**A Quantum Field Theory Model of Gravity Induced by Negative Mass Dark Matter: Mathematical Self-Consistency and Comparison with Newtonian Gravitation**  
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 Abstract  
We develop a mathematically self-consistent model demonstrating how repulsive forces from a negative mass dark matter fluid induce apparent gravitational attraction between ordinary matter. By treating dark matter as a quantum-coherent medium with characteristic parameters (coherence length , density , and matter-dark matter coupling ), we derive Newton’s law of gravitation as a long-range limit. The model establishes a constraint relation for consistency with observational gravity, predicts deviations at galactic/cosmological scales, and eliminates the need for particle dark matter or dark energy.  
 1. Introduction  
Newtonian gravitation () is empirically robust but lacks a fundamental mechanism. We propose that gravity emerges from the repulsive interaction between ordinary matter and a **negative mass dark matter fluid** (NMF). This NMF, characterized by quantum coherence and uniform density gradients, generates apparent attraction via displacement effects. We construct a quantum field theory (QFT) framework where:  
- NMF repulsion Matter displacement Apparent attraction.  
- Newtonian gravity is the limit of a more general theory.  
2. Theoretical Framework  
 2.1 Negative Mass Dark Matter Fluid  
The NMF is modeled as a scalar field with:  
- **Negative energy density**: (repulsive gravity).  
- **Quantum coherence**: Characterized by length scale (de Broglie wavelength).  
- **Uniform density gradient**: at macroscopic scales.  
 2.2 Repulsion-Induced Attraction Mechanism  
For two masses embedded in NMF:  
1. Each mass experiences NMF repulsion: .  
2. Masses displace NMF, creating density deficits around them.  
3. The overlap of deficits generates apparent attraction:

3. Mathematical Model and Newtonian Limit  
 3.1 General Force Law  
The full QFT-derived force is:

where is **not fundamental** but emerges from NMF parameters.  
 3.2 Constraint for Newtonian Consistency  
To recover at , NMF parameters must satisfy:

**Key conditions**:  
1. (cosmological scale).  
2. synchronized with .  
3. remains finite or weakly -dependent.  
3.3 Dark Matter Characteristic Parameters  
| **Parameter** | **Physical Meaning** | **Behavior as**  |  
|—————|———————-|————————————–|  
| | Quantum coherence length | (universe scale) |  
| | NMF density magnitude | (synchronized with ) |  
| | Matter-NMF coupling | Finite (or ) |  
 4. Observational Constraints and Predictions  
 4.1 Cosmological Parameter Constraint  
From :

- **Example**: If (observable universe), then (matches galaxy halo observations).  
 4.2 Scale-Dependent Deviations  
- **Laboratory scales** ():

Deviations are negligible; Newtonian gravity holds.  
- **Galactic scales** ():

Explains flat rotation curves **without particle dark matter**.  
- **Cosmological scales** ():

Mimics dark energy-driven acceleration.  
 5. Discussion  
 5.1 Why Newtonian Gravity Emerges  
- **Long-range limit**: NMF density gradients appear uniform at .  
- **Effective field theory**: Newtonian gravity is the infrared fixed point of NMF-induced dynamics.  
 5.2 Resolution of Anomalies  
- **Galaxy rotation curves**: Enhanced replaces dark matter.  
- **Cosmic acceleration**: Repulsive decay at replaces dark energy.  
 5.3 Testable Predictions  
1. **Scale-dependent** :

Detectable via lunar laser ranging or pulsar timing.  
2. **Anisotropic gravity**: NMF inhomogeneities induce direction-dependent .  
6. Conclusion  
We have demonstrated that:  
1. Newtonian gravity is an **emergent phenomenon** from negative mass dark matter repulsion.  
2. The constraint ensures self-consistency.  
3. **Key NMF parameters** (, , ) are constrained by cosmology:  
- (universe scale),  
- (halo density).  
4. The model **unifies dark matter and dark energy** as scale-dependent manifestations of NMF dynamics.  
This framework provides a testable alternative to CDM, with gravity arising from quantum-coherent dark matter geometry.  
 References  
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