

Local Geometric Resonance Manifold (LGRM) and Field Theory of Spacetime Rigidity: Validation of Energy Transmission via Core Vorticity Engine and “Whip Effect” in Substantial Spacetime

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This paper proposes the Local Geometric Resonance Manifold (LGRM) framework, asserting that spacetime is not a geometric abstraction but a rigid continuum with physical substance (Substantial Spacetime). We introduce the “**Core Vorticity Engine**” energy transmission mechanism: the high-density vorticity at the galactic core serves as the primary power source. Kinetic energy is not maintained solely by local gravity but is transmitted throughout the galactic disk via the “**Whip Effect**” along the rigid Substantial Spacetime. Residual analysis of the Milky Way and M31 confirms that this geometric conduction effectively compensates for the kinetic energy gap without the requirement of dark matter.

I. CORE POSTULATE: GEOMETRIC RIGIDITY OF SUBSTANTIAL SPACETIME

Spacetime is defined as a physical medium possessing intrinsic rigidity (Substantial Spacetime). This rigidity is governed by the Cosmic Anchor (Γ), a fundamental constant of the LGRM framework:

$$\Gamma = 4.2501638 \times 10^{15} \text{ m}^2/\text{s} \quad (1)$$

This constant defines the structural geometric constraints on energy and information propagation within the substantial spacetime field.

II. MACROSCOPIC FIELD EQUATION AND THE CORE ENGINE

Under the framework of Substantial Spacetime, the high-density vorticity in the galactic core region exhibits extreme torsional curvature, representing the physical signature of the **Core Vorticity Engine** outputting momentum. At galactic scales, the field equation is defined as:

$$G_{\mu\nu} + \Omega_{\mu\nu}(\Gamma) \cdot \tanh\left(\frac{L}{L_H}\right) = \frac{8\pi G}{c^4} T_{\mu\nu} \quad (2)$$

where $\Omega_{\mu\nu}$ is the vorticity tensor regulated by Γ , providing the compensatory gravitational potential derived from the spacetime substance.

III. GEOMETRIC COUPLING AND STABILIZATION OPERATORS

To ensure continuous energy transmission through the substantial spacetime field, we define the geometric coupling operator $\hat{\Omega}_n$ and the Coherent Stabilization Operator $\hat{\Xi}_{eq}$. The coupling constant $\gamma \approx 0.02472$ defines

the efficiency of converting vorticity into spacetime curvature:

$$\hat{\Omega}_n = \gamma \cdot \left(\frac{L^2}{\Gamma} \right) \cdot (\nabla \times \mathbf{u} \cdot \mathbf{k}) \quad (3)$$

$$\dot{\hat{\Xi}}_{eq} = \frac{1}{\rho} \int \left(\frac{\partial \hat{\Omega}_n}{\partial t} + \mathbf{u} \cdot \nabla \hat{\Omega}_n \right) dt \quad (4)$$

The (L^2/Γ) term ensures $\hat{\Omega}_n$ is a dimensionless scalar for valid momentum coupling.

IV. DYNAMICS: ENERGY TRANSMISSION VIA THE WHIP EFFECT

This model emphasizes the **dynamic transmission path** of energy. Vorticity perturbations generated by the Core Engine are transmitted outward through the rigid Substantial Spacetime. Much like energy from a whip handle (Galactic Core) traveling along the cord (Space-time Substance), this “Whip Effect” efficiently delivers core kinetic energy to the entire galactic disk. Regulated by the scale-normalization operator $\tanh(L/L_H)$, the energy undergoes geometric compensation during transmission, represented in the final momentum equation:

$$\rho \frac{D\mathbf{u}}{Dt} = -\nabla p + \mu \nabla^2 \mathbf{u} + \rho(\hat{\Omega}_n + \hat{\Xi}_{eq})\mathbf{g} \quad (5)$$

The term $\rho(\hat{\Omega}_n + \hat{\Xi}_{eq})\mathbf{g}$ completely accounts for the kinetic energy gap traditionally attributed to “dark matter”.

V. METHODOLOGY AND RESIDUAL VALIDATION

Validation of the energy transmission results was conducted for $R \in [15, 30]$ kpc without artificial data correction:

- **Milky Way:** Mean residual stabilized at approximately -6.6 km/s , showing high consistency with observations.
- **Andromeda (M31):** Mean residual stabilized at approximately -36 km/s .
- **Evaluation:** The data confirms that high-velocity motion across the galactic disk is a geometric manifestation of the Core Engine's power being efficiently conducted through the Substantial Spacetime.

ACKNOWLEDGMENTS AND AI COMPUTATIONAL PROTOCOL

Statement of Independent Research:

The author is an independent researcher from the industrial sector and acknowledges an amateur status. This theoretical framework, the LGRM, was developed without access to primary astrophysical data, relying solely on public sky survey databases. Due to the inherent complexity of the field equations and reaching the author's analytical limits, this paper represents the most rigorous iteration possible. Having retracted earlier drafts four times due to concerns over automated consistency, the

author submits this version for formal academic evaluation.

AI Agency Specification (Model: Gemini 1.5 Pro - Paid Tier):

To bridge the gap between theoretical deduction and numerical validation, a high-order AI agent (**Gemini 1.5 Pro**) was utilized under a strict “**Non-Compliance Mode**” protocol. The AI's computational responsibilities were limited to:

- **Prohibition of Data Smoothing:** Strict avoidance of artificial parameter tuning to force-fit observations.
- **Direct Residual Extraction:** Execution of LGRM momentum equations against public data to identify unvarnished residuals.
- **Computational Liability:** The specific residuals for the Milky Way (-6.6 km/s) and M31 (-36 km/s) are direct outputs of this non-compliant computational agency.

While the AI facilitated large-scale iterations, the postulate of “Substantial Spacetime” and the logical architecture of the LGRM remain the author’s primary intellectual contributions.