

Scale-Time Theory 11.0 - Simulation Evidence Pack

Release 1.0 · Companion to the manuscript *Scale-Time Theory 11.0 - The Pre-Geometry of Scale Space* · Fixed seed 20599373

1. What this pack is

This pack is the constructive simulation evidence behind every claim tagged **[S:E1]** through **[S:E5]** in the Scale-Time Theory 11.0 manuscript. It contains one self-contained script, the figures it produces (including the manuscript's data figures), the machine-readable results, and an automated verification mode that re-checks every number the manuscript quotes. All support in this pack is constructive simulation evidence; no external empirical confirmation is claimed or implied.

The model is deliberately minimal and identical across all experiments: a deterministic rotating phasor (or a superposed counter-rotating pair), additive Gaussian readout noise with per-quadrature scale η , and stroboscopic sampling at R_A samples per standing-mode cycle. No Hilbert space, $\hbar$, Born rule, wavefunction, or quantum postulate is inserted anywhere; anything quantum-like in the results emerges from sampling and estimation alone.

2. Contents

`stt11_simulation.py` - the complete simulation (five experiments E1–E5, manuscript-figure composer, verification mode). `results.json` - all measured quantities from the fixed-seed run. `figs/figE1...figE5*.png` - one figure per experiment. `figs/figM3...figM5*.png` - the manuscript's data figures (Figure 3: sampling-regime diagram; Figure 4: kinematic-aliasing triptych; Figure 5: lock windows). Manuscript Figures 1 and 2 (the radar grammar and the zoetrope) are interpretive illustrations, tagged **[I]** in the manuscript, and are intentionally not part of this evidence pack.

3. Design rules

Every experiment obeys the same discipline. The only ingredients are the deterministic phasor, Gaussian readout noise, and standard estimators (lag-1

direction statistic, matched-filter phase estimation, maximum-likelihood frequency search). The random seed is fixed at 20599373 and all reported numbers regenerate exactly. Proportions carry Wilson 95% intervals; estimation errors are compared against Cramér–Rao lower bounds wherever those exist. The initial phase of every trial is unknown to the observer (drawn uniformly), so nothing is smuggled in through preparation knowledge.

4. Claim–evidence map

Each row links a manuscript claim to the experiment, figure, and headline number that supports it.

Manuscript claim (section, tag)	Experiment	Figure	Headline number
Structural Nyquist identity: $s_+ \equiv s_-$ at $R_A = 2$ (§8.1, [S:E4])	E4a	figE4	overlap 1.000; discrimination error 0.500, exact
Statistical ambiguity zone around the edge (§8.1, [S:E1][S:E4])	E1a	figE1(a)	$P(\text{correct}) \approx 0.50$ at $R_A = 2$ for both η ; $P \geq 0.95$ by $R_A \approx 2.16$ ($\eta = 0.35$) and ≈ 2.60 ($\eta = 0.7$)
Alias-reversal band, $R_A < 2$ (§8.1, [S:E1])	E1a, E1b	figE1(a,b), figM3(a)	direction confidently reversed below the edge
Stroboscopic freeze at $\Delta\phi = 2\pi$ per sample (§8.1, [S:E1])	E1b	figE1(b), figM3(a)	apparent frequency 0 at $R_A = 1$
Per-cycle error $\varepsilon \sim C \cdot \eta / \sqrt{R_A}$ (§8.2, [S:E3])	E2a, E3b	figE2(a), figE3(b)	log–log slope -0.504 vs CRLB $-1/2$; residuals $\leq 5.5\%$ from smooth fit, no privileged sampling values
Resolvability threshold R^* (O,A) moves with η and $\Delta\phi_{\text{res}}$ (§8.2, [S:E3])	E3	figE3(a), figM3(b)	$R^* \approx 20.9, 99.9, 330.1$ for $\eta = 0.2, 0.45, 0.8$ at $\Delta\phi_{\text{res}} = 0.126$ rad/cycle
Structure-relativity of thresholds (§8.3, [S:E1] [S:E3])	E1a + E3	figM3	coarse direction stable by $\approx 2.2\text{--}2.6$; fine residual only at $\approx$ 21–330

Quantized-readout convention $\Delta\alpha = 2\pi/R_A$ (§8.4, [D], illustration)	E2a	figE2(a)	quantized curve rides the bin floor $\Delta\alpha/\sqrt{12}$
Amplitude-squared-weighted outcomes (§8.5, [S:E1][P])	E1c	figE1©	max deviation from $\cos^2\chi$: 0.151 ($R_A = 2.2$), 0.163 (4), 0.214 (32)
Passive recurrence lacks selection, $\kappa = 0$ (§7.2, [S:E2])	E2b, E5a	figE2(b), figE5(a), figM5	measure-zero rational locks; winding follows bare detuning at $\kappa = 0$
Finite lock windows at $\kappa > 0$, ordered by rational simplicity (§7.2–7.3, [S:E5])	E5	figE5(a,b), figM5	widths 0.151, 0.067, 0.026, 0.013 for $q = 1-4$; locked fraction 0.449
Locked states noise-rigid, unlocked diffusive (§7.3, [S:E5])	E5c	figE5©	ensemble spread bounded at 0.30 vs 0.91 and growing
Coherent aliasing supplies a stable $\hat{n}$ (§9, [S:E3][P])	E3 triptych	figM4	identical dynamics: flicker at $R_A = 2$, loop at 8, clean precessing circle at 64
Frequency uncertainty: $N^{-3/2}$ bound at depth, blow-up at the edge (§8.6, [S:E4])	E4b	figE4(b)	RMSE tracks the single-tone bound, rising ~two orders of magnitude toward $R_A = 2$

5. Manuscript figures and caption template

figM3, figM4, and figM5 are drop-in candidates for manuscript Figures 3, 4, and 5. They are composed from the cached experiment data of the same run, so every number in them is the number in `results.json`. Recommended caption footer for any manuscript figure that displays simulation data:

Data: *Scale-Time Theory 11.0 - Simulation Evidence Pack*, release 1.0, experiment En, file `figMx_....png`, fixed seed 20599373.

6. Reproduction and verification

Requirements: Python 3 with numpy and matplotlib. Full run: `python3`

`stt11_simulation.py all` (about 10 seconds on a laptop-class CPU) - this runs E1–E5, writes the figures and `results.json`, and then automatically verifies. Subsets: `python3 stt11_simulation.py e1 e3`. Verification only: `python3 stt11_simulation.py verify` re-checks an existing `results.json` against every number quoted in the manuscript's Appendix A and Sections 7–8, printing a PASS/FAIL line per check and exiting nonzero on any failure, so the check can gate a release. The current run passes 18/18 checks.

7. Symbol map

The manuscript reserves σ for the scale address. In this pack, the per-quadrature readout-noise scale is therefore written η ($\eta\phi, AO$ in the manuscript's notation). A mode detuning δ corresponds to a residual structure $\Delta\phi_{\text{res}} = 2\pi\delta$ per cycle; the pack's standard case $\delta = 0.02$ gives $\Delta\phi_{\text{res}} \approx 0.126$ rad per cycle. R_A is samples of the global sweep per standing-mode cycle throughout.

8. Scope and limitations

The pack is one-mode, one-observer, linear, and Gaussian-noise based. It supports exactly the claims in the map above and nothing more: it does not test entanglement, real quantum spin- $\frac{1}{2}$, $\hbar$, gravity-like organization, phase-lapse, redshift-like appearance, spherical mapping, complexity durability, or external astrophysical data. Those remain conjectural extensions in the manuscript, each paired there with a named future test route (nested-ladder cadence derivation, multi-system baseline drift, focus-domain dilution, path multiplicity, phase-lapse cadence, selected-reference geometry, and multi-mode lock windows).

9. Citation

Canonical form: *Scale-Time Theory 11.0 - Simulation Evidence Pack*, release 1.0 (2026), `stt11_simulation.py`, fixed seed 20599373, figures figE1–figE5 and figM3–figM5, `results.json`. The manuscript's Claim-Status Tags section and Appendix A reference line should cite this pack by this name and release number (adding the DOI or repository URL at publication). Suggested license: CC BY 4.0, matching the manuscript.