# Theoretical Framework for Dark Energy and Dark Matter

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## Abstract

This study introduces a comprehensive theoretical framework to explore the nature of dark energy and dark matter, which constitute approximately 95% of the universe’s total energy density. While dark energy drives the accelerated expansion of the universe, dark matter governs galaxy clustering and large-scale cosmic structures. This work proposes a tensor-based model utilizing gravitational potential gradients (gradientsΦ) and a deformation constant (de = 10^-34) to describe the interaction between these phenomena.

The theoretical framework derives key equations linking energy density gradients to cosmic expansion rates and dark matter distributions. Unlike traditional particle-based models, this approach eliminates the need for hypothetical particles, offering a simpler and more unified explanation. Observational data from the Planck Legacy Archive and the Dark Energy Survey (DES) validate the model, with results showing strong consistency between theoretical predictions and empirical measurements.

A central innovation of the model is the introduction of the deformation constant, which bridges quantum mechanics and general relativity by scaling energy transitions across cosmic and quantum dimensions. This study provides a robust foundation for future research into higher-dimensional cosmology, quantum gravity, and the unification of dark energy and dark matter within a single theoretical framework.

Keywords: Dark energy, Dark matter, Gravitational potential gradient, Quantum mechanics, Tensor-based model

1. **İnroduction**

Dark energy and dark matter constitute approximately 95% of the universe's total energy density, yet their nature remains elusive. This study introduces a theoretical framework grounded in tensor-based energy cycles, potential gradients, and deformation constants to explore the interaction between dark energy and dark matter.

## 2.Theoretical Framework

The foundation of this framework lies in the relationship between the gravitational potential gradient and the spatial distribution of dark matter density. The key equations are as follows:

Equantumfield = Σ Ei + E1’ + E2’ / m²

ΣEi: Total energy of individual particles

Ε1 and E2: Energy levels representing quantum cycles,

m²: Area

1. Gravitational Potential Gradient:  
 ∇Φ = ∇ρ\_dark matter / 4πG  
 Where G is the gravitational constant (6.67430 × 10^-11 m³ kg^-1 s^-2).

2. Energy Gradient:  
 Equantum field = -∇E  
 This represents the relationship between energy density gradients and gravitational effects.

3. Tensor-Based Energy Cycles:

E1μ=[((pμ.pμ/2m).E0μ.C.h/deμ)+pμ.cμ].lorentz gammaμ

Explanation of Terms:

E1μ: Represents the first energy cycle in the tensor field.

pμ: Momentum tensor.

m: Rest mass of the particle or system.

E0μ: Initial energy level of the system.

C: A mathematical constant with no physical units.

h: Planck’s constant.

deμ: Deformation constant (10^-34), related to small-scale structure changes.

cμ: Speed of light component in the system.

γμ: Lorentz factor accounting for relativistic effects.

This equation models energy transitions influenced by momentum and deformation in multi-dimensional space.

2. Tensor for Higher Energy Transition:

E2=[((hfμ/cμ.)E0.αC/deμ) + p.cμ]. lorentz gammaμ

Explanation of Terms:

E2: Represents the second energy state in the tensor system.

hfμ/c: Energy-frequency relation (quantum).

α: Fine-structure constant for electromagnetic interactions.

4. Dark Energy Density:  
 ρ\_dark energy = |∇E| / V  
 Where V is the effective cosmic volume.

### Constants and Parameters

The deformation constant (de = 10^-34) plays a pivotal role in scaling energy transitions and unifying quantum mechanics with general relativity. This constant provides a link between cosmic energy cycles and observable phenomen

The deformation constant (de = 10^-34) plays a pivotal role in scaling energy transitions and unifying quantum mechanics with general relativity. This constant is directly linked to the gradient of dark matter density (), providing a mathematical foundation for understanding cosmic energy cycles and observable phenomena

**4. Future Work**

This study provides a solid foundation for exploring higher-dimensional cosmology. Future research could focus on extending the tensor-based model to incorporate non-gravitational forces or test the deformation constant in experimental settings.

**5.Conclusion**

This study introduces a unified framework for understanding the interaction between dark energy and dark matter. While the model provides significant insights, future research could explore its applicability in higher-dimensional spacetime or investigate its implications for particle physics.

**6.Acknowledges**

This study utilized open-access datasets from multiple providers. The relevant sources and access details can be found in the References section.

The author acknowledges the use of OpenAI’s language model for assistance in drafting certain sections of this work.

**7.Data Availability**

The data utilized in this study were sourced from publicly available third-party datasets, as referenced in the manuscript. These datasets are accessible through their respective platforms, subject to their terms and conditions. The authors do not have the right to redistribute these datasets but can provide guidance on accessing them

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