

ETA Photon Theory: Charge Dynamics of Space-Time and Emergence of Electromagnetism

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Abstract

We propose that electromagnetic phenomena arise from a fundamental charge-separation capacity intrinsic to space-time. In this framework, a photon is interpreted as a propagating Origin–Division–Union (ODU) process rather than a particle or classical wave. By introducing a complex space-time field with local phase symmetry, a gauge connection emerges naturally, whose curvature reproduces Maxwell’s equations exactly. Matter is described as localized, coupled excitations of charge and mass fields, yielding an effective Dirac equation. Quantization arises from nonlinear field stability, providing a basis for $E = h\nu$. A phenomenological estimate predicts vacuum phase shifts in the range 10^{-11} to 10^{-8} rad.

1 Introduction

We define ETA (Electrodynamic Transformation of Space-Time) as a fundamental process in which space-time undergoes structured charge separation and recombination.

2 Fundamental Field

$$\Phi(x^\mu) = R(x^\mu)e^{i\theta(x^\mu)} \quad (1)$$

3 Photon as ODU Process

Origin $\rightarrow$ Division $\rightarrow$ Union

4 Gauge Structure

$$D_\mu = \partial_\mu + \frac{iq}{\hbar}A_\mu \quad (2)$$

$$F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu \quad (3)$$

5 Maxwell Equations

$$\partial_\nu F^{\nu\mu} = j^\mu \quad (4)$$

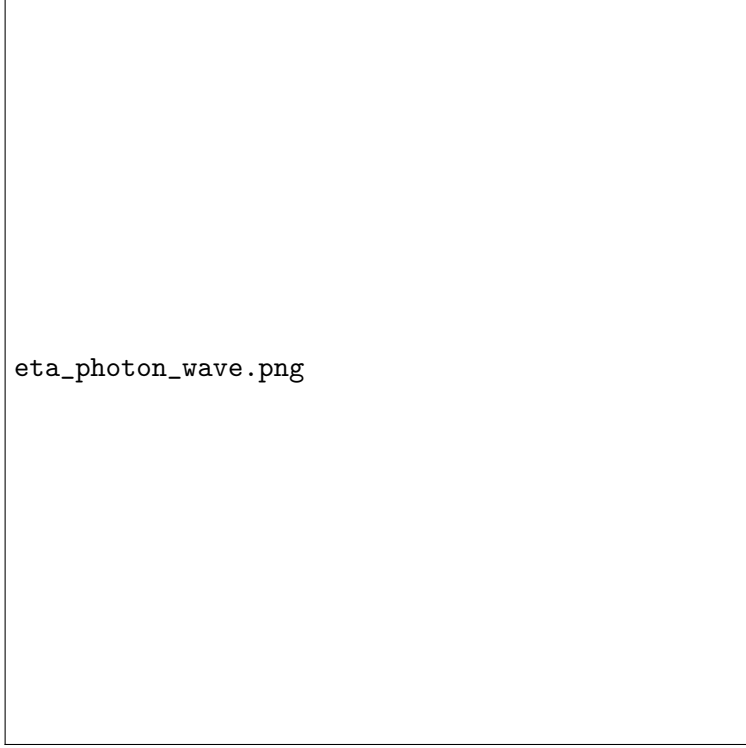


Figure 1: Photon as propagating ODU wave

6 Electron Model

$$\square\Psi_c + \lambda(\Psi_c^2 - a^2)\Psi_c + \gamma\Psi_c\Psi_m^2 = 0 \quad (5)$$

$$\square\Psi_m + \mu^2\Psi_m + \beta\Psi_m^3 + \gamma\Psi_c^2\Psi_m = 0 \quad (6)$$

7 Dirac Limit

$$(i\gamma^\mu\partial_\mu - m)\psi = 0 \quad (7)$$

8 Quantization

$$E = h\nu \quad (8)$$

9 Interference

$$\Psi = \Psi_1 + \Psi_2 \quad (9)$$

10 Prediction

$$n_{\text{eff}} \approx 1 + \alpha_\eta \left(\frac{E}{E_c} \right)^2 \quad (10)$$

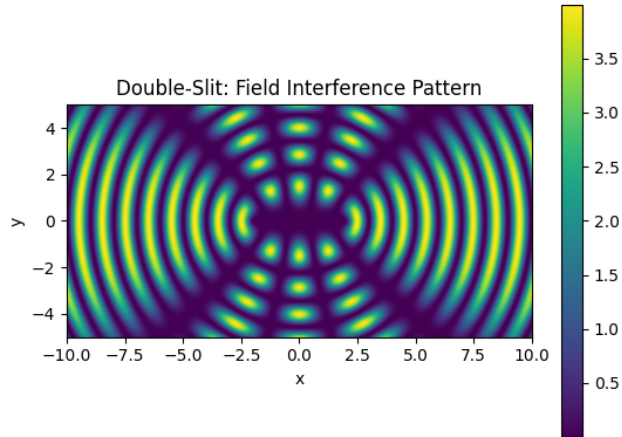


Figure 2: Double-slit interference

$$\Delta\phi \sim 10^{-11} \text{ to } 10^{-8} \text{ rad} \quad (11)$$

11 Conclusion

ETA provides a unified interpretation of electromagnetism and matter as space-time dynamics.

References

- [1] J.C. Maxwell
- [2] P.A.M. Dirac
- [3] R. Feynman