Time Dilation in a 3D Superfluid Æther Model

Based on Vortex Core Rotation and Ætheric Flow

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1 Introduction

Main Section 1

Symbol	Quantity	Value	Unit	Uncertainty
C_e	Vortex-Tangential Velocity	$1.093\,845\,6 \times 10^{6}$ m/s	[1]	
G	Gravitational Constant	$6.674\,300\,0 \times 10^{-11}$ m³/kg/s²	[2]	
α	Fine-Structure Constant	$7.297\,352\,6 \times 10^{-3}$	[3]	
$\rho_{æ}^{\mathrm{core}}$	Æther Core Density	$3.893\,435\,8 \times 10^{18}$	kg/m³	†
$\rho_{æ}$	Æther Vacuum Density	$7.000\,000\,0 \times 10^{-7}$	kg/m³	†
$F_{æ}^{\max}$	Maximum Æther Force	$2.905\,350\,7 \times 10^{1}$	N	†
$F_{\mathrm{gr}}^{\max}$	Maximum Gravitational Force	$3.025\,638\,9 \times 10^{43}$	N	†
γ	Helicity-Mass Coupling Constant	$5.901\,000\,0 \times 10^{-3}$	(dimensionless)	†
r_c	Vortex-Core Radius	$1.408\,970\,2 \times 10^{-15}$	m	exact
c	Speed of Light	$2.997\,924\,6 \times 10^{8}$	m/s	exact
G	Newtonian Gravitational Constant	$6.674\,300\,0 \times 10^{-11}$	m³/kg/s²	2.2×10^{-5}
h	Planck Constant	$6.626\,070\,2 \times 10^{-34}$	J s	exact
α	Fine-Structure Constant	$7.297\,352\,6 \times 10^{-3}$	(dimensionless)	1.6×10^{-10}
R_e	Classical Electron Radius	$2.817\,940\,3 \times 10^{-15}$	m	1.3×10^{-24}
α_g	Gravitational Coupling Constant	$1.751\,800\,0 \times 10^{-45}$	(dimensionless)	exact
μ_0	Vacuum Magnetic Permeability	$1.256\,637\,1 \times 10^{-6}$	N/A²	exact
ε_0	Vacuum Electric Permittivity	$8.854\,187\,8 \times 10^{-12}$	F/m	exact
Z_0	Vacuum Impedance	$3.767\,303\,1 \times 10^{2}$	Ω	1.6×10^{-10}
$\hbar$	Reduced Planck Constant	$1.054\,571\,8 \times 10^{-34}$	J s	exact
L_p	Planck Length	$1.616\,255\,0 \times 10^{-35}$	m	1.1×10^{-5}
M_p	Planck Mass	$2.176\,434\,0 \times 10^{-8}$	kg	1.1×10^{-5}
t_p	Planck Time	$5.391\,247\,0 \times 10^{-44}$	s	1.1×10^{-5}
T_p	Planck Temperature	$1.416\,784\,0 \times 10^{32}$	K	1.1×10^{-5}
q_p	Planck Charge	$1.875\,546\,0 \times 10^{-18}$	C	exact
E_p	Planck Energy	$1.956\,000\,0 \times 10^{9}$	J	exact

Table 1: Core constants in the Vortex Æther Model (VAM) and classical physics. † indicates VAM-defined constants with theoretical precision.

Symbol	Quantity	Value	Unit	Uncertainty
e	Elementary Charge	$1.6021766 \times 10^{-19}$	C	exact
R_∞	Rydberg Constant	1.0973732×10^{7}	1/m	1.1×10^{-12}
a_0	Bohr Radius	$5.2917721 \times 10^{-11}$	m	1.6×10^{-10}
M_e	Electron Mass	$9.1093837 \times 10^{-31}$	kg	3.1×10^{-10}
M_{proton}	Proton Mass	$1.6726219 \times 10^{-27}$	kg	3.1×10^{-10}
$M_{neutron}$	Neutron Mass	$1.6749275 \times 10^{-27}$	kg	5.1×10^{-10}
k_B	Boltzmann Constant	$1.3806490 \times 10^{-23}$	J/K	exact
R	Gas Constant	8.3144626	J/(mol K)	exact
$\frac{1}{\alpha}$	Fine Structure Constant Reciprocal	1.3703600×10^{2}	(dimensionless)	1.6×10^{-10}
f_c	Electron Compton Frequency	1.2355900×10^{20}	Hz	1.0×10^{-10}
Ω_c	Electron Compton Angular Frequency	7.7634407×10^{20}	rad/s	1.0×10^{-10}
λ_c	Compton Wavelength (electron)	$2.4263102 \times 10^{-12}$	m	1.0×10^{-10}
λ_{proton}	Compton Wavelength (proton)	$1.3214099 \times 10^{-15}$	m	4×10^{-25}
Φ_0	Magnetic Flux Quantum	$2.0678339 \times 10^{-15}$	Wb	exact
φ	Golden Ratio	1.6180340	(dimensionless)	7.3×10^{-22}
eV	Electron Volt	$1.6021766 \times 10^{-19}$	J	exact
G_F	Fermi Coupling Constant	1.1663787×10^{-5}	GeV^{-2}	6×10^{-12}
ER_∞	Rydberg Energy	$2.1798724 \times 10^{-18}$	J	1.1×10^{-12}
fR_∞	Rydberg Frequency	3.2898420×10^{15}	Hz	1.1×10^{-12}
σ	Stefan–Boltzmann Constant	5.6703744×10^{-8}	$\mathrm{W/m^2/K^4}$	exact
b	Wien Displacement Constant	2.8977720×10^{-3}	m K	exact
k_e	Coulomb Constant	8.9875518×10^{9}	$\mathrm{N\,m^2/C^2}$	exact

Table 2: Quantum and particle-scale constants relevant for VAM and atomic physics.

A Keystone Constant Relations in VAM

Throughout the main text we defined the three primitive æther parameters

$$F_{\max}, \qquad r_c, \qquad C_e, \tag{1}$$

and showed how they fix all familiar quantum and gravitational constants. For completeness we collect here the four one-line identities that anchor $\hbar$, $E = h\nu$, the Bohr radius a_0 and Newton's constant G in terms of (1). All algebra employs only dimensional relations, the fine-structure constant $\alpha = 2C_e/c$, and the Planck time $t_P \equiv \sqrt{\hbar G/c^5}$. Figures quoted use the canonical numerics of Tab. 1.

A.1 Planck's Constant from Æther Tension

A photon of Compton frequency ν_e wraps two half-wavelength helical arcs ($n = 2$) around the electron vortex. Matching angular momenta and adopting a Hookean core gives

$$h = \frac{4\pi F_{\max} r_c^2}{C_e} = 6.626070 \times 10^{-34}\ \mathrm{J\,s}; \tag{2}$$

see Sec. 3.1.

A.2 Photon Energy: $E = h\nu$

Treating the helical photon as a parallel-plate capacitor of plate area $A = \lambda^2$ and spacing $d = \lambda/2$ yields

$$C = 2\varepsilon_0\,\lambda, \qquad E = \frac{Q^2}{2C} = \frac{e^2}{4\varepsilon_0 C_e}\,\nu = h\nu, \tag{3}$$

where $e^2/4\varepsilon_0 C_e = h$ follows from Eq. (2) plus $\alpha = 2C_e/c$.

A.3 Bohr (or Sommerfeld) Radius

Combining Eq. (2) with $\alpha = 2C_e/c$ gives

$$a_0 = \frac{\hbar}{m_e c\alpha} = \frac{F_{\max} r_c^2}{m_e C_e^2} = 5.291\,772 \times 10^{-11}\ \mathrm{m}. \tag{4}$$

All hydrogenic orbital radii then follow the textbook $r_n = n^2 a_0/Z$ scaling with no further parameters.

A.4 Newton's Constant

Eliminating $\hbar$ between Eq. (2) and the Planck-time identity $t_P^2 = \hbar G/c^5$ yields

$$G = F_{\max}\,\alpha\,\frac{(ct_P)^2}{m_e^2} = \frac{C_e c^5 t_P^2}{2F_{\max} r_c^2} = 6.674\,30 \times 10^{-11}\ \mathrm{m^3\,kg^{-1}\,s^{-2}}. \tag{5}$$

Either form in Eq. (5) matches all laboratory and astronomical measurements within the quoted CODATA uncertainty.

A.5 Consequences

A single triad $(F_{\max}, r_c, C_e)$ locks $\hbar, a_0, h\nu$, and G. Any independent experimental change to one of the three primitives would break *all* four constants simultaneously—making the VAM framework highly falsifiable.

Numerical Inputs (taken from Tab. 1): $F_{\max} = 29.053507\,\mathrm{N}$, $r_c = 1.40897017 \times 10^{-15}\,\mathrm{m}$, $C_e = 1.09384563 \times 10^6\,\mathrm{m\,s^{-1}}$, $m_e = 9.10938356 \times 10^{-31}\,\mathrm{kg}$, $t_P = 5.391247 \times 10^{-44}\,\mathrm{s}$.

The author first encountered the capacitor-wavelength derivation in a 2011 YouTube clip attributed to Lane Davis [**lan**]. 's 2010 PDF later provided the written source used here.

B The Role of C_e^2 in VAM Dynamics

In the Vortex Æther Model (VAM), the constant C_e — the core tangential swirl velocity — plays a role analogous to the speed of light c in relativity. It governs the scale at which internal vortex motion couples to inertial effects, mass, and time evolution. Its square, C_e^2, appears throughout the theory as a natural denominator wherever kinetic, energetic, or gravitational effects emerge.

1. Interpretation of C_e^2

- **Inertia Coupling:** Swirl-induced mass depends on energy-like terms normalized by C_e^2, mirroring $E = mc^2$ in special relativity.
- **Time Dilation:** Local time is modified by swirl velocity as:

$$d\tau = dt \cdot \sqrt{1 - \frac{\omega^2 r^2}{C_e^2}}$$

- **Swirl Mass Generation:** Energy per unit volume from vortex motion ($\sim \frac{1}{2}\rho v^2$) is converted to mass via C_e^2.
- **Gravitational Coupling:** Appears in the VAM expression for G, derived from vortex coupling:

$$G \sim \frac{C_e c^5 t_p^2}{2F_{\max} r_c^2}$$

Thus, C_e^2 is fundamental to scaling rotational energy into inertial and gravitational analogues in the VAM framework.

2. Table of Expressions Involving C_e^2

Expression	Physical Meaning	VAM Role
$\frac{r_c}{C_e^2}$	Core radius over swirl velocity squared	Temporal inertia scaling
$\frac{F_{\max}}{C_e^2}$	Max force per swirl energy unit	Force–mass–energy coupling
$\frac{1}{2}\rho v^2 / C_e^2$	Energy density to mass conversion	Inertial mass from kinetic field
$\frac{\omega^2 r^2}{C_e^2}$	Time dilation correction	Vortex-clock slowdown
$\frac{8\pi\rho_{r_c^3}}{C_e}$	VAM prefactor	Total mass contribution per vortex

Table 3: Representative appearances of C_e^2 in core VAM expressions.

3. Symbolic Equivalence $C_e^2 \leftrightarrow c^2$

VAM exhibits a direct analogue to relativistic dynamics where C_e^2 plays the same role as c^2:

Time Dilation Analogy:

$$\text{Special Relativity:} \quad d\tau = dt \cdot \sqrt{1 - \frac{v^2}{c^2}}$$

$$\text{VAM Swirl Clock:} \quad d\tau = dt \cdot \sqrt{1 - \frac{v_{\text{swirl}}^2}{C_e^2}}, \quad v_{\text{swirl}} = \omega r$$

Mass-Energy Equivalence:

$$\text{Relativity:} \quad E = mc^2$$

$$\text{VAM:} \quad E = mC_e^2 \Rightarrow m = \frac{\frac{1}{2}\rho v^2}{C_e^2}$$

Gravitational Redshift Analogy:

$$\text{GR:} \quad g_{tt} \approx 1 + \frac{2\Phi}{c^2}$$
$$\text{VAM:} \quad g_{tt}^{\text{eff}} \approx 1 - \frac{v^2}{C_e^2}$$

Quantity	**Relativistic (GR)**	**VAM Equivalent**
Limiting speed	c	C_e
Mass-energy conversion	$E = mc^2$	$E = mC_e^2$
Time dilation	$\sqrt{1 - v^2/c^2}$	$\sqrt{1 - v^2/C_e^2}$
Gravitational potential scaling	Φ/c^2	v^2/C_e^2

Table 4: Mapping of relativistic quantities to their vortex-based analogues in VAM.

Summary Equivalence Table: We conclude that:

$$\boxed{C_e^2 \longleftrightarrow c^2}$$

This symbolic equivalence formalizes the deep analogy between relativistic spacetime curvature and the VAM framework of swirl-induced gravitational behavior.

../references