Temporal–Density Framework (Volume 0): Axiomatic Geometry from a single constraint

Linear Invariance and the Emergence of Physical Structure

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Abstract

Physical theories commonly treat spacetime geometry and its associated constants as fundamental inputs. In this work, we instead examine the consequences of taking a single invariant linear constraint as primitive, allowing geometric structure to emerge only as a response to the requirement that this constraint be maintained across volumetric freedom. We show that when invariant one-dimensional propagation is required to remain isotropic within three-dimensional space, geometric resolution becomes unavoidable. Volumetric structure, isotropic closure, and effective physical parameters arise not as independent assumptions, but as necessary consequences of preserving linear invariance across space. Within this view, familiar geometric descriptions—including curvature and field structure—are recovered as secondary, descriptive conveniences for underlying tension redistribution. The analysis preserves established physical laws while reframing their origin as the outcome of a minimal ontological experiment: linear invariance meeting spatial freedom.

Contents

1 Introduction

1.1 Motivation and scope

Most physical theories begin by specifying a substantial geometric and dynamical framework: a spacetime manifold with fixed dimensionality, a metric or connection, field content, symmetry structure, and several empirical constants. These ingredients collectively determine how matter and radiation evolve, but they also introduce a large number of assumptions before any physical behaviour is derived.

In this work we explore a different ordering. Instead of taking geometry and fields as primitive, we begin with a single one-dimensional invariant: a linear propagation constraint denoted by c, introduced without any geometric interpretation or spatial embedding. The central question is how much of the familiar structure of physics must follow once this invariant is required to remain compatible with volumetric freedom.

Our aim is not to modify established laws but to clarify their origin. When invariant linear propagation is expressed within an isotropic three-dimensional setting, volumetric geometry cannot remain neutral: it must adjust to preserve the invariant. These adjustments appear as tension redistributions, from which arise the geometric features commonly attributed to curvature, the temporal and lateral projections identified with electromagnetism, and the stable closures associated with quantum behaviour.

The scope of this paper is therefore deliberately narrow. We identify the minimal ontological assumptions required to recover the structural behaviour of gravitational, electromagnetic, and quantum phenomena, treating geometry and field descriptions as secondary bookkeeping representations rather than independent inputs. No additional postulates are introduced beyond the existence of an invariant linear constraint.

Radial isotropy in this framework should not be interpreted as a return to Newtonian force laws or pre–relativistic geometry. In Newtonian mechanics, radial symmetry is an assumed property of gravitational interaction within an already existing space. Here, by contrast, radial isotropy arises as a structural necessity once volumetric addressability becomes admissible under an invariant propagation constraint. When no direction is privileged *a priori*, the only admissible redistribution of an invariant through an addressable volume is across equivalence classes of direction, yielding isotropic dilution as a consequence rather than an assumption. Inverse–square behaviour therefore reflects not a particular force model, but the minimal geometric expression of invariant conservation once spatial structure is permitted. General relativity preserves this isotropy locally by encoding it into causal and geometric structure; the present framework explains why such isotropy must appear at all, independent of the dynamical language used to describe it.

The significance of this point lies not in the form of isotropic dilution itself, but in its inevitability once invariant propagation and geometric admissibility are taken seriously.

1.2 Structure of the paper

Section 2 introduces the one-dimensional invariant and clarifies how isotropy is to be understood without presupposing spatial structure. Section 3 presents the triadic decomposition required to express the invariant within a geometric setting, emphasising its role as a dimensionless preservation condition rather than a dynamical equation. Section 4 examines how volumetric geometry emerges from enforcing the invariant, including the appearance of radial tension gradients, Lorentzian profiles, and the triadic horizon.

Section 5 shows how electric, magnetic, and gravitational descriptions arise as projections of a single isotropic tension field, and how stable volumetric closures (Coherence Loci) mediate the preservation of the invariant across extended regions. Section 6 discusses the relationship of this framework to existing physical theories, its empirical compatibility, and its implications for further development within the broader TDFT programme.

Throughout, the emphasis is on rearranging the minimal assumptions underlying familiar physical behaviour. The analysis is descriptive rather than prescriptive: it does not propose new laws but clarifies why the ones we already use have the form they do when viewed from the perspective of a single invariant meeting spatial freedom.

2 Linear Invariance as Primitive

2.1 Statement of the Invariant

We begin with a single assumption: that there exists an invariant linear propagation constraint, denoted by the constant c. This invariant is taken to be primitive and universal. No geometric, dynamical, or material interpretation is assigned to it at the outset. It is not introduced as a property of spacetime, nor as the limiting speed of any specific entity, but solely as a rule relating linear propagation to ordered advance.

The invariant acts along a single degree of freedom only. Its one–dimensional character does not denote a spatial line or embedded direction, but the rank of the constraint itself: the invariant specifies one aspect of consistency that must be preserved, independent of any additional structure that may later become admissible. Any subsequent geometric or volumetric description must therefore remain compatible with this linear constraint, which functions as a structural skeleton rather than as a spatial object.

2.2 Isotropy and One–Dimensionality

Isotropy under a one–dimensional invariant is expressed as the equivalence of all possible linear orientations, with no direction privileged *a priori*. Propagation itself remains constrained to a single degree of freedom, while isotropy is preserved through directional indifference rather than simultaneous realisation across multiple directions.

This distinction is essential. If isotropy required concurrent propagation along multiple directions, higher–dimensional structure would already be implied. By contrast, the invariant considered here enforces directional equivalence without introducing geometric extension, curvature, or metric content. Linear isotropy alone does not generate space; it defines the condition that any spatial structure must later satisfy should such structure arise.

The one–dimensional invariant therefore constrains geometry without presupposing it. Space, curvature, and volumetric structure enter only as admissible expressions consistent with the preservation of this linear ordering, not as inputs to the invariant itself.

2.3 Contrast with conventional inputs

In most physical formalisms, geometric and dynamical structure are introduced at the outset. Spacetime dimensionality, metric properties, field content, and a collection of empirical constants are typically taken as fundamental inputs, with subsequent equations formulated within this predefined setting. Curvature, field strengths, and interaction terms are then used to describe how matter and radiation evolve on, or with, the chosen geometric background.

In the present approach, none of these elements are assumed a priori. Dimensionality, metric structure, field descriptions, and effective constants are all treated as secondary. They are introduced only insofar as they are required to remain compatible with a single primitive assumption: the existence of an invariant linear propagation constraint. Geometry is not specified in advance and then populated with dynamics; instead, geometric structure is required to accommodate and preserve the invariant.

This constitutes a change in ontological ordering rather than in physical content. Established theories of gravity, electromagnetism, and quantum fields are not modified here, but regarded as successful descriptive frameworks that any admissible geometry must be able to support. The question addressed in what follows is therefore not how to explain known laws, but how little one must assume for a geometric setting to be capable of realising them.

3 Triadic Decomposition of the Linear Constraint

The preceding sections establish an invariant one-dimensional linear constraint and clarify the meaning of isotropy under such a constraint without invoking geometry or dimensional structure. We now consider the minimal form by which this invariant can be maintained when expressed within a geometric setting. This leads naturally to a triadic decomposition that is not introduced as a new postulate, but as a bookkeeping identity required to preserve linear invariance under volumetric reconciliation.

3.1 The dimensionless triad

When invariant linear propagation is required to remain globally consistent across a setting that admits geometric freedom, the linear constraint must be expressible in a form that is independent of scale, coordinate choice, and unit system. The minimal such expression is a dimensionless identity relating linear propagation, geometric accommodation, and volumetric response. We denote this identity by

$$\alpha\, c\, \lambda = 1. \tag{3.1}$$

Here c retains its role as the primitive invariant linear constraint introduced earlier. The quantities α and λ are introduced not as independent physical constants, but as volumetric accounting factors that together re-express the same linear invariance within a geometric context. The product is dimensionless, reflecting the fact that the triad encodes a preservation condition rather than a dynamical law.

3.2 Ontological ordering within the triad

It is essential to distinguish the roles played by the elements of the triad. The invariant c is taken as primitive and non-derived. By contrast, α and λ do not introduce new structure; they parameterise how the linear constraint is reconciled with geometric freedom once such freedom is admitted.

In this ordering, the triad does not define linear invariance. Instead, it records the minimal way in which linear invariance can be expressed consistently when volumetric geometry is present. The appearance of three factors reflects not an assumption of multiplicity, but the necessity of accommodating a one-dimensional constraint within a setting that admits measure, extension, and scale.

3.3 Volumetric accounting and dimensional reassociation

Although the triad is dimensionless as written, its components may be reassociated with conventional dimensional quantities when expressed in specific unit systems. This reassociation does not elevate those units to ontology, nor does it introduce empirical content. Rather, it provides a means by which the invariant linear constraint may be related to measurements performed within volumetric geometry.

In this sense, α and λ function as geometric conversion factors. They encode how linear invariance is partitioned when expressed across extended structure. Their numerical values, when defined within a given system of units, arise from this reassociation rather than from independent physical postulation.

3.4 Symbolic role of the triad

Within this framework, the triad occupies a symbolic and structural position rather than a dynamical one. It summarises the requirement that invariant linear propagation be preserved under any admissible geometric description. As such, it precedes specific field interpretations, interaction laws, or curvature descriptions.

The triad therefore earns its place at the foundation not by assumption, but by necessity. It is the minimal identity that records how a single one-dimensional invariant expresses its constraint within a resultant three-dimensional geometry. Subsequent sections examine how familiar geometric and physical structures follow from this requirement.

3.5 SI-compatibility and dimensional reassociation

The triadic identity introduced above is dimensionless and does not depend on any specific choice of units. Nevertheless, physical measurements are performed within unit systems that distinguish length, time, and mass as independent dimensional categories. When the invariant linear constraint is expressed within such systems, dimensional reassociation becomes unavoidable.

Within this reassociation, the quantities α and λ function as interfaces between the primitive linear invariant and volumetric geometric description. They do not introduce new physical content, but encode how linear propagation is partitioned and accounted for when described within an extended, measurable setting. Dimensional factors arise as a consequence of representation, not as indicators of independent ontology.

In this context, α naturally characterises the degree to which invariant linear scope is sequestered within volumetric geometry, while λ parameterises the corresponding reconciliation of that sequestration back into linear accounting. Their appearance reflects the necessity of bookkeeping across domains rather than the introduction of new primitives. The numerical values these quantities assume in a given unit system arise from this dimensional reassociation and should not be mistaken for fundamental inputs.

It is important to emphasise that this procedure does not elevate units themselves to physical principles. The linear invariant remains primary throughout. Dimensional constants emerge only insofar as they permit consistent translation between linear invariance and volumetric measurement. Subsequent sections will show how familiar physical parameters arise naturally from this reassociation once geometric structure is made explicit.

4 From Linear Invariance to Volumetric Geometry

4.1 Isotropy, radial structure, and tension

Figure 1 illustrates a two-dimensional radial slice of an isotropic setting governed by a one-dimensional invariant linear constraint. At any event, propagation is defined along a single linear direction, while isotropy is expressed through the equivalence of all radial directions. The representation does not yet introduce curvature, field structure, or dynamics; it serves solely to visualise how a linear constraint is accommodated when expressed isotropically.

When such a constraint is required to remain invariant across extended structure, radial distance becomes the sole meaningful geometric parameter. Angular degrees of freedom are redundant under isotropy and contribute only multiplicity, not additional local structure. As a result, the essential geometric behaviour is fully captured by the radial slice, with three-dimensional structure recovered through angular equivalence.

Within this radial description, the requirement that linear invariance be preserved across differing radii introduces a natural notion of tension. Here, tension is not a force nor a dynamical quantity, but a geometric measure of how invariant linear propagation is redistributed to remain consistent under radial extension. Variations in radial separation correspond to variations in this redistribution, permitting continuous profiles to be defined without introducing curvature as a primitive.

This radial structure provides the geometric stage upon which volumetric descriptions become meaningful. Subsequent sections will show how familiar volumetric behaviour arises from this tension distribution once extended geometry is made explicit.

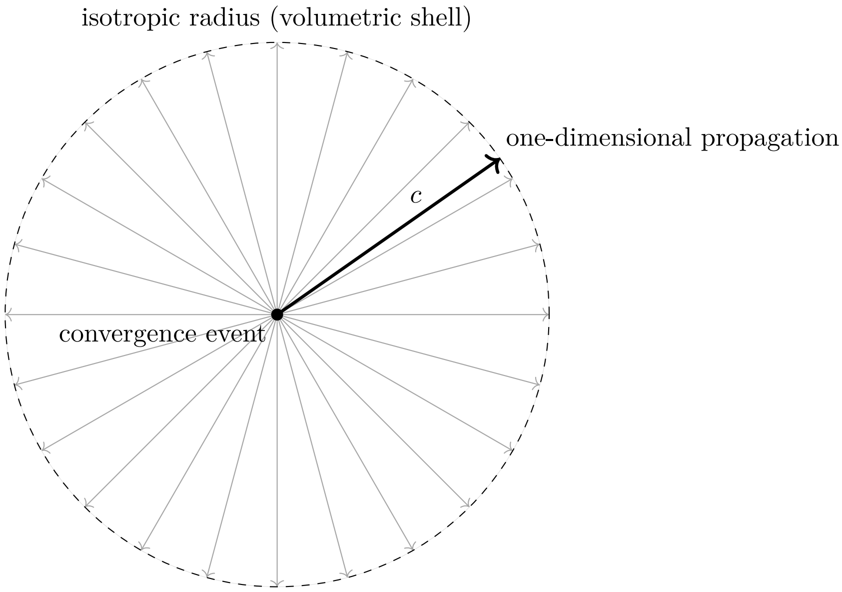

Figure 1: A two-dimensional slice of isotropic linear propagation. The invariant is realised along a single one-dimensional direction at any event (highlighted ray), while all directions remain equally admissible. The dashed circle represents an isotropic shell at fixed radius, providing the volumetric interpretation of a single linear constraint.

It is natural to ask why an isotropic radial description does not immediately constitute a three-dimensional constraint. After all, the geometry under consideration is explicitly spatial and admits extension in all directions. The distinction is subtle but essential. Although the invariant is realised equivalently along every radial direction, it does not acquire additional independent degrees of freedom by doing so. Each radial direction carries the same linear relation.

The dimensionality of the constraint is therefore not determined by the number of directions in which it may be expressed, but by the number of independent parameters it governs. In the present case, radial distance provides the sole non-degenerate geometric variable. Angular degrees of freedom introduce multiplicity without contributing additional constraint structure. The invariant remains one-dimensional in character, even as its expression becomes isotropic.

This separation between geometric extension and constraint dimensionality underlies the emergence of volumetric structure from a single linear rule. The space becomes three-dimensional, yet the governing invariant retains its linear identity, replicated uniformly across one-dimensional radial directions.

Radial isotropy in the absence of distortion The radial slice in Figure 1 represents an idealised setting in which the invariant linear constraint is realised isotropically without interruption. In such a region there are no distinguished locations, no preferred radii, and no volumetric disturbances that would require local adjustment of the invariant. The space is flat in the geometric sense used here: invariant linear propagation proceeds without bias, and isotropy is maintained everywhere without the need for additional structure.

In this undisturbed case, any putative radial "profile" of invariant redistribution is trivial. The constraint is satisfied uniformly at all radii, so there is nothing to plot beyond a constant value. No gradients appear, and no notion of local tension bias arises. No charge, matter, or vacuum rectification is required; the invariant is accommodated directly by the isotropic geometry without the introduction of convergence nodes.

This idealised regime is useful as a reference. It represents the limiting behaviour that would obtain in the complete absence of any volumetric disturbance. In practice, cosmological voids approximate this condition where matter and radiation are sufficiently dilute. Non-trivial radial structure appears only when local convergence conditions are introduced. It is in the presence of such convergence that invariant redistribution acquires a genuine radial profile, and where parameters such as α and λ become meaningful descriptors of accumulated adjustment. The next subsection addresses this onset of structure.

4.2 Localised convergence and α-induced tension

In the unperturbed case of Sec. 4.1 the radial slice encodes nothing but linear invariance: every direction is admissible, no direction is preferred, and no share of the invariant has yet been sequestered into convergence. The geometry is therefore flat in the sense that each ray carries the same null partition and no Lorentzian tension gradient has been formed.

To introduce curvature in the conventional sense while preserving the one-dimensional invariant, we now consider a localised convergence of sequestered linear scope. Let λ_{loc} denote the realised linear density associated with some compact source (a generic star or planet). The role of α in the triad

$$\alpha\, c\, \lambda = 1 \tag{4.1}$$

is then to quantify the strength of the volumetric response to this removal: it measures how strongly area elements must be tensioned in order to keep the one-dimensional invariant compatible with the presence of λ_{loc}.

In a two-dimensional radial slice, this response may be represented by a set of concentric "tension contours" centred on the convergence point. Equal increments in tension density correspond to annuli whose radii grow nonlinearly: near the source, small changes in radius produce large changes in tension, while far from the source large changes in radius produce only small changes in tension. This is the Lorentzian character of the profile. The underlying space remains isotropically flat in the linear sense, but the translation of sequestered phase into volumetric tension produces an effective curvature profile that is naturally described by a Lorentzian radial gauge.

Figure 2 shows this situation schematically. A compact central convergence (realised λ_{loc}) deforms the previously uniform radial slice into a family of tightly spaced inner contours (high α-encoded tension density) that relax towards the outer less tensioned region, where the original isotropy is recovered. No specific functional form for the profile is imposed at this stage; the diagram is intended only to make explicit that the introduction of α and λ_{loc} manifests geometrically as a Lorentzian redistribution of tension around an otherwise unperturbed one-dimensional skeleton.

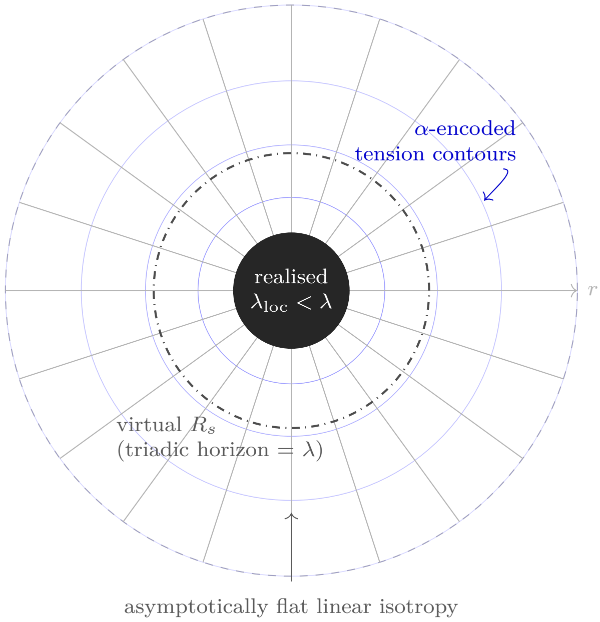

Figure 2: Lorentzian-shaped tension redistribution around a subcritical convergence. A compact source with realised linear density $\lambda_{\text{loc}} < \lambda$ sits at the centre of an otherwise unperturbed radial slice. The one-dimensional invariant skeleton (grey rays) is unchanged, while α-encoded tension contours (blue) concentrate toward the source and relax outward. The dash–dotted circle marks the virtual triadic horizon *that would form if λ_{loc} were driven to the global saturation scale λ. In conventional gravitational units this radius coincides with the Schwarzschild scale, but here it arises purely as the geometric limit of admissible volumetric accounting.*

4.3 Fully realised λ and triadic horizon closure

The Lorentzian-shaped tension gauge of Figure 2 describes a generic compact source for which the realised linear density λ_{loc} remains below the global saturation scale λ. In this regime, radial convergence is a volumetric constraint rather than a primitive obstruction: the one-dimensional invariant skeleton still appears to converge at the geometric centre, and the α-encoded tension contours merely record how strongly each shell must respond to the local sequestration.

A black-hole configuration differs in only one respect, but that difference is decisive. When

$$\lambda_{\text{loc}} = \lambda, \tag{4.2}$$

all admissible linear density has already been realised at a finite radius. Beyond that radius there is no further freedom to express the invariant as a volumetric tension profile. From the standpoint of the triad, volumetric accounting ceases to be defined there: the *horizon* is the radius at which convergence becomes an operational fact.

In the radial slice this appears as a distinguished circle, the triadic horizon, where λ_{loc} attains λ. All radial rays still geometrically *aim* toward the centre, maintaining isotropy, but their effective convergence is intercepted at this critical radius. The geometric centre remains a formal point of the radial construction, yet it no longer participates in volumetric expression. Under SI reassociation (Appendix 6.3), this critical radius coincides numerically with the Schwarzschild scale $R_s = 2GM/c^2$, but within the framework it arises purely from the saturation condition $\lambda_{\text{loc}} = \lambda$. The triad recognises only the horizon.

Figure 3 depicts this situation. The one-dimensional radial skeleton is unchanged outside R_s, but each ray now ends at the horizon rather than at the central point. The region inside the horizon is excised from the volumetric description: it carries no further information for the invariant, functioning instead as the interior of a fully realised convergence. The ink-heavy band of tension contours surrounding R_s reflects the saturation of α-encoded tension in this limit. Beyond this band, the shells relax into the asymptotically flat regime.

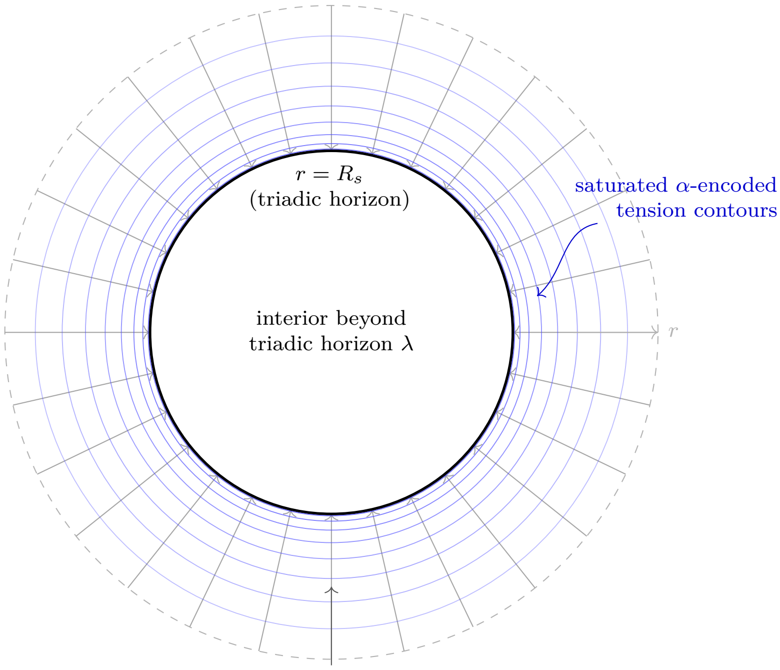

Figure 3: Fully realised λ and horizon closure. Radial invariant lines (grey) still aim geometrically toward the centre, but in the volumetric description their effective convergence is intercepted at the triadic horizon where the realised linear density attains the global saturation scale λ. No further convergence is drawn inside; the interior lies beyond admissible volumetric accounting. Saturated α-encoded tension contours (blue) crowd around the horizon and relax outward into the asymptotically unperturbed region. In SI conventions this critical radius coincides numerically with the Schwarzschild scale R_s, but within the framework it is defined solely by the saturation condition $\lambda_{\text{loc}} = \lambda$.

4.4 Volumetric projection of α: the meaning of G

The previous sections have established the role of the linear–density scale λ and the triadic horizon as geometric limits of admissible volumetric accounting. The detailed relation between λ, saturation gradients, and gravitational response is developed in Volume 1 and will not be repeated here. What remains in the present context is to clarify the physical meaning of the remaining triad element, α, and to explain how the conventional gravitational constant G arises as its representational projection.

The triad

$$\alpha\, c\, \lambda = 1 \tag{4.3}$$

is a dimensionless identity that constrains admissible U(1) configurations. Within this relation, α quantifies the *stiffness of isotropy* under sequestered convergence. It measures how strongly volumetric tension must respond to a local reduction in admissible one–dimensional propagation in order to preserve invariant consistency. In this sense, α governs the linear response of volumetric geometry to saturation deficits, independently of any particular force description or unit system.

In regimes where the realised linear density λ_{loc} remains small compared to the global capacity λ, the volumetric response is weak and admits a linearised description. Under isotropy and superposition, the only scalar profile compatible with a compact central convergence is an inverse–square radial dependence. This behaviour is not imposed but follows directly from the requirement that invariant propagation remain globally consistent under radial redistribution. In conventional language this regime is described using a scalar potential and an associated inverse–square field, but within the framework it represents nothing more than the leading-order expression of volumetric tension gradients.

The constant G enters only when this same bookkeeping is written in SI units, where acceleration and force are taken as primitive descriptors. In that representation, G acts as the conversion factor between volumetric tension gradients and the conventional measures of gravitational response. It is not an independent input to the framework. The relation between α and G is fixed by the same saturation condition that defines the triadic horizon. Under SI reassociation one finds

$$G = \frac{\alpha\, c^3}{2}, \tag{4.4}$$

with the inverse relations

$$\alpha = \frac{2G}{c^3}, \qquad \lambda = \frac{c^2}{2G}, \tag{4.5}$$

holding as consistency conditions rather than definitions.

In this view, α is the fundamental gravitational coupling. It encodes how much volumetric tension must be generated per unit deficit in admissible linear propagation in order to preserve isotropy. The gravitational constant G is what this same response looks like when expressed in the conventional language of scalar potentials and inverse–square fields. Gravity is thus recognised not as an additional interaction but as the volumetric manifestation of the requirement that invariant one–dimensional propagation remain globally consistent in the presence of sequestered convergence.

4.5 Triadic dimensional analysis and SI reassociation

The triad (4.3) is written as a dimensionless identity, $\alpha\, c\, \lambda = 1$. This expresses its role as a structural constraint rather than a dynamical law: it records how the invariant linear propagation rule may be partitioned when expressed within a measurement framework, without committing to any particular system of units. The apparent dimensional content of the triad arises only when this invariant is reassociated with conventional geometric and material bookkeeping.

When projected into SI units, the invariant c acquires dimensions of length per time, while the reassociation through Newton's constant assigns λ the dimensions of linear mass density and α the reciprocal dimensions required to preserve the dimensionless identity. These assignments do not reflect independent physical inputs; they are consequences of how volumetric freedom and mass bookkeeping are introduced in order to interface the invariant with measurement.

From this perspective, α, c, and λ are not separate constants but proportional aspects of a single constraint, distinguished only by the mode of expression adopted. Any choice of dimensional basis that preserves $\alpha\, c\, \lambda = 1$ is therefore equivalent. In practical applications, c is retained as the primitive invariant, while α and λ serve as derived volumetric descriptors determined by the reassociation (4.5). This choice reflects convenience rather than ontological priority.

The introduction of SI units should thus be understood as a reassociation step: it attaches conventional dimensional labels to the invariant in order to permit measurement and comparison, without altering the underlying content of the triad. A complete dimensional and numerical record of this reassociation is provided in Appendix B. The role of the present subsection is solely to clarify why such reassociation is necessary and why the triad itself remains dimensionally neutral.

5 Field Structure as Tension Bookkeeping

5.1 Electric and magnetic components

Having established that the volumetric response to sequestered linear propagation is encoded in the isotropic tension field, we now consider how the familiar electric and magnetic components arise as directional projections of this same structure. No new fields are introduced; the electric and magnetic descriptions follow from how isotropic tension adjusts when temporal or lateral imbalances are imposed on the invariant c.

Temporal bias and the electric component. When a localised convergence removes a portion of freely available linear propagation, neighbouring shells must adjust their isotropic tension to preserve compatibility with the invariant. If this adjustment occurs nonuniformly in time—that is, if the rate at which shells compensate for the deficit varies temporally—the resulting imbalance manifests as a *temporal bias* in the isotropic tension field. This bias is precisely what is described, in conventional electromagnetism, as an electric potential. The associated electric field corresponds to the gradient of this temporally biased tension:

$$\vec{E} \longleftrightarrow -\nabla_t \, \tau_{\text{iso}},$$

where τ_{iso} denotes the isotropic tension. In this view, the electric field is not an independent dynamical entity but a measure of how the invariant is redistributed through time in order to preserve isotropy across the volume.

Lateral redistribution and the magnetic component. Temporal variations in isotropic tension necessarily induce lateral redistribution across shells. When the compensation for a temporal bias cannot be resolved radially, volume-preserving adjustments are made in the angular directions. This lateral movement of tension constitutes a *shear tension* within the isotropic field. In conventional terms, this shear corresponds to the magnetic component:

$$\vec{B} \longleftrightarrow \nabla \times \tau_{\text{shear}},$$

where τ_{shear} denotes the lateral (angular) projection of the isotropic tension. Magnetic fields therefore arise not from any mechanism independent of electric effects, but from the geometric requirement that isotropy be preserved when temporal tension imbalance varies across the volume.

Mutual interdependence. Because both components originate from the same isotropic tension field, their mutual coupling follows directly. A time-varying temporal bias necessarily induces shear redistribution; conversely, changing shear redistribution modifies temporal balance. The familiar Maxwell relations

$$\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}, \qquad \nabla \times \vec{B} = \frac{\partial \vec{E}}{\partial t},$$

are therefore recognised as bookkeeping identities of the isotropic tension field rather than independent dynamical laws. They record the fact that preserving the one-dimensional invariant within volumetric geometry requires tension adjustments to propagate consistently in both temporal and lateral directions.

In this way, the electric and magnetic descriptions arise naturally as orthogonal projections of a single volumetric response mechanism. No separate electromagnetic ontology is required. The same isotropic tension field that encodes gravitational curvature also encodes electric bias and magnetic circulation when viewed from the appropriate geometric perspective.

5.2 Gravitational description as emergent geometry

The isotropic tension field introduced in the previous sections possesses a natural radial projection. Whenever a localised convergence removes a portion of freely available linear propagation, the surrounding shells must adjust their isotropic tension in the radial direction. This directional derivative of isotropic tension constitutes what is ordinarily described as a gravitational field. No additional interaction is introduced: gravity arises as the radial component of the same invariant-preserving tension that generates electric and magnetic effects when projected temporally or laterally.

Radial tension and the appearance of curvature. A compact source produces a non-uniform distribution of isotropic tension. The resulting Lorentzian spacing of shells—tight near the centre, more relaxed at larger radii—is a direct geometric expression of how much tension must be generated to preserve the invariant in the presence of a realised local linear density. The gradient of this radial tension determines the familiar gravitational acceleration. In this framework, curvature is not a primitive property of space but the *appearance* of radial tension differences when represented in a coordinate system that assumes uniform volumetric separation.

Metric structure as a bookkeeping device. Because the radial spacing between shells is non-uniform, any coordinate chart that attempts to assign fixed radial separations to equal tension increments will find those separations distorted. The resulting metric coefficients record this distortion. They are therefore not fundamental objects but bookkeeping devices that encode how isotropic tension varies radially. From this perspective, the spacetime metric is an integrated summary of radial tension geometry, not an independent dynamical field. Its curvature simply reflects the non-linear redistribution of invariant linear propagation around the convergence.

Geodesics as tension-aligned trajectories. A freely moving body experiences no internal forces. Its path is therefore determined by the structure of the isotropic tension field through which it travels. The least-action trajectory coincides with the path of minimal variation in radial tension. In conventional geometric language this is described as a geodesic. Here it is understood more directly: matter follows trajectories that maintain optimal alignment with the invariant under the radial tension imposed by localised convergences. Geodesic behaviour is thus a consequence of the tension field, not an independent postulate.

Horizon formation as failure of volumetric mediation. As the realised local linear density approaches the global scale λ, the radial tension gradient becomes so severe that volumetric mediation ceases to be possible. Shells can no longer adjust in a way that preserves isotropy while accommodating further convergence. The result is a triadic horizon: a finite radius at which volumetric structure terminates. From the metric perspective this appears as a divergence in curvature or the formation of an event horizon. In the present account the phenomenon is simpler. The horizon therefore represents not a failure of the invariant but its exact fulfilment: the one-dimensional constraint has been completely sequestered into the realised linear density, leaving no remaining freedom for volumetric expression.

Summary. Gravitational phenomena therefore arise from the radial projection of the isotropic tension field. The curvature attributed to spacetime is a secondary record of how radial tension varies in the presence of localised convergence. Geodesics follow the contours of this field, and horizons mark the limit at which volumetric bookkeeping breaks down. Gravity is thus not an additional interaction but a geometric manifestation of the same invariant-preserving mechanism that underlies electromagnetic behaviour.

5.3 Coherence Loci and volumetric mediation

The preceding sections have shown that preserving the invariant within volumetric geometry requires continual redistribution of isotropic tension. In regions far from any localised linear density the adjustment is uniform and trivial, while near convergences the redistribution is strongly radial and Lorentzian. Between these regimes, however, the tension field cannot remain fully continuous. To transmit the invariant across extended geometry without accumulating imbalance, the volume requires discrete *Coherence Loci*: points at which isotropy may be locally re-established before further mediation occurs.

Necessity of closures. A continuous volumetric redistribution of tension cannot indefinitely track arbitrary spatial variation. Without intermediate closures, small temporal or lateral imbalances would accumulate as unbounded shear or temporal bias. The existence of stable volumetric structures therefore demands that certain radii provide local isotropic reset points. At such locations the tension field regains a symmetric configuration, allowing the invariant to be re-expressed cleanly in the next radial layer.

Electrons and atomic shells as isotropic Coherence Loci. In conventional physical description these closures correspond to the stable occupation radii of electrons and, more generally, the coherent surfaces associated with atomic and molecular structure. In the present framework they serve a more primitive function. Each such surface acts as an isotropic mediation point: a closed shell at which radial tension is locally neutralised, shear tension is redistributed, and the invariant may pass cleanly through to the next volumetric region without accumulating distortion. The familiar quantised structure of atoms is thus interpreted as the geometric necessity of maintaining local isotropic reconciliation in the presence of non-uniform tension created by the localised sequestration of linear propagation.

Role in electromagnetic and gravitational structure. Coherence Loci do not interrupt the isotropic tension field; they stabilise it. Electric fields are sustained by temporal bias between these loci, magnetic fields by shear distributions across them, and gravitational gradients by the radial tension differences they mediate. In each case, the stability of the field depends on the presence of discrete closures that prevent runaway redistribution. Coherence Loci therefore provide the scaffolding that allows the geometric projections of the tension field to remain globally consistent.

Continuity through structured volume. Although the presence of Coherence Loci divides the volume into distinct regions, the invariant remains globally continuous. Each locus re-establishes isotropy locally, ensuring that the cumulative mediation of tension across shells does not diverge. This layered structure allows the one-dimensional invariant to be preserved across arbitrarily complex volumetric arrangements, with gravitational, electric, and magnetic phenomena arising as the structured projections of the same tension mechanism.

Summary. Coherence Loci are therefore not auxiliary physical entities but geometric necessities. They ensure that volumetric mediation of the invariant remains stable, that tension does not accumulate unchecked, and that the isotropic field can support the variety of structures observed in atomic, electromagnetic, and gravitational systems. Their existence follows not from additional physical postulates but from the requirement that a one-dimensional invariant be maintained across extended geometry.

6 Discussion and Outlook

6.1 Relation to existing formalisms

The framework developed in this paper does not modify the empirical content of general relativity, electromagnetism, or quantum theory. Each of these established formalisms remains valid within its domain. What changes here is the ordering of assumptions. Instead of beginning with geometric structure, field content, and multiple empirical constants, the analysis shows that much of this structure follows from preserving a single one-dimensional invariant across volumetric geometry.

In this view, spacetime curvature is the geometric record of radial tension gradients, electromagnetic fields are projections of tension biases across temporal and lateral directions, and quantum stability emerges from the necessity of maintaining isotropic reconciliation at discrete volumetric closures. The familiar formalisms therefore appear not as competing descriptions but as different coordinatisations of the same underlying invariant-preserving mechanism.

This reinterpretation does not seek to replace existing theories but to reveal their shared foundation. The success of general relativity and Maxwell theory becomes understandable once their governing equations are recognised as the natural bookkeeping rules of a single isotropic tension field expressed in different projection modes.

6.2 Empirical compatibility and constraints

Because gravitational, electric, and magnetic behaviour all arise as projections of the isotropic tension field, the empirical tests of these phenomena correspond to tests of how tension gradients behave in specific limits. In weak gravitational fields the radial tension profile reduces to the familiar inverse-square dependence, reproducing Newtonian gravity. Light deflection, gravitational redshift, and orbital precession follow directly from the Lorentzian spacing of tension contours. The triadic horizon yields the correct Schwarzschild radius without invoking curvature as a primitive.

Electromagnetic phenomena similarly align with observation. Temporal biases in isotropic tension reproduce electric field behaviour, while shear redistribution accounts for magnetic circulation and its coupling to temporal variation. Maxwell's equations emerge naturally as constraints ensuring that tension redistribution remains consistent across shells.

No contradictions with established measurement are introduced. Instead, observational success is explained by showing that each empirical law arises as the accessible face of a deeper invariant-preserving tension structure. Future experimental constraints therefore translate into constraints on specific projections of this field rather than on separate physical entities.

6.3 Further directions

The ontological foundation developed here sits beneath the detailed treatments provided in the broader TDFT programme. By isolating the primitive invariant and showing how geometry, fields, and effective constants emerge from its preservation, the present work supplies the base upon which more specialised analyses can be grounded. These include the gauge-cascade structure of matter, the role of entropy gradients in early-universe dynamics, the emergence of dark-matter distributions, and the geometrodynamics of coherence radii and particle thresholds.

While those developments lie beyond the scope of this paper, they become considerably simpler when viewed through the present framework. Instead of introducing new assumptions for each physical domain, one traces how the isotropic tension field responds to localised distributions of sequestered linear propagation across different symmetry regimes. The resulting picture is unified not by assertion but by construction: all physical behaviour arises from the volumetric accommodation of a single one-dimensional invariant.

The outlook is therefore not that of a new theory competing with established physics, but of a clarification. By identifying the invariant and its projections as the common thread linking geometric, electromagnetic, and quantum behaviour, we obtain a coherent, minimalist foundation from which the diversity of physical structure can be understood.

Appendix A: Terminology and Projections of the Isotropic Tension Field

For clarity we collect here the terminology used throughout the paper to describe how invariant linear propagation is redistributed within volumetric geometry. All volumetric responses to localised sequestration of linear propagation are expressed in terms of a single parent quantity: *isotropic tension*. This denotes the symmetric tension field carried by concentric shells centred on a localised convergence, representing the volumetric accommodation of the one-dimensional invariant c.

Different physical regimes correspond to directional projections of this isotropic tension field:

- **Radial tension** The component of isotropic tension that varies along convergence rays. Its gradient determines the gravitational behaviour ordinarily described as curvature or acceleration, arising from the redistribution required to preserve the invariant around a realised linear density.
- **Temporal-bias tension** A departure from uniform temporal adjustment of isotropic tension. Such bias constitutes the asymmetry responsible for electric behaviour in conventional terms: the electric field is the manifestation of non-uniform temporal re-equilibration of isotropic tension across neighbouring shells.
- **Shear tension** The lateral (angular) redistribution of isotropic tension across shells. Temporal variations inevitably induce such shear, which appears as magnetic circulation in standard electromagnetic terminology.

These components should not be regarded as distinct physical entities. They are geometric decompositions of a single invariant-preserving field. Their separation reflects projection rather than ontology: each directional component records how volumetric geometry adjusts to maintain compatibility with the one-dimensional invariant under different forms of local imbalance.

The isotropic tension field. The analysis presented in this work implies that gravitational, electric, magnetic, and quantum-stabilising behaviours share a common origin: they are distinct projections of the isotropic tension field required to preserve the invariant across volumetric freedom. Curvature, field dynamics, and volumetric closures arise not from independent assumptions but from the minimal structure needed to express a one-dimensional invariant within extended geometry.

No additional interactions or fields are postulated. The familiar divisions between physical domains emerge from observational emphasis on different projections of the same underlying structure. The isotropic tension field is therefore not an auxiliary construct but the common foundation from which gravitational and electromagnetic behaviour, as well as the existence of stable volumetric Coherence Loci, obtain their geometric and dynamical form.

Coherence Loci. A further notion used in the main text is that of a *Coherence Loci*. This term refers to a volumetric closure at which local isotropy is re-established so that the invariant may be relayed consistently across regions of non-uniform tension. Such loci do not introduce new degrees of freedom or field content; they are geometric consequences of the tension landscape itself. An isotropic Coherence Loci marks the location where radial, angular, and temporal tension projections reconcile to maintain compatibility with the one-dimensional invariant c. Familiar examples include stable atomic shells and other volumetric closures that enforce isotropy within their neighbourhoods.

Appendix B: Dimensional Reassociation and the Invariant Triad

The triadic identity

$$\alpha\, c\, \lambda = 1$$

is intrinsically dimensionless and does not depend on any particular system of units. Throughout the main text, the parameters α, c, and λ are treated as primary geometric quantities governing admissible propagation and volumetric accounting in the U(1) regime.

This appendix records how the invariant is expressed when represented in SI conventions, where length, mass, and time are taken as independent dimensional primitives. The purpose of this reassociation is not to establish the triad as an empirical result, but to demonstrate that no choice of dimensional bookkeeping can introduce independent content into a relation that is dimensionless by construction. The components (α, c, λ) do not possess independent ontological status; their dimensions reflect only how the invariant is partitioned when volumetric extension is assigned units.

Dimensional assignments

Using SI conventions,

$$[c] = \mathrm{m\,s^{-1}}, \qquad [G] = \mathrm{m^3\,kg^{-1}\,s^{-2}},$$

the reassociation implied by the saturation (horizon) condition yields

$$\lambda_{\mathrm{SI}} = \frac{c_{\mathrm{SI}}^2}{2G}, \qquad \alpha_{\mathrm{SI}} = \frac{2G}{c_{\mathrm{SI}}^3}. \tag{6.1}$$

From these expressions one obtains

$$[\lambda] = \mathrm{kg\,m^{-1}}, \qquad [\alpha] = \mathrm{s\,kg^{-1}},$$

which satisfy

$$[\alpha\, c\, \lambda] = (\mathrm{s\,kg^{-1}})\,(\mathrm{m\,s^{-1}})\,(\mathrm{kg\,m^{-1}}) = 1.$$

The invariant is therefore dimensionless regardless of unit system; SI factors merely distribute the dimensional content of the invariant across the three components.

Numerical reassociation

Using standard CODATA values for the SI reassociation, the numerical expressions for the triad components are

$$\begin{aligned}\alpha_{\mathrm{SI}} &\approx 4.95844 \times 10^{-36}\,\mathrm{s\,kg^{-1}},\\ c_{\mathrm{SI}} &= 2.99792458 \times 10^{8}\,\mathrm{m\,s^{-1}},\\ \lambda_{\mathrm{SI}} &\approx 6.72890 \times 10^{26}\,\mathrm{kg\,m^{-1}}.\end{aligned}$$

Although these quantities occupy widely separated numerical scales when written in SI units, their product evaluates identically to unity,

$$\alpha_{\mathrm{SI}}\, c_{\mathrm{SI}}\, \lambda_{\mathrm{SI}} = 1,$$

with any apparent deviation attributable solely to rounding of intermediate quantities. This confirms that the SI reassociation preserves the invariant closure relation without introducing additional numerical structure.

Interpretation

This reassociation should not be interpreted as evidence that α, c, or λ represent independent physical constants. Only the invariant itself is primitive. The dimensional assignments above arise solely from representing the one-dimensional invariant within a volumetric measurement framework.

In particular, the appearance of the gravitational constant G does not reflect a fundamental input. It emerges as a derived bookkeeping parameter according to

$$G = \frac{\alpha\, c^3}{2},$$

which follows directly from the SI reassociation of the invariant. Empirical measurements of G therefore correspond to the volumetric expression of invariant preservation within SI conventions, not to an independent dynamical constant.

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