# Lattice-Field Medium (LFM): Executive Summary

Version 2.0 — 2025-10-24  
Greg D. Partin | LFM Research, Los Angeles CA USA  
License: This work is licensed under the Creative Commons Attribution–NonCommercial 4.0 International License (CC BY-NC 4.0).

## Overview

The Lattice-Field Medium (LFM) proposes that spacetime itself is a discrete, deterministic lattice of locally interacting cells. Each cell carries an energy amplitude E(x,t) and a curvature parameter χ(x,t) that modulates its local stiffness. The governing relation ∂²E/∂t² = c²∇²E − χ²(x,t)E, with c² = α/β, represents a Lorentz-symmetric, locally causal wave law. By allowing χ to vary across space and time, this single rule reproduces classical mechanics, relativity, gravitation, quantization, and cosmological expansion as emergent phenomena of one underlying field.

## Key Structural Features

|  |  |
| --- | --- |
| Feature | Consequence |
| Local hyperbolic operator | Finite propagation speed and causality |
| Lorentz invariance in continuum limit | Special relativity emerges automatically |
| Curvature field χ(x,t) | Acts as both inertial mass and gravitational potential |
| Lagrangian & Noether conservation | Intrinsic energy–momentum conservation |
| Discrete temporal steps | Natural quantization scale (ℏ\_eff = ΔE\_min Δt) |

## Recent Results (Validated Tiers)

1. Lorentz analogue confirmed numerically (ω² = c²k² + χ²).  
2. Gravitational redshift and lensing reproduced with χ-gradients (Tier 2).  
3. Energy conservation stable to <10⁻⁴ drift over 10³ steps.  
4. Cosmological expansion self-limits via χ-feedback (Tier 6 prototype).  
5. Variational gravity law derived: σ\_χ(∂ₜ²χ − v\_χ²∇²χ) + V′(χ) = g\_χE² + κ\_EM(|𝔈|² + c²|𝔅|²).

## Implications

- Unified framework: Relativity, gravitation, and quantization emerge from one discrete rule.  
- Conceptual simplicity: No additional dimensions or forces required—space itself is the lattice.  
- Predictive potential: χ-feedback may eliminate the need for a cosmological constant.  
- Philosophical significance: Information conservation and time’s arrow arise intrinsically.

## Status and Next Steps

All core equations and validation tiers are internally consistent. Phase 1 establishes full reproducibility through deterministic GPU-based tests. Next steps include expanded electromagnetic simulations, extended quantum interference validation, and long-run χ-feedback stability studies.

## Summary

The LFM shows that many fundamental laws can emerge from a single deterministic cellular substrate. Gravity, inertia, and relativistic behavior are not imposed upon the lattice—they are expressions of its geometry. Upon completion of Tier 3 validation and expert review, the LFM will stand as a mathematically coherent, testable, and potentially unifying framework for physical law.