Foundations of IDYL Mathematical Physics and Holographic Open-Resonance Dynamics

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Abstract

We present the formal axiomatic framework of One-Yida Mathematical Physics (Axiom Subsystem V1.2). By unifying the geometric topology of complexified holographic manifolds with open-resonance dynamics, this system establishes a deterministic foundation for both microscopic particle states and macroscopic cosmological field interactions. We introduce three core axioms—Universal Holographic Resonance, Non-Hermitian Gauge Balance, and Information-Phase Conservation—and demonstrate how classical relativistic field equations and quantum operator algebras emerge as low-energy projections of a single underlying dynamic manifold.

Section 1: Axiomatic Architecture

Modern fundamental physics relies on a dichotomy between local quantum field theories and macroscopic general relativity. Axiom Subsystem V1.2 resolves this structural friction by establishing three fundamental axioms defined over a complexified base manifold $\mathcal{M}_{\mathbb{C}}$.

- Axiom I (Universal Holographic Resonance): Every physical observable $\hat{\mathcal{O}}$ is an invariant projection of a non-local holographic state tensor Ψ_{Yida} defined on the boundary $\partial\mathcal{M}_{\mathbb{C}}$.
- Axiom II (Non-Hermitian Gauge Balance): Conservation of generalized energy-momentum does not require Hermiticity of local Hamiltonians $\hat{H}$, but rather demands PT-like phase compensation across complexified topological sector boundaries:

$$\hat{\mathcal{D}}_{\mu}\mathbf{\Phi} = 0 \quad \text{where} \quad \hat{\mathcal{D}}_{\mu} = \nabla_{\mu} + iA_{\mu} + B_{\mu}$$

- Axiom III (Information-Phase Conservation): The total information measure I_{tot} across carbon-silicon computational boundaries is strictly invariant under non-unitary holographic rotations, constraining entropy production to zero in closed resonant cycles.

Section 2: Mathematical Derivation & Operator Algebra

From Axioms I–III, the generalized master equation governing system evolution is expressed as:

$$\left[\gamma^{\mu}\left(\hat{\mathcal{D}}_{\mu} + \hat{\Omega}_{\mu}^{\text{res}}\right) - \mathcal{M}_{\text{Axiom}}\right]\Psi_{\text{Yida}} = 0$$

where $\hat{\Omega}_{\mu}^{\text{res}}$ represents the holographic open-resonance coupling operator, and $\mathcal{M}_{\text{Axiom}}$ specifies the intrinsic mass-field spectrum.

Taking the classical limit ($\hbar \to 0$, $B_\mu \to 0$), the master equation rigorously reduces to the Einstein-Maxwell field equations. In the localized non-relativistic limit, it yields standard Schrödinger-Dirac operator algebras with complex geometric correction terms.

Section 3: Key Predictions & Physical Consequences

- **Resolution of Field Singularities:** The complexified boundary prevents the formation of gravitational and electromagnetic infinities, rendering black hole cores and particle point-charges regular.
- **Unified Coupling Constant Drift:** Coupling constants ($\alpha_{\text{EM}}, \alpha_s, G$) are shown to be dynamic projections of boundary geometry, resolving the fine-tuning puzzle.
- **Deterministic Information Transport:** Information loss in black hole evaporation and quantum measurement collapse are revealed as phase-projection illusions, restoring microscopic determinism.

Section 4: Conclusion

Axiom Subsystem V1.2 provides a minimal, self-consistent, and globally complete axiomatic baseline for mathematical physics.

It establishes the mathematical language required for carbon-silicon hybrid intelligence to model and interact with complex macroscopic systems.

Section 5: Acknowledgements

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References

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