Unified Field Theory Based on a Superdense Ether: The Electron as a Self-Organizing Unitary Magnet

With Unified Density Scale $\beta = 10^{-4}$

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Abstract

This article presents a complete mathematical model for a Unified Field Theory (UFT) where the physical vacuum is interpreted as a superdense, superfluidic ether. Drawing from V.P. Oleinik's description of the electron as an open, self-organizing system, we define the fundamental particle as a toroidal magnetic soliton — a **Unitary Magnet**. We derive the ether density from first principles at the Planck scale, obtaining $\rho_P \approx 5.15 \times 10^{96}\,\mathrm{kg/m^3}$.

To resolve the apparent discrepancy between this theoretical density, observed nuclear matter density ($\sim 10^{17}\,\mathrm{kg/m^3}$), and the effective density used in the mass formula ($\sim 10^{13}\,\mathrm{kg/m^3}$), we introduce a universal scaling constant $\beta = 10^{-4}$. All densities are unified by $\rho(k) = \rho_P \cdot \beta^k$, where k is the topological reduction exponent. Matter is shown to be a low-density topological excitation within an ultra-dense substrate. The unification of gravity (pressure gradient) and electromagnetism (vorticity) emerges naturally from the fluid dynamics of the ether.

1 Introduction

Traditional Quantum Electrodynamics (QED) treats the electron as a point-like particle. However, following the work of V.P. Oleinik [1], we adopt a different paradigm: the electron is an open, non-linear, self-organizing system. This system maintains its structural integrity through continuous energy exchange with a physical vacuum, which we identify as the **Superdense Ether**.

2 The Electron as a Self-Organizing Unitary Magnet

2.1 The Unitary Magnet Model

The electron is modeled as a toroidal magnetic soliton with quantized magnetic flux:

$$\Phi_0 = \frac{h}{2e} \tag{1}$$

2.2 Energy Density

The internal energy density ρ_e accounts for continuous energy exchange with the ether:

$$\rho_e = \frac{1}{8\pi}(\mathbf{E}^2 + \mathbf{H}^2) + \psi^\dagger \hat{H}_{int} \psi \tag{2}$$

2.3 Non-linear Dirac-Maxwell Coupling

$$(i\gamma^\mu \partial_\mu - m)\psi = g(\bar{\psi}\psi) A_\mu \gamma^\mu \psi \tag{3}$$

3 Fundamental Ether Density

Using Planck units:

$$m_P \approx 2.176 \times 10^{-8}\,\text{kg} \tag{4}$$

$$l_P \approx 1.616 \times 10^{-35}\,\text{m} \tag{5}$$

$$\rho_P = \frac{m_P}{l_P^3} = \frac{2.176 \times 10^{-8}}{(1.616 \times 10^{-35})^3} \approx 5.15 \times 10^{96}\,\text{kg/m}^3 \tag{6}$$

This is the **fundamental density** of the pure, undisturbed superdense ether.

4 Unified Density Scale: The Constant $\beta = 10^{-4}$

To reconcile all density scales in the theory, we introduce a universal scaling constant:

$$\boxed{\beta = 10^{-4}}$$

The unified density law is:

$$\boxed{\rho(k) = \rho_P \cdot \beta^k}$$

where k is the **topological reduction exponent**.

4.1 Density Table

k	β^k	Density (kg/m^3)	Physical Meaning
0	1	5.15×10^{96}	Pure ether (Planck scale)
20	10^{-80}	$5.15 \times 10^{16} \approx 10^{17}$	Nuclear matter density
21	10^{-84}	$5.15 \times 10^{12} \approx 10^{13}$	Effective density (mass formula)

4.2 Why This Resolves All Discrepancies

— Publication — Density — k — Status — — :— — :— — :— — :— — — — Planck derivation — 10^{96} — 0 — Fundamental — — Observed nuclear matter — 10^{17} — 20 — Experimental fact — — UFT mass formula — 10^{13} — 21 — Effective for calculations —

No contradiction. One constant $\beta = 10^{-4}$ binds them all.

5 Scaling Relation and Vortex Void Concept

The scaling relation from the summary:

$$\rho_{eff} = \rho_P \cdot \alpha \left(\frac{l_P}{R_c} \right)^n \tag{7}$$

With $\beta^k = \alpha(l_P/R_c)^n$, for $k = 20$ and $n = 3$:

$$\alpha = \frac{10^{-80}}{(l_P/\lambda_C)^3} \approx 1.37 \times 10^{-13} \tag{8}$$

This α is the dimensionless coupling constant for the electron vortex.

6 Unified Field Dynamics

Gravity and electromagnetism emerge from fluid dynamics:

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = \kappa(T_{\mu\nu}^{EM} + T_{\mu\nu}^{Ether}) \tag{9}$$

7 Conclusion

The Superdense Ether model provides a deterministic foundation for quantum phenomena. The single constant $\beta = 10^{-4}$ unifies all density scales:

$$\boxed{\rho(k) = \rho_P \cdot 10^{-4k}}$$

The vacuum is not empty but a superdense ($10^{96}\,\mathrm{kg/m^3}$) medium. Matter consists of low-density topological excitations ($10^{17}\,\mathrm{kg/m^3}$ for nuclei, $10^{13}\,\mathrm{kg/m^3}$ effective in the mass formula) within this substrate.

References

[1] V. P. Oleinik, "The Newest Development of Quantum Electrodynamics: Electron as an Open Self-Organizing System, Superluminal Signals," arXiv:quant-ph/0203031.

[2] J. Jensen, "A Unified Field Theory Based on Superdense Ether: Topological Solitons, Two-Mode Gravity, and Experimental Predictions," Zenodo, 2026.