

Ontological Hierarchy of Energy Reduction

The Levels of Fundamental Reality in Natural Units

From Time-Mass Duality to Universal Energy Field

Ontological Systematics

February 6, 2026

Abstract

This work examines the ontological hierarchy of T0 theory under the paradigm of natural units, where through time-mass duality $T \cdot m = 1$ all physical quantities can be reduced to energy. The central insight: There exist **five ontological levels of reduction**, ranging from the most fundamental (universal energy field) to observable physics. Each level emerges from the underlying one through mathematical necessity. The analysis shows: (1) **Level 0 – Absolute Foundation**: The universal energy field $E_{\text{Field}}(x, t)$ with wave equation $\square E = 0$. (2) **Level 1 – Time-Mass Duality**: $T(x, t) \cdot m(x, t) = 1$ in natural units. (3) **Level 2 – Geometric Parameters**: $\xi = 4/30000$ and 4D torsion structure. (4) **Level 3 – Effective Field Theory**: Modified laws with $\sim 1\text{--}2\%$ corrections. (5) **Level 4 – SI Units Physics**: Classical observation level with c, \hbar, G as separate constants. Narrative integration occurs through upward propagation: From the fundamental energy field emerges duality, from that geometry, from that effective laws, from that classical physics.

Contents

1 Introduction: The Reduction Program

1.1 The Central Question

Fundamental Question

If in natural units ($\hbar = c = 1$) through time-mass duality everything can be reduced to energy, which ontological levels exist, and how do they organize themselves hierarchically?

Put differently: What are the **depths of reality** when we systematically descend from human conventions (SI units) to fundamental structures (energy field)?

1.2 The Dimensional Reduction

In natural units:

$$\hbar = c = 1 \quad \Rightarrow \quad [L] = [T] = [E^{-1}], \quad [M] = [E] \quad (1)$$

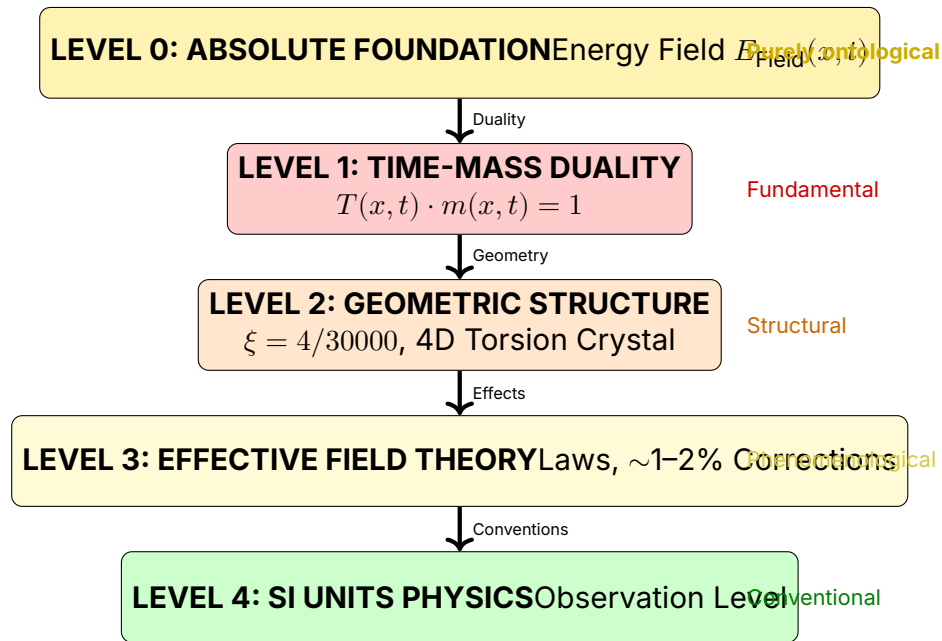
Consequence: All physical quantities are reduced to **one dimension** – energy!

Quantity	SI Units	Natural Units
Length	m	E^{-1}
Time	s	E^{-1}
Mass	kg	E
Temperature	K	E
Charge	C	dimensionless
Energy	J	E

Table 1: Dimensional reduction in natural units

2 The Five Ontological Levels

2.1 Hierarchy Overview



3 Level 0: The Absolute Foundation

3.1 Ontological Description

The Most Fundamental Reality

At the deepest level exists:

A Universal Energy Field $E_{\text{Field}}(x, t)$

This field is:

- **Non-dual:** No separation into space/time/mass
- **Self-evident:** Requires no further concepts
- **Dynamic:** Obeys the wave equation
- **Universal:** Permeates the entire universe

3.2 The Fundamental Equation

$$\square E_{\text{Field}}(x, t) = 0 \quad (2)$$

where $\square = \frac{\partial^2}{\partial t^2} - \nabla^2$ is the d'Alembert operator.

Physical meaning:

- Energy propagates as wave
- No sources or sinks at fundamental level
- Completely deterministic
- Local in space and time

3.3 Why is this fundamental?

Justification of Fundamentality

The energy field is fundamental because:

1. Minimal assumptions:

- Only one field
- Only one equation
- No free parameters (in natural units)

2. Maximal explanatory power:

- All other concepts emerge from it
- Space = configuration space of the field
- Time = evolution of the field
- Mass = field excitation

3. Mathematical elegance:

- Linear (superposition valid)
- Lorentz invariant
- Energy conserving

3.4 Ontological Status

What exists:

- The energy field $E_{\text{Field}}(x, t)$
- Its configuration at each time
- Its evolution dynamics

What doesn't exist (at this level):

- Separate time as independent entity
- Separate mass as substance
- Particles as fundamental objects
- Space as empty container

4 Level 1: Time-Mass Duality

4.1 Emergence of Duality

From the fundamental energy field emerges the first structuring:

Time-Mass Duality

In natural units holds the fundamental relationship:

$$T(x, t) \cdot m(x, t) = 1 \quad (3)$$

This is equivalent to:

$$T(x, t) = \frac{1}{m(x, t)} = \frac{1}{E(x, t)} \quad (4)$$

4.2 Mathematical Derivation

From the Heisenberg uncertainty principle:

$$\Delta E \cdot \Delta t \geq \frac{\hbar}{2} \quad (5)$$

In natural units ($\hbar = 1$):

$$\Delta E \cdot \Delta t \geq \frac{1}{2} \quad (6)$$

In the limit $\Delta \rightarrow 0$:

$$E \cdot T = 1 \quad \Leftrightarrow \quad m \cdot T = 1 \quad (7)$$

4.3 The Intrinsic Time Field

The duality manifests as a field:

$$T(x, t) = \frac{1}{\max(m(x, t), \omega)} \quad (8)$$

Dimensional verification:

$$[T(x, t)] = [E^{-1}] \quad (9)$$

$$[m(x, t)] = [E] \quad (10)$$

$$[T \cdot m] = [E^{-1}] \cdot [E] = [1] \quad \checkmark \quad (11)$$

4.4 Ontological Status**At this level exist:**

- Time as **field quantity** $T(x, t)$ (not as parameter)
- Mass as **field quantity** $m(x, t)$ (not as substance)
- Their reciprocal relationship as **fundamental law**

Physical meaning:

- Time varies with energy: $T \propto 1/E$
- Mass varies with energy: $m \propto E$
- Both are **aspects of the energy field**

4.5 Reduction to Energy

In natural units:

$$E = m \quad (\text{Energy} = \text{Mass}) \quad (12)$$

$$E = \omega \quad (\text{Energy} = \text{Frequency}) \quad (13)$$

$$E = 1/T \quad (\text{Energy} = \text{inverse time}) \quad (14)$$

$$E = 1/L \quad (\text{Energy} = \text{inverse length}) \quad (15)$$

Everything is energy in various manifestations!

5 Level 2: Geometric Structure**5.1 Emergence of Geometry**

From time-mass duality emerges geometric structure:

Geometric Manifestation

The duality manifests geometrically as:

- **Parameter:** $\xi = \frac{4}{30000} = 1.333 \times 10^{-4}$
- **Structure:** 4D torsion crystal

- **Scale:** Sub-Planck granulation $\Lambda_0 = \xi \cdot \ell_P$
- **Symmetry:** Pentagonal breaking via golden ratio φ

5.2 The Field Equation

The time-mass field obeys:

$$\boxed{\nabla^2 m(x, t) = 4\pi G \rho(x, t) \cdot m(x, t)} \quad (16)$$

Dimensional verification (natural units):

$$[\nabla^2 m] = [E^2] \cdot [E] = [E^3] \quad (17)$$

$$[4\pi G \rho m] = [1] \cdot [E^{-2}] \cdot [E^4] \cdot [E] = [E^3] \quad \checkmark \quad (18)$$

5.3 Geometric Parameters

From the field equation follow:

$$\beta = \frac{2Gm}{r} = \frac{2m}{r} \quad (\text{in nat. units with } G = 1) \quad (19)$$

$$\xi_{\text{geom}} = 2\sqrt{G} \cdot m = 2m \quad (\text{geometric parameter}) \quad (20)$$

5.4 The 4D Torsion Structure

Topology:

$$\mathcal{M}_{\text{fund}} = \mathbb{R}^3 \times S_{\text{comp}}^1 \quad (21)$$

where:

- \mathbb{R}^3 = observable 3D space
- S_{comp}^1 = compactified 4th dimension with radius $r_4 = \xi \cdot \ell_P$

5.5 Ontological Status

At this level exist:

- Geometric structure as **emergent property** of duality
- Parameter ξ as **manifestation** of 4D structure
- Torsion as **twisting** of compact dimension
- **Not yet existent** (only higher levels):
- Separate constants c, \hbar, G

- Particles as distinct objects
- Classical trajectories

6 Level 3: Effective Field Theory

6.1 Emergence of Phenomenological Laws

From geometric structure emerge measurable effects:

Effective Description

At measurable scales ($\ell \gg \Lambda_0$) we see:

- Modified force laws with ξ -corrections
- Fractal dimension $D_f = 3 - \xi$
- Anomalous moments with $\sim 2\%$ deviation
- Geometric constant predictions

6.2 Modified Laws

Coulomb's law:

$$F_{\text{Coulomb}} \propto \frac{1}{r^{1+\xi}} \approx \frac{1}{r^2} \left(1 - \xi \ln \frac{r}{\ell_P} \right) \quad (22)$$

Gravitational potential:

$$\Phi(r) = -\frac{Gm}{r}(1 + \kappa r) \quad (23)$$

Fine structure constant:

$$\alpha^{-1} = \pi^4 \cdot \sqrt{2} \approx 137.76 \quad (24)$$

6.3 Correction Factors

Over many orders of magnitude, ξ accumulates:

$$K_{\text{frak}} = 1 - 100\xi \approx 0.9867 \quad (25)$$

This leads to $\sim 1.33\%$ corrections in observables.

6.4 Ontological Status

At this level exist:

- Effective laws as **approximations** of geometry
- Measurable deviations from Standard Model
- Phenomenological parameters (not yet c, \hbar, G separate)

Characteristics:

- **Not fundamental**, but practically relevant
- **Emergent** from deeper levels
- **Approximative** with defined accuracy

7 Level 4: SI Units Physics

7.1 Emergence of Conventions

From effective theory emerge human conventions:

Conventional Physics

For practical purposes we introduce:

- Separate constants: $c = 299\,792\,458$ m/s, $\hbar = 1.055 \times 10^{-34}$ Js
- Separate units: Meter, kilogram, second
- Separate quantities: Energy \neq mass \neq time

This is the level of human measurements!

7.2 Back Translation

From natural to SI units:

$$E \text{ (nat.)} \rightarrow E \text{ (SI)} = E \cdot (\hbar c) \quad (26)$$

$$m \text{ (nat.)} \rightarrow m \text{ (SI)} = m \cdot \frac{\hbar}{c^2} \quad (27)$$

$$T \text{ (nat.)} \rightarrow T \text{ (SI)} = T \cdot \frac{\hbar}{c^2} \quad (28)$$

7.3 Ontological Status

At this level exist:

- Human conventions as **measurement tools**
- Separate concepts for practical applications
- Classical approximations for everyday physics

Characteristics:

- **Not fundamental**, but conventional
- **Useful** for technology and experiments
- **Obscures** the deeper unity of physics

8 Narrative Integration

8.1 Bottom-Up: The Emergence Narrative

The Story of Reality

LEVEL 0 – In the beginning was the field:

There exists a universal energy field $E_{\text{Field}}(x, t)$ that obeys the wave equation $\square E = 0$. Nothing else exists – only this one field.

⇓

LEVEL 1 – Duality emerges:

From the quantum nature of the field ($\Delta E \cdot \Delta t \geq \hbar/2$) emerges time-mass duality: $T \cdot m = 1$. Time is no longer parameter, but field!

⇓

LEVEL 2 – Geometry manifests:

The duality manifests geometrically: 4D torsion crystal with parameter $\xi = 4/30000$, compact 4th dimension at sub-Planck scale.

⇓

LEVEL 3 – Effects scale:

At measurable scales we see modified laws: Coulomb $\propto 1/r^{1+\xi}$, anomalous moments with $\sim 2\%$ deviation, geometric constants.

⇓

LEVEL 4 – Conventions arise:

Humans introduce SI units: meter, kilogram, second. They artificially separate c, \hbar, G . The deeper unity is obscured.

8.2 Top-Down: The Reduction Narrative

The Path to Fundamentality

START: SI Physics (Level 4)

We begin with separate concepts: energy, mass, time, length. We have many constants: c, \hbar, G, k_B, \dots

↓ *Simplification*

Natural Units (Level 3)

We set $c = \hbar = 1$. Suddenly: energy = mass, time = inverse energy. Everything becomes simpler!

↓ *Deeper analysis*

Geometric Structure (Level 2)

We recognize: The simplicity comes from 4D geometry. Parameter ξ encodes everything. Torsion explains mass!

↓ *Ultimate reduction*

Time-Mass Duality (Level 1)

We understand: Time and mass are dual, $T \cdot m = 1$. Both are aspects of energy!

↓ *Fundamental truth*

Universal Energy Field (Level 0)

At the foundation: One field, one equation. Everything else emerges.

9 Comparison of Both Descriptions

9.1 4D Torsion Crystal vs. Energy Reduction

4D Torsion Crystal (Level 2)	Energy Reduction (Level 0–1)
Geometric perspective Intuitive: Twisting 4 dimensions topological	Field-theoretic perspective Abstract: Duality 1 dimension (energy) reductive
Torsion as cause Sub-Planck structure primary	Field excitation as cause Wave equation primary
BOTH describe the same reality!	
Level 2 in hierarchy Emerges from Level 1 Geometrically manifest	Level 0–1 in hierarchy Fundamental for Level 2 Energetically fundamental

Table 2: Complementary descriptions

9.2 Ontological Classification

How do both fit in?

Energy Reduction (Level 0–1):

- **More fundamental** – goes deeper
- **More abstract** – less intuitive
- **More universal** – holds without restrictions

4D Torsion Crystal (Level 2):

- **Emergent** – follows from Level 1
- **More intuitive** – geometrically visualizable
- **Structural** – manifests duality

Relationship:

Energy Field (Level 0) $\xrightarrow{\text{creates}}$ Duality (Level 1) $\xrightarrow{\text{manifests}}$ Geometry (Level 2)

9.3 Why Both Descriptions Coexist

Complementarity

Analogous to wave-particle duality in quantum mechanics:

Energy Reduction:

- Like wave description
- Fundamental, but abstract
- Mathematically elegant
- Hard to visualize

4D Geometry:

- Like particle description
- Emergent, but intuitive
- Geometrically intuitive
- Practically useful

Both are valid, describing different aspects of the same reality!

10 Practical Consequences

10.1 For Calculations

Which level to choose?

Level 0–1 (Energy Reduction):

- Theoretical derivations
- Fundamental principles
- Symmetry arguments
- Conceptual clarity

Level 2 (Geometry):

- Visual explanations
- Particle masses
- Structural predictions
- Narrative presentations

Level 3 (Effective):

- Experimental predictions
- Comparison with data

- Phenomenology
- Level 4 (SI):**
- Practical measurements
 - Technology
 - Everyday applications

10.2 For Communication

Target Audience	Preferred Level	Reason
Laypeople	Level 4 (SI)	Familiar
Students	Level 3 (Effective)	Learnable
Physicists	Level 2 (Geometry)	Intuitive
Theorists	Level 1 (Duality)	Fundamental
Philosophers	Level 0 (Field)	Ontological

Table 3: Level choice by target audience