperature steps, nulled by staticity. Moving strings drag characteristic step-like discontinuities across the microwave sky (the Kaiser–Stebbins effect) — the sharpest standard string bound. A crystallized, frozen bundle has no transverse motion. No steps.

Clustering, nulled by single-booking. Wiggly strings gravitate and seed structure — the third standard bound. Part II’s sharpened commitment (temperature is period, not stored energy) switches wiggle gravity off; it was adopted to balance the books, and it disarms this bound as a by-product.

Three bounds, three nulls, none invented for the purpose. The re-derivation of subtler channels remains owed, and the note says so.

3. Will It Freeze? The Criterion and the Trial

A field of identical repelling lines crystallizes when the repulsion dominates the jiggling: in the trade, when the ratio Γ of neighbor-interaction energy to thermal energy $k_B T$ exceeds about 130. At the wall, $T = 3,000$ K, so freezing demands a definite minimum coupling — a lower bound on the *screw-charge per unit length* of a fall line, the one quantity Part III could not normalize. And here the theory has volunteered for its final trial, because that same charge is already employed elsewhere: it must drive the galaxy screw (the rotation-curve phenomenology at the $a_0 = cH$ scale), it must set the crystal’s phonon speed (and hence the drum’s spacing, 295 in ℓ), and it must keep the lattice frozen at the wall. **One mediator charge, three measured duties: the galaxies’ rotation, the drum’s spacing, the crystal’s existence.** Three unknowns stand open (the charge, the phonon speed, the duct depth); three measured numbers wait as judges (the spacing, the damping tail, the rotation curves) — with the quarter offset already matched by the boundary pair. The moment the fiber field equation normalizes the charge — the calculation Part V is named for — the system is over-constrained, and the theory passes or fails with no room to negotiate.

4. The State of the War

Four parts, and the shape of the whole is visible. The medium is identified (fall lines); its silence is explained (zero active mass — the same fact as its stability); its shimmer is named (the Flimmer, transverse waves at c); its budget balances (single-booking, in its sharp form); its lines repel through the one long-range mode the galaxies already demanded; the bundle crystallizes; the crystal’s photograph is excluded and its music is the

last candidate standing for the drum — carrying the right ladder offset from the wall's own anatomy, at a tension spun six e-folds above the Planck floor, at the summit where the forces meet. Nothing yet is proven; everything is now *stated* — in one chain, with one missing normalization, before judges that already have their numbers. That is as honest as a theory can stand before nature, and it is exactly where this one stands tonight.

References

Powder diffraction of 2D lattices (standard); N. Kaiser and A. Stebbins, *Nature* 310, 391 (1984); one-component-plasma freezing ($\Gamma \approx 130\text{--}137$); A. Vilenkin and E. P. S. Shellard (1994); and the documents of this series (Parts I–III; the campaign chronicle; the dark-matter paper; script: part4calc.py). (*Citations from memory; the literature-verification pass applies.*)