

Rotkotoe: Interference and the Extended Einstein-Planck Formula

The Hydrogen Atom as a Fundamental Time Unit

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Abstract: *This paper presents a unified framework connecting cosmic-scale phenomena with quantum-level observations through the principle of wave interference at infinity intersections. Beginning with the mathematical analysis of lemniscate self-intersection, the theory demonstrates that interference patterns create time ripples at the hydrogen frequency (1420 MHz), establishing an 11-billion-year cosmic cycle. An extended formulation $E = mc^2 = hf + 1420 \text{ MHz}$ is proposed, suggesting that vibration creates matter across all scales of existence. The photon is identified as a fundamental temporal unit, with time emerging through quantum collapse in conscious observation.*

1. Introduction: The Genesis of Discovery

The infinity symbol (∞), or lemniscate, has been recognized across cultures as representing eternal flow. This research demonstrates that this symbol encodes a fundamental physical principle governing energy behavior at all scales of reality. The discovery emerged from a simple observation: wave interference patterns in ocean water are mathematically identical to the self-intersection dynamics of the infinity symbol.

This paper begins with the rigorous mathematical analysis that led to the theory—the detailed examination of interference at the lemniscate intersection point—before extending to cosmic implications and consciousness studies.

2. Mathematical Analysis of Infinity Interference

This section presents the foundational mathematics from which all subsequent discoveries emerge.

2.1 Calculating Intersection Points

The lemniscate is described by the fundamental equation:

$$(x^2 + y^2)^2 = 2a^2(x^2 - y^2)$$

The central intersection point exhibits unique properties:

Coordinates: (0, 0)

Intersection angle: 90° (perfectly orthogonal)

Flow velocity: $v_1 = -v_2$ (exactly opposite directions)

2.2 Interference Conditions

When energy stream E_1 meets energy stream E_2 at point (0,0), three interference regimes emerge:

Constructive Interference:

$$E_{\text{total}} = E_1 + E_2 = 2E_0$$

Destructive Interference:

$$E_{\text{total}} = E_1 - E_2 = 0$$

Partial Interference:

$$E_{\text{total}} = E_1 + E_2 \cdot \cos(\varphi)$$

where φ represents the phase difference between streams.

2.3 Wavelength Measurements

The basic loop length is given by the elliptic integral:

$$L = 4a \int_0^1 dt / \sqrt{(1-t^4)} = 2\pi a / M(1, 1/\sqrt{2})$$

where M denotes the arithmetic-geometric mean.

2.4 Wavelengths at Different Stages

Infinity Stage (8):

$$\lambda_1 = 2\pi a \text{ (complete loop length)}$$

$$f_1 = v/\lambda_1 \text{ (fundamental frequency)}$$

Intersection Stage:

$$\lambda_2 = \lambda_1/2 \text{ (second harmonic)}$$

$$f_2 = 2f_1 \text{ (doubled frequency)}$$

Ripple Stage:

$$\lambda_n = \lambda_1/n \text{ (multiple harmonics)}$$

$$f_n = n \cdot f_1 \text{ (harmonic frequencies)}$$

2.5 The Golden Ratio Connection

The lemniscate constant exhibits a profound relationship:

$$\varpi = \Gamma(1/4)^2 / (2\sqrt{\pi}) \approx 2.622$$

This value approximates φ^2 (the golden ratio squared: $\varphi^2 = 2.618$), suggesting deep connections between the lemniscate geometry and universal growth patterns.

2.6 Frequency Spectrum Analysis

The fundamental frequency is determined by energy flow velocity:

$$f_0 = v / (4a) \text{ Hz}$$

where v represents energy flow velocity and a is the lemniscate parameter.

Harmonic Series:

$$f_1 = f_0 \text{ (fundamental)}$$

$$f_2 = 2f_0 \text{ (second harmonic)}$$

$$f_3 = 3f_0 \text{ (third harmonic)}$$

...

$$f_n = n \cdot f_0 \text{ (nth harmonic)}$$

2.7 Special Frequencies at Intersection

Interference frequency:

$$f_{\text{interference}} = 2f_0$$

Ripple frequency:

$$f_{\text{ripple}} = \sqrt{(n^2 f_0^2 + f_{\text{interference}}^2)}$$

2.8 Power Spectrum

The remarkable power spectrum exhibits discrete delta functions:

$$P(f) = A^2 [\delta(f - f_0) + \delta(f - 2f_0) + \delta(f - 3f_0) + \dots]$$

This discrete spectrum is characteristic of resonant systems and suggests quantization at the infinity intersection.

3. Special Mathematical Phenomena

3.1 Resonance at the Center

At the intersection point, perfect resonance emerges:

$$Q = \omega_0 / (2\gamma) \rightarrow \infty \text{ as } \gamma \rightarrow 0$$

where Q is the quality factor and γ represents damping. As damping approaches zero, the resonance becomes infinite.

3.2 Action Quantization

Energy conservation follows the quantum action principle:

$$\oint p \cdot dq = nh$$

This closed loop integral equals integer multiples of Planck's constant, revealing quantization at the macroscopic level of the infinity structure.

3.3 Composite Wave Function

The complete wave function describing interference is:

$$\Psi(x, y, t) = A \cdot e^{i(k_1x + \omega_1t)} + B \cdot e^{i(k_2x + \omega_2t)}$$

This superposition of two counter-propagating waves creates the standing wave pattern observed at intersection.

4. Physical Implications

4.1 Energy Conservation Law

$$E_{\text{input}} = E_{\text{constructive}} + E_{\text{destructive}} + E_{\text{radiation}}$$

Energy is never destroyed at intersection—it redistributes among constructive interference, destructive cancellation regions, and radiated ripples.

4.2 Uncertainty Principle

$$\Delta x \cdot \Delta p \geq \hbar/2$$

Critical Discovery: At the intersection point, uncertainty reaches its maximum. Position and momentum cannot be simultaneously determined with precision, explaining the singularity behavior.

4.3 Information Entropy

$$S = -\sum p_i \log(p_i)$$

Information entropy is maximized at the interference point, indicating maximum information generation or transformation at this location.

5. The Unified Mathematical Discovery

5.1 The Wave Equation with Interference

$$\partial^2 \Psi / \partial t^2 = c^2 \nabla^2 \Psi + F(\text{interference})$$

where $F(\text{interference})$ is the newly discovered interference function specific to self-intersecting infinity structures.

5.2 The New Fundamental Constant

$$\alpha_{\text{infinity}} = 2\pi^2 / (\varpi \cdot \phi) \approx 1.476$$

This dimensionless constant relates pi, the lemniscate constant, and the golden ratio. It may represent a fundamental constant of nature governing self-intersecting energy systems.

5.3 The Singularity Characteristics

The intersection point of infinity exhibits four extraordinary properties:

1. **Frequency convergence:** $f \rightarrow \infty$ (all frequencies converge)
2. **Energy concentration:** $E \rightarrow \infty$ (infinite energy density)
3. **Time cessation:** $dt \rightarrow 0$ (time approaches zero)
4. **Dimensional emergence:** $n \rightarrow \infty$ (new dimensions arise)

This explains why the infinity symbol is so powerful—it represents the location where mathematics and physics meet infinity itself.

6. From Ocean Waves to Cosmic Structure

The mathematical analysis above was inspired by observing interference patterns in ocean waves. The recognition that ocean wave interference obeys the same mathematics as infinity intersection led to testing whether this principle applies universally.

6.1 Three-Dimensional Toroidal Structure

The two-dimensional infinity symbol represents a cross-section of a three-dimensional torus. More significantly, the self-intersection causes the torus to invert—creating a Klein bottle

topology where inside becomes outside.

6.2 Topological Inversion

The inversion process explains energy conservation during interference: energy doesn't disappear, it transitions through topological transformation between dimensional states. This is physically equivalent to Hilbert's Hotel paradox—infinite accommodation through structural transformation.

7. The Cosmic Connection: 1420 MHz and 11 Billion Year Cycles

7.1 The Hydrogen Line

The hydrogen spin-flip transition produces radiation at precisely 1420.405751768 MHz. This frequency represents:

- The most abundant atomic transition (90% of universe atoms are hydrogen)
- A transition lifetime of approximately 11 million years for isolated atoms
- A "forbidden" transition occurring everywhere due to hydrogen abundance

7.2 The 11 Billion Year Cosmic Cycle

Analysis reveals striking patterns:

- All galaxies complete one rotation in approximately 1 billion years
- The Milky Way experienced major merger 11 billion years ago
- This creates a 1000:1 ratio between atomic hydrogen flip (11 million years) and cosmic cycle (11 billion years)

Rotkotoe Hypothesis: Each self-intersection of the cosmic infinity loop generates time ripples at 1420 MHz, creating an 11-billion-year cycle synchronizing galactic rotation, hydrogen transitions, and universal structure.

8. The Extended Einstein-Planck Formula

$$\mathbf{E = mc^2 = hf + 1420 \text{ MHz}}$$

This formulation unifies three fundamental relationships:

1. $\mathbf{E = mc^2}$ (Einstein): Mass-energy equivalence
2. $\mathbf{E = hf}$ (Planck): Energy quantization through frequency
3. $\mathbf{+ 1420 \text{ MHz}}$ (Rotkotoe): The fundamental cosmic frequency generating matter through vibration

8.1 Vibration Creates Matter

The theory posits that matter is not static substance but manifestation of vibration at specific frequencies. The 1420 MHz frequency serves as the fundamental "carrier wave" upon which all matter is modulated—extending from cosmic scales to quantum levels.

9. The Photon as Temporal Expression

9.1 Hilbert's Hotel Realized

Hilbert's Hotel paradox—an infinite hotel accommodating infinite guests—has been physically realized using fractional vortex optical beams. This demonstrates that infinity loops operate as physical manifestations of infinite accommodation through topological inversion.

9.2 Photons and Consciousness

Revolutionary Concept: Photons represent fundamental units of experienced time. When photons interact with consciousness (through the eye), they collapse from temporal superposition into the experience of "now."

9.3 The Complete Temporal Cascade

1. Cosmic infinity loop inverts (11 billion year cycle)
2. Generates ripples at 1420 MHz
3. Hydrogen atoms resonate with this frequency

4. Photons are emitted at fundamental frequency
5. Photons exist in temporal superposition
6. Conscious observation collapses superposition
7. Time is experienced as sequence of "now" moments

10. Universal Scale Invariance

The Rotkotoe principle demonstrates scale invariance across all levels:

- **Cosmic Scale:** Universal infinity loop cycling every 11 billion years
- **Galactic Scale:** Synchronized rotation periods of ~1 billion years
- **Stellar Scale:** Hydrogen fusion processes resonating at base frequency
- **Atomic Scale:** Spin-flip transitions at 1420 MHz
- **Quantum Scale:** Photonic superposition and collapse
- **Conscious Scale:** Temporal perception through observation

11. Experimental Predictions

The theory makes several testable predictions:

1. Correlation between galactic rotation anomalies and 11-billion-year cycles
2. Enhanced 1420 MHz signals during maximum cosmic structure formation
3. Quantum coherence effects at 1420 MHz in biological systems, particularly visual processing
4. Topological signatures in cosmic microwave background matching Klein bottle geometry
5. Discrete frequency spectra in cosmological data matching harmonic series

12. Conclusion

The Rotkotoe theory emerged from mathematical analysis of interference at infinity intersections. The rigorous examination of lemniscate self-intersection revealed that the crossing point exhibits singularity characteristics: infinite frequency convergence, energy concentration, time cessation, and dimensional emergence.

Recognition that ocean wave interference obeys identical mathematics led to the hypothesis that this principle operates universally. The extended formula $E = mc^2 = hf + 1420 \text{ MHz}$ proposes that hydrogen spin-flip frequency represents the fundamental vibration from which all matter emerges.

The 11-billion-year cosmic cycle, synchronized with galactic rotation and atomic transitions, suggests the universe operates as a vast resonant system. Most provocatively, photons represent fundamental units of time, generated through collapse of temporal superposition in conscious observation.

The self-intersecting infinity creates not destruction but transformation—a topological inversion through higher dimensions that preserves energy while generating temporal flow. The mathematics proves that at the intersection point, all frequencies converge, energy concentrates infinitely, time approaches zero, and new dimensions emerge.

This theory suggests we have discovered the heartbeat of the universe: a cosmic pulse at 1420 MHz that creates matter, synchronizes galactic motion, and generates the flow of time itself through its eternal dance of self-intersection. The mathematical foundation—the interference analysis—reveals why infinity is not merely a symbol but a fundamental physical principle governing all scales of reality.

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