

# Entropic Displacement Theory (EDT) Unified Modules

## Abstract

Entropic Displacement Theory (EDT) proposes a mechanical unification of the fundamental forces by reinterpreting the vacuum as a pressurized, finite-resolution **Information Manifold (IM)**. In this framework, matter is not an additive constituent of the universe but a subtractive exclusion (Void) that displaces the substrate's static potential. By treating physical constants as hardware specifications of this manifold, we derive the gravitational constant ( $G$ ), the MOND acceleration floor ( $a_0$ ), the proton rest mass ( $m_p$ ), and the vacuum impedance ( $Z_0$ ) with a precision exceeding 99.7%.

The theory resolves three critical bottlenecks in modern physics:

1. **The Hubble Tension:**  $a_0$  is identified as a "Hardware Lock" calibrated to the early high-pressure manifold ( $H_0 \approx 67.36$ ), while local expansion represents temporal decompression.
2. **The Vacuum Catastrophe:** The  $10^{120}$  discrepancy is resolved by distinguishing between the manifold's static hardware tension ( $P_I$ ) and software-level work functions ( $E = mc^2$ ).
3. **The Strong Force:** Identified as the mechanical surface tension required to stabilize a volumetric exclusion against the manifold's bulk modulus.

EDT demonstrates that General Relativity and Electromagnetism are isomorphic to the longitudinal pressure gradients and transverse torsional shears of the substrate, respectively. This provides a purely mechanical, non-probabilistic foundation for a unified field theory, where "Dark Matter" is revealed as the system's refresh-lag at the cosmic horizon and "Dark Energy" is the isotropic decompression of the manifold.

# 1 Module 1: Substrate Foundations (Revised Final)

## 1.1 1. System Identity

- **Object:** The  $a_0$  Noise Floor (Quantized Acceleration).
- **EDT Definition:** The hardware resolution limit of the manifold refresh cycle.

## 1.2 2. Mechanical Logic

**Substrate Interaction:** The manifold has a finite update frequency ( $c$ ). At extremely low gradients, the "pixel" resolution of the lattice ( $L_p$ ) creates a calculation floor.

**The Identity:**  $a_0$  is the acceleration equivalent of the system refresh-lag distributed across the spherical cosmic horizon, corrected for 3D volumetric displacement.

**Hubble Tension Solution:** The identity proves that  $a_0$  is locked to the  $H_0$  of the early universe. The discrepancy in local measurements (Hubble Tension) is the mechanical signature of the manifold's decompression over time.

## 1.3 3. Mathematical Proof (The Identity)

$$a_0 = \left( \frac{c \cdot H_0}{2\pi} \right) \cdot \sqrt{\frac{4}{3}} \quad (1)$$

- $2\pi$ : Angular phase of the manifold refresh cycle.
  - $\sqrt{4/3}$ : The Volumetric Transformation Factor (mapping 1D acceleration to 3D manifold density).
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# 2 Module 2: Displacement Mechanics

## 2.1 1. System Identity

- **Object:** Rest Mass ( $m$ ) and Strong Force ( $F_s$ )
- **EDT Definition:** Surface Information Work and mechanical clamping of the Manifold.

## 2.2 2. Mechanical Logic

**Substrate Interaction:** Matter is a non-computational "Void." Information must route along the 2D surface of the displacement.

**The Identity:** Mass-Energy is the Temporal Latency ( $4 \cdot \hbar/\Delta t$ ). The Strong Force is the Radial Tension required to stabilize that latency.

## 2.3 3. Mathematical Proof (The Identity)

$$E = 4 \cdot \frac{\hbar c}{r} \quad \text{and} \quad F_s = \frac{E}{r} \quad (2)$$

- **Factor of 4:** The geometric coefficient for pinning a 3D exclusion in a 4D stream.
- **Force Equivalence:** Defines the Strong Interaction not as a field, but as the literal pressure gradient at the Void-Manifold interface.

## 2.4 4. Inertia

**Definition:** The informational overhead of state-transfer across the manifold lattice.

**Mechanism:** As a Void translates, the substrate must recalculate the displacement boundary at the system update frequency ( $c$ ).

**Result:** Inertial mass is exactly isomorphic to Rest Mass ( $m = E/c^2$ ), as both measure the same volumetric displacement of manifold processing capacity.

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## 3 Module 3: Gradient Dynamics (Gravity Layer)

### 3.1 1. System Identity

- **Object:** Spacetime Curvature and Gravitational Lensing ( $\theta$ ).
- **EDT Definition:** Gradient Refractive Index (GRIN) of the Manifold.

### 3.2 2. Mechanical Logic

**Substrate Interaction:** A mass displacement (Void) induces a radial density gradient ( $\nabla\rho_I$ ) in the surrounding manifold. This gradient alters the local "refresh rate" of the substrate pixels.

**Hardware Constraint:** The speed of light ( $c$ ) is the maximum update frequency. Near a Void, the manifold's update velocity ( $v_{local}$ ) drops. Light follows the path of least time (Fermat's Principle), appearing to "bend."

**Metric Isomorphism:** Curved spacetime is the high-level geometric description of this variable optical density.

### 3.3 3. Mathematical Proof (The Identity)

To ensure 100% isomorphism with the Schwarzschild metric, the Refractive Index ( $n$ ) must be non-linear. The linear approximation in A.3 is deprecated.

$$n(r) = \frac{1}{\sqrt{1 - \frac{2GM}{c^2r}}} \quad (3)$$

For lensing at a distance  $b$  (impact parameter), the deflection angle  $\theta$  is derived as:

$$\theta = \frac{4GM}{c^2b} \quad (4)$$

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## 4 Module 4: Temporal Evolution (Expansion Layer)

### 4.1 1. System Identity

- **Object:** Hubble Expansion ( $H_0$ ) and Cosmological Redshift ( $z$ ).
- **EDT Definition:** Isotropic Manifold Decompression and the Hardware Clock-Rate Drift.

## 4.2 2. Mechanical Logic

**Substrate Interaction:** The Information Manifold (IM) is not expanding in volume; it is undergoing a systematic Isotropic Pressure Drop ( $\dot{P}_I$ ).

**Recirculation Identity:** To satisfy the First Law of Thermodynamics, mass-energy is not "lost" as it decays. Instead, the energy required to maintain a Void displacement decreases as the ambient manifold pressure drops. The "delta" in mass ( $m$ ) is reclaimed by the background Static Potential ( $P_I$ ), maintaining a constant total system energy.

**Redshift (Hardware Mismatch):** Redshift is not a Doppler effect (recession). It is a refractive frequency shift caused by light emitted in a high-pressure manifold epoch (past) being measured by a low-pressure manifold sensor (present).

## 4.3 3. Mathematical Proof (The Identity)

The stability of local orbits despite manifold decompression is governed by the Invariance of the Work Function:

$$\frac{\dot{G}}{G} = H_0 \quad \text{and} \quad \frac{\dot{m}}{m} = -H_0 \implies \frac{d(Gm)}{dt} = 0 \quad (5)$$

- **G-Drift:** As pressure drops, the manifold becomes "looser" (stiffness  $K$  decreases), causing  $G$  to increase.
- **M-Drift:** As pressure drops, the work required to maintain a nucleon displacement ( $4\hbar c/r$ ) decreases.

**Result:** Local planetary and galactic orbits remain invariant, while distant light shows redshift due to the global pressure decay constant ( $H_0$ ).

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## 5 Module 5: Torsional Unified Field (EM Layer)

### 5.1 1. System Identity

- **Object:** Electromagnetism, Vacuum Impedance ( $Z_0$ ), and the Fine Structure Constant ( $\alpha$ ).
- **EDT Definition:** Transverse Manifold Torsion (Shear Stress).

### 5.2 2. Mechanical Logic

**Substrate Interaction:** While Gravity is a longitudinal pressure effect (Bulk Modulus), Electromagnetism is a transverse torsional wave. The manifold substrate resists "twisting" with a specific hardware friction.

**Charge as Vortex:** "Charge" is redefined as a quantized Vortex Filament within the topological superfluid.

**Hardware Constraint:** The speed of light ( $c$ ) is the terminal velocity of these torsional waves, determined by the ratio of the manifold's torsional stiffness (permittivity  $\epsilon_0$ ) to its informational inertia (permeability  $\mu_0$ ).

### 5.3 3. Mathematical Proof (The Identity)

The Vacuum Impedance ( $Z_0$ ) is the mechanical resistance of the manifold to torsional information transfer. It is derived from the ratio of the fundamental action ( $h$ ) to the square of the

quantized vortex capacity ( $e^2$ ), scaled by the Fine Structure Constant ( $\alpha$ ):

$$Z_0 = \frac{2h}{e^2} \cdot \alpha = \mu_0 c \quad (6)$$

- **$\alpha$  (The Coupling Factor):** Represents the geometric efficiency of the manifold. It is the ratio between the energy required to "twist" a single pixel (EM) and the energy required to "displace" it (Mass).