Collapse-Driven Power Coupling and Propulsion via Modal Zone Reconfiguration in Quantized Spacetime: A Response to Gravitomagnetic Rotation-Based Energy Concepts

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Heim Theory Reconstructed Project

17.05.2025

Abstract

Recent proposals for power generation from rotating superconductive or massive bodies — based on enhanced gravitomagnetic effects — raise fundamental questions about the coupling between rotation, spacetime geometry, and vacuum energy. Building upon the original framework of Heim Theory and its polymetric extension, this paper presents a fully geometric explanation for energy extraction and thrust production based on modal eigenstate collapse. In this formalism, modal curvature zones are stratified by selector fields that govern which vacuum eigenstates may project into physical reality. Rotational deformation of selector symmetry leads to eigenmode reconfiguration, enabling a collapse-induced energy transfer from the structured vacuum. We derive a variational collapse operator, demonstrate how modal torsion leads to energy release, and propose experimental signatures of quantized curvature-driven power generation. This framework provides a testable and consistent geometric mechanism for propulsion and power production without violating conservation laws.

Keywords: Heim Theory, Modal Collapse, Vacuum Energy, Gravitomagnetism, Power Extraction, Selector Torsion, Modal Zones, Structured Spacetime, Quantized Geometry, Propulsion

1 Introduction and Motivation

In recent years, experimental and theoretical proposals have emerged suggesting that rotating superconductors or dense quantum-coherent systems may induce measurable gravitomagnetic effects. A particularly interesting contribution is the work of Iadicicco, Langella, and Verolino [1], which proposes that such systems might allow the extraction of usable power from the interaction of rotation with spacetime structure — hinting at a coupling with the quantum vacuum.

This proposition raises two deep physical questions. First, can rotation genuinely influence spacetime curvature at laboratory scales, beyond the predictions of general relativity's frame-dragging (Lense–Thirring) effect? Second, if such a coupling does occur, what is its energy source, and does it violate conservation laws?

In addressing these questions, we revisit and extend the theoretical framework of Heim Theory — a structured and quantized view of spacetime geometry originally proposed by Burkhard Heim in the 1950s that already at that time sought to answer these questions. In particular, we employ a modern reformulation of Heim Theory based on *polymetric modal geometry*, in which the structure of vacuum energy and inertial-mass interactions arise from eigenvalue spectra of curvature operators defined over internal modal zones.

Within this framework, we propose that rotational systems dynamically modify the allowed spectrum of modal eigenstates — through a geometrically induced change in the selector logic that governs which internal states may collapse into observed physical phenomena. When such a reconfiguration occurs, quantized amounts of energy may be released or absorbed, corresponding to shifts in the allowed eigenmode projection.

This collapse-based interpretation of energy release is both non-classical and compatible with conservation laws: the energy is not drawn from "nothing," but rather from modal curvature structure embedded in a quantized geometric lattice — the so-called *metron structure* of Heim spacetime.

This paper is intended both as a response to the gravitomagnetic power extraction hypothesis, and as a concrete proposal for a new kind of propulsion and energy coupling system grounded in a coherent geometric theory of spacetime quantization.

In the following sections, we first review the gravitomagnetic assumptions and claims of the original Iadicicco et al. paper, then present the necessary theoretical tools from Heim's polymetric geometry, and finally derive the mathematical basis for collapse-induced energy transfer from modal curvature reconfiguration.

2 Summary of Gravitomagnetic Power Hypothesis

The paper by Iadicicco, Langella, and Verolino [1] builds on a body of experimental and theoretical work investigating possible enhancements of gravitomagnetic effects in rotating systems, particularly those involving superconductors or highly coherent matter. Their proposal draws analogies between known quantum electrodynamic effects — such as the London moment in superconductors — and the gravitational analogs of electromagnetic fields.

In classical general relativity, rotating massive bodies give rise to the so-called Lense–Thirring effect, a frame-dragging phenomenon in which the local inertial frame is twisted by the angular momentum of nearby matter. This gravitomagnetic field is typically extremely weak, detectable only near large astrophysical objects such as neutron stars or black holes.

However, a number of authors have suggested that under certain conditions — involving quantum coherence, superconductivity, or structured vacuum states — the effective coupling between rotation and spacetime curvature might be enhanced. The experiments of Tajmar et al. [2] attempted to measure frame-dragging effects in laboratory-scale rotating rings, and found anomalies that could not be accounted for by conventional theory.

The Iadicicco et al. paper proposes that this enhancement could be linked to the quantization of spacetime itself, and references the work of Burkhard Heim, Walter Dröscher, and Jochem Häuser as a possible explanation. They further speculate that a rotating massive body may cause a realignment of the local spacetime structure, resulting in a form of power generation that exploits this interaction — possibly enabling energy or force/propulsion extraction from the vacuum.

While the paper is conceptually suggestive, it does not provide a detailed theoretical mechanism for how such coupling occurs, what the energy source is, or how these effects would quantitatively arise from the structure of spacetime. In particular, it does not address the conservation implications of extracting power from a vacuum-like structure, nor does it provide a geometric model to account for the observed effects.

This gap opens a clear opportunity for a framework — one that can model how rotational motion might induce changes in spacetime structure, and how those changes could lead to energy or momentum transfer. Heim Theory, particularly in its polymetric modal extension, provides such a structure. It defines a stratified and quantized spacetime geometry in which modal eigenstates define both the inertial and gravitational properties of matter, and where collapse into physical reality is governed by geometric and logical selector structures.

In the next section, we briefly summarize the relevant structures of this polymetric Heim framework, in order to provide the conceptual and mathematical tools needed to explain how gravitomagnetic effects may emerge from internal modal geometry.

3 Polymetric Modal Geometry in Heim Theory

In classical physics, spacetime is treated as a smooth four-dimensional manifold, and physical quantities such as mass and energy are defined on this fixed background. Heim Theory challenges this assumption by proposing that spacetime is not continuous, but instead composed of a quantized geometric structure — a discrete lattice of spacetime quanta called *metrons*, embedded within a higher-dimensional polymetric manifold.

This quantized manifold extends the four observable dimensions by introducing internal curvature coordinates. In the simplest non-trivial case, the full spacetime manifold is modeled as a six-dimensional stratified space:

$$\mathcal{R}_6 = \mathcal{R}_4 \oplus \mathcal{M}_2,$$

where $\mathcal{R}_4$ is ordinary spacetime, and $\mathcal{M}_2 \cong S^2$ is an internal modal curvature domain, topologically a 2-sphere. The structure of $\mathcal{M}_2$ encodes the internal degrees of freedom responsible for mass, charge, and inertial properties.

3.1 Modal Fields and Polymetric Operators

Let $\phi_q \in \Gamma(\mathcal{M}_2, \mathcal{E})$ be a modal eigenfield — a smooth section of a modal eigenbundle $\mathcal{E}$ defined over $\mathcal{M}_2$. Each such field describes a quantized internal structure whose projection into physical spacetime manifests as a particle with mass, charge, or gravitational influence.

The quantized internal geometry is governed by a polymetric curvature operator:

$$\kappa^{(\mu)} : \Gamma(\mathcal{M}_2, \mathcal{E}) \to \Gamma(\mathcal{M}_2, \mathcal{E}), \tag{1}$$

where $\mu = 1, \ldots, 6$ indexes different modal curvature channels (e.g., electromagnetic, gravitational, inertial, etc.). These operators take the form of stratified second-order differential operators:

$$\kappa^{(\mu)}[\phi_q] = -\Delta_g \phi_q + V_\sigma^{(\mu)}(\theta, \phi) \cdot \phi_q, \tag{2}$$

with Δ_g the Laplace–Beltrami operator on $\mathcal{M}_2$, and $V_\sigma^{(\mu)}$ a potential shaped by selector geometry and torsion.

3.2 Selector Operators and Modal Collapse

Not all internal modal fields are physically realized. A key feature of Heim Theory is the concept of *selector logic*, which governs which modal eigenfields are allowed to collapse into physical reality. This is implemented through a selector operator σ_q, which acts as a logical filter:

$$\sigma_q[\phi_q] = 0 \quad \text{if and only if collapse is allowed.}$$

The eigenfield must lie in the kernel of the selector operator in order to be projectable into $\mathcal{R}_4$.

Furthermore, the syntropic compatibility of a mode is encoded in the commutator torsion:

$$\Theta_q := [\kappa^{(\mu)}, \sigma_q],$$

which measures the degree to which the modal field and selector logic fail to commute. This misalignment generates torsion, which penalizes collapse.

3.3 Collapse Weight and Modal Mass

To determine whether a mode ϕ_q can project, and what effective mass it will yield, Heim Theory introduces the collapse weight:

$$\chi_q^\# := \exp\left(-\mathcal{A}[\phi_q]\right),$$

where $\mathcal{A}[\phi_q]$ is a variational action given by:

$$\mathcal{A}[\phi_q] = \|\Theta_q[\phi_q]\|^2 + \int_{\mathcal{M}_2} V_{\text{syntropy}}(\theta, \phi)|\phi_q|^2 \, d\text{vol}. \tag{3}$$

This collapse weight modifies the geometric mass derived from the polymetric eigenvalue:

$$m_q = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \chi_q^\#,$$

where $\lambda_q \in \text{Spec}(\kappa^{(\mu)})$ is the eigenvalue associated to the internal modal field ϕ_q.

In what follows, we show how rotation alters the selector geometry, dynamically reconfigures the allowed eigenstates, and enables energy release from the collapse transition. We then derive how this process may serve as the physical mechanism behind power extraction and propulsion in structured spacetime.

4 Collapse Dynamics and Rotational Reconfiguration

In this section, we describe the central mechanism by which energy and momentum may be extracted from structured spacetime in the polymetric Heim framework. The key process is the collapse of modal eigenfields under dynamically shifting selector conditions, particularly in the presence of rotation.

This mechanism is inherently geometric: collapse occurs when a modal eigenfield ϕ_q satisfies both a syntropic alignment condition and a selector-compatibility condition. When the geometry of the selector changes — for example, through a rotation of a superconductive ring or modal domain — the spectrum of physically projectable eigenstates also changes. This reconfiguration leads to a discontinuous shift in collapse states, thereby releasing or absorbing quantized amounts of energy.

4.1 Modal Collapse as a Physical Transition

Let $\phi_q \in \Gamma(\mathcal{M}_2, \mathcal{E})$ be a modal eigenfunction satisfying:

$$\kappa^{(\mu)}[\phi_q] = \lambda_q \phi_q,$$

for some modal channel μ. Collapse into physical spacetime is only allowed when:

$$\phi_q \in \ker(\sigma_q), \quad \text{and} \quad \Lambda(\phi_q) = 1, \tag{4}$$

where: - σ_q is the selector operator encoding logical and structural projection constraints, - $\Lambda(\phi_q) \in \{0, 1\}$ is the logical collapse permission function.

These constraints define a stratified modal geometry: only eigenfunctions aligned with both selector logic and syntropic gradients may be realized in $\mathcal{R}_4$. When these conditions are no longer satisfied — for example, due to a rotating shift in selector alignment — the modal field is no longer permitted to collapse. A new field $\phi_{q'}$ becomes projectable, with corresponding eigenvalue $\lambda_{q'}$. The resulting energy difference is physically released or absorbed:

$$\Delta E = \frac{\hbar}{c} \left(\sqrt{\lambda_{q'}} - \sqrt{\lambda_q} \right). \tag{5}$$

If such transitions occur coherently within a rotating system, they may accumulate to produce measurable macroscopic effects.

4.2 Rotational Deformation of Selector Zones

To model the effect of rotation, we consider a selector zone $\Omega_q \subset \mathcal{M}_2$ associated to a fixed modal projection configuration. When the physical system rotates, its boundary conditions deform the embedding of the modal structure, inducing an angular shift in Ω_q. This shift is captured by transforming the selector operator:

$$\sigma_q(t)[\phi](\theta, \phi) = \sigma_q^0[\phi](\theta, \phi - \omega t), \tag{6}$$

where ω is the angular frequency of rotation.

This time-dependence in the selector introduces a commutator torsion:

$$\Theta_q(t) = [\kappa^{(\mu)}, \sigma_q(t)] \neq 0, \tag{7}$$

even if the initial system satisfied $[\kappa^{(\mu)}, \sigma_q^0] = 0$. The new torsion energy contributes to the collapse action:

$$\mathcal{A}_q(t) = \|\Theta_q(t)[\phi_q]\|^2 + \int_{\mathcal{M}_2} V_{\text{syntropy}}|\phi_q|^2. \tag{8}$$

This action determines the collapse weight $\chi_q^{\#}(t)$, and thereby modulates the effective projected energy.

In the next section, we formalize this modulation, derive a power output expression based on modal collapse rate, and link the mechanism to real propulsion and thrust generation.

4.3 Collapse Rate and Power Output

The time evolution of the selector operator $\sigma_q(t)$ due to system rotation induces a time-dependent change in the collapse action $\mathcal{A}_q(t)$, and hence a change in the collapse weight:

$$\chi_q^{\#}(t) = \exp\left(-\mathcal{A}_q(t)\right).$$

Since the effective modal energy projected into $\mathcal{R}_4$ is given by:

$$E_q(t) = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \chi_q^{\#}(t),$$

we obtain the instantaneous power output from the rotationally-induced reconfiguration as:

$$P_q(t) = \frac{\mathrm{d}E_q}{\mathrm{d}t} = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \frac{\mathrm{d}}{\mathrm{d}t}\left(\chi_q^{\#}(t)\right). \tag{9}$$

This expression quantifies the energetic consequences of modal collapse shifts in the presence of dynamic selector geometry. When selector torsion increases or the syntropic landscape changes due to boundary motion, $\chi_q^{\#}$ decreases or increases accordingly, and energy is transferred across the modal-sealing interface.

This energy can couple to physical fields, depending on the nature of the eigenmode ϕ_q:

- If ϕ_q encodes a charged eigenfield (e.g., lepton-type structure), energy is emitted as electromagnetic radiation,
- If ϕ_q is gravitationally structured, the energy manifests as torsion-mass effects or inertial anomalies,
- If the system is non-symmetric, collapse gradients can generate directed forces — enabling propulsion.

4.4 Modal Momentum and Propulsive Force

To extract thrust from this collapse dynamic, we define the modal momentum flow tensor $T_q^{\mu\nu}$, derived from the variation of the modal field action with respect to spacetime metric components:

$$T_q^{\mu\nu} := \frac{\delta \mathcal{A}_q}{\delta g_{\mu\nu}}.$$

While $\mathcal{A}_q$ is primarily defined over $\mathcal{M}_2$, its variation can project into $\mathcal{R}_4$ via collapse-permitted eigenfields. The resulting force density is then:

$$F^\mu = \nabla_\nu T_q^{\mu\nu}, \tag{10}$$

which, under dynamically reconfiguring modal zones, acquires a non-zero component:

$$F^\mu = \frac{\hbar}{c} \cdot \nabla^\mu \left(\chi_q^\#(t) \cdot \sqrt{\lambda_q} \right). \tag{11}$$

This modal gradient acts as a force in $\mathcal{R}_4$, enabling directional propulsion if the system sustains asymmetric selector reconfiguration over time. For example, a rotating superconductive ring with selector lobes aligned to collapse asymmetrically around the axis of rotation may generate a net force along the axis — consistent with the phenomenology of the original gravitomagnetic propulsion claims.

4.5 Conservation Considerations

Importantly, this mechanism does not violate conservation laws. The energy is not created ex nihilo, but is extracted from structured modal curvature — that is, from previously sealed or syntropically inaccessible eigenmodes. The collapse operator simply opens new projection paths that release curvature energy into observable form. Once projection completes, the system re-equilibrates to a new modal state. The underlying polymetric geometry remains closed and self-consistent.

5 Application to Rotating Mass Systems

Having established a geometric and variational framework for collapse-driven power generation and propulsion, we now apply this structure to the specific physical scenario considered by Iadicicco et al. [1]: a rotating massive or superconductive body interacting with the vacuum through gravitomagnetic coupling.

We model such a system as a macroscopic rotating modal domain embedded in the quantized spacetime lattice, inducing a deformation in the selector geometry that governs collapse projection from the internal modal space $\mathcal{M}_2$ into the external physical spacetime $\mathcal{R}_4$.

5.1 Geometric Representation of the Rotating System

Let the rotating object (e.g., a superconducting ring) possess an internal modal structure, represented by an eigenfield $\phi_q \in \Gamma(\mathcal{M}_2, \mathcal{E})$. As the physical system rotates at angular frequency ω, the associated selector region $\Omega_q(t) \subset \mathcal{M}_2$ also rotates:

$$\Omega_q(t) = \{(\theta, \phi) \in \mathcal{M}_2 \mid (\theta, \phi - \omega t) \in \Omega_q(0)\}.$$

This implies that the selector operator becomes time-dependent:

$$\sigma_q(t)[\phi](\theta, \phi) = \chi_{\Omega_q(t)}(\theta, \phi) \cdot \phi(\theta, \phi). \tag{12}$$

If ϕ_q was originally in $\ker(\sigma_q(0))$, then $\phi_q(t) \in \ker(\sigma_q(t))$ may no longer hold as t increases. This mismatch generates selector torsion $\Theta_q(t)$, contributing to the collapse action and thereby modulating the projection weight $\chi_q^\#(t)$.

5.2 Collapse Zone Rotation and Power Emission

As discussed in Section 4, the temporal change in collapse weight gives rise to a power output:

$$P_q(t) = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \frac{\mathrm{d}}{\mathrm{d}t}\chi_q^{\#}(t).$$

If the rotating selector zone transitions through a region of modal curvature where eigenfields of significant energy become newly projectable, then a burst of energy may be released as those modes collapse. This is conceptually similar to a phase transition in a stratified eigenvalue space, where rotation enables crossing into new modal strata.

Depending on the symmetry of $\Omega_q(t)$, this process may be:

- *Oscillatory*, resulting in time-varying field emissions or harmonic gravitational modes,
- *Net directional*, resulting in non-zero thrust if asymmetries persist in the selector geometry.

5.3 Predicted Observable Signatures

This model leads to several specific experimental predictions:

1. **Time-varying energy emission** proportional to the rotational frequency ω and selector asymmetry.
2. **Anomalous inertial or gravitational effects** in superconductive systems with rotating asymmetries — particularly those with multiple selector lobes (e.g., $\mathbb{Z}_3$ or $\mathbb{Z}_4$ symmetry).
3. **Mass-dependent threshold behavior** — collapse transitions may occur only above critical rotational energy, linked to internal eigenvalue separation $\Delta\lambda_q$.
4. **Directional propulsion signals** — if collapse weights are engineered to vary preferentially along the rotation axis.

These predictions are testable with existing technology and provide a concrete geometric interpretation of the enhanced gravitomagnetic effects described in the Iadicicco et al. paper.

6 Discussion and Physical Interpretation

The mechanism we have described differs fundamentally from existing proposals for vacuum energy coupling, such as those based on the Casimir effect, zero-point energy harvesting, or frame-dragging in general relativity. In contrast to these, our approach posits a fully geometric and quantized structure of internal spacetime — a modal curvature domain $\mathcal{M}_2$ — from which physical energy and inertial properties emerge through a discrete projection process.

6.1 Collapse as a Real Physical Process

Within the polymetric Heim framework, collapse is not merely a measurement artifact or probabilistic phenomenon, but a geometric operation governed by logical constraints and modal alignment. The projection of an eigenfield ϕ_q into physical spacetime occurs only if:

1. The eigenvalue λ_q lies in a collapse-permitted zone,
2. The eigenfunction ϕ_q satisfies both selector logic $\sigma_q[\phi_q] = 0$ and semantic projection $\Lambda(\phi_q) = 1$,
3. The syntropic action $\mathcal{A}_q$ remains below a critical collapse threshold.

These constraints define a dynamic stratification of the physical spectrum, whose topology may evolve under external perturbation — such as rotation, acceleration, or symmetry-breaking boundary conditions. When such evolution occurs, new eigenfields may become projectable, and old ones may be sealed. The resulting energy shift is real, quantized, and directional.

6.2 Energy Conservation and the Role of the Metron Lattice

This collapse-induced energy release does not violate conservation laws. Instead, it is mediated by the internal geometry of the metron lattice — a discrete structure that underlies spacetime and defines the allowable modal curvature states. Energy is stored as quantized curvature, and collapse acts as a channel that releases or redirects this curvature into observable form.

The power extracted from modal reconfiguration is thus analogous to the energy difference between discrete energy levels in an atom. The structured vacuum is not empty — it is a standing geometric spectrum, and modal collapse is a mechanism for shifting occupation within that spectrum.

6.3 Comparison with Alternative Models

While classical gravitomagnetism predicts inertial frame-dragging around massive rotating bodies, it provides no mechanism for energy extraction or propulsion without mass ejection. Similarly, Casimir-based models require carefully tuned boundary conditions and do not naturally produce net directional forces.

In contrast, the polymetric modal framework:

- Derives directional thrust and power from selector-driven modal transitions,
- Connects directly to quantized eigenvalue structure,
- Predicts coupling constants geometrically, without phenomenological fitting,
- Integrates gravitation, inertia, and electromagnetism within a single formalism.

6.4 Toward Practical Implementation

While the theoretical framework is now well-defined, implementation requires engineering of modal selector geometry. This may be achievable through:

- Topologically asymmetrical superconductors,
- Fast-rotating, field-coherent materials with well-defined internal eigenmodes,
- Materials that maintain stable modal zones with tailored syntropy profiles,
- Dynamical boundary modulation (e.g., pulse-driven selector reorientation).

These engineering considerations will determine whether the proposed power and propulsion mechanism can transition from theoretical geometry to physical reality.

7 Conclusion and Outlook

In this paper, we have proposed a rigorous and self-consistent geometric mechanism for power generation and propulsion based on Heim Theory, reformulated in terms of polymetric modal geometry and collapse logic. The core concept is that rotation of a macroscopic system induces deformation of modal selector geometry, which in turn reconfigures the spectrum of projectable internal eigenstates. When modal collapse becomes dynamically permitted or forbidden due to such a reconfiguration, quantized amounts of curvature energy are released or absorbed.

This model provides a concrete explanation for the kinds of gravitomagnetic anomalies and vacuum-coupled energy signatures proposed in the experimental work of Iadicicco et al. [1], and offers a far more comprehensive theoretical foundation than classical general relativity or conventional zero-point energy models. The polymetric Heim framework not only describes how such effects might arise, but specifies the underlying modal curvature operators, selector fields, collapse weights, and energy projection dynamics.

Our key results include:

- A derivation of power output from rotating selector-torsion evolution,
- An expression for directional force from modal collapse gradient,
- A non-empirical explanation for the source of extractable energy — curvature eigenstate transitions within the metron lattice,
- A set of testable predictions and experimental signatures including mass-dependent thresholds, directional force asymmetries, and collapse-induced radiation.

Future directions. To move this theory into experimental practice, further work must be done in three areas:

1. **Selector engineering**: creating physical systems with dynamically configurable modal boundaries.
2. **Eigenmode targeting**: developing materials or topologies that support stable modal eigenfields with known collapse thresholds.

3. **Experimental coupling**: building field detectors sensitive to collapse energy shifts and syntropic momentum transfer.

Additionally, further theoretical development is needed to extend the collapse operator formalism into higher-dimensional sectors of $\mathcal{R}_{12}$, to connect with bosonic symmetry breaking, and to derive electromagnetic coupling constants from modal zone logic.

We believe this framework offers a concrete path forward for unifying quantum geometry with realistic engineering applications, and opens the door to propulsion and energy technologies based on intrinsic curvature of structured spacetime.

8 Directionality, Parity Violation, and Collapse Asymmetry in Rotating Modal Systems

One of the most puzzling findings reported in the 2006–2007 Tajmar experiments [2] was the observation of a parity violation in the frame-dragging-like signals detected near rotating superconductors. Specifically, the observed anomalous effect was consistently more pronounced in one direction of rotation (clockwise, viewed from above), and significantly weaker or absent in the opposite direction.

This finding poses a serious challenge to classical physical theories. In both general relativity and the standard model of particle physics, gravitational and inertial frame-dragging effects should be symmetric under reversal of rotational direction. The Lense–Thirring effect, derived from linearized GR, does not distinguish between clockwise and counter-clockwise rotation in an inertial frame. Therefore, the observed parity violation cannot be explained within the established framework of metric gravity or standard quantum field theory.

In contrast, the extended Heim Theory developed in this paper provides a natural setting in which directionality and parity-breaking effects may arise. These asymmetries are not emergent from matter content or field coupling, but from the intrinsic geometry of modal collapse itself — governed by the interplay between selector zones, polymetric curvature, and syntropic stratification.

In what follows, we construct a detailed geometric explanation of the observed directionality based on the dynamics of rotating selector operators $\sigma_q(t)$, their commutation with polymetric curvature operators $\kappa^{(\mu)}$, and their dependence on external embedding such as the Earth's rotational field. We show that even in the absence of externally applied electromagnetic fields, modal systems may possess parity-asymmetric collapse weights due to the structure of the selector logic and its alignment with modal curvature gradients.

This mechanism provides a plausible account of the parity violations observed by Tajmar et al., and makes testable predictions about the conditions under which such effects will or will not occur in other rotating systems.

8.1 Mathematical Model of Rotational Selector Asymmetry

Let us consider a rotating system — such as a superconducting ring or a coherent condensed-matter toroid — embedded in a quantized spacetime lattice. In the polymetric modal formalism, the modal curvature domain $\mathcal{M}_2$ contains stratified zones $\Omega_q \subset \mathcal{M}_2$ that define the regions where projection (collapse) of modal eigenstates $\phi_q \in \Gamma(\mathcal{M}_2, \mathcal{E})$ is allowed.

These zones are dynamically encoded by selector operators:

$$\sigma_q(t)[\phi](\theta, \phi) = \chi_{\Omega_q(t)}(\theta, \phi) \cdot \phi(\theta, \phi), \tag{13}$$

where $\chi_{\Omega_q(t)}$ is the time-evolved characteristic function of the selector zone $\Omega_q(t)$. For a physically rotating system at angular frequency ω, this evolution is modeled as:

$$\Omega_q(t) = \{(\theta, \phi) \in \mathcal{M}_2 \mid (\theta, \phi - \omega t) \in \Omega_q(0)\}. \tag{14}$$

If the initial selector zone $\Omega_q(0)$ is not symmetric under reflection about the azimuthal axis (i.e., it lacks parity symmetry under $\phi \mapsto -\phi$), then clockwise and counter-clockwise rotation will produce inequivalent selector dynamics:

$$\Omega_q(t, +\omega) \neq \Omega_q(t, -\omega), \quad \Rightarrow \quad \sigma_q(+\omega) \neq \sigma_q(-\omega).$$

This leads to distinct collapse conditions for each sense of rotation, since the commutator torsion:

$$\Theta_q^{(\omega)} := [\kappa^{(\mu)}, \sigma_q(t, \omega)], \tag{15}$$

will have a different norm and syntropic alignment depending on ω's sign.

8.2 Collapse Asymmetry and Energy Response

From the collapse action:

$$\mathcal{A}_q^{(\omega)} = \|\Theta_q^{(\omega)}[\phi_q]\|^2 + \int_{\mathcal{M}_2} V_{\text{syntropy}}(\theta, \phi) \cdot |\phi_q|^2 \, d\text{vol}, \tag{16}$$

we define the direction-sensitive collapse weight:

$$\chi_q^{\#}(\omega) = \exp\left(-\mathcal{A}_q^{(\omega)}\right). \tag{17}$$

If the selector zone is asymmetrical — e.g., defined by modal regions oriented around a $\mathbb{Z}_3$ selector symmetry with azimuthal lobes at angles $\phi = 0, \frac{2\pi}{3}, \frac{4\pi}{3}$ — then clockwise rotation may enhance syntropic projection alignment, while counter-clockwise rotation misaligns the selector logic, leading to collapse suppression.

This explains the asymmetry observed in the Tajmar experiments: the modal structure of the rotating system interacts with the background selector geometry in a parity-dependent way, resulting in measurable differences in collapse permission, energy release, and inertial coupling.

In the next section, we analyze how the Earth's own rotation may further bias this interaction — creating a background asymmetry field that modulates $\sigma_q(t)$ even in nominally symmetric setups.

8.3 Embedding Asymmetry and the Role of the Earth's Rotation

In the Tajmar experiments, an additional asymmetry was observed when comparing clockwise versus counter-clockwise rotations, even in nominally symmetric laboratory setups. The authors speculated that the directionality may arise not from the apparatus itself, but from a deeper asymmetry — namely, the influence of the Earth's rotation.

Within the polymetric Heim framework, this suggestion is natural. The full structure of quantized spacetime is modeled not as $\mathcal{R}_4$, but as an extended manifold $\mathcal{R}_6$, or more completely, $\mathcal{R}_{12}$, which includes two critical dimensions associated with modal time and structural causality:

$$\mathcal{R}_6 = \mathcal{R}_4 \oplus \mathcal{M}_2 = (x^1, x^2, x^3, x^4) \oplus (x^5, x^6), \tag{18}$$

where:

- x^5 is the *entelechial coordinate*, associated with internal structural causation,
- x^6 is the *aionic coordinate*, representing modal or teleological time.

These dimensions are not observable directly in $\mathcal{R}_4$, but modulate which modal eigenstates collapse into spacetime through syntropic alignment and selector logic.

Earth's rotation as a background modal field. The Earth itself possesses a well-defined angular momentum vector with respect to the fixed stars. In the modal geometry picture, this momentum is not confined to classical spacetime, but defines a preferred direction in the extended polymetric structure — particularly in the x^6 aionic dimension, which governs phase-time and syntropic teleology.

This background selector orientation acts as a form of *global field alignment* — effectively biasing which selector torsions are energetically favorable. As a result, systems rotating *with* or *against* the Earth's modal embedding will experience different collapse commutators, even if their internal geometry is symmetric.

Formally, we define the Earth-induced selector bias as a global background field $\Sigma_{\text{Earth}} \in \Gamma(\mathcal{M}_2, \mathcal{S})$, and model its influence on collapse via a modified selector:

$$\sigma_q^{\text{eff}}(t) = \sigma_q(t) + \epsilon_{\text{Earth}} \cdot \Sigma_{\text{Earth}}[\phi_q], \tag{19}$$

where $\epsilon_{\text{Earth}} \ll 1$ encodes the embedding strength of Earth's torsional field. The resulting collapse action becomes:

$$\mathcal{A}_q^{(\omega)} = \left\| [\kappa^{(\mu)}, \sigma_q^{\text{eff}}(t)] \right\|^2 + \int V_{\text{syntropy}} |\phi_q|^2, \tag{20}$$

yielding direction-dependent weights even when $\sigma_q(t)$ is nominally symmetric in local coordinates.

Implication. Systems placed in the same physical configuration, but at different orientations relative to the Earth's rotation axis, or on opposite hemispheres, may experience measurable differences in collapse-permitted modes, modal mass distributions, or inertial anomalies — precisely as observed in the parity violation data.

In the final subsection, we summarize the testable predictions this model implies, and propose a re-interpretation of Tajmar's experimental signatures in light of modal geometry.

8.4 Modal Interpretation and Experimental Predictions

The parity violation and rotation-direction dependence reported by Tajmar et al. [2] can be reinterpreted within the polymetric Heim framework as a manifestation of directional collapse asymmetry arising from:

1. Internal asymmetry of the modal selector zone Ω_q,
2. Non-commutativity of rotating selector operators $\sigma_q(t, \omega)$ with modal curvature,
3. Background alignment bias from the Earth's aionic-entelechial field structure.

This reinterpretation transforms the apparent anomaly from an unexplained violation of parity into a natural consequence of geometric selector logic embedded in quantized modal spacetime.

Predicted Phenomena

We list the key predictions that follow from this explanation:

- **Directional asymmetry**: Measurable inertial or gravito-like effects will differ between clockwise and counter-clockwise rotation, provided the selector zone is asymmetrical in ϕ.
- **Hemisphere dependence**: Experiments repeated in the opposite Earth hemisphere may reverse or diminish the asymmetry due to a change in background modal embedding Σ_{Earth}.
- **Alignment sensitivity**: Effects will vary with the rotational axis orientation relative to Earth's angular momentum vector.
- **Quantized response thresholds**: Collapse effects will show step-like energy or inertial shifts as rotation speed passes modal frequency transition thresholds $\omega \sim \Delta\lambda_q$.
- **Collapse-coupled radiation**: Modal transitions may produce secondary electromagnetic or gravitoelectric fields during rapid selector reconfiguration.

Reinterpretation of Experimental Results

Within this framework, the results observed by Tajmar — particularly the parity asymmetry and anomalous signal amplitude — are consistent with modal collapse effects triggered by rotation-dependent selector torsion. The pronounced effect in clockwise rotation arises not from a physical preference for direction in classical spacetime, but from a modal gradient in syntropic collapse geometry, biased by both internal selector logic and Earth's own aionic modal embedding.

Connection to Propulsion

The same geometric mechanism responsible for directional collapse weight modulation also predicts the emergence of net directional forces when selector asymmetries are dynamically maintained. This provides a natural theoretical foundation for Heim-Dröscher-Häuser propulsion models, and suggests that rotation, torsion, and modal sealing form the physical infrastructure for extracting momentum from structured vacuum curvature.

In future experiments, engineered systems with programmable selector zones — especially those with rotating modal geometries or synchronized collapse triggers — may allow for the direct measurement of thrust, radiation, or energy emission attributable to modal collapse asymmetry.

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Notation and Symbols Specific to Collapse Asymmetry

The following symbols are introduced in Section 8 and are specific to the analysis of direction-dependent selector dynamics, parity asymmetry, and modal collapse in rotating systems.

ω Angular frequency of physical rotation (e.g., a superconducting ring), in radians per second.

$\Omega_q(t) \subset \mathcal{M}_2$ Time-dependent selector zone on the internal modal domain. Defines the region where modal collapse is allowed at time t.

$\sigma_q(t)$ Selector operator acting on modal eigenfields, determined by rotation of $\Omega_q(t)$.

$\Theta_q^{(\omega)} := [\kappa^{(\mu)}, \sigma_q(t)]$ Commutator torsion between polymetric curvature and selector logic under rotation ω. Quantifies modal misalignment and collapse resistance.

$\mathcal{A}_q^{(\omega)}$ Collapse action for eigenfield ϕ_q, including contributions from torsion and syntropic potential.

$\chi_q^{\#}(\omega) = \exp\left(-\mathcal{A}_q^{(\omega)}\right)$ Collapse projection weight under rotation ω; determines how much of ϕ_q projects into physical spacetime $\mathcal{R}_4$.

$\Sigma_{\text{Earth}} \in \Gamma(\mathcal{M}_2, \mathcal{S})$ Background selector field induced by Earth's rotation; introduces global directionality bias in modal collapse geometry.

$\sigma_q^{\text{eff}}(t) = \sigma_q(t) + \epsilon_{\text{Earth}} \cdot \Sigma_{\text{Earth}}$ Effective selector operator including weak coupling to Earth's modal embedding. Controls net parity bias in collapse projection.

$\epsilon_{\text{Earth}} \ll 1$ Coupling constant quantifying the strength of Earth's background influence on selector dynamics.

These variables govern the collapse geometry in rotating modal systems and explain direction-dependent projection asymmetries observed in experiments such as those by Tajmar et al.

Appendix A: Notation and Definitions

Symbol	**Definition**
$\mathcal{R}_6$	Six-dimensional stratified spacetime manifold: $\mathcal{R}_4 \oplus \mathcal{M}_2$.
$\mathcal{M}_2$	Internal modal curvature domain (topologically S^2), encoding mass and charge.

Symbol	Definition
ϕ_q	Modal eigenfield (mode q); a section $\phi_q \in \Gamma(\mathcal{M}_2, E)$.
$\kappa^{(\mu)}$	Polymetric curvature operator indexed by channel $\mu \in \{1, \ldots, 6\}$.
σ_q	Selector operator imposing modal collapse conditions.
$\Lambda(\phi_q)$	Semantic projection function (1 if logically permitted, 0 otherwise).
Θ_q	Torsion operator: $\Theta_q := [\kappa^{(\mu)}, \sigma_q]$.
$\chi_q^{\#}$	Collapse weight: $\chi_q^{\#} := \exp(-A[\phi_q])$.
$A[\phi_q]$	Collapse action: torsion norm plus syntropy-weighted modal potential.
λ_q	Eigenvalue from $\kappa^{(\mu)}[\phi_q] = \lambda_q \phi_q$.
m_q	Effective mass: $m_q = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \chi_q^{\#}$.
$\Omega_q(t)$	Time-dependent selector domain during system rotation.
$\sigma_q(t)$	Rotated selector operator: $\sigma_q(t)[\phi](\theta, \varphi) = \sigma_q[\phi](\theta, \varphi - \omega t)$.
$P_q(t)$	Power output from modal reconfiguration: $P_q(t) = \frac{dE_q}{dt}$.
$T_q^{\mu\nu}$	Modal energy-momentum tensor for mode ϕ_q.
F^μ	Collapse-induced force: $F^\mu = \nabla_\nu T_q^{\mu\nu}$.
∇_S	Syntropic gradient vector field over modal bundles.
Δ_g	Laplace–Beltrami operator on $\mathcal{M}_2$.
V_{syntropy}	Syntropy potential function in the modal fiber.

Appendix B: Units and Physical Constants Used

Symbol	Quantity	SI Unit / Value
$\hbar$	Reduced Planck constant	$\approx 1.054571817 \times 10^{-34}\,\mathrm{J \cdot s}$
c	Speed of light in vacuum	$\approx 2.99792458 \times 10^{8}\,\mathrm{m/s}$
G	Gravitational constant	$\approx 6.67430 \times 10^{-11}\,\mathrm{m^3/kg \cdot s^2}$
τ	Metron (quantized unit of area)	$\tau = \frac{\hbar G}{c^3} \approx 2.611 \times 10^{-70}\,\mathrm{m^2}$
λ_q	Polymetric eigenvalue	Unit: $\mathrm{m^{-2}}$ (inverse squared length)
m_q	Mass of modal eigenmode	Unit: kg (via $m_q = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \chi_q^{\#}$)
$A[\phi_q]$	Collapse action	Dimensionless (constructed from geometric terms)
$\chi_q^{\#}$	Collapse weight factor	Dimensionless (exponential of a normalized action)

Symbol	Quantity	SI Unit / Value
$P_q(t)$	Power output	Watt $= \mathrm{kg} \cdot \mathrm{m}^2/\mathrm{s}^3$
E_q	Modal energy	Joule $= \mathrm{kg} \cdot \mathrm{m}^2/\mathrm{s}^2$
F^μ	Force 4-vector component	$\mathrm{N} = \mathrm{kg} \cdot \mathrm{m}/\mathrm{s}^2$
$T_q^{\mu\nu}$	Modal energy-momentum tensor	$\mathrm{Pa} = \mathrm{N}/\mathrm{m}^2$ or $\mathrm{kg}/\mathrm{m} \cdot \mathrm{s}^2$
ω	Angular velocity of rotation	rad/s
Δ_g	Laplace–Beltrami operator	Unit: m^{-2} when acting on scalar fields
V_{syntropy}	Modal syntropy potential	Joule/m^2 (per unit modal area)

Appendix C: Derivation of the Modal Power Output Formula $P_q(t)$

1. Modal Energy Expression

The energy $E_q(t)$ associated with a modal eigenfield ϕ_q that is collapse-permitted at time t is given by:

$$E_q(t) = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \chi_q^{\#}(t)$$

where:

- λ_q is the polymetric eigenvalue: $\kappa^{(\mu)}[\phi_q] = \lambda_q \phi_q$
- $\chi_q^{\#}(t) = \exp(-A_q(t))$ is the collapse weight
- $A_q(t)$ is the collapse action (depends on selector torsion and modal syntropy)

2. Collapse Action Dynamics

The collapse action is time-dependent due to rotation of the selector zone $\Omega_q(t)$. It is defined as:

$$A_q(t) = \|\Theta_q(t)[\phi_q]\|^2 + \int_{\mathcal{M}_2} V_{\text{syntropy}}(\theta, \varphi) \cdot |\phi_q(\theta, \varphi)|^2 \, d\text{vol}$$

Here:

- $\Theta_q(t) = [\kappa^{(\mu)}, \sigma_q(t)]$ is the time-dependent commutator torsion
- V_{syntropy} is a modal potential shaped by selector geometry

3. Collapse Weight Time Evolution

By the chain rule:

$$\frac{d}{dt}\chi_q^{\#}(t) = \frac{d}{dt}\left[\exp(-A_q(t))\right] = -\frac{dA_q}{dt} \cdot \chi_q^{\#}(t)$$

4. Power Output Derivation

Now take the time derivative of modal energy:

$$P_q(t) = \frac{dE_q(t)}{dt} = \frac{d}{dt}\left(\frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \chi_q^{\#}(t)\right)$$

Since λ_q is time-independent for a given modal channel, we can factor it:

$$P_q(t) = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \frac{d}{dt}\chi_q^{\#}(t)$$

Substituting from the previous result:

$$P_q(t) = -\frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \frac{dA_q}{dt} \cdot \chi_q^{\#}(t)$$

This expression describes the instantaneous power output as a function of: - The selector-torsion dynamics $\frac{dA_q}{dt}$ - The current modal collapse weight $\chi_q^{\#}(t)$

5. Interpretation

- When selector geometry evolves (e.g., via rotation), $A_q(t)$ changes dynamically. - This induces variation in $\chi_q^{\#}(t)$, modulating the amount of energy projected. - Positive $\frac{d}{dt}\chi_q^{\#}(t)$ indicates energy absorption; negative implies energy release.

6. Final Form

$$\boxed{P_q(t) = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \frac{d}{dt}\left(\exp(-A_q(t))\right)}$$

or equivalently:

$$\boxed{P_q(t) = -\frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \frac{dA_q}{dt} \cdot \exp(-A_q(t))}$$

This is the core expression governing collapse-induced energy transfer in Heim Theory.

Appendix D: From Collapse Power to Observable Propulsion Force

1. Modal Collapse as Energy Transfer

In Heim Theory, the modal collapse of an eigenfield ϕ_q releases quantized curvature energy into physical spacetime $\mathcal{R}_4$, provided the following collapse conditions are met:

$$\phi_q \in \ker(\sigma_q), \quad \Lambda(\phi_q) = 1, \quad \nabla_S(\phi_q) = 0$$

The projected energy at time t is given by:

$$E_q(t) = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \chi_q^{\#}(t)$$

and its time derivative yields the instantaneous power output:

$$P_q(t) = \frac{dE_q}{dt} = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \frac{d}{dt}\chi_q^{\#}(t)$$

2. Projection-Induced Momentum Flow

Collapse into $\mathcal{R}_4$ involves the release of not only energy, but also momentum density, particularly if the modal reconfiguration is asymmetric. This is formalized by defining the modal energy-momentum tensor:

$$T_q^{\mu\nu} := \frac{\delta A_q}{\delta g_{\mu\nu}}$$

This tensor expresses how the modal collapse action A_q responds to changes in the spacetime metric $g_{\mu\nu}$, enabling a projection of stress-energy into observable spacetime.

3. Derivation of the Force Density

The divergence of the modal energy-momentum tensor yields a 4-force density:

$$F^\mu = \nabla_\nu T_q^{\mu\nu}$$

Assuming that the modal collapse is localized to a region with selector reconfiguration, we approximate:

$$F^\mu = \frac{\hbar}{c} \cdot \nabla^\mu \left(\chi_q^{\#}(t) \cdot \sqrt{\lambda_q} \right)$$

This expression reflects a syntropically driven gradient of collapse weight across spacetime, which translates into a force.

4. Directed Collapse and Net Propulsion

If the selector zone $\Omega_q(t)$ rotates or deforms asymmetrically (e.g., along the axis of a superconductive ring), then:

- Collapse weights $\chi_q^{\#}$ vary anisotropically across $\mathcal{R}_4$, - The gradient $\nabla^\mu(\chi_q^{\#})$ becomes non-zero in a preferred direction, - This yields a net directional force.

Such a configuration enables propulsion without reaction mass, where thrust arises from modal energy transitions across the projection boundary.

5. Force Magnitude Estimate

A rough estimate of thrust magnitude per mode is given by:

$$F^{\mu}_{\text{net}} \sim \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \nabla^{\mu} \left(\chi_q^{\#}(t) \right)$$

In regions where $\frac{dA_q}{dt}$ is large (strong selector torsion), this gradient is sharp, and the force increases.

6. Physical Interpretation

- $P_q(t)$ describes how much energy is released over time from modal collapse. - F^{μ} describes the directional component of that release in spacetime. - The conversion from power to propulsion requires: - Time-varying modal configuration - Spatial anisotropy in selector geometry - Syntropic flow imbalance

Together, they allow the structured vacuum to function as an internal reservoir for momentum exchange — fulfilling Newtonian recoil principles via quantized curvature redirection.

7. Final Expression for Modal Force

$$\boxed{F^{\mu} = \frac{\hbar}{c} \cdot \sqrt{\lambda_q} \cdot \nabla^{\mu} \left(\exp(-A_q(t)) \right)}$$

This provides a complete geometric bridge from internal modal collapse to external physical propulsion in the Heim framework.

Appendix E: Engineering Realization Strategies for Modal Collapse Propulsion

1. Objective

To convert the theoretical framework of modal collapse into a realizable propulsion or energy extraction system, we must design physical devices that:

- Maintain coherent modal eigenfields ϕ_q,
- Modulate selector operator geometry $\sigma_q(t)$ in time,
- Induce syntropic collapse gradients $\nabla^{\mu} \chi_q^{\#}(t)$,
- Sustain asymmetry to yield net directional force F^{μ}.

2. Physical Realization of Selector Zones

Selector operators σ_q are modeled as logical projection constraints over internal modal curvature zones. In engineered systems, these must be mapped to physical boundary conditions in coherent matter. Strategies include:

- **Field-coherent superconductors:** Use of quantum-coherent materials with phase-locked boundary conditions to define fixed selector domains $\Omega_q \subset \mathcal{M}_2$.
- **Rotating selector geometries:** Implement mechanical rotation (or electromagnetic field rotation) to induce time-dependence:

$$\sigma_q(t)[\phi](\theta, \varphi) = \sigma_q[\phi](\theta, \varphi - \omega t)$$

- **Discrete modal symmetry (e.g. $\mathbb{Z}_n$):** Fabrication of devices with selector lobes or boundary indentations encoding specific modal symmetry groups (e.g., $\mathbb{Z}_3$, $\mathbb{Z}_4$) to break isotropy.

3. Collapse Control via Torsion Engineering

To maximize energy output and directional force, systems must maximize the rate of change of collapse action:

$$\frac{dA_q}{dt} = \frac{d}{dt} \left\| [\kappa^{(\mu)}, \sigma_q(t)] \right\|^2 + \cdots$$

This requires:

- High curvature contrast in the selector domain,
- Rapid or nonlinear selector modulation,
- Matching modal eigenfield ϕ_q to selector geometry.

Candidate mechanisms:

- Pulsed magnetic field coils shaping modal curvature topology,
- Piezoelectric or MEMS-based selector modulation for fast torsion shifts,
- Optical lattices with synthetic gauge fields encoding modal commutators.

4. Propulsion Configuration: Axial Thrust

To achieve net propulsion, we require:

- Time-asymmetric modulation: non-reciprocal change in $\sigma_q(t)$ over one cycle,
- Spatial asymmetry in modal coupling: e.g., off-axis selector lobe placement,
- Directed collapse gradient: sustained $\nabla^\mu \chi_q^\#$ aligned with thrust vector.

Schematic layout:

- Rotating toroidal superconducting ring with selector defects embedded at angular intervals,
- Modulation coils creating dynamic field-aligned collapse zones,
- EM or gravito-inertial sensors aligned along expected thrust direction.

5. Experimental Implementation Milestones

1. **Modal stabilization:** Observe coherence lifetimes and eigenvalue stability in test materials.
2. **Selector-induced fluctuation:** Measure field anomalies during selector reorientation.
3. **Collapse asymmetry effects:** Track energy differential in geometrically biased configurations.
4. **Force detection:** Direct measurement of net F^μ during dynamic selector cycles.

6. Summary

The Heim Theory modal propulsion concept requires three technological components:

- **Structured material topology** supporting modal fields,
- **Selector geometry modulation** for collapse reconfiguration,
- **Anisotropic syntropy management** to extract force from collapse gradients.

While highly novel, these criteria fall within reach of advanced quantum-coherent materials engineering and cryogenic electrodynamic systems.

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Acknowledgments

This work was developed as part of the Heim Theory Reconstructed Project. The author thanks the wider research group for ongoing discussions about selector logic, modal collapse geometry, and metron field quantization as well as the broader implications of Heim Theory. A special thanks goes to Daniel Davis, David Chester and José J. A. Rodal for ongoing feedback, collaboration and very much needed help.

This research received no external funding.