GIBM v0.1 Technical Companion

Lean Formal Scaffold, Bridge Notes, and Open Burdens

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Purpose. This document is a lean technical companion to the GIBM v0.1 framework paper. It preserves the central notation, bridge arguments, status labels, and open derivation burdens without attempting to be a complete mathematical monograph.

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Abstract

This technical companion states the lean formal scaffold of GIBM v0.1. GIBM treats space, time, particles, fields, forces, mass, gravity, probability, and observation as recovered maps or regimes rather than basement primitives. The primitive working structure is distinction, local relation, admissibility, ordered update, and persistence criterion. From this base, the document records the current technical status of the framework: formal core definitions, map-faithfulness rules, quantum support and Born-measure bridge, residualized possibility and entropy, energy and mass recovery, gravity and free-fall scaffold, black-hole placement, dark-sector taxonomy, Standard Model category placement, and explicit open burdens. This document does not claim a completed derivation of quantum gravity, the Standard Model, black-hole entropy, or the actualization selector. Its function is to make clear what is locked, what is bridged, and what remains open.

Claim-Status Labels

Label	Meaning
Locked Definition	A stable GIBM definition or category placement used in v0.1. It may later be refined, but it is no longer vague.
Strong Bridge	A structurally coherent recovery route from GIBM terms to known physical language. It is not yet a theorem.
Near-Real-Pass Under Assumptions	A result that follows tightly if the stated assumptions are accepted. The assumptions remain visible.

Label	Meaning
Open Recovery Target	A known result or structure that GIBM must eventually recover or explain, but has not yet derived.
Speculative / Not Public Claim	A live internal thought that should not be presented as a result.

Table of Contents

1. Primitive Scaffold

GIBM v0.1 begins with five basement primitives. These are not physical objects in space. They are the minimal structural requirements for a local update framework from which physical maps may later be recovered.

Primitive	Working meaning	Audit note
Distinction	The minimum basis by which alternatives are not identical.	Does not assume measurement, observer, or probability.
Local relation	Direct coupling in the dependency/update structure.	Locality is dependency-local before it is geometric.
Admissibility	Structurally possible local successor existence under the current update regime.	Not dominance, stability, or selection.
Ordered update	Dependency-ordered transition from current local state toward successor state.	Time is recovered from ordered update, not assumed.
Persistence criterion	The retention condition by which a structure can remain expressible across update or map recovery.	Used to recover coherent structures, maps, and identity.

The first audit rule is that space, time, particles, fields, forces, waves, geometry, spacetime, mass, gravity, electromagnetism, and probability must not be inserted as basement assumptions. They may appear only as recovered maps, regimes, or bridge targets.

$$\text{Basement} = \{\text{distinction, local relation, admissibility, ordered update, persistence criterion}\}$$

$$\text{Recovered later} = \{\text{space, time, fields, particles, forces, geometry, mass, probability}\}$$

Item	Status	Meaning
Primitive scaffold	Locked Definition	Clean enough for v0.1; future work may refine notation but should not add map-level physics to the basement without explicit justification.

2. Formal State, Admissibility, and Update

A cell is not a particle or a spatial box. A cell is a minimal local admissibility/update domain. Information is not semantic content or human knowledge; it is admissible distinguishable local state-content.

$$q_c(t+1) = U_c(q_c(t), N_c(t), A_c(t), P_c(t))$$

Here q_c(t) is the local state of domain c at update index t; N_c(t) is the directly related neighborhood; A_c(t) is the admissibility structure; and P_c(t) is persistence weighting. The update index t is not primitive physical time. It is an ordering parameter that may later be recovered as clock-chain time in faithful maps.

2.1 Exact Admissibility Structure

A candidate local successor state q is admissible only if it passes four structural tests: internal consistency, neighborhood compatibility possibility, update-continuity possibility, and nonzero persistence possibility.

$$A_c(q,t) = I_c(q)\ N_c(q,t)\ U_c(q,t)\ P_c(q,t)$$

$$q \text{ is admissible iff } A_c(q,t) = 1$$

Term	Meaning
I_c(q)	Internal consistency of the candidate successor state.
N_c(q,t)	Possibility of compatibility with directly related neighborhood.
U_c(q,t)	Possibility of update-continuity with the current local state.
P_c(q,t)	Nonzero persistence possibility.

Admissibility is deliberately weaker than expression. A state can be admissible, short-lived, unstable, or non-dominant without being selected as the expressed successor.

Item	Status	Meaning
Admissibility	Locked Definition	Defined as possible successor existence, not selection.

3. Dominance, Closure, and Tension

When multiple admissible successor states exist, expression is not automatic. GIBM distinguishes admissibility from dominance, and dominance from closure.

$$\Sigma_c(q,t) = \alpha L_c + \beta C_c + \gamma S_c + \delta R_c + \varepsilon K_c$$

Symbol	Meaning
L_c	Local fit pressure.
C_c	Continuity pressure.
S_c	Rival suppression pressure.
R_c	Resolving-interaction pressure.
K_c	Closure pressure.

A candidate q becomes expressed only if its dominance over rivals exceeds a minimum gap and closure pressure is sufficient. Otherwise the domain remains in tension.

$$\text{Express } q_k \text{ only if } \Sigma_c(q_k,t) - \max_{j\neq k} \Sigma_c(q_j,t) \geq \Delta_D \text{ and } K_c \geq \Theta_K$$

$$\text{Otherwise: domain remains in tension}$$

This prevents both premature closure and endless indecision. It also creates the formal place where actualization remains open: the framework can state closure conditions and expression constraints without yet deriving a complete individual-event selector.

Item	Status	Meaning
Dominance and closure architecture	Strong Bridge	Structurally coherent; exact closure-pressure law remains open.

4. Map Faithfulness and Recovered Maps

GIBM treats GR, QM, QFT, and the Standard Model as successful empirical maps within their domains. A recovered map is faithful when it preserves the relevant structure of the underlying update/relation pattern without turning the map into the basement.

$$D_M(P,t) = \lambda_R D_R + \lambda_U D_U + \lambda_C D_C$$

$$F_M(P,t) = 1 - D_M(P,t)$$

Term	Meaning
P	Underlying patch/domain being coarse-grained.
M	Map family being used.
D_R	Relational distortion.
D_U	Update-order distortion.
D_C	Contrast distortion.
F_M	Map faithfulness for the chosen map family.

A map is valid only if the patch persists, distortion remains below the map-relative limit, and the relevant feature family remains representable. Smooth-looking maps are not automatically faithful; a map that erases relevant relations is invalid even if it is mathematically convenient.

Item	Status	Meaning
Map faithfulness	Locked Definition	Central audit rule for future recovery work.

5. Quantum Support and Born Measure

GIBM does not insert the Born rule as an unexplained rule. The current bridge starts from unresolved support capable of recombination. If unresolved alternatives can interfere, support must carry orientation or cyclic offset, not merely scalar amount.

$$z = r\,e^{i\varphi} = r(\cos\varphi + i\sin\varphi)$$

$$Z = z_A + z_B$$

$$|Z|^2 = |z_A|^2 + |z_B|^2 + 2\,\mathrm{Re}(z_A^* z_B)$$

The cross term is the interference term. Scalar weights cannot produce destructive interference under simple additive composition. Oriented support is therefore a strong bridge requirement.

5.1 Squared Measure from Additivity

Exclusive record outcomes must have additive measure under coarse-graining. If M(Z)=|Z|^p and e_1, e_2 are orthogonal unit supports, then additivity requires:

$$M(e_1 + e_2) = M(e_1) + M(e_2)$$

$$(\sqrt{2})^p = 2$$

$$p = 2$$

Thus squared norm is forced under the assumptions of oriented support, orthogonal additivity, and coarse-graining consistency.

$$M(Z) = |Z|^2$$

$$P_i = |Z_i|^2 / \Sigma_j |Z_j|^2$$

5.2 Hilbert-like Support Space

$$\Psi = \Sigma_i\, z_i\, e_i$$

$$\langle\Phi,\Psi\rangle = \Sigma_i\, \varphi_i^*\, \psi_i$$

$$||\Psi||^2 = \Sigma_i\, |z_i|^2$$

Hilbert-like structure is therefore the natural mathematical home for oriented unresolved support, orthogonal records, compatibility/overlap, norm preservation, and continuous refinement. This does not yet derive all of quantum mechanics; it locks the support-measure bridge.

Item	Status	Meaning
Born/Hilbert bridge	Near-Real-Pass Under Assumptions	Squared measure follows tightly if oriented support, orthogonal record additivity, phase invariance, and coarse-graining consistency are accepted. Full Hilbert-space quantum mechanics remains open.

6. Observation, Actualization, and Residualized Possibility

Observation is not consciousness. Observation is outcome-resolving interaction. A detector, environment, or other realized interacting system can observe if it participates in resolving outcome.

6.1 Closure by Record Formation

$$\Psi_{TD} = \alpha(A, D_A) + \beta(B, D_B)$$

$$\mu_D = \langle D_B | D_A \rangle$$

$$C_{rec} \propto |\mu_D|$$

If detector/environment states become distinguishable, local recombination capacity falls. With persistent record structure, closure occurs at the relevant record scope.

$$C_{rec,\sigma} < C_{min,\sigma} \text{ and } L_R \geq 2$$

6.2 Actualization Architecture

Actualization is the expression of one record-compatible outcome at a scope where recombination has failed and record stability has formed. The individual selector remains open.

$$\{R_i\} \rightarrow R_k + \{Res_\sigma(R_{j \neq k})\}$$

6.3 Residualized Possibility

Residualized possibility is nonexpressed viable structure after realization. It is not a full alternate world, and it is not erased into absolute nothing. It is residual accounting relative to a scope of recovery, recombination, or record expression.

$$Res_\sigma(X) = \text{residual status of } X \text{ relative to scope } \sigma$$

$$M_{pre} = M_{expressed} + M_{residual} + M_{env} + M_{ent} + M_{deep} + M_{unknown}$$

Item	Status	Meaning
Actualization	Architecture locked / selector open	One record at scope plus residualized nonexpression is placed; individual selector remains the largest open core.

7. Entropy as Recoverability Loss

GIBM defines entropy as scope-relative recoverability loss with accounting preserved. Entropy is not merely disorder. It measures the degree to which prior distinctions, viable possibilities, update histories, or fine relational structures remain part of the accounting but are no longer cleanly reconstructable, recombinable, or expressible within the current map or record scope.

$$S_\sigma \sim -\log C_{rec,\sigma}$$

$$S = k_B \log \Omega$$

In GIBM, Ω is interpreted as the measure of recoverability-degenerate underlying configurations compatible with the current expressed map. Environmental redundancy increases record stability while driving recombination capacity down.

$$|\mu_E| = \Pi_k |\mu_k|$$

$$Red_R = -\log |\mu_E|$$

In this language: entropy is the shadow of unresolved or unrecoverable structure in the expressed map. The line is poetic but technically direct: entropy measures what the present map cannot reconstruct while the accounting remains relevant.

Item	Status	Meaning

Item	Status	Meaning
Entropy	Locked Definition / Strong Bridge	Conceptually locked as recoverability loss; exact physical functional remains open.

8. Energy and Mass

Energy is not primitive substance. It is recovered from action/support-phase behavior. Momentum is the relation-access or spatial side of the same action-gradient.

$$\varphi = S / \hbar$$

$$E = -\partial_t S$$

$$p = \nabla S$$

Energy and momentum are projections of the action-gradient. Mass is not amount of matter. Mass is the invariant rest component of a persistent patch's action-energy-momentum structure.

$$E^2 = p^2 c^2 + m^2 c^4$$

$$m = (1/c^2) \sqrt{(E^2 - p^2 c^2)}$$

$$p = 0 \Rightarrow m = E_{rest} / c^2$$

Rest does not mean absence of update. Rest means no net translational support-phase gradient. A rest patch may retain internal update/action activity.

$$E_{rest}(P) = - (\partial_t S_P)|_{p=0}$$

Inertia is the cost of redirecting persistent rest-action. In the low-velocity limit:

$$E \approx mc^2 + p^2/(2m)$$

$$T \approx p^2/(2m) = (1/2)mv^2$$

Item	Status	Meaning
Energy and mass	Recovered-definition lock / Strong Bridge	Energy, momentum, and mass are placed as action-gradient structures. Constants and real mass-generation mechanisms remain open.

9. Gravity, Geodesics, and Weak Limits

Gravity is not a primitive force or primitive curvature. It is recovered as path-structure distortion in a relation-access map. Dense persistent support/action-energy structure modifies admissible path structure; in faithful maps this appears as curvature, time dilation, and free-fall geometry.

$$T^{GIBM}_{\mu\nu} \rightarrow \Delta A_{paths} \rightarrow g^{rec}_{\mu\nu}$$

Mass is only the weak localized rest-matter source limit. Full gravity requires a stress-energy-like support/action distribution that includes energy density, momentum flow, pressure, stress, field energy, and radiation.

9.1 Free Fall

$$S_{free} = -mc^2 \int d\tau = -E_{rest} \int d\tau$$

$$\delta S = 0 \Rightarrow \delta \int d\tau = 0$$

Free fall is stationary rest-action through a recovered relation-access map. The rest-action scale affects phase rate but cancels from the stationary path condition, giving universal free fall in the test-body regime.

9.2 Weak Newtonian Limit

$$g_{00} \approx -(1 + 2\Phi/c^2)$$

$$a = -\nabla\Phi$$

$$\Phi(r) = -GM/r \; ; \; |a| = GM/r^2$$

The weak Newtonian regime is therefore the scalar low-speed limit of broader relation-access/path distortion sourced primarily by rest-energy density.

Item	Status	Meaning
Gravity	Architecture locked / Full derivation open	Free-fall bridge is strong. Full field equation, coupling constant, and tensor dynamics remain open.

10. Black Holes and Horizons

Black holes are recoverability crisis zones, not automatic deletion zones. A horizon is a map-accessibility boundary where outward recoverability fails for a given external map.

$$\text{external recovery channel} \to 0$$

$$\text{external recoverability failure} \neq \text{basement continuity failure}$$

Continuity can persist beyond recoverability. Information loss at a black hole is first treated as external recoverability loss, not proven basement deletion. Black-hole entropy is placed as horizon-scope recoverability loss.

$$S_{BH} \sim \text{recoverability loss at horizon boundary}$$

The area law is not derived here. GIBM only places its category: external maps recover boundary-accessible relation, not hidden interior structure. A singularity is treated as map-faithfulness failure under extreme coherence/path-shaping compression, not as proven basement infinity.

$$F_{map} \to 0 \text{ or } F_{map} < F_{min}$$

Item	Status	Meaning
Black holes	Conceptual lock / Quantitative recovery open	Horizons, entropy, information loss, and singularities are placed; area law, Hawking radiation, and interior dynamics remain open.

11. Dark Matter / Dark Energy Taxonomy

GIBM must not collapse every unknown into one vague category. Dark matter, residualized possibility, entropy, and dark-energy-like expansion behavior may belong to the broad problem of non-ordinary recoverability, but they are not interchangeable.

Category	GIBM role	Status
Ordinary matter	Realized, coherent, persistent, EM-resolved structure.	Placed.
Dark matter	Realized path-shaping structure outside ordinary electromagnetic resolution.	Taxonomy locked; physical identity open.
Residualized possibility	Nonexpressed viable structure after realization.	Category locked; physical effect open.
Entropy	Scope-relative recoverability loss with accounting preserved.	Conceptually locked.
Dark energy target	Possible cosmological recovery target for relation-access, residual-accounting, vacuum, or expansion-map behavior.	Not claimed.

The public-safe line is: dark energy is not identified with residualized possibility in v0.1. It remains a later recovery target.

Item	Status	Meaning
Dark sector taxonomy	Locked enough	Dark matter and residualized possibility are separated; dark energy is not claimed.

12. Standard Model Category Placement

GIBM does not derive the Standard Model in v0.1. It treats it as a high-performing empirical particle/interaction map. The immediate task is category placement without smuggling Standard Model objects into the basement.

Standard category	GIBM category placement	Status
Electromagnetism	Resolved coupling relation and propagation.	Conceptually locked; gauge derivation open.
Strong force	Extreme local coherence-locking under narrow compatibility conditions.	Category locked; QCD recovery open.
Weak force	Continuity-permitted local reconfiguration.	Category locked; electroweak recovery open.
Quarks	Narrow-lock localized structures dependent on strong coherence-locking.	Placed, not derived.
Electrons	Stable localized EM-coupling structures.	Placed, not derived.
Photons	Propagated resolved coupling changes / massless support-action flow.	Strong conceptual placement.
Neutrinos	Barely coupled structures primarily visible through weak reconfiguration accounting.	Placed, not derived.

Standard category	GIBM category placement	Status
Antimatter	Matching rest-action magnitude with oppositely resolved coupling orientation.	Placeholder locked.
Higgs/mass generation	Open recovery target for stable invariant rest-action terms.	Open.
Gauge groups / spin / generations	Open recovery targets.	Open.

A safe summary is: the Standard Model names stable roles; GIBM asks why such roles can exist.

Item	Status	Meaning
Standard Model placement	Category placement locked / Formal recovery open	Every major category has a place, but no Standard Model mathematics is claimed as derived.

13. Consolidated Open Burdens

Burden	Why it matters	Current status
Actualization selector	Born weights give frequencies, but not why this record is expressed in this event.	Largest open core.
Full gravity field equation	Need source-response law, coupling constant, and tensor dynamics.	Open recovery target.
Constants $\hbar$, c, G	Numerical physical constants are used in bridges but not derived from basement.	Open.
Gauge and Standard Model recovery	Need U(1), SU(2), SU(3), spin, charge, generations, couplings.	Open.
Black-hole area law and Hawking radiation	Need quantitative horizon thermodynamics and information accounting.	Open.
Mass-generation mechanisms	Need Higgs/QCD/neutrino mass connections to rest-action content.	Open.
Empirical predictions	Need deviations, falsifiers, or new recoveries beyond reinterpretation.	Open.
Functional entropy law	Need exact scope-relative entropy functional and thermodynamic constants.	Open.
Composite/tensor support formalism	Need deeper support-composition rule for multi-domain systems.	Open.

The central discipline remains: everything gets a place; nothing gets a free pass.

14. Notation Summary

Notation	Meaning
c	Cell or local admissibility/update domain when

Notation	Meaning
	subscripted; speed parameter when appearing as c in physics equations. Use context carefully.
q_c(t)	State of domain c at update index t.
N_c(t)	Directly related neighborhood of c.
A_c(q,t)	Admissibility of candidate successor q.
P_c(t)	Persistence weighting or criterion.
Σ_c(q,t)	Dominance functional for candidate successor q.
K_c	Closure pressure.
Δ_D	Minimum dominance gap for expression.
Θ_K	Closure threshold.
D_M(P,t)	Distortion of map family M over patch P.
F_M(P,t)	Map faithfulness.
z, Z	Oriented support amplitude and recombined support.
M(Z)	Record-support measure, M(Z)=|Z|^2 under bridge assumptions.
Ψ	Support state in Hilbert-like representation.
μ_D	Detector-state overlap.
C_rec,σ	Recoverable recombination capacity at scope σ.
Res_σ(X)	Residual status of X relative to scope σ.
S_σ	Scope-relative entropy/recoverability loss.
S	Action when used in action equations; entropy when context indicates thermodynamics. Avoid ambiguity in final notation.
E	Recovered clock-side action-rate.
p	Recovered spatial/relation-access action-gradient.
m	Invariant rest-action content / rest mass.
T^GIBM_{μν}	Stress-energy-like support/action distribution.
g^rec_{μν}	Recovered metric/relation-access map.

Closing Technical Statement

GIBM v0.1 is technically lock-ready as a scaffold, not derivation-complete as a final theory. It provides a disciplined primitive structure, a map-faithfulness rule, strong bridges for quantum support, residualized possibility, entropy, energy/mass, gravity/free-fall, dark-sector taxonomy, black holes, and Standard Model category placement. The largest unresolved internal issue is the individual actualization selector. The largest external derivation burdens are full gravity recovery, Standard Model/gauge recovery, black-hole thermodynamics, physical constants, mass-generation mechanisms, and empirical predictions.

Everything gets a place. Nothing gets a free pass.