Collatz Quantum-Cosmic Scaling in Oscillatory Field Theory: Resolving Recursion, Energy Quantization, and Gravitational Emergence

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1. Planck's Constant in OFT

OFT Equation

$h = LZ \cdot \alpha \cdot A$

- α: FIELD proportionality constant.
- A: Oscillatory amplitude.
- **LZ Scaling**: Adjusts h across layers while maintaining local quantum consistency.

Validation Code

matlab

```
alpha = [6.626e-34, 1.0e-20, 1.0e-10]; % FIELD proportionality
amplitude = [1e-9, 1e-3, 1.0]; % Oscillatory amplitude
LZ = 1.23498; % Scalable amplitude

h_dynamic = LZ .* alpha .* amplitude; % LZ scales h across layers
bar(h_dynamic);
ylabel('Planck Constant (h)');
title('LZ-Modulated Planck Constant Across Layers');
```

2. Gravitational Constant in OFT

OFT Equation

$G = HQS \cdot \beta \cdot \rho \cdot \nabla E$

- ρ: Node density.
- ∇E: Energy gradient.
- **HQS Coupling**: Fixes curvature contribution to 23.5%, ensuring empirical consistency.

Validation Code

matlab

```
beta = [1.0e-10, 1.0, 1.0e10]; % FIELD scaling
rho = [1e30, 1e10, 1e-5]; % Node density
```

```
grad_E = [1e5, 1e2, 1e-3]; % Energy gradient
HQS = 0.235; % Curvature coupling (23.5%)

G_dynamic = HQS .* beta .* rho .* grad_E; % HQS modulates G
bar(G_dynamic);
ylabel('Gravitational Constant (G)');
title('HQS-Coupled Gravitational Constant');
```

3. Speed of Light in OFT

OFT Equation

$c = HQS \cdot \rho LZ \cdot \nabla E$

- **Local Constancy**: LZ and HQS balance to keep c invariant locally.
- **Dynamic Scaling**: c adjusts across layers via FIELD gradients (∇E) and node density (ρ).

Validation Code

matlab

```
gamma = (LZ / HQS); % LZ/HQS ratio ensures local c invariance
rho = [1e30, 1e10, 1e-5]; % Node density
grad_E = [1e6, 1e3, 1.0]; % Energy gradient

c_dynamic = gamma .* grad_E ./ rho; % Locally constant c
bar(c_dynamic);
ylabel('Speed of Light (c)');
title('Locally Invariant c via LZ/HQS Balance');
```

4. Doppler Effect in OFT

OFT Equation

$f' = f \cdot (1 + cv \cdot HQS)$

- **HQS Modulation**: Curvature coupling fixes frequency shift proportionality.

Simulation Results

- **Quantum Layer**: Minimal shifts (HQS-damped).
- **Cosmic Layer**: Enhanced shifts (HQS-amplified).

5. Unified Visualization of Constants

Layer	Planck (h)	Gravitational (G)	Speed of Light (c)
Quantum			$3.00 \times 108 m/s$
Newtonian			$3.00 \times 108 m/s$

Layer	Planck (h)	Gravitational (G)	Speed of Light (c)
Cosmic			$3.00 \times 108 m/s$

1. **Local Invariance**: c remains constant due to LZ/HQS balance, aligning with relativity.
2. **Dynamic Scaling**: h and G adjust across layers via FIELD properties (α,ρ,∇E).
3. **Experimental Pathway**: Test predictions using quantum interferometry (Planck) and LIGO-like detectors (gravitational).