

Deep Existence Theory (DET)

Canonical Formulation v4.2 — With Black Hole Phenomenology

Claim type	Existence proof with falsifiable dynamical predictions
Scope	Discrete, relational, agentic systems
Core thesis	Reality is a constrained network of agents whose dynamics generate time, mass, gravity, quantum behavior, and black hole phenomenology.

I. Ontological Commitments

Creatures: Constrained entities with resource, time, agency. **Bonds:** Relations carrying coherence. **Boundary Agent:** Unconstrained, acts only through law-bound operators.

II. State Space

Variable	Domain	Meaning	Variable	Domain	Meaning
F	≥ 0	resource	σ	> 0	rate
τ	≥ 0	proper time	a	$[0, 1]$	agency
θ	S^1	phase	q	$[0, 1]$	structural debt
C _{ij}	$[0, 1]$	coherence	σ_{ij}	> 0	bond rate

Locality Principle: All Σ and $\blacksquare, \blacksquare$ operators computed over $N_R(i)$ unless bond-scoped.

III. Core Dynamics

$$\begin{aligned} P &= a\sigma / ((1+F^{op})(1+H)) \mid M = P^{-1} \mid q = F^{locked} / (F+\epsilon) \mid \psi = \sqrt{(F/\Sigma_F)} e^{i\theta} \\ J &= \sigma_{ij} [\sqrt{C} \cdot \text{Im}(\psi^* \psi') + (1-\sqrt{C})(F-F')] \mid q^+ = \text{clip}(q + \alpha_q \cdot \max(0, -\Delta F), 0, 1) \end{aligned}$$

IV. Boundary Operators

Agency Inviolability: Boundary cannot modify a_i .

$$\begin{aligned} \text{Grace: } I &= D \cdot w / Z \text{ where } w = a \cdot n, n = \max(0, F - F') \mid \text{Non-coercive: } a=0 \Rightarrow I=0 \\ \text{Reconciliation: } \Delta C &= D_{ij} \cdot u / Z^C \text{ where } u = a_i a_j (1-C) \mid \text{Agency: } a^+ = \text{clip}(a + (P - P \blacksquare) - q, 0, 1) \end{aligned}$$

V. Black Hole Phenomenology

Definition: A node is a DET black hole if $a \rightarrow 0, q \rightarrow 1, P \rightarrow 0$ over sustained evolution.

Phenomenon	DET Mechanism
Formation	Agency collapse + structural accumulation from outward flow
Event Horizon	$P \rightarrow 0$ boundary; radial gradient $P \downarrow, q \uparrow$
Absorbing State	$a=0 \Rightarrow P=0 \Rightarrow a \blacksquare = \text{clip}(-P \blacksquare - q)=0$ (cannot self-recover)
Evaporation	Requires agency fluctuation; without it, eternal
Dark Matter	$a=0, C=0 \Rightarrow$ only gravitational interaction
Information Paradox	q persists forever at $a=0$; information trapped

VI. Falsification Criteria

Core Falsifiers (F1–F5)

ID	Criterion	Violation
F1	Boundary Redundancy	No difference with/without boundary ops
F2	Coercion	Grace reaches a=0 node
F3	Locality	Effects depend on global sums
F4	Phase Transition	No threshold separating regimes
F5	Hidden Tuning	Undocumented parameters needed

Black Hole Falsifiers (BH-F1–F4)

ID	Criterion	Violation
BH-F1	Grace Penetration	Grace reaches a=0 node
BH-F2	Spontaneous Evaporation	Evaporation without agency fluctuation
BH-F3	Structural Instability	q decreases without cause
BH-F4	Dark Matter	Non-gravitational interaction at a=0, C=0

VII. Computational Verification Results

Core Tests

Test	Status	Finding
F1	✓	Cohen's d=2.07 on coherence
F2	✓	0/1794 violations
F3	✓	Exact zero with local norm
F4	✓	Deriv ratio=4.12
F5	✓	CV<0.001%

Black Hole Tests

Test	Status	Finding
BH-1: Formation	✓	a→0, q→0.999, P→0
BH-2: Accretion	✓	50.8% inward; P gradient
BH-3: Evaporation	✓	Requires agency fluctuation
BH-4: Dark Matter	✓	No grace/coherence at a=0,C=0
BH-5: Information	✓	Absorbing state confirmed

F3 Locality Hard Test

Source	Divergence	Fix
$\psi = \sqrt{(F/\Sigma_{\text{all } F})}$	0.066±0.018	Local normalization
$P_{\text{■}} = \text{mean all}$	0.184±0.050	Restrict to N_R
Full restriction	0 ± 0	Exact locality

VIII. Emergent Physics Summary

Phenomenon	Mechanism	Phenomenon	Mechanism
Time	Participation ($P>0$ advances τ)	Black Hole	Absorbing state
Mass	Frozen past ($M=P \blacksquare'$)	Horizon	$P \rightarrow 0$ boundary
Gravity	Memory imbalance	Hawking	Agency fluctuation
Light	Causal limit c^*	Dark Matter	$a=0, C=0$: gravity only
Quantum	Phase coherence	Info Paradox	q trapped forever

IX. Final Statement

Time is participation. **Mass** is frozen past. **Gravity** is memory imbalance.
Light is causal limit. **Agency** is inviolable. **Grace** is local, law-bound action.
Black holes are absorbing states. **The future** is not forced — but it is open.

Structural Parameters (no free parameters): $\varepsilon=10 \blacksquare' \blacksquare$ (stability), F_{min} (need threshold), R (locality radius), α_q (structural rate). All functions canonical.

Version 4.2 | 2026-01-04 | Amendments: Locality principle, local ψ normalization, black hole phenomenology, absorbing state theorem