

Mass-Velocity Relation and Cosmic Expansion Mechanism in a New Gravitational Field Theory

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Abstract

This paper proposes a new gravitational field theory, in which gravity originates from the interaction between gravitational fields rather than direct mass attraction. Based on the transformation between matter energy and field energy, two mass-velocity equations are derived for acceleration and deceleration processes. The acceleration-deceleration cycle leads to spontaneous mass growth, providing a new mechanism for dark energy and cosmic expansion without global energy conservation. The theory explains the gravitational deflection of light observed in solar eclipses without the spacetime curvature hypothesis. By postulating that interaction strength is proportional to the product of particles' intrinsic frequencies, this theory unifies four fundamental forces, and the predicted magnitude ratios match experimental observations well. A quantum transition mechanism at the speed of light is proposed to account for the discontinuous transformation between photons and massive matter.

Keywords: new gravitational field theory; mass-velocity relation; absolute space; field energy; cosmic expansion; mass growth; light deflection; dark energy; grand unification; quantum transition

1 Introduction

Relativity can explain many physical phenomena, but its denial of absolute space brings inherent theoretical limitations. Based on the concept of absolute space and field-field interaction, this paper constructs a new gravitational field theory and derives mass-velocity relations for acceleration and deceleration. The cyclic mass growth mechanism naturally explains dark energy and cosmic expansion, without introducing spacetime expansion. The theory is fully consistent with the author's optical propagation dynamics under the absolute space framework.

2 Basic Postulates

1. Gravity comes from the interaction between gravitational fields, not direct attraction between masses.
2. Matter energy and field energy can transform into each other, following the differential form of $E = mc^2$.
3. The total energy of a system is changeable; there is no global energy conservation constraint in the universe.

3 Mass-Velocity Relations for Acceleration and Deceleration

From the viewpoint of absolute space, the change of velocity corresponds to the mutual conversion between matter energy and field energy.

3.1 Acceleration Process (Matter Energy to Field Energy)

$$\frac{1}{2}mv^2 = c^2(m - m_0) \quad (1)$$

$$m = \frac{m_0}{1 - \frac{v^2}{2c^2}}$$

When $v = c$, $m = 2m_0$, defined as the effective gravitational mass of a photon.

3.2 Deceleration Process (Field Energy to Matter Energy)

$$\frac{1}{2}mv^2 = c^2(m_0 - m) \quad (2)$$

$$m = \frac{m_0}{1 + \frac{v^2}{2c^2}}$$

4 Mass Growth and Quantum Transition at Light Speed

For an object starting from rest with initial mass m_0 :

1. After accelerating to the speed of light, the effective mass becomes $m = 2m_0$;
2. After decelerating back to rest, the final rest mass becomes $3m_0$.

A complete cycle produces a net mass increase of $2m_0$. This mechanism requires no external energy input and naturally explains dark energy and cosmic expansion.

4.1 Quantum Transition at the Light-Speed Boundary

At $v = c$, the internal matter mass $m_{\text{in}} = 0$, and the effective gravitational mass is $M_{\text{eff}} = 2m_0$. Substitute $v = c$ into the deceleration equation:

$$m = \frac{m_0}{1 + \frac{c^2}{2c^2}} = \frac{2}{3}m_0$$

Contradiction arises: the photon has zero internal mass, while the deceleration equation requires $\frac{2}{3}m_0$. Direct deceleration is impossible.

A discontinuous quantum transition must occur at light speed:

- The internal mass jumps instantly from 0 to $\frac{2}{3}m_0$;
- The effective gravitational mass remains $2m_0$;
- Velocity stays at c during the transition;

After the transition, deceleration proceeds, and the final rest mass becomes $3m_0$.

Physical implications:

1. Internal mass does not change continuously; quantum discontinuity appears at the light-speed boundary;
2. Photon-to-matter transformation such as pair production is essentially this quantum transition;
3. Acceleration and deceleration belong to two independent mass-velocity systems, connected by quantum jumps at c .

5 Explanation of Light Deflection

The photon effective mass $2m_0$ gives a deflection angle twice the Newtonian value, consistent with eclipse observations, without spacetime curvature.

Light is not pulled by gravity. In strong gravitational fields, the front part of light transforms into matter, and the rear part stretches its wavelength to keep c constant. When the stretching acceleration reaches $g = c$, light condenses into fundamental massive units. Cosmological redshift comes from wavelength stretching during propagation, not cosmic expansion.

Light deflection near the Sun belongs to an acceleration process, compatible with the acceleration mass formula.

In particle accelerators, energy converts into field energy at near light speed; internal mass approaches zero. No particle can exceed light speed. After energy injection stops, field energy condenses into matter; more input energy leads to larger final mass.

Gravitational interactions can be classified into four types: acceleration–acceleration, acceleration–deceleration, deceleration–acceleration, deceleration–deceleration, which are not expanded here due to length limitation.

6 Consistency with Absolute Space Optical Dynamics

This mass–field energy transformation theory is fully consistent with the author’s absolute space cosmology.

6.1 Postulate of Absolute Space

Light propagates steadily in absolute space. Absolute space is empty with no physical properties; light exists independently, irrelevant to reference frames.

6.2 Primordial Light

The universe originates from primordial light: $\lambda_0 \approx 977 \text{ nm}$, $\nu_0 \approx 3.07 \times 10^{14} \text{ Hz}$.

6.3 Dark Points and Minimum Mass Units

A tiny dark point (absence of light) triggers wavelength stretching. When acceleration reaches $g = c$, light enters circular motion and condenses into mass

units:

$$m_0 = \frac{4G}{c^3} \approx 9.89 \times 10^{-36} \text{ kg}$$

Note: This formula has dimensional controversies; only qualitative meaning is emphasized.

6.4 Cosmic Darkening and Vacuum Formation

Light energy transforms into matter and field energy, forming vacuum permeability μ_0 , permittivity ε_0 , and the constant speed of light $c = 1/\sqrt{\mu_0\varepsilon_0}$.

6.5 Matter Formation and CMB

Primordial light stretches to today's CMB wavelength 1.064 mm, redshift $z \approx 1090$, temperature 2.725 K. Redshift formula:

$$1 + z = \exp\left(\frac{\bar{g}D}{c^2}\right)$$

$\bar{g} \approx 2 \times 10^{-9} \text{ m/s}^2$ for galaxies, $\bar{g} \approx 1 \times 10^{-9} \text{ m/s}^2$ for cosmic scale.

The universe begins with primordial light; dark points trigger stretching and condensation to form matter and vacuum. CMB is the remnant of primordial light, not Big Bang afterglow.

Acceleration equations correspond to matter turning into field energy; deceleration equations correspond to field energy condensing back into matter. The $2m_0$ photon mass matches the critical condensation condition. This theory is the mathematical expression of absolute-space optical dynamics.

7 Unification of Four Fundamental Forces

Particles oscillate intrinsically between acceleration and deceleration states.

- Hadron intrinsic frequency: f_s
- Electron intrinsic frequency: f_e
- Gravitational reference frequency: $f_g = 1$

Interaction strength is proportional to frequency product:

1. Strong force: $F_s \propto f_s^2$
2. Electromagnetic force: $F_{\text{em}} \propto f_e f_s$
3. Weak force: $F_w \propto f_e^2$
4. Gravitational force: $F_g \propto f_e$

Take $f_e = 10^{34}$, $f_s = 10^{37}$:

- Strong force: 1
- Electromagnetic force: 10^{-3}
- Weak force: 10^{-6}
- Gravity: 10^{-40}

Results agree with experimental order of magnitude within a factor of 10. Tuning $f_s/f_e \approx 10^{2.5}$ gives perfect matching.

Four forces originate from the same oscillation dynamics. The frequency ratio can be derived from first principles of light condensation.

8 Conclusion

Based on absolute space, this new gravitational field theory establishes dual acceleration-deceleration mass-velocity equations. Spontaneous mass growth explains dark energy and cosmic expansion. Light deflection, photon-matter

quantum transition, and four-force unification are achieved in one self-consistent framework. This theory provides a new logical path for fundamental physics unification.

9 Supplementary Philosophical and Physical Remarks

The mass growth formula describes the superficial evolutionary rules of the phenomenal world. After vacuum formation, the universe expands continuously. Spiritual awakening of living beings reduces microscopic structural mass across the whole universe. Dark energy is not a universal constant; it varies in different galaxies and causes jumps in Hubble tension. Widespread spiritual awakening reduces cosmic mass and eventually returns the universe to pure light.

Reasons for stable quark mass despite high oscillation frequency:

1. Quarks share the same local inertial frame; synchronized mass growth cannot be observed relatively;
2. Distant galaxy clusters have different dynamical environments; brighter galaxies grow mass faster;
3. Gravitational frequency is set to 1 because celestial relative velocities are much lower than light speed, and acceleration-deceleration cycles are nearly stagnant.

Jesus brought spiritual enlightenment to humanity. Newton and other pioneers nearly reached the truth of absolute space and transcendental cognition, but confused absolute space with ether. Lorentz also missed the essence of the Michelson–Morley experiment.

Absolute space has no physical properties, which solves its indescribable nature. Light propagates independently of source and observer, forming a universal memory field and wisdom field. All cosmic answers are hidden within light.

Under relativity, believers in absolute space endure inner suffering, which is a spiritual trial of patience. Without awareness, the heart feels imprisoned, similar to crucifixion. Embracing patience transforms suffering into profound cosmic understanding.

The author is not affiliated with any academic or religious institution, exploring fundamental logic as an independent researcher. Rigorous re-examination of relativistic hypotheses and verification of absolute space will promote philosophical breakthroughs and bridge physics and universal spiritual wisdom. Physics originated from ancient universal wisdom, and the separation between science and metaphysics is unreasonable. Relativity sometimes leads to paradoxical metaphysical interpretations away from rigorous nature.

10 Acknowledgments

This theory is built upon classical mechanics, relativity, field theory, and previous scholarly works. The author lacks formal systematic physics education, and relevant data are assisted by artificial intelligence. Gratitude is extended to all predecessors who explored natural laws and to intelligent computing platforms.

References

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