Rational Prime-Mirror Resonance in Analog Circuits:
From Discrete Quantum Arithmetic to the Hardware Koide Constant

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Abstract

Modern physics relies on imaginary numbers and continuous mathematics, which may obscure the discrete, rational foundations of reality. We propose a "rational quantum" framework where prime numbers order the microcosm ($1/p$) and macrocosm ($p/1$), with 1/1 as the transitional boundary. This study validates the framework via exact software simulations (v4) and an 8-oscillator NE555 breadboard ring. Results identify a "Hardware Koide" fixed point ($Q_\ell \approx 0.86$), demonstrating that prime-mirror symmetry provides a robust, fault-tolerant metric for energy-efficient analog AI computing.

1 Introduction

The status quo in physics utilizes imaginary numbers (i) for oscillation, which we argue is a philosophical abstraction that obscures foundational rational reality. We hypothesize that the microcosm orders along $1/p$ and the macrocosm along $p/1$, with 1/1 as the boundary. By utilizing maxel theory and harmonic bipolynomials, we free algebra from infinite approximations.

2 Software Simulation (Theoretical Proof-of-Concept)

To explore the hypothesis, a Python script rational_prime_mirror-v4.py was implemented using exact rational arithmetic. Using symmetric ratios across 1/1 (1/7, 1/5, 1/3, 1/2, 1/1, 2, 3, 5, 7), the simulation produced razor-sharp revivals. By introducing a Gaussian wavepacket to model a physical pulse, the simulation identified critical return probability peaks at $t = 2$ (0.795) and $t = 4$ (0.808), providing a mathematical template for analog "breathing" modulations.

3 Hardware Methodology

An 8-oscillator chain using NE555 timers was constructed on a breadboard. Frequencies were tuned to primes using specific resistors (R_1) and 1μF capacitors. Coupling was achieved via a 47pF capacitor in parallel with a 1MΩ resistor. A pulse was applied to the 1/1 center mode via a 10μF capacitor to initialize the ring.

4 Results: Observations and Hardware Measurements

The hardware temporal behavior was measured relative to the 1/1 trigger.

Mirror Stage	Ratio	Resistance (R_1)	Measured Delay (Δt)
X7	1/7	68kΩ	∼76.35 ms
X5	1/5	50kΩ	∼56.12 ms
X3	1/3	30kΩ	∼33.68 ms
X2	1/2	20kΩ	∼22.45 ms
Centre	1/1	10kΩ	0.00 ms (Ref)
X2up	2/1	4.7kΩ	∼5.28 ms
X3up	3/1	3.3kΩ	∼3.71 ms
X5up	5/1	2kΩ	∼2.24 ms

Table 1: Hardware temporal delays defining the mirror boundary.

The breadboard baseline exhibited "clean breathing" with ∼90–95% revival post-pulse. Detuning X2up to 6.76kΩ only reduced revival to 85%, demonstrating the robustness of the symmetric ring.

5 Analysis: The Hardware Koide Constant

We utilize the Koide-like constant (Q_ℓ) as a metric for rational coherence. Using the hybrid v14 bridge, hardware delays were converted to torsion-weighted densities (α).

Configuration	α (Derived)	Q_ℓ Result	Deviation to 0.667
Ideal Simulation	0.50	0.6667	0.0000
Breadboard Baseline	0.50	0.9507	0.2840
Hardware-Derived	0.93	**0.8630**	0.1963

Table 2: Convergence of the Hardware Koide Constant.

The $t = 2$ and $t = 4$ Gaussian peaks from software represent the points of maximum coherence in the observed hardware "zigzag" modulation. The shift to $Q_\ell \approx 0.86$ is the physical fixed point where material constraints meet prime-mirror symmetry.

6 Conclusion

Rational primes enable exact recurrence in software and analog hardware. This symmetry serves as a fault-tolerant metric for RRAM and analog AI computing, offering energy-efficient alternatives to digital bottlenecks.

7 References

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3. Prime Wave Lab Repository: `https://github.com/Tusk-Bilasimo/Prime_Wave_Lab`
4. Supplemental Shared Data Repository: