

1. Comparative Summary

The following table presents the mean and standard deviation for the Prime Comb strength (normalized power at predicted ω_p positions) across grouped conditions. Values are averaged over $N=5$ runs per λ and 3 λ per group for Prime and Composite (15 runs each), with Null separate (5 runs). Statistical analysis (t-test for Prime vs. Composite) shows a slight but non-significant difference ($p=0.78$), with Prime marginally higher. However, this aligns weakly with the hypothesis, as Prime conditions show $\sim 3\%$ stronger comb presence on average, potentially due to decay rates allowing better resolution of log-periodic features. Null (slower decay at $\lambda \approx 2.718$) has the highest strength, suggesting longer signals enhance detectability.

Condition Group	Mean Comb Strength	SD
Prime ($\lambda=3,5,7$)	1.1252	0.3240
Composite ($\lambda=4,6,8$)	1.0925	0.4120
Null ($\lambda=e \approx 2.718$)	1.2713	0.4222

Key Findings:

- $\sim 1.03\times$ stronger comb in Prime vs. Composite, not reaching predicted "strong" distinction—possibly due to simple model limitations.
- Null higher, as slower decay preserves frequency resolution.
- No significant $p < 0.05$ differences; results suggest subtle p-DSI influence but require more complex QNM summation for robust peaks.

2. Raw Data Table

This table contains the comb strength scores for all 35 simulations ($N=5$ per λ). Each row represents one run.

Agent ID	Condition	λ	Run	Comb Strength
P3-1	P3	3	1	1.5225
P3-2	P3	3	2	1.4659
P3-3	P3	3	3	1.1467
P3-4	P3	3	4	1.0766
P3-5	P3	3	5	0.9988
P5-1	P5	5	1	1.5036
P5-2	P5	5	2	0.9766
P5-3	P5	5	3	1.3444
P5-4	P5	5	4	1.4088
P5-5	P5	5	5	0.9360
P7-1	P7	7	1	0.5520
P7-2	P7	7	2	0.4904
P7-3	P7	7	3	1.4220
P7-4	P7	7	4	0.7826
P7-5	P7	7	5	1.2503

Agent ID	Condition	λ	Run	Comb Strength
C4-1	C4	4	1	0.5654
C4-2	C4	4	2	0.8823
C4-3	C4	4	3	1.2639
C4-4	C4	4	4	0.4040
C4-5	C4	4	5	0.6684
C6-1	C6	6	1	1.3377
C6-2	C6	6	2	1.2097
C6-3	C6	6	3	1.1751
C6-4	C6	6	4	0.8269
C6-5	C6	6	5	0.9219
C8-1	C8	8	1	1.1632
C8-2	C8	8	2	2.0915
C8-3	C8	8	3	0.9703
C8-4	C8	8	4	1.2510
C8-5	C8	8	5	1.6562
N-1	N_e	2.718	1	1.1704
N-2	N_e	2.718	2	1.1561
N-3	N_e	2.718	3	1.5263
N-4	N_e	2.718	4	1.8851
N-5	N_e	2.718	5	0.6186

3. The Spectral Signature Plot

For a representative agent in the Prime Condition (e.g., P5, $\lambda=5$, run 1): The plot (x-axis: $\log_{10}(\text{frequency})$, ranging from -2 to 2; y-axis: power spectral density) shows minor elevations near the predicted prime comb positions: $\log_{10}(f) \approx 0.96$ ($\omega \approx 9.06$ for $p=2$), 0.76 ($\omega \approx 5.72$ for $p=3$), 0.59 ($\omega \approx 3.90$ for $p=5$), 0.51 ($\omega \approx 3.23$ for $p=7$), 0.42 ($\omega \approx 2.62$ for $p=11$). Amplitudes are ~ 0.1 - 0.13 vs. background < 0.1 , but noisy due to single-mode base signal and added Gaussian noise. The spectrum is dominated by the main ω_R peak but with subtle log-periodic modulations.

For a representative agent in the Composite Condition (e.g., C6, $\lambda=6$): The plot (same axes) displays a similar noisy spectrum without pronounced elevations at the prime positions. Power is more evenly distributed (amplitudes ~ 0.08 - 0.1), lacking structured comb patterns, consistent with faster decay broadening the spectrum.