Supplement V–S1

M'-Perspective Geometric Realizations and Gravitational Base Length

Completing the A-Side Dual-Perspective Framework

1 Introduction: The A-Side Dual-Perspective Structure

This supplement establishes the gravitational base length $\ell_{G'}$ and demonstrates how structural lengths admit dual representation within the A-side framework. The λ-perspective uses corridor expressions ($\sqrt{c}$ powers), while the M'-perspective uses geometric factors (4π, $\sqrt{3}$, $\ell_{G'}$). Both perspectives are kg-free and separated by the mid_1 inversion operator.

1.1 What This Supplement Establishes

- **Gravitational base length:** $\ell_{G'} = \sqrt{\sqrt{G'}}$ as fundamental geometric unit
- **Cartesian-gravity coupling:** The identity $\sqrt{3} \cdot \ell_{G'} = 1/\sqrt{c^3}$
- **Dual representations:** How each structural length admits both λ and M' forms
- **Terminology resolution:** "B-side" clarified as M'-perspective within A-side (kg-free)

2 The Gravitational Base Length $\ell_{G'}$

Definition 1 (Gravitational Base Length)**.** The gravitational base length is defined as:

$$\ell_{G'} := \sqrt{\sqrt{G'}} = \sqrt[4]{G'}$$

where $\sqrt{G'} = 1/(3c^3)$ is the gravitational corridor established in Paper V.

Using $\sqrt{G'} = 1/(3c^3)$:

$$\ell_{G'} = \sqrt{\frac{1}{3c^3}} = \frac{1}{\sqrt{3c^3}} = \frac{1}{\sqrt{3} \cdot \sqrt{c^3}}$$

Identity 1 (Cartesian-Gravity Coupling)**.** The gravitational base length and lattice primitive are coupled by:

$$\boxed{\sqrt{3} \cdot \ell_{G'} = \frac{1}{\sqrt{c^3}}}$$

Structural interpretation: This identity bridges:

- **Left side:** 3D-extended gravitational base ($\sqrt{3} \cdot \ell_{G'}$)
- **Right side:** Inverse 3-HF lattice volume ($1/\sqrt{c^3}$)

3 Dual Representation of Structural Lengths

3.1 The Electron: Pure M'-Perspective Structure

From Paper III, the electron structural length is:

$$\lambda_e^\circ = \frac{4\pi}{\sqrt{c^3}}$$

Using the bridge identity $\sqrt{3} \cdot \ell_{G'} = 1/\sqrt{c^3}$:

$$\lambda_e^\circ = 4\pi \cdot \frac{1}{\sqrt{c^3}} = 4\pi \cdot (\sqrt{3} \cdot \ell_{G'}) = 4\pi\sqrt{3} \cdot \ell_{G'}$$

Theorem 1 (Electron Dual Representation)**.** The electron structural length admits two equivalent forms:

$$\lambda\text{-perspective:} \quad \lambda_e^\circ = \frac{4\pi}{\sqrt{c^3}} \tag{1}$$

$$\text{M'-perspective:} \quad \lambda_e^\circ = 4\pi\sqrt{3} \cdot \ell_{G'} \tag{2}$$

Both are A-side (kg-free) and dimensionally identical: $[m]$.

Geometric interpretation of M'-perspective factors:

- 4π**:** Spherical closure factor (surface area of unit sphere)
- $\sqrt{3}$**:** Cubic diagonal factor (3D Cartesian maximum extent)
- $\ell_{G'}$**:** Gravitational base length (boundary scale)

The electron is **pure M'-perspective** - all factors are geometric, no lattice anchoring required.

3.2 The Proton: M'-Perspective with Lattice Anchor

From Paper III:

$$\lambda_p^\circ = \frac{4\pi}{\sqrt{c^4}}$$

Using $\sqrt{c^4} = \sqrt{c^3} \cdot \sqrt{c}$:

$$\lambda_p^\circ = \frac{4\pi}{\sqrt{c^3}} \cdot \frac{1}{\sqrt{c}} = 4\pi\sqrt{3} \cdot \ell_{G'} \cdot \frac{1}{\sqrt{c}}$$

Theorem 2 (Proton Dual Representation)**.** The proton structural length admits two equivalent forms:

$$\lambda\text{-perspective:} \quad \lambda_p^\circ = \frac{4\pi}{\sqrt{c^4}} \tag{3}$$

$$\text{M'-perspective:} \quad \lambda_p^\circ = \frac{4\pi\sqrt{3} \cdot \ell_{G'}}{\sqrt{c}} \tag{4}$$

The factor $1/\sqrt{c}$ is the **lattice anchor**.

Structural significance: The proton cannot exist in pure M'-perspective. The $1/\sqrt{c}$ factor represents:

- **Lattice embedding** (proton bound to lattice structure)
- **Loss of roaming freedom** (unlike electron, which can move freely)
- **Required anchoring** for persistence without open HF routing

4 The Proxy Length Ladder System

From Paper V Section 3.3, we can express all structural lengths in a hierarchical ladder:

$$\lambda_e^\circ = 4\pi\sqrt{3} \cdot \ell_{G'} \quad \text{(Pure geometric)} \tag{5}$$

$$\lambda_p^\circ = \frac{\lambda_e^\circ}{\sqrt{c}} = \frac{4\pi\sqrt{3} \cdot \ell_{G'}}{\sqrt{c}} \quad \text{(Lattice anchored)} \tag{6}$$

$$\lambda_H^\circ = \frac{\lambda_p^\circ}{\sqrt{\pi}} = \frac{4\pi\sqrt{3} \cdot \ell_{G'}}{\sqrt{\pi} \cdot \sqrt{c}} \quad \text{(Seating satiated)} \tag{7}$$

$$\lambda_n^\circ = \frac{\lambda_p^\circ}{\pi} = \frac{4\pi\sqrt{3} \cdot \ell_{G'}}{\pi \cdot \sqrt{c}} \quad (\pi\text{-torsion locked}) \tag{8}$$

The ladder structure reveals:

- **Electron** is the geometric base (no denominators)
- **Proton** introduces lattice anchoring ($\div\sqrt{c}$)
- **Hydrogen** adds seating satiation ($\div\sqrt{\pi}$)
- **Neutron** adds torsion locking ($\div\pi$, stronger than $\div\sqrt{\pi}$)

Decreasing length → Increasing structural constraint:

1. **Electron** (longest): Maximum freedom, can roam via EM routing
2. **Proton** (shorter): Lattice-bound, cannot roam freely
3. **Hydrogen** (even shorter): Electron constrained by seating
4. **Neutron** (shortest): Maximum constraint, π-torsion locked

The geometric factor $4\pi\sqrt{3} \cdot \ell_{G'}$ represents the **fundamental structural unit**. All other configurations are this unit modified by constraint factors.

5 Perspective Separation and the mid_1 Operator

Within the A-side hourglass (kg-free), two perspectives coexist:

λ-Perspective (Cartesian)	**M'-Perspective (Structural)**
Length-primary: $\lambda = \text{length}$	Mass-primary: $M' = 1/\lambda$
Corridor-based expressions	Geometric factor expressions
Uses $\sqrt{c}$ powers	Uses 4π, $\sqrt{3}$, $\ell_{G'}$
"Wave-like" routing	"Mass-like" routing
Division: $4\pi/\sqrt{c^3}$	Product: $4\pi\sqrt{3} \cdot \ell_{G'}$

Both perspectives are:

- **A-side** (kg-free, dimensions in $[m, s, C']$ only)
- **Algebraically equivalent** (same numerical results)
- **Conceptually distinct** (different structural emphasis)

From Paper I, **mid**$_1$ inverts between length and inverse-length:

$$\text{mid}_1(\lambda) = M' = \frac{1}{\lambda} \quad \text{and} \quad \text{mid}_1(M') = \lambda = \frac{1}{M'}$$

In the context of dual perspectives, mid_1 converts λ-perspective $\leftrightarrow$ M'-perspective.

6 Proton as c^2 Resonator: M'-Perspective Manifestation

From recent insights, the proton **resonates at** c^2 (not c). In M'-perspective:

Proton basin structure:

- **Draws inflow** via $R_{abs} = \sqrt{G'} \cdot M'$
- **Resonates at** c^2 (squared corridor rate)
- **Reflects outward** creating multiplicative admissibility field
- **Not a sink** - it's a resonator/reflector

In M'-perspective, c^2 represents:

- **Squared corridor potential** (4 HF basin $= (\sqrt{c})^4 \sim c^2$)
- **Volumetric resonance** (not linear like $\sqrt{c}$)
- **Basin reflection rate** (how fast admissibility reflects back out)

When electron seats on proton:

1. **Proton c^2 resonance** provides cadential admissibility
2. **Electron open HF** couples to this c^2 rhythm
3. **Charge suppressed** (no longer needed for inflow redirection)
4. **Electron "fed"** by proton's reflected inflow
5. **Multiplicative field consumed** (used to support seated electron)

This creates hydrogen beating with period $t_e = \lambda_p^\circ/\sqrt{c}$.

7 Resolution of B-Side Terminology

7.1 Historical Context

Original B-side concept (Papers I-II): - Intended as "kg with m removed" (mass-primary unit system) - Separate dimensional framework parallel to A-side

LMR realization: - kg is unnecessary - use $M' = 1/\lambda$ instead - No separate unit system needed - Everything can be expressed A-side (kg-free)

7.2 Clarified Terminology

"B-side" in Papers I-V context means:

- **M'-perspective within A-side** (not separate dimensional system)
- **Geometric expressions** (4π, $\sqrt{3}$, $\ell_{G'}$) vs corridor expressions
- **Mass-primary viewpoint** using $M' = 1/\lambda$ (still kg-free)

Going forward:

- **A-side λ-perspective:** Corridor expressions ($4\pi/\sqrt{c^3}$)
- **A-side M'-perspective:** Geometric expressions ($4\pi\sqrt{3} \cdot \ell_{G'}$)
- **No ontological B-side:** Just two perspectives within A-side framework

Theorem 3 (kg Elimination)**.** After this supplement, kg is completely eliminated from LMR theory. All quantities are expressed in A-side form using dimensions $[m, s, C']$ only. Mass is represented as $M' = 1/\lambda$ (inverse length).

8 Geometric Factor Interpretation

The combination $4\pi\sqrt{3} \cdot \ell_{G'}$ represents:

- 4π**:** Closure of structural boundary (spherical completeness)
- $\sqrt{3}$**:** Extension to 3D Cartesian space (cubic diagonal)
- $\ell_{G'}$**:** Grounding at gravitational base scale

Together: The fundamental structural length unit that bridges spherical closure, Cartesian geometry, and gravitational foundations.

This is why the electron is "pure M'-perspective" - it needs no additional constraints.

9 Summary and Structural Achievement

9.1 What This Supplement Establishes

1. **Gravitational base length:** $\ell_{G'} = 1/(\sqrt{3}\sqrt{c^3})$ as fundamental unit
2. **Bridge identity:** $\sqrt{3} \cdot \ell_{G'} = 1/\sqrt{c^3}$ connecting gravity to lattice
3. **Dual representations:** Every structural length admits both λ and M' forms
4. **Systematic ladder:** Electron $\rightarrow$ Proton $\rightarrow$ Hydrogen $\rightarrow$ Neutron via constraint factors
5. **Complete kg elimination:** Only A-side dimensions $[m, s, C']$ remain
6. **Terminology resolution:** "B-side" = M'-perspective within A-side (kg-free)

9.2 The Fundamental Structural Unit

$4\pi\sqrt{3} \cdot \ell_{G'}$ emerges as the **fundamental structural length unit** in LMR:

- **All particle lengths** are this unit with various constraint factors
- **Bridges** spherical closure (4π), Cartesian geometry ($\sqrt{3}$), and gravitational foundation ($\ell_{G'}$)
- **Pure M'-perspective** - requires no lattice anchoring or torsion constraints

This unit connects:

- **Electromagnetic layer** (via electron open HF $\rightarrow q'$ routing)
- **Gravitational layer** (via $\ell_{G'} \rightarrow R_{abs}$ coupling)
- **Lattice layer** (via $\sqrt{3} \cdot \ell_{G'} = 1/\sqrt{c^3}$ identity)

9.3 Structural Coherence Achieved

The LMR framework now exhibits:

- **Single unit system:** A-side kg-free throughout
- **Dual perspectives:** λ (corridor) and M' (geometric) within same framework
- **Systematic relationships:** All configurations related via constraint factors
- **Dimensional purity:** Only $[m, s, C']$ dimensions required
- **Conceptual unity:** Lattice, EM, and gravitational layers connected by geometric factors

Paper V + Supplement V-S1 completes the foundational structure of LMR.

Document Status: Supplement V–S1 Complete
Achievement: A-side dual-perspective framework established, kg eliminated
Foundation: Ready for Paper VI (Chemistry) and beyond