Unification of the T0 Model: Foundations, Dark Energy, and Galaxy Dynamics

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Zusammenfassung

This work presents a unified framework for the T0 model, integrating its foundational principles with applications to dark energy and galaxy dynamics in a static universe. Based on absolute time and variable mass, the T0 model contrasts with relativity's relative time and constant mass, offering alternative explanations for cosmic redshift (via energy loss), dark energy (emergent from the intrinsic time field $T(x)$), and galaxy dynamics (through mass variation without dark matter). This paper ensures mathematical consistency across these domains and provides a comprehensive theory with experimentally testable predictions.

Inhaltsverzeichnis

1 Introduction to the T0 Model: Core Concepts

1.1 Fundamental Assumptions of the T0 Model

The T0 model is based on assumptions detailed in [3] and [1]:

Fundamental Assumptions of the T0 Model

- Time is absolute and universally constant ([3], Section "Time-Mass Duality").
- Mass varies as $m = \frac{\hbar}{T(x)c^2}$, where $T(x)$ is the intrinsic time field ([3], Section "Intrinsic Time").
- Gravity emerges from gradients of $T(x)$ ([1], Section "Emergent Gravity").
- Redshift results from energy loss: $1 + z = e^{\alpha d}$ ([2], Section "Energy Loss").

1.2 Intrinsic Time and Time-Mass Duality

The intrinsic time $T(x)$ is defined as:

$$T(x) = \frac{\hbar}{mc^2} \tag{1}$$

Details in [3] (Section "Definition of Intrinsic Time"). This leads to the duality:

- **Standard Model**: Relative time, constant mass.
- **T0 Model**: Absolute time, variable mass ([3]).

1.3 Unified Lagrangian Density

The Lagrangian density is derived in [5] (Section "Total Lagrangian Density"):

$$\mathcal{L}_{\text{total}} = \mathcal{L}_{\text{SM}} + \mathcal{L}_{\text{Higgs}} + \mathcal{L}_{\text{intrinsic}} \tag{2}$$

With $\mathcal{L}_{\text{intrinsic}} = \frac{1}{2}\partial_\mu T(x)\partial^\mu T(x) - V(T(x))$.

1.4 The Role of Gravity in the T0 Model

Gravity emerges from $T(x)$:

Theorem 1.1 (Emergence of Gravity)**.**

$$\nabla T(x) = -\frac{\hbar}{m^2c^2}\nabla m \sim \nabla \Phi_g \tag{3}$$

See [1] (Section "Emergent Gravity").

2 Dark Energy in the T0 Model

2.1 Reinterpretation of Dark Energy

Dark energy is an emergent effect of $T(x)$:

- **ΛCDM**: Cosmological constant.
- **T0 Model**: Energy exchange via $T(x)$ ([8], Section "Dark Energy").

Energy density:

$$\rho_{DE}(r) = \frac{\kappa}{r^2} \tag{4}$$

2.2 Field-Theoretic Description

$$\mathcal{L}_{\text{intrinsic}} = \frac{1}{2}\partial_\mu T(x)\partial^\mu T(x) - V(T(x)) \tag{5}$$

Field equation:

$$\Box T(x) - \frac{dV}{dT(x)} = 0 \tag{6}$$

See [5].

2.3 Energy Transfer and Redshift

Redshift due to energy loss:

$$\frac{dE_\gamma}{dx} = -\alpha E_\gamma, \quad 1 + z = e^{\alpha d} \tag{7}$$

With $\alpha \approx 2.3 \times 10^{-18}\,\mathrm{m}^{-1}$ ([2]).

3 Galaxy Dynamics in the T0 Model

3.1 Flat Rotation Curves Without Dark Matter

Rotation curves:

$$v^2(r) = \frac{GM(r)}{r} + \kappa r \tag{8}$$

$\kappa \approx 4.8 \times 10^{-11}\,\mathrm{m\,s^{-2}}$ ([1]).

3.2 Effective Gravitational Constant

$$G_{\text{eff}}(r) = G\left(1 + \beta_{\text{T}}\frac{\kappa}{r}\right) \tag{9}$$

With $\beta_{\text{T}}^{\text{SI}} \approx 0.008$ ([3]).

4 Unified Mathematical Formulation

4.1 Common Field Equations

Action:

$$S_{\text{unified}} = \int \mathcal{L}_{\text{total}}\, d^4x \tag{10}$$

Static universe:

$$\left(\frac{\dot{m}}{m}\right)^2 = \frac{8\pi G}{3}\rho_{\text{eff}} \tag{11}$$

$$\frac{\ddot{m}}{m} = -\frac{4\pi G}{3}(\rho_{\text{eff}} + 3p_{\text{eff}}) \tag{12}$$

4.2 Consistent Parameterization

Parameters:

- $\alpha \approx 2.3 \times 10^{-18}\,\mathrm{m}^{-1}$
- $\kappa \approx 4.8 \times 10^{-11}\,\mathrm{m\,s}^{-2}$
- $\beta_{\mathrm{T}}^{\mathrm{SI}} \approx 0.008$, $\beta_{\mathrm{T}}^{\mathrm{nat}} = 1$ ([3]).

Relationship:

$$\kappa = \beta_{\mathrm{T}} \frac{yvc^2}{r_g^2} \tag{13}$$

5 Experimental Tests of the T0 Model

5.1 Common Predictions

1. Mass-dependent time evolution ([7]).
2. Environment-dependent redshift: $\frac{z_{\mathrm{Cluster}}}{z_{\mathrm{Void}}} \approx 1 + 0.003$.
3. Differential redshift: $\frac{z(\lambda_1)}{z(\lambda_2)} \approx 1 + \beta_{\mathrm{T}} \frac{\lambda_1 - \lambda_2}{\lambda_0}$.

5.2 Tests for Galaxy Dynamics

1. Tully-Fisher Relation: $L \propto v_{\max}^{4+\epsilon}$, $\epsilon \approx \beta_{\mathrm{T}}$.
2. Gravitational lensing effects: $\alpha_{\mathrm{lens}} \propto \int \nabla\Phi\, dz$ ([1]).

6 Comparison with the ΛCDM Standard Model

Model Comparison

ΛCDM Model	**T0 Model**
Dark matter as particles	No dark matter, mass variation
NFW profile: $\rho_{\mathrm{DM}}(r)$	$\rho_{\mathrm{eff}}(r) \approx \frac{\kappa}{r^2}$
Relative time, constant mass	Absolute time, variable mass
Dark energy drives expansion	Dark energy from $T(x)$ exchange
Redshift from expansion	Redshift from energy loss
Expanding universe	Static universe

7 Summary

The T0 model unifies absolute time and variable mass to explain cosmic phenomena, supported by internal consistency and references to [1, 3, 2].

Literatur

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