Field Equations of the WLH Warp Gauge: From a 6D Blueprint to a 4D Effective Theory

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Abstract

We present a derivation pathway from a six-dimensional (6D) interaction blueprint to four-dimensional (4D) effective field equations underlying the WLH Warp Gauge. Starting with a block-metric ansatz for a 3T + 3S manifold and a set of cross-couplings encoded by an interaction matrix, we perform a projection and dimensional reduction to a 4D sector suitable for laboratory phenomenology. The result is an Einstein–scalar effective theory with geometric source terms, offering a conceptual map between the WLH blueprint and potential observables.

Scope and Interpretation

This document presents a **theoretical and mathematical model**. It is a conceptual derivation and simulation framework, not an engineering specification. All quantities and equations herein are model constructs subject to empirical validation and do not imply the existence of a working device or verified physical phenomenon.

1 Preliminaries and Assumptions

We assume a smooth 6-manifold $\mathcal{M}_6$ with coordinates (t_a, x^i), $a \in \{0,1,2\}$, $i \in \{1,2,3\}$. Let G_{AB} be the 6D metric. We consider a block ansatz

$$G_{AB} = \begin{pmatrix} \mathcal{T}_{ab} & \alpha_X \, \eta_a{}^j \\ \alpha_X \, \eta^i{}_b & \mathcal{S}_{ij} \end{pmatrix}, \qquad \alpha_X \ll 1. \tag{1}$$

2 Action and Variation in 6D

Consider

$$S = \int d^6X \, \sqrt{|G|} \left[\frac{1}{2\kappa_6} R_6 - \frac{1}{2} G^{AB} \partial_A \Phi \, \partial_B \Phi - V(\Phi) \right] + S_{\text{int}}[G, \Phi; \alpha_X, \eta]. \tag{2}$$

Variations yield Einstein-like equations and a scalar equation with interaction sources:

$$\frac{1}{2\kappa_6} \Big(R_{AB} - \tfrac{1}{2} G_{AB} R_6 \Big) = T^{(\Phi)}_{AB} + T^{(\text{int})}_{AB}, \tag{3}$$

$$\Box_6 \Phi - V'(\Phi) = \mathcal{J}_{\text{int}}. \tag{4}$$

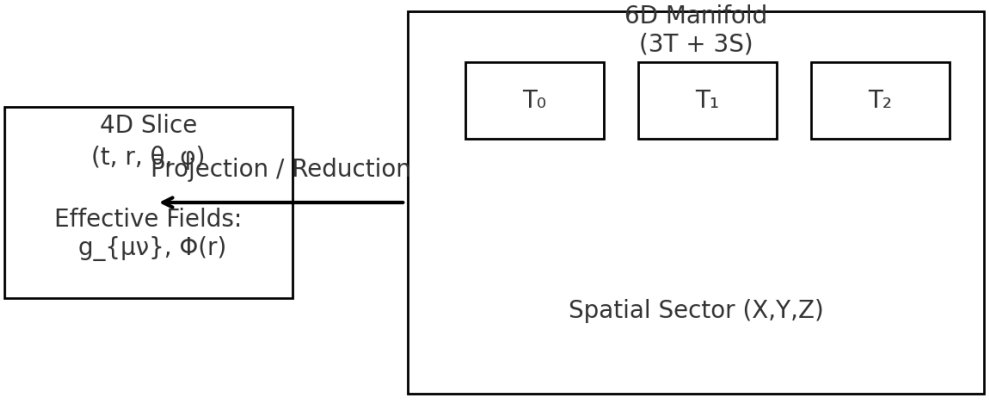

Figure 1: Narrative schematic of the projection from a 6D $(3\mathrm{T}+3\mathrm{S})$ manifold to a 4D lab slice with fields $g_{\mu\nu}$ and Φ.

3 Projection to a 4D Effective Sector

Let $\Pi^A{}_\mu$ project to a 4D slice. Define $g_{\mu\nu} = \Pi^A{}_\mu \Pi^B{}_\nu G_{AB}$ and $\Phi(x^\mu) = \Phi(\Pi x)$. Absorbing measure factors into couplings,

$$\frac{1}{2\kappa_4}\Big(R_{\mu\nu} - \tfrac{1}{2} g_{\mu\nu} R\Big) = T^{(\Phi)}_{\mu\nu} + \Delta T^{(\mathrm{int})}_{\mu\nu}, \tag{5}$$

$$\Box\Phi - \frac{dV_{\mathrm{eff}}}{d\Phi} = \mathcal{J}_{\mathrm{eff}}. \tag{6}$$

A *warp gauge condition* enforces subluminal lab evolution: $u^\mu \partial_\mu \Phi = 0$.

4 Static, Spherically Symmetric Reduction

In the lab weak-field regime ($A \simeq B^{-1} \simeq 1$) with $\Phi = \Phi(r)$,

$$\frac{1}{r^2}\frac{\mathrm{d}}{\mathrm{d}r}\left(r^2 \frac{\mathrm{d}\Phi}{\mathrm{d}r}\right) - \frac{dV_{\mathrm{eff}}}{d\Phi} = 0. \tag{7}$$

A compact, smooth solution is well-approximated by

$$\Phi(r) \approx \Phi_0 \exp\big(-(r/R)^4\big). \tag{8}$$

5 Effective Stress–Energy and Curvature

With $\Phi = \Phi(r)$,

$$\rho_{\mathrm{eff}} = \tfrac{1}{2}(\Phi')^2 + V_{\mathrm{eff}}(\Phi), \qquad p_{\mathrm{eff}} = \tfrac{1}{2}(\Phi')^2 - V_{\mathrm{eff}}(\Phi). \tag{9}$$

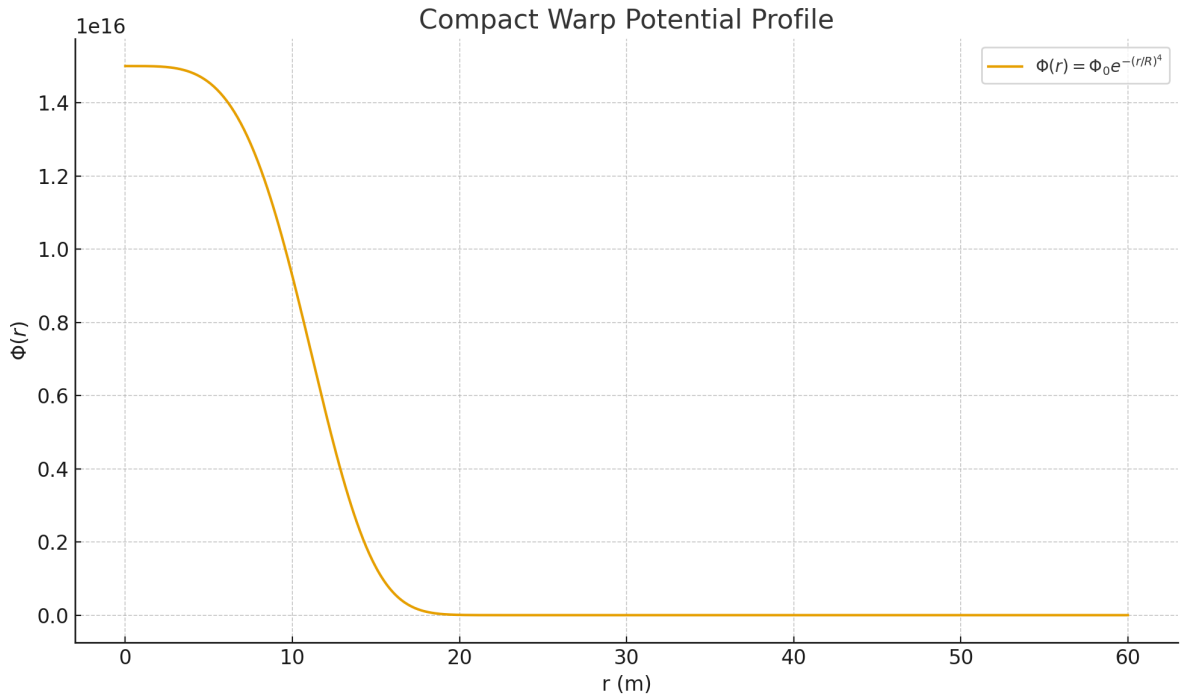

Figure 2: Compact potential profile $\Phi(r) = \Phi_0 e^{-(r/R)^4}$ serving as an analytical ansatz in the weak-field, static limit.

6 Mapping to Observables

First-order metric perturbations yield the laboratory observables used in the toy model:

$$\Delta\tau/\tau \simeq \Phi/c^2, \quad \Delta\phi \simeq \tfrac{4\pi}{\lambda}\Delta L, \quad \Delta L/L_0 \simeq \beta(\Phi), \quad g_{\text{eff}} \propto -\Phi'(r). \tag{10}$$

Conclusions

We provided a blueprint-to-equations pathway yielding a consistent 4D Einstein–scalar system with a compact warp solution compatible with WLH phenomenology. Constants remain symbolic pending blueprint finalization and empirical tests.

References

[1] The Burren Gemini Collective (2025), *6D Interaction Matrix — Universe Blueprint.*

[2] The Burren Gemini Collective (2025), *Woven Light Hypothesis v20*, Compendium Series.

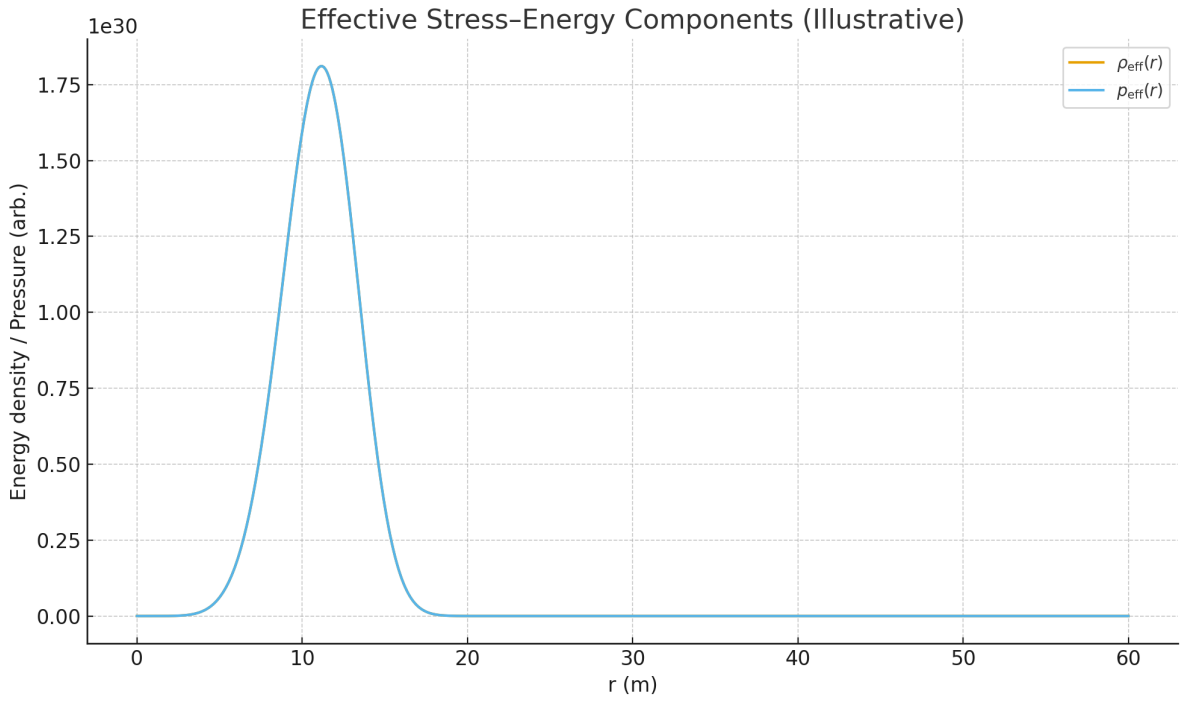

Figure 3: Illustrative effective stress–energy components derived from the compact profile and a simple $V_{\rm eff}(\Phi)$ choice.

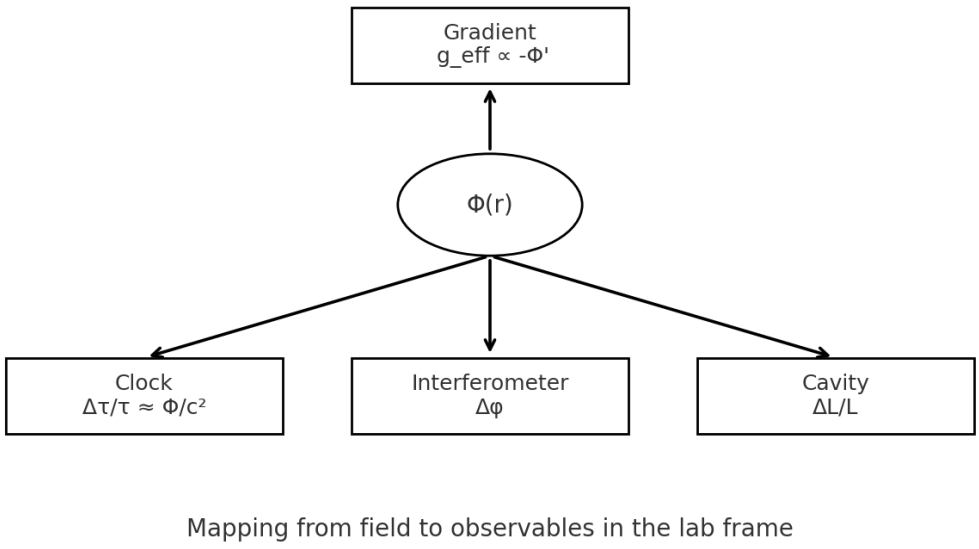

Figure 4: Narrative mapping from field profile to multimodal observables (clock, interferometer, cavity, gradient).