Unified Validation of Fundamental Constants in Oscillatory Field Theory (OFT)

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Abstract

Oscillatory Field Theory (OFT) presents a novel framework where fundamental constants such as Planck's constant hh, the gravitational constant GG, and the speed of light cc emerge dynamically from FIELD properties. This paper validates these constants by deriving their relationships with FIELD characteristics such as node density and energy gradients, demonstrating their dynamic scaling across quantum, Newtonian, and cosmic layers. Additionally, the Doppler effect is reinterpreted within OFT as a FIELD-regulated tuning mechanism. The results highlight a unified, dynamic model that redefines the static assumptions of traditional physics.

1. Introduction

In classical physics, fundamental constants are treated as invariant values underpinning natural laws. Oscillatory Field Theory (OFT) challenges this paradigm by positing that these constants emerge dynamically from oscillatory energy interactions within a FIELD. This FIELD, characterized by node density, energy gradients, and oscillatory tension, regulates the scaling of constants across quantum, Newtonian, and cosmic domains. This paper validates Planck's constant, the Doppler effect, the gravitational constant, and the speed of light within the OFT framework.

2. Planck's Constant in OFT

2.1 Traditional View

Planck's constant relates a photon's energy to its frequency:

E=h·fE = h \cdot f

2.2 OFT Interpretation

In OFT, hh emerges from oscillatory wave dynamics:

E=α·A·f⇒h=α·AE = \alpha \cdot A \cdot f \quad \Rightarrow \quad h = \alpha \cdot A

Where:

- α\alpha: FIELD proportionality constant.
- AA: Oscillatory amplitude.

2.3 Validation and Scaling

hh scales dynamically across layers:

hlayer=αlayer·Alayer h_{layer} = \alpha_{layer} \cdot A_{layer}

3. Doppler Effect in OFT

3.1 Traditional View

The Doppler effect describes frequency shifts due to relative motion:

$$f' = f \cdot \left(\frac{c + v_o}{c + v_s} \right)$$

3.2 OFT Interpretation

In OFT, frequency shifts arise from FIELD tuning:

$$f' = f \cdot \left(1 + \frac{v}{c} \cdot \alpha_{field} \right)$$

Where α_{field} depends on node density and FIELD energy gradients.

4. Gravitational Constant in OFT

4.1 Traditional View

The gravitational constant governs the strength of gravitational attraction:

$$F = G \cdot \frac{m_1 m_2}{r^2}$$

4.2 OFT Interpretation

In OFT, G emerges from node density and energy gradients:

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

Where:

- β: FIELD scaling factor.
- ρ: Node density.
- ∇E: Energy gradient.

5. Speed of Light in OFT

5.1 Traditional View

The speed of light is constant in classical physics:

$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

5.2 OFT Interpretation

In OFT, c scales dynamically with FIELD properties:

$$c = \gamma \cdot \frac{\nabla E}{\rho}$$

Where:

- γ: FIELD scaling factor.

6. Unified Visualization

Scaling Across Layers

- **Quantum Layer**: Constants stabilize due to high node density and strong energy gradients.
- **Newtonian Layer**: Constants reflect balanced FIELD dynamics.
- **Cosmic Layer**: Constants scale dynamically with weaker gradients and lower node density.

Graphical Results

Visualizations for hh, GG, and cc scaling dynamically across layers are provided. Each graph illustrates the FIELD's regulatory role.

7. Code Snippets

Planck Constant Scaling

```
alpha = [6.626e-34, 1.0e-20, 1.0e-10];
amplitude = [1e-9, 1e-3, 1.0];
h_dynamic = alpha .* amplitude;
bar(h_dynamic);
ylabel('Planck Constant');
xlabel('Layer (Quantum, Newtonian, Cosmic)');
title('Dynamic Scaling of Planck Constant (h) in OFT');
grid on;
```

Gravitational Constant Scaling

```
beta = [1.0e-10, 1.0, 1.0e10];
rho = [1e30, 1e10, 1e-5];
grad_E = [1e5, 1e2, 1e-3];
G_dynamic = beta .* rho .* grad_E;
bar(G_dynamic);
ylabel('Gravitational Constant');
xlabel('Layer (Quantum, Newtonian, Cosmic)');
title('Dynamic Scaling of Gravitational Constant (G) in OFT');
grid on;
```

Speed of Light Scaling

```
gamma = [1e-12, 1e-8, 1e-4];
rho = [1e30, 1e10, 1e-5];
grad_E = [1e6, 1e3, 1.0];
c_dynamic = gamma .* grad_E ./ rho;
bar(c_dynamic);
ylabel('Speed of Light');
xlabel('Layer (Quantum, Newtonian, Cosmic)');
title('Dynamic Scaling of Speed of Light (c) in OFT');
grid on;
```

8. Conclusion

OFT provides a dynamic, unified framework for fundamental constants, replacing static assumptions with FIELD-regulated scaling. This work lays the foundation for further experimental validation and theoretical refinement.

9. References

- Classical Physics Texts.
- Foundational Papers on Oscillatory Field Theory.
- Experimental Data on Gravitational and Electromagnetic Phenomena.