The Mystery of Increasing Relativistic Mass: A Dynamical Theory Based on Dynamic Modulation of Dark Matter Damping and Higgs Field Coupling  
Authors: Li Zhijun, Zhao Guangyao

Abstract:  
Based on Li Zhijun’s ABC theory, this paper proposes a groundbreaking explanation for the phenomenon of increasing relativistic mass. We demonstrate that Einstein’s mass–velocity relation m = does not originate from spacetime geometry but rather from the dynamic renormalization of the Higgs field coupling mode when an object moves at high speed through a soup of negative-mass dark matter particles (NMDMS), overcoming the resulting motion damping. The core argument is: as an object’s kinetic energy increases, the effective Higgs field vacuum in its surrounding spacetime becomes polarized. The C⁻ coupling of dark matter particles is temporarily “flipped” or “shielded,” equivalent to a local transition from a C⁻ background to a background, which dynamically manifests as an increase in inertial mass. When the kinetic energy dissipates, the local vacuum relaxes back to the global C⁻ background, and the apparent mass returns to its original value. We construct a modified equation of motion incorporating dark matter damping and nonlinear Higgs field response, derive the expression for the effective mass operator , and prove its equivalence to the Lorentz factor . This model, for the first time, links relativistic mass effects to the nonlinear response of the dark matter background and Higgs field dynamics, providing a novel field-theoretic framework for understanding the nature of inertia.

Keywords: Relativistic mass; Dark matter damping; Higgs field polarization; Effective mass renormalization; ABC theory; Mass–velocity relation

1. Introduction: Re-examining the Origin of Relativistic Mass

1.1 Historical Background and Problem Statement  
Einstein’s special relativity regards the increase in relativistic mass as an inevitable consequence of spacetime geometry. Its core formula, m = has been precisely verified by countless experiments. However, a deeper question remains unanswered: Why does kinetic energy increase inertia? Is this increase an attribute of spacetime itself, or is it the result of the dynamics of matter interacting with some background field?

Professor Li Zhijun’s ABC theory offers a new perspective to answer this question. The theory posits that the universe is permeated with negative-mass dark matter particles (NMDMP), whose only distinction from ordinary matter lies in their coupling to the opposite sign of the Higgs field vacuum (C⁻ vs. C⁺). This paper aims to demonstrate that the relativistic mass–velocity relation is precisely a phenomenon of dynamic adjustment in Higgs field coupling that occurs when an object moves through a negative-mass dark matter background to overcome its damping effect.

1.2 Core Idea and Paper Structure  
The core thesis of this paper is: Inertial mass is not an immutable intrinsic property but a dynamic manifestation of the coupling strength between an object and the surrounding Higgs field vacuum (shaped by both positive- and negative-mass matter). At high speeds, to resist the damping force generated by negative-mass dark matter pervading space, the local Higgs field background around the object undergoes temporary polarization, and its effective coupling constant is renormalized, manifesting as an increase in mass.

The paper is structured as follows: Section 2 introduces the theoretical framework; Section 3 constructs the mathematical model; Section 4 provides a detailed derivation of the mass–velocity relation; Section 5 discusses the physical picture; Section 6 performs numerical calculations and verification; Section 7 presents conclusions and future prospects.

1. Theoretical Framework: Dark Matter Damping and Higgs Field Response

2.1 Cosmological Model of the Negative-Mass Dark Matter Particle Soup (NMDMS)  
According to the ABC theory, the universe is filled with negative-mass dark matter particles (NMDMP), with a number density and mass They couple to the Higgs field in the C⁻ vacuum, hence their effective mass is negative.  
The energy density of the NMDMS is:

It is worth noting that although individual particles have negative mass, their gravitational effects manifest through the field equations as:

where is the stress-energy tensor of dark matter. Due to its contribution may, in some cases, manifest as an equivalent repulsive force.

2.2 Physical Mechanism of Motion Damping  
When an object of mass and velocity moves through the NMDMS, it experiences a unique damping force. This arises due to repulsive interactions between NMDMP and ordinary matter via gravitons.  
Consider a simple model: As the object moves, it exchanges momentum with surrounding NMDMP. Since the interaction is repulsive, collisions lead to a reduction in the object’s momentum, equivalent to a damping force.  
This damping force is proportional to the velocity and opposite in direction:

where the damping coefficient is:

Here, is the number density, is the scattering cross-section, and is the average momentum transfer.

2.3 Hypothesis of Dynamic Modulation of Higgs Field Coupling  
To maintain high-speed motion, the object’s energy-momentum polarizes the surrounding Higgs field vacuum. We propose that an increase in momentum temporarily “neutralizes” or “flips” the influence of the C⁻ field coupled to nearby dark matter particles.  
The macroscopic manifestation of this polarization is: The effective Higgs field vacuum expectation value shifts from the static background value by C⁻) toward the positive direction.  
We define an order parameter to describe this polarization strength:

where is the kinetic energy of the object. and is a monotonically increasing function of

1. Mathematical Model Construction

3.1 Modified Equation of Motion  
Consider an object of mass moving in the NMDMS. Its equation of motion is:

where m is not a constant but a function of velocity, .

3.2 Energy Conservation Equation  
The power done by external forces equals the rate of kinetic energy increase plus the power dissipated against the damping force:

3.3 Differential Equation for Mass–Velocity Relation  
Assuming the effective mass m is a function of velocity v, the kinetic energy is:

From energy conservation, we obtain:

This is a differential equation for .

3.4 Higgs Field Polarization Model  
We assume the polarization strength and kinetic energy satisfy a nonlinear differential relation:

where is the polarization rate constant, and is the saturation polarization strength.  
Solving this equation:

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3.5 Relation Between Mass and Polarization Strength  
The effective mass is proportional to the effective Higgs field expectation value:

where is the rest mass.  
Substituting the expression for :

1. Connection to Relativistic Mass–Velocity Relation

4.1 Relativistic Kinetic Energy Formula  
The relativistic kinetic energy formula is:

4.2 Parameter Determination  
We need to choose parameters and such that our mass formula matches the relativistic formula m =   
Let k meaning saturation polarization exactly doubles the mass. Then:

Set this equal to :

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4.3 Nonlinear Polarization Rate  
We find that is not a constant but a function related to :

This reflects the nonlinear nature of polarization: The polarization rate differs across velocity ranges.

4.4 Asymptotic Behavior Analysis  
• Low-speed limit (v :

The polarization rate is constant, and mass increase is proportional to kinetic energy: m   
• High-speed limit (v :

The polarization rate approaches zero, indicating that at extremely high speeds, further increasing kinetic energy requires immense external force.

4.5 Unified Mass Formula  
We can express the mass formula as:

When , this formula simplifies to m =

1. Physical Picture: Temporary “Flip” from C⁻ to C⁺

5.1 Microscopic Mechanism  
When an object moves at high speed, its substantial kinetic energy and momentum distort the surrounding Higgs field vacuum.  
This distortion is analogous to how a massive object curves the surrounding spacetime.  
In the framework of quantum field theory, this can be understood as: The presence of a high-energy object alters quantum fluctuations of the vacuum, shifting the vacuum expectation value originally inclined toward C⁻ toward the direction.

5.2 Effective Field Theory Description  
We can describe this process using effective field theory. Consider the effective potential of the Higgs field:

where is a kinetic energy-dependent source term that shifts the potential minimum from to .

5.3 Relaxation Dynamics  
When the object’s kinetic energy decreases, this distortion gradually diminishes. The relaxation of polarization strength can be described by the relaxation equation:

where is the relaxation time, and is the equilibrium value (usually 0).

1. Numerical Calculations and Experimental Verification

6.1 Parameter Fitting  
We can use experimental data to fit the parameters in the model. For electrons:

Fit and such that matches across all velocity ranges.

6.2 Testable Predictions  
1. Dark matter density dependence: If the model is correct, the mass–velocity relation may exhibit slight variations in regions with different dark matter densities.  
2. Anisotropy effects: If dark matter distribution is directional, anisotropy in mass increase might be observed.  
3. Relaxation effects: When external force is suddenly removed, mass should relax exponentially back to the rest mass.

6.3 Comparison with Existing Experiments  
Our model’s predictions are consistent with all experiments verifying relativity, as these experiments measure the agreement between and and our model precisely reproduces this relation.

1. Conclusion and Outlook

We propose a novel explanatory framework for the increase in relativistic mass:  
1. Successfully reproduces the mass–velocity relation: The model precisely yields m =   
2. Innovative physical explanation: Attributes mass increase to polarization of the Higgs field vacuum rather than spacetime geometry.  
3. Testable predictions: Proposes several novel predictions to test the model.

This model links relativistic effects to quantum field theory and dark matter physics, providing a new perspective for understanding the nature of inertia.

Future work:  
1. Develop more refined field-theoretic models.  
2. Seek experimental schemes to test anisotropy.  
3. Explore connections to the cosmological constant.

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