K.E.Y.C.H.A.I.N. × V.A.S.K. — MASTER ABSOLUTION (Text-Only)

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Abstract
K.E.Y.C.H.A.I.N. and V.A.S.K. are presented here as a single, internally consistent framework built from (i) an interaction-first ontology (interaction space first, spacetime later), (ii) a permission (projector) account of particle species, and (iii) an activation (order-parameter / field) account of why particular sectors of interaction are dynamically available in a given epoch or region. The framework is formulated to be killable: it specifies mathematical objects, dynamical laws, and classes of falsifiers. This document is a text-only 'master file' intended for public distribution and later layout into booklet/trifold formats.

How to read this document

- This is a technical note: definitions first, then equations, then derived consequences, then falsifiers.
- Statements are tagged as: Axiom/Ultimata (postulate), Definition, Derived, Closure (modelling choice), or Template (illustrative form).
- No claim is protected from falsification by rhetoric: if an assumption is required, it is stated explicitly.
- This text is deliberately image-free. It is designed to remain legible in photocopy.

Notation

- H: interaction Hilbert space (the primary arena).
- $|\Psi\rangle$: global state (pure) or ρ: density operator (mixed).
- Π_a: projector onto interaction sector a. Π_a^2=Π_a, Π_a†=Π_a.
- Π_p: particle / species permission operator ('keychain'): Π_p=∑_a w_{p,a} Π_a.
- w_{p,a}: permission weight (minimal {0,1}; refined [0,1]).
- α_a(x)∈[0,1]: local activation/order parameter for sector a on emergent spacetime M.
- g_{p a}(x): effective coupling of particle p to sector a at x.
- τ: proper time along an observer worldline; D/Dτ: covariant derivative including internal connection Γ_τ.
- $C_2(a)$: quadratic Casimir (adjoint convention), d_a: sector dimension.

PART I — KEYCHAIN (Permissions / Projectors)

1. Ontological claim

KEYCHAIN proposes an ontological inversion: particle species are not primitive 'objects in spacetime' endowed with intrinsic properties. Instead, a species is a rule specifying which interaction channels are permitted to couple to an excitation. Observable 'properties' (mass-like inertia, charge-like response, confinement-like restrictions, decay channels) are treated as emergent consequences of those permitted couplings.

2. Formal substrate: interaction Hilbert space

Definition (Interaction space). Let H be a complex Hilbert space with an orthonormal basis $\{|e_i\rangle\}$. An interaction family (sector) a corresponds to a subspace $S_a \subset H$ with projector Π_a.

Projector identities:

$\Pi_a^2 = \Pi_a$

$\Pi_a\dagger = \Pi_a$

3. Particle species as composite permissions

Definition (Keychain). A particle species p is represented by a composite permission operator Π_p built from sector projectors:

$\Pi_p = \sum_a w_{p,a} \Pi_a$

where $w_{p,a} \in \{0,1\}$ (minimal) or $w_{p,a} \in [0,1]$ (refined).

Interpretation: Π_p is a rule describing admissible interaction channels. The 'state of the particle' is the restriction $\Pi_p|\Psi\rangle$.

4. Observables within the permitted subspace

Definition (Sector-conditioned expectation). For any observable operator $\hat{O}$, particle-relative expectations are computed by inserting the permissions:

$\langle \hat{O} \rangle_p = \langle \Psi | \Pi_p \hat{O} \Pi_p | \Psi \rangle$

(or normalised by $\langle \Psi | \Pi_p | \Psi \rangle$ when required).

5. Dynamics: stability, mixing, and leakage

Let an effective generator $\hat{H}$ act on H and decompose into within-sector terms and cross-sector mixing terms. Stability corresponds to approximate conservation of sector occupations; decay corresponds to leakage into different effective projector patterns.

$i\hbar \, d|\psi\rangle/dt = \hat{H}|\psi\rangle$

$\hat{H} = \sum_a \hat{H}_a + \sum_{a \neq b} \hat{H}_{ab}$

Stability (template): $d/dt \, \langle \psi | \Pi_p | \psi \rangle \approx 0$

6. What KEYCHAIN predicts (and what it does not)

- Prediction class A (leakage): if sector mixing exists, strictly-zero couplings are non-generic; suppressed 'forbidden' effects are expected at some level.
- Prediction class B (sector-dependent dispersion): different permission bundles can induce distinct effective dispersion or inertial response in an emergent / medium-like regime.
- KEYCHAIN alone does not select which sectors are dynamically active in our epoch; it classifies permissions, but does not provide the epoch selection mechanism.

PART II — V.A.S.K. (Activation / Epoch Selection)

7. Ultimata: activation fields and effective couplings

Ultimata (Activation). Each sector a has an activation $\alpha_a(x) \in [0,1]$ on emergent spacetime M. Effective couplings factorise into permission × activation:

$g_{p\,a}(x) = g_a^{(0)} \cdot w_{p,a} \cdot \alpha_a(x)$

Definition (Dormant key). A dormant key is permission without availability: $w_{p,a}=1$ while $\alpha_a(x) \approx 0$ in the current epoch/region.

8. Activation as an order parameter (stat-mech closure)

Closure. VASK treats α_a not merely as a dial, but as an order parameter arising from coarse-graining: a collective coordinate summarising how strongly a sector is realised in the effective low-energy description.

9. Landau–Ginzburg effective potential

Closure (Landau expansion). For each sector a, define an effective free-energy density $V_{eff,a}(\alpha)$ with a Landau–Ginzburg form:

$V_{eff}(\alpha) = -\mu\,\alpha + 1/2\,(T_{eff}\,d_a - r_a)\,\alpha^2 + 1/4\,u_a\,\alpha^4 + O(\alpha^6)$

- μ: bias/tilt selecting a preferred phase.
- T_{eff}: 'information temperature' / coarse-graining scale.
- d_a: sector dimension (entropy/complexity weight).
- r_a: ordering drive (microscopic mixing/structure).
- $u_a>0$: stabiliser ensuring boundedness.

10. The Casimir filter: a structured activation hierarchy

Closure (Casimir/RMT hypothesis). A compact hypothesis links the ordering drive to algebraic invariants:

$r_a \propto \beta_{info}\,\lambda^2\,\sigma_g^2\,C_2(a)$

From the Landau form, a mean-field activation inequality can be stated:

Active iff $r_a > 4\,T_{eff}\,d_a$

Dormant iff $r_a < 4\,T_{eff}\,d_a$

Define the stability ratio: $R_a = d_a / C_2(a)$.

Then (up to conventions): $\beta_{info}\,\lambda^2\,\sigma_g^2 > 4\,R_a$

Interpretation. Low R_a sectors are easy to keep active; high R_a sectors are naturally hard to activate and can remain dormant over cosmological time. A monotone ordering $U(1) \to SU(2) \to SU(3) \to G_2 \to F_4 \to E_6 \to E_7 \to E_8$ is an explicit example of such an ordering.

11. R2 upgrade: α_a(x) as dynamical fields (epochs as solutions)
Upgrade. To remove narrative 'epoch switches', promote α_a to dynamical scalar fields with an action. Epochs become metastable plateaus of solutions; activation events become real transitions (roll/tunnel).
$S_\alpha = \int d^4x \sqrt{-g}\,[\, \Sigma_a \tfrac{1}{2} (\nabla\alpha_a)^2 - \Sigma_a V_a(\alpha_a) - \Sigma_{a<b} \lambda_{ab} \alpha_a^2 \alpha_b^2 \,]$
In FRW (homogeneous): $\ddot{\alpha}_a + 3H \dot{\alpha}_a + \partial V_{eff}/\partial \alpha_a + \ldots = 0$
Minimal plateau potential (template): $V_a(\alpha)=\lambda_a \alpha^2(\alpha-1)^2 + \varepsilon_a \alpha$

PART III — VASK_R5 Closure (Ultimata + Model Card)

12. Ultimata axioms (non-negotiables)

- U0 (Substrate). There exists a separable complex Hilbert space H with rigid internal symmetry algebra g; a concrete closure selects g=e8 with a faithful 248-dimensional representation block as substrate.
- U1 (Reality state). Reality is a normalised state on H: $|\Psi\rangle$ with $\langle\Psi|\Psi\rangle=1$, or density operator $\rho\geq 0$ with $\mathrm{Tr}\rho=1$.
- U2 (Permissions). Interaction access is encoded by Hermitian projectors Π_a on H.
- U3 (Keychains). Particle species are composite permissions Π_p built from sector permissions.
- U4 (Local activation). Each sector has $\alpha_a(x)\in[0,1]$ on emergent spacetime; couplings are permission×activation.
- U5 (Proper-time covariance). Evolution is parameterised by proper time τ along an observer worldline; fundamental law $i\hbar\, D|\Psi\rangle/D\tau = \hat{H}|\Psi\rangle$.
- U6 (Conditioned observables). Observable values are computed by sector-conditioned expectations.
- U7 (Fundamental linearity). Total evolution is linear and norm-preserving; any effective cross-scale feedback must be implemented via coupling to auxiliary degrees of freedom (to avoid signalling pathologies).

13. Structure: algebra → sectors → projectors
Closure. Sector definitions are fixed by representation-theoretic branching. A canonical embedding chain places Standard Model gauge structure inside e8 via so(16), $so(10)\oplus so(6)$, $su(5)\oplus u(1)$, and finally $su(3)_C\oplus su(2)_L\oplus u(1)_Y$. Electromagnetism is the derived $u(1)_{EM}$ direction generated by $Q=T3+Y/2$ after electroweak symmetry breaking.

14. Dynamics: Absolution Hamiltonian
A standard split separates locking, mixing, geometry/connection, and scale-completion terms:
$\hat{H} = \hat{H}_0 + \hat{H}_{mix} + \hat{H}_{geom} + \hat{H}_{ren}$
Locking: $\hat{H}_0(x) = -\Sigma_a \mu_a \alpha_a(x) \Pi_a$
Mixing: $\hat{H}_{mix}(x) = \Sigma_{a<b} \varepsilon_{ab} \alpha_a(x)\alpha_b(x) (M_{ab}+M_{ab}^\dagger)$
Geometry: Γ_τ enters $D/D\tau = d/d\tau + \Gamma_\tau$; Γ_τ matches the spin-connection structure in the Dirac limit.
Scale completion: $\hat{H}_{ren}$ implemented via coupling to an auxiliary bath so total evolution remains linear on $H\otimes K$.

15. Emergent EFT limit (QFT + GR as projections)
Derived template. In the low-energy regime, sector-conditioned expectations define effective local fields. A Dirac/Yang–Mills template is:
[iγ^μ(∂_μ + i Σ_a g_{p a}(x) A_μ^a(x)) − m_p(x)] ψ_p(x) = 0
g_{p a}(x) = g_a^(0) w_{p,a} α_a(x)
Mass closure (template): m_p(x) = y_p^(0) v^(0) α_H(x) F_H(P_H(x)), P_H(x)=⟨Ψ|Π_H|Ψ⟩

16. Model Card (explicit closure instance)
This section records one explicit, testable instance (a 'model card'). Values marked Illustrative are placeholders for fitting to data; the point is to provide a killable numeric target.

- Embedding choice: e8 with the canonical branching chain to SM; EM defined via Q=T3+Y/2.
- Activation potentials: Dark sector quadratic near α=1; EM/Strong/Weak/Higgs deeply locked today (m_i ≫ H0).
- Cross-couplings: symmetry-suppressed (example: λ_{D,EM}=0 at tree level).
- Dark-energy template: w(z) ≈ −1 + C(1+z)^3 (low-z). (C=0.01 Illustrative).
- Fine-structure drift template: Δα/α = A exp(−kt) with A≈10^−18, k≫H0 (Template).
- Equivalence principle template: η_AB ≈ β_S (f_{S,A}−f_{S,B}) with β_S=10^−8 (Illustrative).
- Binary falsifier: if neutrino/antineutrino are orthogonal permissions, 0νββ amplitude vanishes; detection falsifies that postulate.

PART IV — One-object synthesis and test programme

17. One master functional (disciplined container)
This framework can be expressed as one disciplined container that combines (i) spacetime geometry, (ii) activation fields, and (iii) matter fields with activation-weighted couplings. A compact schematic is:
Z_total = ∫ Dg_{μν} Π_a Dα_a Π_p Dψ̄_p Dψ_p exp[−(1/ħ)(S_grav + S_α + Σ_p S_p)]
The content is: gravity + activation + matter, with KEYCHAIN permissions appearing in Π_p and VASK availability appearing in α_a(x).

18. Two unavoidable consequences (if the machinery is real)

- Activation thresholds / hierarchies: the sign change in the quadratic term of V_eff selects whether α_a sits near 0 or near a non-zero minimum; the Casimir/complexity ratio provides a structured ordering of that selection difficulty.
- No perfect off-switch (leakage floor): if an entropy barrier term (e.g., α ln α + (1−α) ln(1−α)) is used, exact α=0 is generically avoided at finite T_eff; empirically this translates into 'strictly zero couplings are non-generic' and motivates leakage searches.

19. Where it collides hard with known physics (and how it stays honest)

- Hard species-dependent speed caps contradict SR/QFT if taken as fundamental kinematics. The consistent reading is: sector structure modifies effective dispersion/inertial response in an emergent regime, not the existence of Lorentz symmetry at the fundamental level.
- If $\alpha_a(x)$ are promoted to real dynamical fields, they generically contribute energy density, couple to gravity, and leave imprints; the framework must either provide screening/decoupling mechanisms or treat α as an order parameter rather than a new propagating degree of freedom.
- The Casimir filter depends on modelling choices (normalisations, coarse-graining definition of T_{eff}, mapping of 'entropy cost' to d_a). The theory is obliged to show the monotone hierarchy is robust under reasonable variations, or else accept falsification.

20. Minimal experimental programme (kill switches)

1. Photon dispersion/birefringence: high-energy time-of-flight and polarisation constraints test leakage and sector-dependent propagation.
2. $0\nu\beta\beta$ searches: a strict null postulate is killable if detection is confirmed under the model's orthogonality assumption.
3. Precision clocks with different interaction sensitivities (EM vs nuclear/strong): tests any sector-dependent gravitational response templates.
4. Cosmological reconstruction of $w(z)$: compare dark-energy template forms to survey reconstructions.
5. 'Hierarchy test': if a new low-energy force is found with effective complexity far above SU(3) yet active, the Casimir-filter mechanism is broken.

21. Computational recipe (how to run the theory)

6. Fix algebra and embedding; construct explicit sector projectors Π_a.
7. Choose activation potentials V_a and cross-couplings λ_{ab} allowed by symmetry.
8. Solve α_a dynamics on FRW or chosen background.
9. Construct $\hat{H}$ with locking, mixing, geometry, and scale-completion terms.
10. Evolve $|\Psi\rangle$ unitarily (proper-time or Tomonaga–Schwinger form).
11. Compute occupations $P_a(x)=\langle\Psi|\Pi_a|\Psi\rangle$ and map to effective constants.
12. Generate falsifiable outputs with uncertainties and compare to data.

PART V — Glossary and indexing

Glossary

- Permission (w): species-level allowance to couple to a sector.
- Activation (α): epoch/region-level availability of a sector.
- Dormant key: w=1 but α≈0.
- Epoch: long-lived plateau of α(t) (or α(x)).
- Activation event: transition between plateaus.
- Leakage: suppressed but nonzero cross-sector influence induced by mixing and/or entropy closure.
- Casimir filter: structured inequality comparing ordering drive $\propto C_2$ to entropy cost $\propto d$.
- Scale-completion: linear implementation of effective running via coupling to auxiliary degrees of freedom.

Document status

This master file is designed to be a single source for multiple output formats (booklet, stapled report, tri-fold). It contains no images by design. For layout versions, import figures separately as needed.

Setup

Interaction-first ontology, activation dynamics, covariant evolution, and falsifiability

Unified VASK-Absolution System: Total Equation

Partition Function, recursively substituted:

$$Z_{\text{total}} = \int \mathcal{D}g_{\mu\nu} \prod_a \mathcal{D}\alpha_a \prod_p \mathcal{D}\bar{\psi}_p \mathcal{D}\psi_p \exp\left[-\frac{1}{\hbar} \int d^4x \sqrt{-g} \left(\frac{R - 2\Lambda}{16\pi G} + \sum_a \frac{1}{2} Z_a g^{\mu\nu} \partial_\mu \alpha_a \partial_\nu \alpha_a \right.\right.$$
$$- \sum_a \left[-\mu_a \alpha_a + \frac{1}{2}(T_{\text{eff}} d_a - r_a)\alpha_a^2 + \frac{u_a}{4}\alpha_a^4 + T_{\text{eff}} d_a \left(\alpha_a \ln \alpha_a + (1-\alpha_a)\ln(1-\alpha_a)\right) \right]$$
$$\left.\left. - \sum_{a<b} \lambda_{ab} \alpha_a^2 \alpha_b^2 + \sum_p \bar{\psi}_p \left(i\gamma^\mu \nabla_\mu - m_p(x) + i \sum_{a'} g_{a'}^{(0)} w_{p,a'} \alpha_{a'}(x) \gamma^\mu A_{\mu'}^{a'}(x) \right) \psi_p \right) \right]$$

With defining conditisnnt inıess:

$$w_{p,a} \in \{0,1\} \text{ or } [0,1], \quad \Pi_p = \sum_a w_{p,a} \Pi_a, \quad \alpha_a(x) \equiv \langle \Psi(x) | \Pi_a | \Psi(x) \rangle \in [0,1]$$

Self-consistent evolution along $x(\tau)$:

$$i\hbar \left(\frac{d}{d\tau} + \frac{1}{4} \omega_\mu^{bc}(x(\tau)) \frac{dx^\mu}{d\tau} \Sigma_{bc} \right) |\Psi\rangle = \hat{H}(x(\tau)) \, |\Psi\rangle, \quad \text{where } \Gamma_\tau = \frac{1}{4} \omega_\mu^{bc} \frac{dx^\mu}{d\tau} \Sigma_{bc}$$

$$\hat{H}(x) = -\sum_a \mu_a \alpha_a(x) \Pi_a + \sum_{a<b} \varepsilon_{ab} \alpha_a(x) \alpha_b(x) (M_{ab} + M_{ab}^\dagger) + \hat{H}_{\text{geom}} + \hat{H}_{\text{ren}}$$

