LFM Phase 1 Test Design

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Lattice-Field Medium (LFM): Phase 1 Test Design — Proof-of-Concept Validation System

Version 3.1 — 2025-11-05 (Defensive ND Release) Greg D. Partin | LFM Research — Los Angeles CA USA

Abstract

Phase 1 defines the design and implementation framework for validating the Lattice-Field Medium (LFM) through reproducible Tier 1–5 tests. It specifies the environment, configuration architecture, pass/fail criteria, and proof-packet generation protocol required to establish numerical and physical correctness of the model including complete electromagnetic theory validation. This version modernizes the document layout for reproducibility and OSF publication compliance.

1 Purpose

Phase 1 establishes the full architecture for the LFM Proof-of-Concept Validation System. The goal is to provide a reproducible testing environment that demonstrates Tier 1–5 correctness and creates a foundation for expert review.

2 Hardware and Environment

Component Specification Notes

System MSI Katana A15 AI Primary development node

CPU / GPU Ryzen 7 8845HS / RTX Hardware sufficient for all 4060 (8 GB VRAM) Tier 1–5 test campaigns

RAM / Storage 32 GB / 1 TB SSD Sufficient for 3D Tier 3 tests

OS Windows 11 x64

Python Environment 3.11.9 + NumPy, SciPy, Standard computation Numba, CuPy-CUDA12x stack

Version Control Git (local → GitHub Ensures provenance and private) reproducibility

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3 Folder and File Architecture

The LFM Proof-of-Concept environment follows a strict folder structure: LFM\code — Source modules and Tier kernels LFM\config — JSON configuration and thresholds LFM\runs — Runtime data for each experiment LFM\results — Metrics, plots, and summaries LFM\logs — Execution and environment logs LFM\packages — Proof-packet archives

4 Configuration and Validation Logic

Global tolerances reside in /config/validation_thresholds.json, with Tier-specific overrides in /config/tierN_default.json. Merge order: global → local → runtime. Configuration keys include tier, parameters, tolerances, run_settings, and notes.

5 Pass/Fail Framework

Tier Goal Pass Criteria (Phase 1)

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1 Lorentz isotropy & Δv/c 1 %, anisotropy 1 %; energy drift within typical dispersion bounds 10 … 10 depending on grid/BCs

2 Weak-field / redshift Correlation > 0.95 with analytic model; drift 1 %

3 Energy conservation Relative energy drift |ΔE| / |E | within 10 … 10 typical; strict baseline tolerance configured as 1×10^{12} in /config/validation_thresholds.json for conservative runs

4 Quantum behavior Discrete energy eigenvalues with <2% error; quantum tunneling demonstrated; uncertainty relation Δx · Δk 0.5 confirmed

5 Electromagnetic theory Complete Maxwell equation validation; Coulomb's law = kq/r within ±0.1%; electromagnetic wave speed c = 1/√( ) confirmed; {{PASS_RATE:Electromagnetic}} test success rate on implemented electromagnetic phenomena

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6 Orchestration and Parallelism

The master script run_all_tiers.py references /config/orchestration.json to schedule tiers and variants with a concurrency limit (default 3). Each run executes run_tier.py, writes results, and

aggregates metrics into /results//summary_overall.json.

7 Visualization and Reporting

Plots auto-generate under /results////plots/. Each follows scientific styling standards (energy_vs_time, anisotropy_vs_time, etc.). A summary dashboard (summary_dashboard.html) compiles all Tier results.

8 Expert Review Packaging Workflow

After all Tier tests complete, the system assembles a proof packet in /packages/LFM_ProofPacket___vX.Y.zip. Each archive contains README, manifest, environment info, configs, code snapshot, results, logs, and SHA-256 hashes. Integrity checks and optional Cardano anchoring ensure reproducibility.

9 Phase 1 Test Scope

Phase 1 currently executes Tier 1–5 tests. Canonical expected counts are tracked in the results registry; refer to the results rollups for authoritative counts. Additional exploratory tests may be present. Refer to the per-tier results under results//* for PASS/FAIL/SKIP status. Expected duration for a full run depends on hardware and concurrency.

10 Data Reproducibility and Licensing

All code and data products are released under CC BY-NC-ND 4.0 (non-commercial, attribution required; no derivatives). Each result file includes environment hashes and deterministic seeds. Reproducibility requires the same configuration files and random seed identifiers as recorded in the proof packets.

11 Metadata Alignment

Field Value

Keywords lattice field theory; discrete spacetime; emergent relativity; reproducibility; computational physics

Category Tags Theoretical Physics · Computational Physics · Simulation Frameworks

Data Availability All proof packets and logs provided as supplemental data under reproducible archive.

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12 Summary

Phase 1 provides the reproducibility framework for all Tier 1–5 LFM tests. It defines configuration structure, orchestration logic, validation thresholds, and proof-packet packaging. Successful completion confirms the model's stability, isotropy, conservation, quantum behavior, and electromagnetic theory reproduction—forming a complete empirical foundation for this phase.

13 Legal & Licensing Notice

License Update (v3.1 — 2025-11-05):

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