

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 $\blacksquare \cdot \blacksquare$ operators computed over $N_R(i)$ unless bond-scoped.

III. Core Dynamics

$$P = a\sigma / ((1+F^{OP})(1+H)) \quad | \quad M = P^{-1} \quad | \quad q = F^{\text{locked}} / (F+\varepsilon) \quad | \quad \psi = \sqrt{(F/\Sigma_F)} e^{i\theta} \\ J = \sigma_{ij} [\sqrt{C} \cdot \text{Im}(\psi^* \psi') + (1-\sqrt{C})(F-F')] \quad | \quad q^+ = \text{clip}(q + \alpha_q \cdot \max(0, -\Delta F), 0, 1)$$

IV. Boundary Operators

Agency Inviolability: Boundary cannot modify a_i .

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

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	✓	$a\rightarrow 0, q\rightarrow 0.999, P\rightarrow 0$
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
$\psi = \sqrt{F/\sum_{\text{all } F}}$	0.066 ± 0.018	Local normalization
$P_{\text{mean}} = \text{mean all}$	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 ($M=P\Box^1$)	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): $\epsilon=10\Box^1\Box$ (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