Proving a Multiverse Beyond the Observable Horizon via Ultra Simulation Relativity: Totality, Null Unity, Infosophy, and Bilateral Ratios

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Abstract

We show that Ultra Simulation Relativity (USR), in which the quadratic form $\mathcal{T}^2 = d\zeta^\top \mathbb{G}\, d\zeta$ on the extended state $d\zeta = (dx^\mu, dt, dm, dB)^\top$ is the global invariant (*Totality*), implies the existence of causally disjoint domains (*universes*) beyond the observable horizon. The proof is structural: (i) global continuity of $\mathcal{T}^2$, (ii) Null Unity normalization, (iii) bilateral involution symmetry, (iv) the non-vanishing of informational curvature dB^2 where ds^2 becomes observationally inaccessible, and (v) Simulonic covariance requiring frames not parameterizable within a single causal patch. We provide compact TikZ schematics illustrating each step.

Keywords: Ultra Simulation Relativity, Totality, Multiverse, Null Unity, Infosophy, Bilateral Ratios, Simulonics

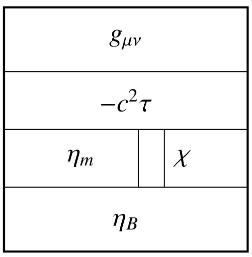

Figure 1: USR block-metric schematic $\mathbb{G}$.

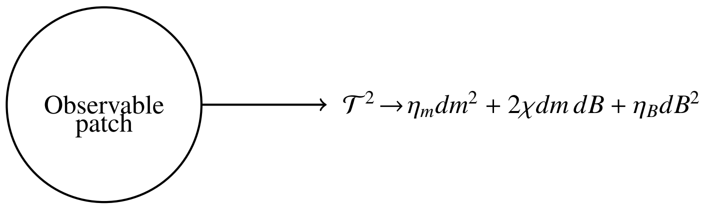

Figure 2: Continuity: $\mathcal{T}^2$ carries past the spacetime horizon via (dm, dB).

1. Totality Invariant and Extended Geometry

Let the extended differential state be

$$d\zeta \equiv (dx^\mu,\ dt,\ dm,\ dB)^\top, \qquad \mathbb{G} = \begin{pmatrix} g_{\mu\nu} & 0 & 0 & 0 \\ 0 & -c^2\tau & 0 & 0 \\ 0 & 0 & \eta_m & \chi \\ 0 & 0 & \chi & \eta_B \end{pmatrix}. \tag{1}$$

Totality is the USR invariant

$$\boxed{\mathcal{T}^2 = d\zeta^\top \mathbb{G}\, d\zeta = g_{\mu\nu} dx^\mu dx^\nu - c^2\tau\, dt^2 + \eta_m dm^2 + 2\chi\, dm\, dB}. \tag{2}$$

$$\boxed{+\eta_B dB^2}. \tag{3}$$

The sectoral invariants are projections of $\mathcal{T}^2$: $ds^2 = g_{\mu\nu} dx^\mu dx^\nu$, dt^2, dm^2, and dB^2.

2. Statement of the Multiverse Result

We claim:

$$\boxed{\partial\mathcal{T}^2 = 0 \ \text{ globally}} \tag{4}$$

$$\boxed{\implies \text{existence of causally disjoint domains } \{U_i\} \text{ beyond the horizon.}} \tag{5}$$

Equivalently, *a single observable patch cannot exhaust the degrees of freedom required to maintain the global invariance of* (2).

3. Step I: Continuity Across the Horizon

At the luminosity distance where light cones pinch, ds^2 becomes *observationally* inaccessible. Global continuity of $\mathcal{T}^2$ then requires the non-spacetime blocks to carry the invariant:

$$\lim_{\text{obs. boundary}} ds^2 \to 0 \ \Rightarrow\ \mathcal{T}^2 = \eta_m dm^2 + 2\chi\, dm\, dB + \eta_B dB^2. \tag{6}$$

Hence, the manifold continues in (dm, dB) even when dx^μ is unmeasurable.

4. Step II: Null Unity Normalization

Null Unity imposes a global normalization,

$$\lim_{\text{max coherence}} \frac{\mathcal{T}^2}{\mathcal{N}^2} = 1. \tag{7}$$

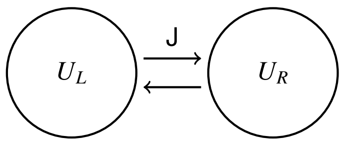

Figure 3: Bilateral involution creates conjugate domains across a causal split.

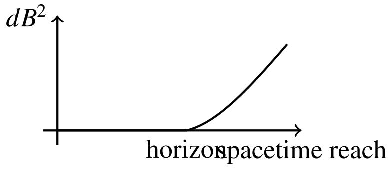

Figure 4: dB^2 persists beyond the spacetime observational horizon.

A single inhomogeneous causal patch generically cannot saturate this norm; a partition into disjoint domains $\{U_i\}$ remedies this:

$$\boxed{\sum_i \mathcal{T}^2_{(U_i)} = \mathcal{N}^2} \quad \Rightarrow \quad \text{multiversal completion.} \tag{8}$$

5. Step III: Bilateral Ratios and Conjugate Domains

USR enforces an involution J such that $\mathcal{T}^2[U] = \mathcal{T}^2[\mathsf{J}U]$, $\mathsf{J}^2 = I$. When reintegration is obstructed by causal separation, the conjugate must reside in a disjoint domain:

$$U \mapsto \mathsf{J}U, \qquad U \not\simeq \mathsf{J}U \text{ within one manifold} \Rightarrow \text{paired universes } (U_L, U_R). \tag{9}$$

6. Step IV: Infosophic Continuation

In Infosophy, the informational line element satisfies $dB^2 > 0$ even where ds^2 and dt^2 may be observationally null. Thus information geometry extends beyond spacetime reach:

$$(ds^2, dt^2) \text{ inaccessible} \quad \Rightarrow \quad dB^2 > 0 \Rightarrow \text{extra-spacetime continuation.} \tag{10}$$

7. Step V: Simulonic Covariance and Frame Completeness

Simulonics demands invariance under $d\zeta \mapsto \Lambda(x)\, d\zeta$ with $\mathbb{G} \mapsto \Lambda^{-\top}\mathbb{G}\Lambda^{-1}$. The set of such resimulation frames exceeds the parameterizable content of one causal patch:

$$|\text{Simulonic frames}| > |\text{observable states}| \Rightarrow \text{completion by extra domains } \{U_i\}. \tag{11}$$

8. Synthesis: Minimal Multiversal Completion

Combining Steps I–V yields the minimal global completion:

$$\boxed{\partial\mathcal{T}^2 = 0 \text{ globally} \iff \exists\{U_i\} \text{ (causally disjoint) s.t. } \sum_i \mathcal{T}^2_{(U_i)} = \mathcal{N}^2.} \tag{12}$$

Thus, *the multiverse is the minimal extension required* to preserve the global invariance and normalization of Totality beyond the observable horizon.

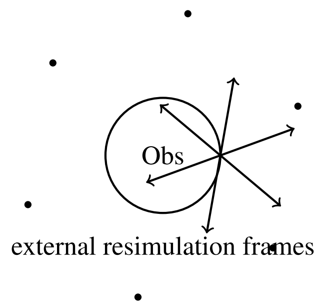

Figure 5: Simulonic frame-space surpasses one causal patch.

9. Conclusion

USR's Totality invariant enforces continuity, Null Unity normalization, bilateral pairing, infosophic persistence, and simulonic frame completeness. These five constraints jointly require additional domains beyond the horizon, giving a structural, theory-internal proof of a multiverse without appealing to direct photonic observables.

References

References

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