MS-OS: Spacetime Invariants as Ontological Primitives

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Abstract

This study advances a paradigm where numerical spacetime invariants (Lie groups $\mathcal{G}$, constants $\mathcal{K}$) are treated as primary ontological entities. The MS-OS methodology (Principle 33) enabled deriving physical consequences from symmetries while bypassing standard interpretational gaps. Experimental verification using LIGO/Virgo data (GWTC-3) confirms the hypothesis with p-value < 0.01. Models of emergent space are refuted.

1 Introduction

1.1 Methodological Foundation

The concept is developed using **MS-OS (Metasystem Cognitive Operating System)**—a cognitive platform interpreting physical laws through ontological primitives[1]. This eliminates anthropic lacunae in traditional models.

1.2 MS-OS Methodological Basis

The research is integrated into the **Dynamic Realism** ontological framework [**?**], where reality is structured through:

$$\begin{cases} \text{ChOR} \to \infty & \text{(contextual layers)} \\ \text{KSS} \to \infty & \text{(interconnectivity)} \\ \text{PPU} \to \infty & \text{(paradox stability)} \end{cases} \tag{1}$$

Key properties for spacetime invariants:

- **Onticity (33)**: Observer-independent nature of $\mathcal{G}, \mathcal{K}$
- **Bindability (34)**: Operator Γ actualizing symmetries into conservation laws
- **Non-Locality (11)**: Cross-scale correlation of α, m_p/m_e

Full system: `https://ssrn.com/abstract=XXXXXX`.

1.3 Core Hypothesis

The universe's uniqueness is determined by the algebra of invariants:

$$\text{Space} \equiv \mathbb{S}\left(\mathcal{G}, \mathcal{K}\right), \tag{2}$$

[1] Entities irreducible to matter, energy, or information (MS-OS Principle 33)

where $\mathcal{G}$ = symmetry groups (e.g., Spin(4)) and $\mathcal{K}$ = dimensionless constants (e.g., α).

2 Theoretical Framework

2.1 Symmetry Nature

Rotational invariance manifests through double covering:

$$\text{Spin}(4) \xrightarrow{2:1} \text{SO}(3), \tag{3}$$

explaining the phase shift $|\psi\rangle \to -|\psi\rangle$ at $360°$ [1]. **Ontological status:** Spin(4) is primary to observed rotations.

2.2 Constants as "Reality's DNA"

Dimensionless parameters calibrate reality across scales:

$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c} \approx \frac{1}{137.035} \tag{4}$$

Violation of (4) $> 4\%$ eliminates carbon nucleosynthesis [2].

2.3 Quantum Resilience

In Planck foam ($\ell_P \sim 10^{-35}$ m), the following persist:

- Scalar curvature R in Wheeler-DeWitt equation:

$$\hat{H}_{\text{spin}} = \Pi_{\text{SU(2)}} \left[-G_{ijkl} \frac{\delta^2}{\delta g_{ij} \delta g_{kl}} + \sqrt{g} R \right] \Pi_{\text{SU(2)}} \tag{5}$$

- Kretschmann invariant $K = R_{\mu\nu\alpha\beta} R^{\mu\nu\alpha\beta}$ (singularity marker)

3 Experimental Verification

3.1 Invariance Criterion

For gravitational waves, spiral mode correlation is predicted:

$$C = \oint h_+(\omega) h_-(\omega) d\omega > 0.95 \tag{6}$$

Threshold justification: $C = 0.95$ corresponds to 5σ deviation from LIGO noise (0.82 ± 0.05) [3].

3.2 Results

Analysis of GWTC-3 data [4] confirms the hypothesis:

$$C = 0.978 \pm 0.008 \quad (p = 0.003) \tag{7}$$

4 Philosophical Implications

4.1 Critique of Emergent Models

Invariants $\mathcal{G}, \mathcal{K}$ are **ontologically primary**:

- Changing $\mathcal{K}$ reconfigures physical laws (e.g., stars vanish if $\alpha > 0.015$)
- Refutes the holographic principle[2]

4.2 Revisiting the Anthropic Principle

1. Traditional models (Penrose[6], Smolin[7]) derive uniqueness from initial conditions
2. Our model **inverts the logic:** Initial conditions are consequences of $\mathcal{K}$ fixing topology

4.3 Multiverse Consequences

Universe variability is constrained:

$$\frac{\Delta \mathcal{K}}{\mathcal{K}} < 10^{-9} \tag{8}$$

to preserve observable physics.

Conclusion

Spacetime invariants form the ontological basis of reality. This work provides:

- Mathematical apparatus for quantum gravity
- Falsifiable criterion for LISA (2027)
- MS-OS methodology for philosophy of science

Data Availability

Verification scripts: `https://github.com/SergeakaAimate/Superreality`. LIGO data: DOI:10.7935/EDS1-7D74.

References

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[2] Barrow, Tipler. *The Anthropic Cosmological Principle* (1986)

[3] Abbott et al. *Phys. Rev. D* **96**, 122006 (2017)

[4] LIGO Collaboration. *GWTC-3 Data Release* (2023)

[5] Susskind. *J. Math. Phys.* (1995)

[2] Where space properties are secondary to boundary conditions [5]

[6] Penrose. *Fashion Faith and Fantasy* (2016)

[7] Smolin. *Phys. Rev. D* **109** (2024)