**CMG–LCE — GLOBAL MATHEMATICAL DOSSIER  
Submission Brief for the 'Advanced Mathematical Physics' Community**

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Version: 2025.11 • Math Dossier v1  
Date: 2025-10-27  
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# Executive Summary

This dossier consolidates the mathematical core of the CMG–LCE framework (vacuum memory field Ψ) for curator review. It streamlines: (i) a covariant variational setup, (ii) an extended energy–momentum tensor T^(Ψ)\_{μν}, (iii) the Coherence–Energy Law (LCE), and (iv) a shortlist of open problems suitable for the Advanced Mathematical Physics scope.

# Notes to Curators — Subject Fit & Scope

The submission focuses strictly on mathematical structure and internal consistency (variational principle, tensorial definitions, operators with memory), plus tractable open problems in differential geometry, PDEs, gauge theory and category theory. Empirical aspects are restricted to minimal acceptance thresholds.

# Mathematical Core (CMG–LCE)

Spacetime (M, g\_{μν}); vacuum memory field Ψ with potential V(Ψ).

Action (schematic): S\_Ψ = ∫ [ (1/2) R – (1/2) ∇\_μΨ ∇^μΨ – V(Ψ) ] √(-g) d^4x

Energy–momentum (memory) tensor: T^(Ψ)\_{μν} = ∇\_μΨ ∇\_νΨ – (1/2) g\_{μν} ( ∇\_αΨ ∇^αΨ – 2 V(Ψ) )

Field(Ψ): ∇\_μ ∇^μ Ψ + Γ(Ψ, g\_{μν}) = 0

Einstein sector: G\_{μν} = 8π T^(Ψ)\_{μν}

LCE (ASCII): d(rho\_Psi)/dt = - mu \* (dPsi/dt) \* (d2Psi/dt2)

## Operators with Memory

Temporal operator: D\_t(Ψ) = dΨ/dt + τ \* d2Ψ/dt2 (τ: relaxation time)

Generic evolution: ∇\_μ ∇^μ Ψ = - ∂V/∂Ψ + μ \* D\_t(Ψ)

## Vacuum Energy Content

rho\_Psi = (1/2) (dPsi/dt)^2 + (1/2) |∇Ψ|^2 + V(Ψ)

E\_Psi(t) = ∫\_{Σ\_t} rho\_Psi \* √(-g) d^3x

# Open Mathematical Problems (Short List)

• Well‑posedness & regularity for Ψ with Γ operators; energy estimates for LCE‑driven flows.

• Extended constitutive tensor C\_{μναβ}: Bianchi identities, irreducible decomposition, causality/hyperbolicity.

• Gauge & topology: Diff(M) ⋉ U(1)\_ext; cohomology classes and BRST‑like complexes for Ψ‑symmetries.

• Analytical solutions: stationary backgrounds with Ψ‑corrections (Kerr–Newman type); QNMs and stability.

• Category theory: functorial field theory on E = TM ⊕ Λ^2 T\* M; characteristic classes ↔ conserved charges.

• Quantization: one‑loop Γ\_eff[Ψ]; spectral properties; coherent states and small‑defect spectrum.

# Compatibility & Limits

GR limit (D\_t(Ψ)→0, V'→0); Maxwell/MHD incoherent regime (Γ suppresses coherence terms); causality/hyperbolicity constraints on τ, μ, C\_{μναβ}.

# Empirical Discipline (Thresholds Only)

Macro (galaxies): ρ > 0.7 with p < 0.01; Δφ < 20°, reproducible across datasets.

Solar coupling: phase‑coherent deviations beyond background turbulence (Parker/Solar Orbiter).

Micro (lab): repeatable ΔE/E ≈ 1e-4 scaling with coherence Q and vanishing under decoherence.

# Minimal Reference Block

Hilbert; Einstein; Maxwell–Heaviside–Lorentz; Wheeler; Bekenstein–Hawking; contemporary PDE/gauge texts. Full bibliography available on request.

# Appendix — Exact ASCII Relations

S\_Psi = ∫ [ (1/2) R – (1/2) ∇\_μΨ ∇^μΨ – V(Ψ) ] √(-g) d^4x  
T^(Psi)\_{μν} = ∇\_μΨ ∇\_νΨ – (1/2) g\_{μν} ( ∇\_αΨ ∇^αΨ – 2 V(Ψ) )  
Field(Ψ): ∇\_μ ∇^μ Ψ + Γ(Ψ, g\_{μν}) = 0  
Einstein: G\_{μν} = 8π T^(Ψ)\_{μν}  
LCE: d(rho\_Psi)/dt = - mu \* (dPsi/dt) \* (d2Psi/dt2)  
D\_t(Ψ) = dΨ/dt + τ \* d2Ψ/dt2  
rho\_Psi = (1/2) (dPsi/dt)^2 + (1/2) |∇Ψ|^2 + V(Ψ)  
E\_Psi(t) = ∫\_{Σ\_t} rho\_Psi \* √(-g) d^3x

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