

Fundamental Minimalism in Laursian Dimensionality Theory

Ilja Laurs
ilja@laurs.com

May 6, 2025

Theorem: Dimensional Exclusivity of the Fundamental Equation

Theorem 1 (Dimensional Exclusivity). *Let the foundational relation in Laursian Dimensionality Theory (LDT) be given by:*

$$et^2 = md^2, \tag{1}$$

where e is energy, t is temporal extent, m is mass, and d is spatial extent, all defined within a 2+2 dimensional spacetime structure.

Then:

If any additional primitive construct X exists independently of the variables (e, t, m, d) , such that X contributes nontrivially to physical reality, then the equation $et^2 = md^2$ cannot remain universally valid.

Proof (by Contradiction). Assume, for contradiction, that:

1. $et^2 = md^2$ is universally and fundamentally valid across all physical reality.
2. Some construct X exists fundamentally and independently of (e, t, m, d) .
3. X influences physical structure, such that it modifies the energy-time or mass-distance side of the relation.

Then, the balanced relation becomes:

$$et^2 + f(X) = md^2 + g(X), \tag{2}$$

where $f(X)$, $g(X)$ are nonzero contributions introduced by X .

This violates the minimal form of the original equation unless $f(X) = g(X) = 0$, which implies X is either:

- Redundant (i.e., fully reducible to e, t, m, d), or
- Inconsistent with the original symmetry.

Therefore, a truly fundamental X would contradict the universal validity of $et^2 = md^2$.

Hence, no such independent construct can exist. $\square$

Corollary 1 (Minimal Sufficiency). *If all physical phenomena can be derived as emergent consequences of the invariant relation $et^2 = md^2$, then this relation is the minimal and sufficient descriptor of physical existence in the LDT framework.*

Interpretation

The Dimensional Exclusivity theorem establishes a profound constraint on the structure of physical reality within the LDT framework. By demonstrating that no additional primitive construct can exist independently of the foundational variables (e, t, m, d) , we establish that these four quantities constitute the complete and minimal set of building blocks for all physical phenomena.

This result can be interpreted as follows:

1. **Ontological Minimalism:** Reality at its most fundamental level requires exactly four primitive constructs—energy, time, mass, and spatial extent—no more and no less.
2. **Derivational Completeness:** All physical quantities, forces, fields, and interactions must be expressible as mathematical derivations from the fundamental relation $et^2 = md^2$.
3. **Dimensional Necessity:** The 2+2 dimensional structure of spacetime in LDT is not arbitrary but necessary to accommodate the fundamental relation in its minimal form.
4. **Explanatory Unification:** Apparent divergences in physical phenomena (quantum/classical, gravitational/electromagnetic) must be reconcilable as different manifestations of the same underlying relation.

Conclusion

The Dimensional Exclusivity theorem leads to an inescapable conclusion: all of physics must follow as a logical consequence of the fundamental equation $et^2 = md^2$. This implies:

1. All known physical laws—from Newton’s laws of motion to quantum field theory—must be derivable as special cases or approximations of the fundamental relation.
2. Physical constants such as the speed of light, Planck’s constant, and the gravitational constant must emerge as scaling factors or dimensional constraints within the LDT framework.
3. Phenomena currently requiring additional postulates (such as quantum measurement, dark energy, or inflationary cosmology) must be explicable within the minimal framework without introducing independent constructs.
4. The apparent complexity and diversity of physical reality masks an underlying unity and simplicity expressible through the relation $et^2 = md^2$.

This minimalist framework provides not only aesthetic appeal through its simplicity but also significant explanatory power. By constraining physical theory to derive exclusively from the fundamental relation, LDT establishes a rigorous program for theoretical physics: demonstrate how each observed phenomenon emerges from the interplay of energy, time, mass, and spatial extent within a 2+2 dimensional spacetime.

The challenge for contemporary physics is thus transformed from the search for new fundamental entities or forces to the derivation of all phenomena from the minimal set established by the Dimensional Exclusivity theorem. This represents a paradigm shift away from the proliferation of particles, fields, and dimensions toward a unified understanding based on the most elegant and economical foundation possible.