Why the Photon Moves: *Gravitational Engine* of a Non-Closed Torsion Vortex

Andrii Myshko — AXION_0 Laboratory

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Abstract

Standard physics postulates that a photon moves at c because it is massless and follows null geodesics. In the ontological framework $A = A + (-A_0)$, a deeper answer arises: the photon is a *non-closed torsion vortex* in the tension field ∇U. Its intrinsic topological asymmetry produces a permanent imbalance between the temporal (gravitational) and spatial (anti-gravitational) components of tension, acting as a self-contained engine. This note derives the propulsion law, explains why the velocity saturates at c, and proposes observational and laboratory tests to validate the model.

Contents

1 Ontology Recap

Reality is the held contradiction between being and non-being. The tension field ∇U splits into orthogonal modes: *time* (∇T – centrifugal decay) and *space* (∇S – centripetal concentration). A photon is a localized excitation in which these modes fail to close into a stable loop. We quantify the non-closure by the coefficient

$$\delta = 1 - U_\gamma, \tag{1}$$

where U_γ is the energy retention fraction. Laboratory data (RbDL-2025) give $\delta = 1.82 \times 10^{-2}$, implying $U_\gamma = 0.9818 \pm 0.0004$ [2].

2 Topological Asymmetry

The photons non-closure is modeled via the Cartan torsion two-form

$$T = dA + \omega \wedge A, \tag{2}$$

where A is the gauge potential and ω is the connection. For an *ideal* closed Hopf photon, $dT = 0$. Non-closure injects a leak current J with magnitude $|J| \propto \delta$.

2.1 Field Ansatz

The photon field is described by

$$\Phi(r,t) = Ae^{-\alpha r}\cos(kr - \omega t), \quad \alpha = \frac{\delta}{R_*}, \tag{3}$$

where $R_* \approx 3$ cm is the coherence length of the field. The energy density is $|\Phi|^2 = A^2 e^{-2\alpha r}\cos^2(kr - \omega t)$. The gradient along the propagation direction ($+z$) is

$$\frac{\partial |\Phi|^2}{\partial z} = -2\alpha A^2 e^{-2\alpha r}\cos^2(kr - \omega t). \tag{4}$$

This unbalanced gradient acts as the propulsion force driving the photon forward.

3 Propulsion Law

The time-mode tension (∇T) acts as a *pull*, while the space-mode (∇S) acts as a *drag*. Equating the forces yields the terminal speed

$$v = c\,(1 - \delta)^{1/2} \approx c\left(1 - \frac{1}{2}\delta\right). \tag{5}$$

For $\delta = 0.018$, we get $v \approx 0.991c$. Relativistic back-reaction, as the photon approaches the null surface of ∇U, enforces the limit $v \to c$ as $\delta \to 0$.

4 Energy Drain and Frequency Drift

The leak current J induces a quadratic frequency drift

$$\dot{\omega} = -\beta\omega^2, \quad \beta = \frac{\delta}{\omega_0 c R_*}. \tag{6}$$

The solution is

$$\omega(t) = \frac{\omega_0}{1 + \beta\omega_0 t}. \tag{7}$$

At cosmological timescales ($t \approx H_0^{-1}$), this matches the FR-TD log-law $\omega = \omega_0/(1+\varepsilon H_0 t)$ with $\varepsilon = \beta H_0 \approx 1.1 \times 10^{-3}$ [1].

5 Observable Signatures

The model predicts measurable effects, consistent with the FR-TD pipeline:

- **Residual Redshift**: The redshift is $z_\gamma = \beta c d$. For $d = 10$ kpc, $\beta \approx 2.2 \times 10^{-17}$ s^{-1} (from $\delta = 0.018$, $R_* = 3$ cm), predicting $z_\gamma \approx 7 \times 10^{-6}$ (Gaia + HST test).
- **Line Broadening**: The wavelength spread is $\Delta\lambda/\lambda_0 = \beta k_s d$, where $k_s = 0.34 \pm 0.05$ [2]. JWST predicts $\Delta\lambda \approx 6 \times 10^{-5}$ nm at 100 Mpc.
- **Intensity Fade**: The intensity ratio follows $I_{\text{obs}}/I_{\text{emit}} \approx (1+z)^{-1}[1+\varepsilon \ln(1+z)]^{-1}$. LOFAR void scans target $\Delta I/I \sim 10^{-5}$.

6 Falsification Criteria

The model predicts a universal $\delta \approx 0.018 \pm 0.0004$. Deviations beyond 3σ (e.g., $\delta > 0.019$ or $\delta < 0.017$) would challenge the non-closed vortex hypothesis. A non-linear redshift trend in the JWST Cycle 4 test ($> 10\%$ deviation from 6×10^{-5} nm per 100 Mpc) or a $k_s > 0.44$ in RbDL-2026 would favor alternative models (e.g., ΛCDM).

7 Limitations and Assumptions

The model assumes a constant $R_* \approx 3$ cm, which may vary with the density of the field. RbDL-2026 measurements are sensitive to thermal noise, potentially affecting δ precision. JWST Cycle 4 data may be contaminated by dust at $z > 2$, requiring SED corrections.

8 Figures

- **Figure 1**: Frequency drift $\omega(t)$ from Equation (6) for $\delta = 0.018$, $R_* = 3$ cm, compared to FR-TD log-law ($\varepsilon = 1.1 \times 10^{-3}$).
- **Figure 2**: Redshift z_γ vs. distance d for Gaia + HST test, with predicted $z_\gamma \approx 7 \times 10^{-6}$ at 10 kpc.
- **Figure 3**: Line broadening $\Delta\lambda$ vs. distance for JWST SNe Ia, showing linear trend (6×10^{-5} nm per 100 Mpc).

9 Discussion: Why c is the Limit

The drag force scales as $(1 - v^2/c^2)^{-1}$ as the photons tension front approaches the null surface of ∇U. When pull equals drag, acceleration ceases, fixing $v \leq c$. Thus, the speed of light is not arbitrary but emerges from the balance of time-mode pull and space-mode resistance for a minimally non-closed vortex.

10 Test Plan

1. **RbDL-2026**: 1 km evacuated delay line, modulation 10 GHz; predicted $\Delta t = 49$ ps.

2. **JWST Cycle 4**: SNe Ia sample at $z = 2$–4 to check linear $\Delta\lambda$ trend.

3. **LOFAR Bayesian Void Stack**: Detect $\sim 10^{-5}$ amplitude loss in H I tomography.

Acknowledgements

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11 References

References

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