MONOGRAPH

BASIC KLT-RBD PROJECT

VOLUME III

V*P PHYSICS AND STRATIFIED TIME: REDUCED PREDICTIVE PACKET COSMOLOGY

Frozen English Edition: Immutable Authorial Release and Detached Receipt Protocol

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FROZEN RELEASE. T3-EN-FREEZE-v1.0. This file is the immutable authorial English edition derived from T3-FREEZE-v1.0 RU after the v0.7 bilingual formula-parity and terminology audit. Scientific content, identifiers, and evidence boundaries are frozen for this release.

STATUS LOCK. truth_layer_promotion=0. The Russian master remains the scientific authority. The English freeze creates no EXT-RUN, EMP-OBS, external certification, or physical validation. Future changes require a new documented change-set and a new version.

Release Passport

Field	Locked value
Author	Ivan Borisovich Kurpishev
Project	LOGIC OF KURPISHEV 2 · Basic KLT-RBD Project
Volume	III · V*P Physics and Stratified Time
Checkpoint	T3-EN-FREEZE-v1.0
Canonical source	T3-FREEZE-v1.0 · tom3_v1_0.docx / PDF
Previous English checkpoint	T3-EN-FREEZE-CANDIDATE-v0.7
Translation scope	Chapters 1–24; Appendices A–J; T3-PO-001–208; blockers; SRC-001–081; SNAP-001–009
Editorial status	FROZEN FOR AUTHORIAL RELEASE; external bilingual certification remains OPEN NON-VETO
Mathematical status	Preserved from RU source; no layer promotion
Physical status	MODEL / COND / PHY-HYP; overall physical verdict ABSTAIN
Next checkpoint	T3-ZH-START-v0.1

0. Change Register

ID	Change	Status
T3-EN-CS-037	Executed a verifier independent of the document-generation path against T3-FREEZE-v1.0 RU.	NUM-AUDIT
T3-EN-CS-038	Synchronized all 166 canonical formula blocks; corrected 53 English formula lines.	PARITY-CLOSED
T3-EN-CS-039	Repaired critical formula-ID/content mismatches, including T3-EQ-0091–0093 and T3-EQ-0120.	CORRECTED
T3-EN-CS-040	Restored canonical mathematical symbols where plain-letter substitutions altered notation.	CORRECTED
T3-EN-CS-041	Normalized three internal source-card names while preserving source IDs, locators, and verdicts.	SOURCE-QA
T3-EN-CS-042	Verified chapter, equation, figure, table, locator, T3-PO, SRC, and SNAP inventories.	QA-CLOSED
T3-EN-CS-043	Added Appendix I, controlled change-set ledger, and detached-release protocol.	DOC-CLOSED
T3-EN-CS-044	Preserved all negative results, blockers, and physical/empirical vetoes.	STATUS-CLOSED
T3-EN-CS-045	Promoted the accepted v0.7 candidate to a new immutable authorial English release without overwriting the candidate.	DOC-FREEZE
T3-EN-CS-046	Updated cover, header, release passport, archive map, and freeze verdict to T3-EN-FREEZE-v1.0.	DOC-CLOSED
T3-EN-CS-047	Preserved all 166 canonical formula blocks, 24 chapters, 54 figures, 92 tables, 126 locators, and T3-PO-001–208.	PARITY-CLOSED
T3-EN-CS-048	Added Appendix J with immutability policy, RU/EN/ZH archive map, detached receipt protocol, and change-set rules.	DOC-CLOSED
T3-EN-CS-049	Closed the candidate-only final-hash blocker by generating v1.0 artifacts and a detached receipt.	MANIFEST-CLOSED
T3-EN-CS-050	Retained external bilingual/source audits as OPEN NON-VETO and empirical/EXT-RUN blockers as OPEN VETO FOR EMP.	STATUS-CLOSED
T3-EN-CS-051	Declared T3-ZH-START-v0.1 as the next controlled derivative checkpoint.	NEXT

1. Controlled Derivation Contract

The English volume is a derivative, not a replacement. Every scientific statement is governed by the following contract:

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T3-EN-EQ-0001 · formula parity: exact symbol string preserved from T3-FREEZE-v1.0
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$$\text{Status\_EN}(x) \le \text{Status\_RU}(x), \quad \text{Formula\_EN}(x) = \text{Formula\_RU}(x), \quad \text{ID\_EN}(x) = \text{ID\_RU}(x).$$

- A translated statement may preserve or weaken the Russian wording, but it may not strengthen its evidence status.
- A mathematical formula is copied symbol-for-symbol unless the change is explicitly recorded as a notation change-set.
- The English prose preserves the distinction between a definition, a proposition, a theorem, a conditional bridge, a model, a numerical certificate, an empirical plan, and an observation.
- The terms Reper, NAPG, V*P, PredRep, KLT-RBD, and ABSTAIN are treated as controlled technical terms.
- A source locator identifies the Russian master location from which a translated block is derived.

TRANSLATION BOUNDARY. The English derivative does not constitute an independent proof, an EXT-RUN, or an empirical observation. Its evidence status is DOC/EN-DERIVATIVE.

2. Core Terminology Lock

Russian canonical term	Locked English form	Rule
репер / Reper	Reper	Do not replace by frame, benchmark, or reference point when the technical object is meant.
достаточное основание	sufficient foundation	The D-component of Reper; not merely “context”.
область допустимости	admissible domain	Used for Dom and for certified operator domains.
D/Dom-барьер	D/Dom barrier	The evidence and typing gate must be preserved.
событие@состояние	event@state	The @ notation is retained.
Время@Пространство	Time@Space	Conceptual term from Volume I.
Время*Пространство / V*P	Time*Space / V*P	Project architecture name; not ordinary multiplication.
разворот Y	reversal Y	The word “reversal” is used for the authorial operator; a local realization may be a retraction.
воздержание	ABSTAIN	A formal verdict, not a stylistic refusal.
доказательный объект	proof object	Carries assumptions, scope, status, and provenance.
принцип слабейшего звена	weakest-link principle	Status is inherited from the weakest mandatory component.

3. Static Contents of This Checkpoint

Chapter 1. Interface with Volumes I–II and Evidence Boundaries

T3-CH-01 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-001–003 · source block range P0000–P0064 / T0004–T0061

Accessible Introduction

T3-EXPL-01 · translated explanatory block · source T3-EDIT-v0.17

CENTRAL QUESTION	How can the results of Volumes I–II be used in the physics volume without rewriting their definitions or raising their evidence status?
PLAIN MEANING	This chapter is a strict interface between frozen mathematics and the new physical layer. A formula is imported together with its domain, hypotheses, status, and prohibitions.
MINIMAL EXAMPLE	If Volume II proves a statement only for an internal NAPG object, it remains THM within that object. The phrase “this is physical curvature” creates a new COND bridge that needs its own justification.
ONTOLOGY	Frozen objects of Volumes I–II and maps importing them into the vocabulary of Volume III exist. A new physical object appears only after an explicit bridge contract.
EPISTEMOLOGY	Correct import is established by a stable locator, control hash, matching definition, and preservation of the status vector.
PHENOMENOLOGY	For every physical statement, a reader can trace back to the source formula, inspect its Dom, and locate the step at which interpretation entered.
PHYSICAL MEANING	The interface prevents a geometric model from silently becoming a law of nature. It displays the exact point at which a physical hypothesis begins.
LIMITATION	Import alone does not prove V*P, a physical carrier of the associator, or an observable correction. Without a bridge the result is ABSTAIN.
AUTHORIAL NOVELTY	The authorial contribution is a status-preserving Reper/D/Dom import architecture linking the mathematical canon to physical export without loss of evidence boundaries.

CHAPTER ROUTE	Two import contracts are fixed first, followed by the multichannel status firewall. Chapter 2 then freezes the notation used throughout the remainder of the volume.

Editorial function of T3-EXPL-01: to facilitate reading of Chapter 1 without changing its formal definitions, Dom/Cod, or evidence statuses.

CHAPTER STATUS. The chapter is imported from earlier checkpoints with the original THM/PROP/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/OPEN/ABSTAIN labels preserved. Editorial assembly does not raise status.

Import Contract with Volume I

T3-LOC-001 · RU source: tom3_v0_2.docx · “Canonical interface with Volume I”

ONTOLOGY. The interface exists as an immutable set of references to already frozen objects. Volume III does not acquire the right to rewrite the carrier or meaning of an imported definition.

EPISTEMOLOGY. Import is correct only when the source file, version, locator, hash, and status are present. Matching terminology without a source card does not establish provenance.

Volume I v197 RU fixes the source language of Volume III. Import is performed by reference rather than by redefining an object. If a physics chapter needs a different structure, it must introduce a new symbol and a separate change-set instead of silently replacing the canon.

T3-TBL-001 · canonical imports from Volume I

ID	Symbol / object	Imported meaning	Status	Safeguard
T1-I01	C@C=(e,s)	minimal event@state object	DEF-A	Not replaced by an ordinary point
T1-I02	Pack / packet	typed connection of objects	DEF-A	Not identical to a Cartesian product or multiplication
T1-I03	Reper(R,I,U;D)	quadruple of reality, idea, possibilities, and foundation	DEF-A	D is not removed
T1-I04	D/Dom	sufficient foundation and admissible domain	DEF-A	$\lambda \approx -1$ does not replace D/Dom
T1-I05	$\lambda = cr(U,I;R,D)$	projective-harmonic coordinate	CL/DEF-A	Not a physical constant
T1-I06	$\delta\_truth = \lvert\lambda+1\rvert$	diagnostic defect	DEF-A	Not a p-value or probability of truth
T1-I07	PN.2	mathematical minimax construction in a specified model	THM/MODEL	Physical export remains PHY-HYP
T1-I08	F-1–F-14	canonical physical hypotheses	PHY-HYP	No EMP-OBS without EXT-RUN
T1-I09	PredRep interface	partial predictive contract	COND	No absolute future
T1-I10	ABSTAIN	correct abstention under a blocker	DEF-A	Not replaced by an arbitrary numerical score

Source: tom1_v197_ru.pdf, frozen edition v197 RU, with stable addresses for source chapters, formulas F001–F086, and Appendices A–G. The source hash recorded in the Russian master is preserved as provenance metadata.

1.1. Import contract T1→T3

- I1. Volume III uses an imported object only within its source Dom and status.
- I2. An alias is permitted only with an explicit alias→canonical map and a notation-collision entry.
- I3. A physical interpretation of PN.2, λ, Reper, or D/Dom creates a new bridge object and does not modify the mathematical canon.
- I4. Any claim depending on F-1–F-14 inherits PHY-HYP until an independent EMP-OBS exists.
- I5. Missing source card, Dom, or D sends every downstream conclusion to ABSTAIN.

LIMITATION. Volume I contains mathematical and program-methodological results. Import does not prove that nature realizes the selected physical interpretation.

Import Contract with Volume II

T3-LOC-002 · RU source: tom3_v0_2.docx · “Canonical interface with Volume II”

Volume II T2-FREEZE-v1.0 fixes strict NAPG 3.0. Its objects are imported as mathematical infrastructure, not as an already constructed physical geometry. The principal prohibition is that resemblance among an associator, curvature, torsion, or a causal defect does not establish identity among them.

T3-TBL-002 · canonical imports from Volume II

ID	Symbol / object	Imported meaning	Status
T2-I01	$N=(\mathbb{K},\mathscr{A}^\bullet,\odot,\mathfrak{G},\mathscr{R};F^2\_N,X^2\_N,\Psi^2\_N)$	typed quadratic NAPG_q frame	DEF-A
T2-I02	$Ass\_\odot$	trilinear defect between two defined bracketings	DEF-A
T2-I03	$R\star R$	authorial associator-packet object	DEF-A/THM in the model
T2-I04	$O\_B(N)=X^2\_N/\mathrm{Im}\ \Psi^2\_N$	internal obstruction quotient	THM
T2-I05	$\Pi\_N:X^2\_N\to O\_B(N)$	canonical projection	THM
T2-I06	$C\_min^\bullet$, δ_min	minimal internal cochain complex	THM
T2-I07	$\star_h dg$, $\delta_h dg$, $\Delta_h dg$	Hodge star, codifferential, and Laplacian	COND under analytic hypotheses
T2-I08	$\Pi\_E:O\_B\to H^3(E^\bullet)$	conditional external E-bridge	THM under B3–B5; reverse inference OPEN
T2-I09	blocker-safe end-to-end	composition of partial modules	COND/PROP
T2-I10	weakest-link / ABSTAIN	status determined by the weakest mandatory link	PROP

Sources: tom2_v1_0(1).docx and tom2_v1_0(1).pdf, T2-FREEZE-v1.0. Their hashes are carried in the Russian release manifest and are not recomputed as a translation claim.

2.1. Import contract T2→T3

- J1. NAPG_q remains an internal algebraic category; manifolds, dynamics, and measurements do not arise automatically.
- J2. O_B=0 does not imply associativity, and O_B≠0 does not prove physical curvature.
- J3. The Hodge layer is admitted only with a specified metric, orientation, operator domains, and analytic hypotheses.
- J4. Π_E is a one-way bridge until injectivity or reverse detection is proved.
- J5. Physical export requires a separate bridge contract Br and its own falsifiability matrix.

Status Firewall and Boundaries of Inference

T3-LOC-003 · T3-FIG-001 · source section: multichannel evidence

Figure T3-FIG-001. Evidence channels are not collapsed into a decorative single "truth level".

Instead of a single status ladder, the volume uses four independent evidence channels: mathematical, model, computational, and empirical. This blocks the common error of declaring a computation to be a measurement or a well-typeset formula to be a proof.

T3-EQ-0001 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\sigma(c) = (\sigma\_math(c), \sigma\_model(c), \sigma\_num(c), \sigma\_emp(c)).$$

T3-TBL-003 · evidence channel vocabulary

Channel	Admissible labels	Ground
math	DEF / PROP / THM / OPEN / REFUTED	formal proof or counterexample
model	MODEL / COND / NONE	explicit model axioms and bridge hypotheses
num	NUM / NONE	reproducible computational certificate
emp	EMP-PLAN / EMP-OBS / NONE	preregistration or actually obtained data
release	PASS / ABSTAIN	presence of every mandatory certificate

3.1. Definition of a status-preserving step

A step $F{:}c\to c'$ is status-preserving when it does not raise any channel without a separate certificate of the corresponding type. A numerical certificate may change only σ_num; an independent experiment only σ_emp; a proof only σ_math. A model bridge cannot convert MODEL into THM.

T3-EQ-0002 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$truth\_layer\_promotion(F)=0 \;\Leftrightarrow\; \sigma\_i(c') \le \sigma\_i(c) \sqcup Cert\_i(F) \;\text{ for every channel } i.$$

3.2. Firewall composition proposition

PROP T3-CORE-1. A composition of status-preserving steps is again status-preserving. If at least one mandatory step returns ABSTAIN, the mandatory composite returns ABSTAIN.

Proof. For each channel, the status-preservation inequality is transitive. The second statement follows from the definition of mandatory composition: the absence of a value at one partial stage makes the composite arrow undefined. □

AUTHORIAL NOVELTY. The project contributes a formal status firewall for KLT-RBD composition. Mathematical proof, computational experiment, and empirical observation themselves are classical modes of justification.

Chapter 2. Frozen Physico-Mathematical Notation Registry

T3-CH-02 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-004–006 · source block range P0065–P0154 / T0069–T0151

Accessible Introduction

T3-EXPL-02 · translated explanatory block

CENTRAL QUESTION	How can the volume prevent one symbol from denoting different operations and thereby generating false proofs when material is transferred among NAPG, Hodge theory, and physics?
PLAIN MEANING	This chapter is a type dictionary. It separates symbols that look alike: packet operation, Hodge star, algebraic multiplication, action, Laplacian, and small parameters.
MINIMAL EXAMPLE	The symbol $\star$ may denote Hodge duality or an authorial packet operation. Volume III writes $\star_{h}$dg for the former and uses an explicit packet/algebraic index for the latter; substitution between them is prohibited.
ONTOLOGY	The object is a typed registry of symbols, their Dom, Cod, dimensions, and admissible aliases.
EPISTEMOLOGY	Notation is correct when every formula type-checks and the notation ledger has no unresolved collisions.
PHENOMENOLOGY	For a computer, an error appears as an input/output mismatch; for a reader, as inability to recover a unique meaning of a formula.
PHYSICAL MEANING	Symbol separation prevents a geometric operator from being confused with a physical action or a measured quantity.
LIMITATION	A notation lock organizes language but does not prove the existence of the denoted objects or solve their equations.
AUTHORIAL NOVELTY	The authorial contribution is a unified notation firewall across Volumes I–III, recording status, domain, and source for every critical symbol.
CHAPTER ROUTE	Read the collision ledger first, then the Definition Core. After that the V*P construction can be read without hidden type substitution.

CHAPTER STATUS. All imported labels remain unchanged; the translation introduces no new mathematical or physical status.

Notation Lock

T3-LOC-004 · frozen notation registry of Volume III

ONTOLOGY. A notation enters a mathematical object through its type, Dom, Cod, and source. A symbol without a type is merely a typographic trace, not a mathematical entity.

Rule T3-NTL-0: no symbol from Volumes I–II is redefined. A new meaning requires an index, a different font, or a new identifier. The project name V*P is retained as the name of the architecture and is not interpreted as binary multiplication.

T3-TBL-004 · notation registry, part I

ID	Symbol	Dom→Cod	Meaning	Source	Status	Collision
NTL-001	C@C	(e,s)	minimal event@state packet	Vol. I	DEF-A	Not an ordinary point
NTL-002	Rep	Obj→R×I×U×D	Reper(R,I,U;D)	Vol. I	DEF-A	D is mandatory
NTL-003	D	context/certificate	sufficient foundation	Vol. I	DEF-A	Not a differential

ID	Symbol	Dom→Cod	Meaning	Source	Status	Collision
NTL-004	Dom	subset of arguments	admissible domain	Vol. I/II	DEF-A	Do not confuse with D
NTL-005	λ	$Dom\_cr \to \mathbb{K} \cup \{\infty\}$	cross-ratio coordinate	Vol. I	CL/DEF-A	Not a physical constant
NTL-006	δ_truth	$Dom\_\lambda \to \mathbb{R}_+$	|λ+1|	Vol. I	DEF-A	Not a probability
NTL-007	⊙	$Dom\_\odot \subseteq \mathscr{A}^\bullet \otimes \mathscr{A}^\bullet \to \mathscr{A}^\bullet$	bilinear partial operation	Vol. II	DEF-A	Not Hodge star
NTL-008	Ass_⊙	$Dom\_Ass \to \mathscr{A}^\bullet$	associator	Vol. II	DEF-A	Both branches must be defined
NTL-009	R⋆R	$\mathscr{R} \to X^2\_N$	associator-packet object	Vol. II	DEF-A	⋆ is not Hodge
NTL-010	$\star_h dg$	$\Lambda^p E^* \to \Lambda^{n-p} E^*$	Hodge star	Vol. II	COND	Metric + orientation

T3-TBL-005 · notation registry, part II

ID	Symbol	Dom→Cod	Meaning	Source	Status	Collision
NTL-011	F^2_N	—	formal language of degree ≤2	Vol. II	DEF-A	Not X^2_N
NTL-012	X^2_N	—	computed quadratic layer	Vol. II	DEF-A	Not formal syntax
NTL-013	Ψ^2_N	$F^2\_N \to X^2\_N$	evaluation map	Vol. II	DEF-A	Cod fixed
NTL-014	O_B(N)	$X^2\_N / \mathrm{Im}\Psi^2\_N$	internal obstruction quotient	Vol. II	THM	Not the associator itself
NTL-015	Π_N	$X^2\_N \to O\_B(N)$	canonical projection	Vol. II	THM	Not Π_E
NTL-016	δ_min	$C\_min^2 \to C\_min^3$	internal differential	Vol. II	THM	Not δ_E or $\delta_h dg$
NTL-017	δ_E	$E^n \to E^{n+1}$	external differential	Vol. II	COND	$\delta\_E^2=0$ is a hypothesis/condition
NTL-018	$\delta_h dg$	$\Lambda^p \to \Lambda^{p-1}$	Hodge codifferential	Vol. II	COND	Not δ_min
NTL-019	$\Delta_h dg$	$Dom \to L^2$	Hodge Laplacian	Vol. II	COND	Not action operator Δ
NTL-020	Π_E	$O\_B \to H^3(E^\bullet)$	external bridge	Vol. II	COND/THM	Reverse detection OPEN

T3-TBL-006 · notation registry, part III

ID	Symbol	Dom→Cod	Meaning	Source	Status	Collision
NTL-021	V*P	architecture name	Time*Space	T3 legacy	MODEL	Not multiplication
NTL-022	ST	record	stratified-time datum	T3	DEF-A	Not physical spacetime

ID	Symbol	Dom→Cod	Meaning	Source	Status	Collision
NTL-023	$\mathscr{X}_{VP}$	—	model state space	T3	DEF-SLOT	Carrier specified in v0.3
NTL-024	Ξ	$\mathscr{T}_{\Xi}\times\mathscr{X}_{VP}\to\mathscr{X}_{VP}$	change/ evolution	T3	DEF-SLOT	Laws OPEN
NTL-025	Δ_{act}	$\mathscr{A}_{act}\times\mathscr{X}_{VP}\to\mathscr{X}_{VP}$	action/ insertion	T3	DEF-SLOT	Not $\Delta_h dg$
NTL-026	Y	$\mathscr{X}_{post}\to\mathscr{X}_{state}$	reversal/ transition	T3	DEF-SLOT	Invertibility OPEN
NTL-027	T_{cs}	$\Gamma(E_{cs})$	causal tensor slot	T3 legacy	OPEN	Type and units fixed later
NTL-028	CGI	$Dom_{CGI}\to\mathbb{R}_+$	causal gap index	T3 legacy	OPEN	Not a p-value
NTL-029	Obs	$\mathscr{X}_{model}\to\mathscr{Y}_{obs}$	observational adapter	T3	DEF-SLOT	Units/Cov/ Prov mandatory
NTL-030	PredRep	$\mathscr{I}_{cert}\to\mathscr{P}(\mathscr{X}_{cand}\times Cert)\cup\{ABSTAIN\}$	partial predictive operator	T3	COND	Not a unique future

4.1. Critical collision matrix

T3-TBL-007 · collision firewall

Sign	Canon A	Meaning A	Canon B	Meaning B	Rule
⋆	R⋆R	associator-packet layer	$\star_h dg$	Hodge duality	Always index Hodge
Δ	Δ_{act}	action/insertion	$\Delta_h dg$	Laplacian	Write Δ_{act} in physical text
δ	δ_{min}	internal complex	δ_E / $\delta_h dg$	external complex / codifferential	Never omit the index
Π	Π_N	quotient projection	Π_E	external E-bridge	Different Dom/Cod
D	D	sufficient foundation	d, δ	differentials	Distinguish case and font
λ	λ	cross-ratio	λ_{phys}	possible physical parameter	Introduce λ_{phys} separately
V*P	project name	architecture	*	operation	Do not apply algebraic laws to the name

COUNTEREXAMPLE. From $\delta_{min}{}^3\delta_{min}{}^2=0$ one cannot infer $\delta_h dg^2=0$: the operators have different Dom, Cod, and mathematical origins. Sharing a letter is not a bridge.

Definition Core

T3-LOC-005 · T3-FIG-002 · minimal interface structure

Figure T3-FIG-002. Minimal interface structure of Volume III.

The Definition Core does not assert the existence of a physical model. It fixes the minimum data without which subsequent chapters are not type meaningful.

T3-EQ-0003 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathfrak{c}\_T3 = (\mathscr{I}_{12}, \mathrm{ST}, \mathrm{VP}, \mathrm{Br}, \mathrm{Op}, \mathrm{Obs}, \mathrm{Pred}, \mathrm{Cert}, \mathrm{Stat}).$$

5.1. Canonical import interface

Definition T3-DEF-001 [DEF-A]. $\mathscr{I}_{12}$ is the tuple $(S_1,S_2,\iota_1,\iota_2,H_1,H_2)$, where S_1 and S_2 are the frozen source-card sets of Volumes I and II; ι_1 and ι_2 are import maps into the vocabulary of Volume III; and H_1 and H_2 are control hashes. The import map is injective on identifiers and does not change status-at-import.

T3-EQ-0004 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\iota\_j : \mathrm{Symbols}(T\_j) \hookrightarrow \mathrm{Symbols}(T\_3), \quad \mathrm{status}(\iota\_j(s)) = \mathrm{status}(s).$$

5.2. Stratified-time datum ST

Definition T3-DEF-002 [DEF-A/CL]. ST=(X,{X^(k)}_{k=0}^3,{T^(k)}_{k=-1}^3,Str(X),E,g,or,⋆ₕdg,res), where X is a Hausdorff paracompact stratified space; X^(k) are pure smooth strata; T^(k)=∪_{j≥k}X^(j); and T^(−1)=X is a marker for the full envelope, not an independent smooth dimension. Hodge data are assigned only on layers on which E, g, and or are defined.

> **LIMITATION.** ST is a standard mathematical envelope. The statement “ST is physical time” remains MODEL/PHY-HYP and requires a separate Br.

5.3. Candidate V*P realization

Definition T3-DEF-003 [MODEL]. VP=(ST,$\mathscr{S}$_adm,Sec,$\mathscr{D}$_VP), where $\mathscr{S}$_adm is a class of admissible sections, Sec is a partial operation selecting a space-like realization, and $\mathscr{D}$_VP is a package of domain and evidence constraints. For s∈$\mathscr{S}$_adm, Sec(s) is not declared to be physical space without a bridge certificate.

T3-EQ-0005 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{Sec} : \mathscr{S}\_\mathrm{adm} \rightharpoonup \mathrm{Geom}, \quad s \mapsto (M\_s, g\_s, or\_s, \text{additional data}).$$

The existence of a nonempty class $\mathscr{S}$_adm, regularity of sections, and their physical interpretation form T3-PO-006 and remain OPEN.

5.4. Bridge contract Br

Definition T3-DEF-004 [COND]. Br is a partial typed functor or pseudofunctor from a selected subcategory NAPG_adm to a category PhysGeom of physical-geometric data. It must transport Dom, D, obstructions, and statuses, and separately record metric, signature, causal cones, units, and observational maps.

T3-EQ-0006 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{Br} : \mathrm{NAPG\_adm} \rightharpoonup \mathrm{PhysGeom}, \quad \mathrm{Block}(\mathrm{Br})=\varnothing \;\Rightarrow\; \text{candidate bridge}.$$

The core checkpoint does not construct Br and does not assert its existence. It fixes a mandatory interface so that a resemblance of formulas cannot later be presented as a realization theorem.

5.5. Operator package Op

`T3-FIG-003 · typed Dom/Cod for Ξ, Δ_act, and Y`

Figure T3-FIG-003. Dom/Cod of Ξ, Δ_act, and Y are fixed before their laws are discussed.

Definition T3-DEF-005 [DEF-SLOT]. An operator specification is the quintuple O=(Dom(O),Cod(O),Graph(O),Law(O),Cert(O)). A symbol is defined only after Dom, Cod, and Graph are filled; Law lists proved laws, and Cert links them to a source or proof.

T3-EQ-0007 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\Xi:\mathscr{T}\_\Xi\times\mathscr{X}\_\mathrm{VP}\rightharpoonup\mathscr{X}\_\mathrm{VP}, \quad \Delta\_\mathrm{act}:\mathscr{A}\_\mathrm{act}\times\mathscr{X}\_\mathrm{VP}\rightharpoonup\mathscr{X}\_\mathrm{VP}, \quad Y:\mathscr{X}\_\mathrm{post}\rightharpoonup\mathscr{X}\_\mathrm{state}.$$

No globality of Ξ, semigroup law, linearity of Δ_act, existence of Y^{-1}, commutativity, or associativity of compositions is presumed at this point.

5.6. Observational adapter Obs

Definition T3-DEF-006 [DEF-SLOT]. An observational adapter is the tuple Obs=($\mathscr{X}$_model,$\mathscr{Y}$_obs,obs,Unit,Cov,Prov,Sel), where obs is a partial map from model state to observables; Unit records dimensions; Cov the covariance structure of errors; Prov data provenance; and Sel selection and masking rules.

T3-EQ-0008 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{obs} : \mathscr{X}\_\mathrm{model} \rightharpoonup \mathscr{Y}\_\mathrm{obs}, \quad \mathrm{Cert\_obs}=(\mathrm{Unit},\mathrm{Cov},\mathrm{Prov},\mathrm{Sel}).$$

PHYSICAL MEANING. Only Obs connects a formula to an instrument or catalog. Without Obs, a model can be mathematically consistent yet untestable.

5.7. PredRep as a partial multivalued operator

Definition T3-DEF-007 [COND]. PredRep accepts only certified input and returns a finite or measurable set of candidates with passports, or ABSTAIN. A singleton candidate is permitted as a special case but is not postulated.

T3-EQ-0009 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{PredRep} : \mathscr{I}\_\mathrm{cert} \rightharpoonup \mathscr{P}(\mathscr{X}\_\mathrm{cand}\times\mathrm{Cert}) \cup \{\mathrm{ABSTAIN}\}.$$

Correctness of PredRep in Volume III must include domain soundness, preservation of D/provenance, calibration of the observational adapter, and an explicit boundary of causal inference.

Typed Morphisms and Certificates

`T3-LOC-006 · morphisms of the Definition Core`

A morphism F:ɕ_T3→ɕ′_T3 is a family of maps between components of the Definition Core. It is admissible only when eight compatibilities hold. At this stage the construction is an editorial-mathematical framework; a physical category is defined only after the V*P carrier is supplied.

`T3-TBL-008 · compatibility conditions`

Code	Layer	Condition	Purpose
C1	Freeze	F∘ι_j=ι′_j on canonical imports	Forbids rewriting Volumes I–II
C2	Dom	F(Dom O)⊆Dom O′	No silent domain enlargement
C3	D/provenance	F_D(D) compatible with Prov	Foundation travels with the claim
C4	Obstruction	a nonzero mandatory blocker is not erased	No magical passage through a barrier
C5	Status	truth_layer_promotion(F)=0	Preserves evidence channels
C6	Units	Unit′∘F_obs=F_unit∘Unit	Physical dimensions are compatible
C7	Observation	obs′∘F_state=F_data∘obs	Model→data square commutes
C8	Reproducibility	hash/version/container are preserved	Computation is repeatable

6.1. Proposition on blocker-safe composition

PROP T3-CORE-2. If F and G satisfy C1–C8, then their composition G∘F satisfies C1–C8. If a mandatory blocker is not removed by a certified map, it remains in the composition.

Proof. Conditions C1–C3 and C6–C8 are commutativities of the corresponding squares and are preserved under composition. C4 and C5 are monotonicity conditions for blockers and evidence channels; transitivity yields the conclusion. □

6.2. Minimal certificate record

T3-TBL-009 · minimum proof-carrying record

Field	Content	Mode
claim_id	stable identifier of the claim	mandatory
source_id	file, version, locator	mandatory
status_vector	math/model/num/emp/release	mandatory
dom_cod	domain and codomain of all maps	mandatory
assumptions	axioms and bridge hypotheses	mandatory
blockers	open obstructions	mandatory
hashes	hashes of source, code, and data	for NUM/EMP
units_cov	units and covariances	for physical Obs
negative_scope	what the claim does not prove	mandatory

Chapter 3. Ontology of V*P: Time as a Primary Packet Structure

T3-CH-03 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-007–008 · source block range P0155–P0190 / T0159–T0187

Accessible Introduction

T3-EXPL-03 · translated explanatory block

CENTRAL QUESTION	What exactly does the thesis “time is primary and space is its admissible section” mean in a mathematically controlled form?
PLAIN MEANING	V*P is introduced not as a finished theory of nature but as a model carrier: over a stratified temporal base one considers a family of possible spatial layers and rules for selecting them.
MINIMAL EXAMPLE	Over a time interval one can define a bundle whose fiber is a set of spatial metrics h_t. An admissible section selects one compatible metric for each t.
ONTOLOGY	There exist a temporal base T_str, a bundle of spatial candidates, a class of admissible sections, and certificates of their compatibility.
EPISTEMOLOGY	The model is defined after the carrier, regularity, Dom/Cod of sections, and nonemptiness conditions are specified. Physical truth does not follow from this.
PHENOMENOLOGY	An observer sees not the whole V*P structure but a particular section and the measurable coordinates available on it.
PHYSICAL MEANING	The construction models a regime in which observable spatial geometry depends on a more general temporal carrier.
LIMITATION	It is not proved that nature realizes this carrier, that a global section exists, or that it satisfies known field equations.
AUTHORIAL NOVELTY	The authorial contribution is the V*P/Time*Space architecture as a packet-Reper carrier with D/Dom gates and a space of admissible sections.

CHAPTER ROUTE	This chapter gives the ontological frame; Chapter 4 embeds it into standard stratified-space theory, and Chapter 5 constructs space as a section.

CHAPTER STATUS. The V*P carrier is MODEL/DEF-A. No physical realization is inferred from the construction.

Status of the V*P Model

T3-LOC-007 · source and evidence boundary

The volume uses frozen Volume I v197 RU and Volume II T2-FREEZE-v1.0 as canonical zero points. Legacy V*P formulas from Monograph 5.0 and monographiaNAPG are treated only as a source layer: they require type cleaning and are not imported as already proved physics.

T3-TBL-010 · source hierarchy for the V*P layer

ID	Source	Role	Use
SRC-T1	tom1_v197_ru.pdf	CANONICAL	stratified envelope, admissible section, hyparxis maps, status firewall
SRC-T2	tom2_v1_0(1).docx/pdf	CANONICAL	NAPG 3.0, Dom/D, Hodge-interface firewall, ABSTAIN
SRC-VP-L	monograph5_0_ru.pdf, Chs. 17–19	LEGACY/SUPPORT	π_lay, Σ_cl, R_cl, connectivity packet; statements rechecked
SRC-NAPG-L	monographiaNAPG (1).docx	LEGACY/SUPPORT	stratified time, G_2, and analytic bridge
SRC-PILOT	PILOT01_PREPRINT_RU_FINAL.pdf	SUPPORT	D/Dom and prohibition of truth status without foundation
CL-STRAT	Goresky–MacPherson; Mather	PRIOR ART	stratified spaces and control data
CL-ADM	Arnowitt–Deser–Misner; O'Neill	PRIOR ART	3+1 Lorentzian assembly and signature
CL-TUB	Tubular neighborhood theorem	PRIOR ART	local retraction Y

EVIDENCE BOUNDARY. Theorems in this layer establish properties of the constructed local model. They do not show that nature must realize the model and do not identify the associator sector with matter, energy, or curvature.

V*P Carrier and Bundle of Spatial Layers

T3-LOC-008 · T3-FIG-004 · local V*P bundle

Figure T3-FIG-004. Stratified carrier, bundle of spatial layers, and controlled reduction.

Definition T3-VP-003 [MODEL/DEF-A]. A local V*P bundle over an open set $U \subset S\_k$ is a map

T3-EQ-0010 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\pi\_\mathrm{lay} : \mathscr{L}\_U \to U, \quad \mathscr{L}\_U \cong U \times \mathscr{F}\_\Sigma\text{^}r,$$

where Σ is a fixed compact oriented 3-manifold for the local sector, and the fiber of spatial data is

T3-EQ-0011 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathscr{F}\_\Sigma\text{^}r = \mathrm{Met}\_+\text{^}r(\Sigma) \times C\_+\text{^}r(\Sigma) \times \Gamma\text{^}r(T\Sigma) \times \mathscr{P}\_\Sigma \times \mathrm{Rep}\_\Sigma \times \mathrm{Cert}\_\Sigma.$$

T3-TBL-011 · components of the spatial-layer fiber

Component	Type	Role	Status
h	$Met\_+\hat{}r(\Sigma)$	positive-definite spatial metric	CL/MODEL
N	$C\_+\hat{}r(\Sigma)$	positive lapse	CL/MODEL
β	$\Gamma\hat{}r(T\Sigma)$	shift vector	CL/MODEL
P	$\mathscr{P}\_\Sigma$	packet-geometric data	MODEL
Rep	Rep_Σ	Reper(R,I,U;D) of the state	AUTHORIAL
Cert	Cert_Σ	Dom, D, provenance, status, hashes	AUTHORIAL CONTRACT

Definition T3-VP-004 [MODEL]. The local state space is X_VP(U)=Γ_adm(U,𝓛_U), or in a finite-dimensional parametric sector U×F_m, where F_m⊂𝓕_Σ^r is described by finitely many parameters. Every theorem on a local ODE flow Ξ in this checkpoint applies specifically to the finite-dimensional sector F_m.

LIMITATION. Fixing one topology Σ is a local atlas choice. A change in the topology of the spatial layer requires a separate groupoid/stack sector and remains OPEN.

Chapter 4. Standard Mathematical Model of Stratified Time

T3-CH-04 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-009–010 · source block range P0191–P0237 / T0195–T0234

Accessible Introduction

T3-EXPL-04 · translated explanatory block

CENTRAL QUESTION	How can stratified time be represented by standard mathematics while separating the authorial interpretation from classical stratum theory?
PLAIN MEANING	The temporal carrier is placed in a Hausdorff paracompact space with pure strata of dimensions 0–3 and local conical models. Level −1 is kept as a marker of the full envelope rather than a negative smooth dimension.
MINIMAL EXAMPLE	A neighborhood of a point in a k-dimensional stratum has the form ℝ^k×C(L). This describes how a regular layer approaches a singular one without declaring the singularity to be a new physical particle.
ONTOLOGY	The mathematical objects are X, pure strata X^(k), cumulative filtration T^(k), an incidence category, and compatible bundle data.
EPISTEMOLOGY	Existence of local models, the frontier condition, and compatibility of restrictions are checked by stratified-geometry theorems and explicitly specified maps.
PHENOMENOLOGY	A transition between layers appears as a change in the local dimension of the model and in the admissible differential data.
PHYSICAL MEANING	Strata provide a language for regimes of different effective dimension and for transition regions, but do not by themselves define dynamics.
LIMITATION	A local conical model does not prove physical dimensional change, causality, or global hyperbolicity.

AUTHORIAL NOVELTY	Novelty lies in using a standard stratified envelope as a rigorous carrier for the authorial V*P architecture, not in reattributing classical stratum theory.
CHAPTER ROUTE	After defining the envelope, the chapter checks local models and transmission conditions. Chapter 5 selects an admissible spatial section within the envelope.

CHAPTER STATUS. The standard stratified envelope is CL/DEF-A. Its physical interpretation as time is MODEL/PHY-HYP.

Stratified Temporal Carrier

T3-LOC-009 · stratified temporal carrier

ONTOLOGY. The object is a finite stratified space T_{str} with pure smooth strata S_k, $k=0,1,2,3$. Index -1 is a marker for the full envelope and compatibility layer, not a new smooth dimension.

EPISTEMOLOGY. Existence and properties of the carrier are known either from an explicit construction or as an axiomatic MODEL input. Physical time is not derived from a topological definition alone.

PHENOMENOLOGY. For a computer, the carrier appears as a network of local charts, incidence relations, and interface conditions. For an observer it does not yet possess a direct instrumental coordinate.

PHYSICAL MEANING. The model permits time to be interpreted as the primary organization of admissible transitions over which spatial regimes are selected.

LIMITATION. T_{str} is not automatically a Lorentzian manifold and does not replace standard spacetime before reduction.

AUTHORIAL NOVELTY. The authorial element is the role of stratified time in V*P. Stratified-space theory itself belongs to classical prior art.

Definition T3-VP-001 [DEF-A/CL]. A stratified temporal carrier is the datum

T3-EQ-0012 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$T_{str} = (X, \{S_k\}_{k=0}^{3}, \{T^{(k)}\}_{k=-1}^{3}, \mathrm{Inc}, \tau, D_{str}),$$

where X is Hausdorff and paracompact; $X=\sqcup S_k$ is a finite stratification; $T^{(k)}=\cup_{j\geq k} S_j$ and $T^{(-1)}=X$; Inc is incidence data; $\tau: X\to\mathbb{R}$ is an optional orientation function; and D_{str} is a domain and provenance certificate. At every point of S_k a local conical model $\mathbb{R}^k\times C(L_x)$ is admissible.

Definition T3-VP-002 [DEF-A]. A hyparxis map is a partial map $L_k:\mathrm{Dom}(L_k)\subset T^{(k)}\to T^{(k-1)}$ compatible with incidence data. It need not be global and is not declared to be a physical light transition without a separate Br.

T3-EQ-0013 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$L_{k-1}\circ L_k = L_{k-1,k} \quad \text{on} \quad \mathrm{Dom}(L_{k-1}\circ L_k).$$

COUNTEREXAMPLE. If two local transitions are defined but their compositions disagree on an overlap, the result is an inconsistent atlas rather than a global temporal architecture. A project name does not repair a cocycle defect.

Stratum Interfaces and Gluing Conditions

T3-LOC-010 · T3-FIG-005 · interface equations

Figure T3-FIG-005. Interface equations and the prohibition of automatic globalization of local sections.

Definition T3-VP-007 [COND]. For adjacent strata S_α and S_β, let Tr_α^+, Tr_β^- be trace maps and $T_{\alpha\beta}^+$, $T_{\alpha\beta}^-$ transmission maps. Local sections are compatible when

T3-EQ-0014 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$T_{\alpha\beta}^+ Tr_\alpha^+(s_\alpha) = T_{\alpha\beta}^- Tr_\beta^-(s_\beta),$$

where equality includes not only h, N, and β but also packet data, D/Dom, orientation, Hodge choices, and provenance. Triple overlaps require cocycle compatibility.

COND T3-VP-3. A compatible family of local sections defines a global section only when a gluing theorem is available for the selected category or sheaf and when no global obstruction class remains. This is an evidence obligation, not a completed V*P theorem.

T3-TBL-012 · interface tests

Test	Condition	Mode
IF-01	h has compatible traces	mandatory
IF-02	N remains strictly positive on the interface	mandatory
IF-03	β and orientation are compatible	mandatory
IF-04	packet/Hodge data are compatible	mandatory when used
IF-05	D/Dom and provenance do not break	mandatory
IF-06	cocycle compatibility on triple interfaces	for a global witness

Chapter 5. Space as an Admissible Section of Temporal Connectivity

T3-CH-05 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-011–012 · source block range P0238–P0295 / T0242–T0292

Accessible Introduction

T3-EXPL-05 · translated explanatory block

CENTRAL QUESTION	Under what conditions does “space as a section of time” become a valid mathematical object rather than only a philosophical formula?
PLAIN MEANING	A section must select one spatial state over each temporal point and preserve regularity, orientation, metric, constraints, and an evidence passport.
MINIMAL EXAMPLE	For a bundle $U\times F_\Sigma$, a section $s(t)=(h_t,N_t,\beta_t,\ldots)$ defines an ADM metric. Conditions $h_t>0$ and $N_t>0$ guarantee the Lorentzian signature of the local assembly.
ONTOLOGY	There exist a bundle of candidates, a class Σ_{adm}, a partial operation Sec, and a local geometry g_s obtained from a section that passes the gate.
EPISTEMOLOGY	Admissibility is established by checking regularity, constraints, transmission laws, and D/Dom certificates.
PHENOMENOLOGY	For an observer, the selected section is the accessible spacetime geometry; other candidates remain unobserved branches of the model.
PHYSICAL MEANING	The model describes a possible emergence of effective geometry from temporal connectivity and permits an ordinary Lorentzian reduction.

LIMITATION	Local signature does not prove Einstein's equations, global gluing, uniqueness of the section, or observational correctness.
AUTHORIAL NOVELTY	The authorial element is blocker-safe selection of a spatial section with transport of Reper, provenance, and status.
CHAPTER ROUTE	The bundle and class of sections are defined first, followed by local ADM assembly and the gate. Chapter 6 introduces operators that modify the selected state.

CHAPTER STATUS. The reduction is a local mathematical construction. A physical world is not inferred from a section without Br, dynamics, units, and Obs.

Admissible Sections and Lorentzian Reduction

T3-LOC-011 · admissible sections and classical development

ONTOLOGY. An admissible section selects not a point of physical space but a complete spatial-layer datum over a temporal domain: metric, lapse, shift, packet data, Reper, and certificate.

EPISTEMOLOGY. A section is known to be admissible after regularity, positivity, interface conditions, and D/Dom have been checked. Merely writing $s(t)$ is not a certificate.

PHENOMENOLOGY. For an observer, reduction manifests as a family of spatial geometries; for a computer, as a trajectory in the fiber state space.

PHYSICAL MEANING. A local 3+1 assembly gives a candidate classical spacetime to which Obs may later be attached.

LIMITATION. No section is an observed world without Br, unit choices, field dynamics, and an empirical adapter.

AUTHORIAL NOVELTY. The authorial contribution is the inclusion of classical reduction in a blocker-safe V*P packet; ADM decomposition and Lorentzian metric theory are prior art.

Definition T3-VP-005 [DEF-A/MODEL]. A section $s:U\to\mathscr{L}\_U$ is admissible when:

- $\pi\_{lay}\circ s=id\_U$;
- s is C^1 in the temporal-curve parameter and C^r in spatial coordinates;
- h_t is positive definite and $N\_t>0$;
- packet data P_t satisfy the imported $NAPG\_{adm}$ constraints;
- Reper and Cert contain nonempty Dom and D;
- the specified transmission equations hold on stratified interfaces;
- the status vector is not raised by reduction.

T3-EQ-0015 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\Sigma\_{adm}(U) = \{ s\in\Gamma(U,\mathscr{L}\_U) \mid A1\text{–}A7 \}.$$

Definition T3-VP-006 [COND]. For an admissible temporal curve $\gamma:I\to U$ and $s\in\Sigma\_{adm}(U)$, the local classical development is $M\_{\{s,\gamma\}}=I\times\Sigma$ with metric

T3-EQ-0016 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$g\_s = -N\_t^2\, dt^2 + h\_t(dx + \beta\_t\, dt,\, dx + \beta\_t\, dt).$$

T3-FIG-006 · local Lorentzian gate

Figure T3-FIG-006. Conditions for local Lorentzian reduction and a degenerate countermodel.

4.1. Theorem on local Lorentzian reduction

THM T3-VP-1 [CL-THM]. Let h_t be a positive-definite 3-metric, $N_t>0$, and β_t a vector field of the required regularity. Then g_s is nondegenerate and has signature $(-,+,+,+)$. Moreover, $\det(g_s)=-N_t^2 \det(h_t)$.

Proof. In the coframe $\theta^0=N_t\, dt$ and $\theta^i=dx^i+\beta^i\, dt$, the metric is block diagonal: $-(\theta^0)^2+h_{ij}\theta^i\theta^j$. Since $N_t>0$, the coframe transformation is nondegenerate; positive definiteness of h supplies three positive directions and one negative direction. The determinant formula follows from the block transformation or the Schur complement. □

WHAT THE THEOREM DOES NOT PROVE. It does not prove Einstein's equations, physical causality, global hyperbolicity, absence of singularities, or the truth of V*P. It verifies only the signature of a specified assembly.

4.2. Local nonemptiness of the class of sections

PROP T3-VP-2 [CL/PROP]. If $\mathscr{L}_U\cong U\times\mathscr{F}_\Sigma^r$ and the fiber contains at least one datum $(h_0,N_0,\beta_0,P_0,Rep_0,Cert_0)$ satisfying A1–A7, then the constant section $s(u)=(u,h_0,N_0,\beta_0,P_0,Rep_0,Cert_0)$ belongs to $\Sigma_{adm}(U)$.

Proof. The section condition follows from projection to the first factor. Regularity of the constant fiber component is immediate, and the remaining conditions hold by choice of datum. □

BOUNDARY. Local nonemptiness does not yield a global section over all of T_str. Global gluing may be blocked by topology, monodromy, an obstruction, or incompatible D/Dom.

Models and Countermodels of Sections

`T3-LOC-012 · explicit models and countermodels`

`T3-TBL-013 · local witnesses and failures`

ID	Model	Data	Verdict
M-01	Static product model	$T_{str}=I$; $\mathscr{L}=I\times\mathscr{F}_\Sigma$; $h_t=h_0$, $N=1$, $\beta=0$	MODEL; $g=-dt^2+h_0$
M-02	Isotropic parametric sector	$h_t=a(t)^2h_0$, $N=1$, $\beta=0$, $a(t)>0$	MODEL; admits later FLRW-like reduction
M-03	Linear local Ξ	$\Xi_t(z)=\mathrm{diag}(e^{a_i t})z$	NUM witness of semigroup
M-04	Spherical retraction Y	$Y(y)=y/\|y\|$ in an annulus	MODEL; not invertible
CE-11	Zero lapse	$N=0$	REFUTED as Lorentzian: $\det g=0$
CE-12	Indefinite spatial metric	h has a zero/negative direction	signature $(-,+,+,+)$ not guaranteed
CE-13	Inconsistent interface	$Tr^+s_\alpha\neq Tr^-s_\beta$	LOCAL only; global ABSTAIN
CE-14	Section without D	geometric fields specified, sufficient foundation absent	ABSTAIN
CE-15	Symbol Ξ without vector field	no graph or regularity	DEF-SLOT, not an operator

PHENOMENOLOGICAL BOUNDARY. Model M-02 visually resembles a standard cosmological reduction. Until field equations, an observable map, and independent data are supplied, the resemblance is structural rather than empirical.

Chapter 6. Time Packet and the Operators of Change, Action, and Reversal: Ξ, Δ, Υ

T3-CH-06 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-013–014 · source block range P0296–P0348 / T0300–T0345

Accessible Introduction

T3-EXPL-06 · translated explanatory block

CENTRAL QUESTION	How can change, action, and reversal be rigorously distinguished when informal descriptions often merge them into one “motion”?
PLAIN MEANING	Ξ describes extended evolution, Δ_act a local act or jump, and Υ restoration/projection into an admissible layer after the action. Their inputs, outputs, and existence conditions differ.
MINIMAL EXAMPLE	A system evolves continuously by Ξ_t; at a control time Δ_act(a,x) is applied; Υ then returns the result to a constraint submanifold. Invertibility of Υ is not assumed.
ONTOLOGY	The object is a hybrid operator packet composed of a flow, a jump map, and a partial retraction.
EPISTEMOLOGY	Correctness is established by Dom/Cod typing, local existence of the flow, proved properties of the retraction, and composition tests.
PHENOMENOLOGY	An observer distinguishes smooth change, the moment of action, and subsequent restructuring of the state.
PHYSICAL MEANING	The packet is suitable for control, phase transitions, and event-driven dynamics where continuous and discrete parts coexist.
LIMITATION	The operator scheme does not define concrete forces, clocks, or measured parameters without a separate adapter.
AUTHORIAL NOVELTY	The authorial contribution is the Ξ–Δ–Υ triad within the common V*P/Reper architecture and the prohibition of their hidden identification.
CHAPTER ROUTE	After typing, the chapter constructs local models and counterexamples to invertibility. Chapter 7 explains how sufficient foundation is transported with the state.

CHAPTER STATUS. The operator triad is an authorial MODEL architecture. Classical ODE flow and tubular-neighborhood results are imported as prior art under their hypotheses.

Operators Ξ, Δ_act, and Υ

T3-LOC-013 · T3-FIG-007 · typed operator packet
T3-EQ-0017 · mathematical-content parity synchronized with T3-FREEZE-v1.0

Figure 4. Typed sequence action → evolution → state registration.

Figure T3-FIG-007. Typed sequence action → evolution → state registration.

ONTOLOGY. The operators live on an explicitly selected state carrier. Δ_act creates an admissible perturbation, Ξ develops the transient state, and Υ registers or retracts it into the admissible state set.

EPISTEMOLOGY. Knowledge of an operator requires Dom, Cod, graph, regularity, and proved laws. A visually attractive symbol without these data remains a DEF-SLOT.

PHENOMENOLOGY. In computation, the three operators appear as distinct pipeline stages. Merging them hides where an error or blocker arose.

PHYSICAL MEANING. The triad models the distinction among an action, change through time, and formation of a new state.

LIMITATION. The operators are not declared fundamental laws of nature; local realizations are mathematical witnesses of consistency.

AUTHORIAL NOVELTY. The architectural triad and its inclusion in the Reper/D-Dom contract are authorial. Theories of flows, interventions, and retractions are prior art.

6.1. Action Δ_act

Definition T3-VP-008 [MODEL]. Let $C \subset X_{tr}$ be a set of admissible transient states, A_{act} an action space, and $J: A_{act} \times X_{VP} \to X_{tr}$ a smooth map. The partial action operator is

T3-EQ-0018 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\Delta_{act}(a,x)=J(a,x), \quad \mathrm{Dom}(\Delta_{act})=\{(a,x): J(a,x)\in C \text{ and } \mathrm{Cert}_J(a,x) \text{ is valid}\}.$$

In a local affine model, $J(a,x)=x+B(x)a$. If the result leaves C or destroys D/Dom, Δ_{act} is undefined rather than equal to zero.

6.2. Change Ξ

Definition T3-VP-009 [MODEL/COND]. In a finite-dimensional sector F_m, let $V: F_m \to TF_m$ be a C^1 vector field. The local evolution $\Xi_t(x)=\Phi_t(x)$ is defined by the maximal local flow of V.

THM T3-VP-4 [CL-THM]. For each $x_0 \in F_m$ there exists an interval I_{x_0} around 0 and a unique local trajectory $\Xi_t(x_0)$ solving $\dot{x}=V(x)$. On their common domain, $\Xi_{t+s}=\Xi_t \circ \Xi_s$.

The proof is the standard local existence and uniqueness theorem for ODEs. Transfer to the infinite-dimensional full V*P carrier requires separate Banach/Hilbert hypotheses and remains OPEN.

6.3. Reversal Υ

Definition T3-VP-010 [MODEL/COND]. Let $C \subset X_{tr}$ be an embedded admissible-state submanifold. A partial reversal operator Υ is a local retraction $r: U(C) \to C$ with $r|_C = \mathrm{id}_C$, together with an update map for Reper and Cert.

COND T3-VP-5 [CL/COND]. If C is a closed embedded submanifold of a finite-dimensional Riemannian state space, the tubular neighborhood theorem supplies a local smooth retraction Υ. A global retraction and Υ^{-1} do not follow.

COUNTEREXAMPLE TO INVERTIBILITY. The retraction $\Upsilon(y)=y/\|y\|$ onto the unit sphere maps an entire radial family to one point of the sphere. It is a valid local Υ but is not injective and has no global inverse.

Certificate of the Local V*P Model

T3-LOC-014 · computational certificate T3-VP-NUM-001

A reproducible fixed-seed script checked the local algebraic identities: ADM signature for random SPD metrics, the determinant formula, degeneracy at N=0, a retraction witness for Υ, and the semigroup identity for a linear Ξ.

T3-TBL-014 · certificate summary

Check	Result	Comment
Seed	20260726	fixed

Check	Result	Comment
Number of trials	2000	for each test family
ADM signature	2000/2000	PASS
ADM determinant	2000/2000	max relative error=1.925e-13
N=0 determinant	2.852e-13	numerically degenerate
Y norm	2000/2000	PASS
Y identity on target	2000/2000	PASS
Ξ semigroup	2000/2000	max error=9.172e-16
Overall	PASS	NUM only

SHA-256 of the source script: 89238909ff9af16e1355e02539670bad93959951db249a7d7b2b70326b36a138

SHA-256 of the recorded output: 6f0e6091d59a973a41b9d9dccc0d8fa3dc4d56dc2a5cae9f8b5f7b571335c830

NUM LIMITATION. The certificate confirms only the implemented algebraic and local-model tests. It uses no observational data, is not an EXT-RUN, and does not validate V*P as a physical theory.

Chapter 7. Dynamic Reper and Preservation of D/Dom

T3-CH-07 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-015–016 · source checkpoints T3-VP-v0.3 and T3-CAUSAL-v0.4

Accessible Introduction

T3-EXPL-07 · translated explanatory block

CENTRAL QUESTION	How can a system state change without losing the information that says where a conclusion is defined and on what foundation it was obtained?
PLAIN MEANING	A dynamic Reper transports not only a numerical state but also Dom, the sufficient foundation D, provenance, blockers, and status. The history of justification moves with the object.
MINIMAL EXAMPLE	If x_s is carried to x_t while the calibration record or admissible domain cannot be transported, the transition receives no upgraded status and returns ABSTAIN.
ONTOLOGY	There is a Reper bundle over a trajectory and partial transport maps P_{t←s} between its fibers.
EPISTEMOLOGY	Preservation is checked by the composition law, witness morphisms D_s→D_t, and a continuous hash-linked provenance chain.
PHENOMENOLOGY	Every result carries an explanation of its origin; a missing record or open blocker appears as a visible rupture.
PHYSICAL MEANING	The architecture models evolution together with calibration, measurement conditions, and a causal-evidential passport.
LIMITATION	Preserving a certificate does not prove physical truth and does not replace an independent measurement.

AUTHORIAL NOVELTY	The authorial object is Reper as a transportable proof-carrying structure in which D/Dom and blockers are part of the dynamic state.
CHAPTER ROUTE	The chapter defines the bundle, the transport contract, and the compositional preservation proposition. Chapter 8 uses them for causal-structural channels.

CHAPTER STATUS. Definitions and propositions are preserved from the Russian source. No empirical or physical status is promoted.

Transfer of D/Dom in V*P

T3-LOC-015 · source: tom3_v0_3.docx · Section 7

Definition T3-VP-011 [DEF-A]. The certificate of a state is

T3-EQ-0019 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{Cert}(x)=(\mathrm{Dom\_x},\mathrm{D\_x},\mathrm{Prov\_x},\mathrm{Status\_x},\mathrm{Hash\_x},\mathrm{Block\_x}).$$

An operator O is certificate-preserving when for every x∈Dom(O) there exists a map O^# such that

T3-EQ-0020 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{O\hat{~}\#(Cert(x),Cert\_O) = Cert(Ox)},$$

and Status(Ox) does not exceed the input status except in the single evidence channel explicitly certified by Cert_O.

PROP T3-VP-6 [PROP]. The composition of certificate-preserving operators Δ_act, Ξ_t, and Y is certificate-preserving on the intersection of their domains. If any mandatory blocker remains open, the composition returns ABSTAIN.

Proof. Composition of the O^# maps transports Dom, D, provenance, and status in sequence. An undischarged blocker makes the corresponding partial operator undefined; hence the mandatory composition is undefined as well. □

T3-TBL-015 · certificate inputs, outputs, and blockers

Operator	Input certificate	Output	Blocker
Δ_act	action ID; admissibility of intervention; D_action	new transient state	constraint violation
Ξ_t	vector-field/model ID; time domain	trajectory provenance	blow-up / exit from Dom
Y	retraction chart; target-state class	registered Reper/Cert	no tubular neighborhood / ambiguity
Dev	section + curve + interface certificate	Lorentzian candidate datum	N≤0 / h not SPD / gluing failure

Dynamic Reper Bundle

T3-LOC-016 · source: tom3_v0_4.docx · Section 2

ONTOLOGY. The object is a trajectory Reper_t=(R_t,I_t,U_t;D_t) together with domain, provenance, status, and blockers. Dynamics acts on admissibility as well as on numerical coordinates.

EPISTEMOLOGY. Preservation is known through an explicit transport contract, composition laws, and a verifiable certificate chain. Continuity of symbols is insufficient.

PHENOMENOLOGY. For software the object appears as a state record with hash-linked transitions; for a researcher it is a history of which claims were admissible at each step.

PHYSICAL MEANING. The construction models preservation of a causal-evidential support while a V*P state develops.

LIMITATION. Reper transport proves neither physical determinism nor existence of a global trajectory.

AUTHORIAL NOVELTY. The authorial contribution is the unified dynamic contract joining Reper(R,I,U;D), D/Dom, provenance, and status nonpromotion.

Figure T3-FIG-008. Dynamic Reper and the hard gate for certificate transport.

Definition T3-CAU-001 [DEF-A]. Over an admissible curve $\gamma: I \to X_{VP}$ define the Reper bundle

T3-EQ-0021 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E_{Rep}|_{\gamma} = E_R \times_I E_I \times_I E_U \times_I E_D \times_I E_{Cert}.$$

A section $\rho(t)=(R_t,I_t,U_t,D_t,C_t)$ is a dynamic Reper when its numerical components are absolutely continuous and every C_t contains Dom_t, foundation D_t, $provenance_t$, $status_t$, and blocker set B_t.

Definition T3-CAU-002 [DEF-A]. An admissible transport from s to t is a partial map

T3-EQ-0022 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$P_{t\leftarrow s}: Dom(P_{t\leftarrow s}) \subset E_{Rep,s} \rightharpoonup E_{Rep,t},$$

satisfying $P_{s\leftarrow s}=id$; $P_{u\leftarrow t}\circ P_{t\leftarrow s}=P_{u\leftarrow s}$ on the common domain; $P(Dom_s)\subset Dom_t$; a witness morphism $D_s\to D_t$; a hash-linked provenance chain; $status_t \le status_s$; and persistence of every open blocker unless a discharge certificate is supplied.

7.1. Compositional Preservation

THM T3-CAU-1 [PROP]. A composition of two admissible transport maps is admissible on its composition domain. Its final status is no stronger than the initial status, and the provenance chain contains both steps unambiguously.

Proof. Identity and associativity follow from partial-map laws on the common domain. Domain inclusions compose. Witness morphisms $D_s\to D_t\to D_u$ produce a witness $D_s\to D_u$. Transitivity of the status order prohibits promotion. The hash chain incorporates the previous digest at each step. Failure of any condition yields ABSTAIN. □

COUNTEREXAMPLE. Suppose the numerical component is transported identically but D_t is empty. The coordinates match, yet Reper transport is inadmissible. Reusing the former status would be a hidden truth-layer promotion.

Chapter 8. Causal Tensor T_cs and the Causal Gap Index CGI

T3-CH-08 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-017–020 · source checkpoint T3-CAUSAL-v0.4

Accessible Introduction

T3-EXPL-08 · translated explanatory block

CENTRAL QUESTION	How can causal defects be represented without adding incompatible tensors and without turning a diagnostic index into an unsupported physical constant?
PLAIN MEANING	Torsion and curvature are placed in a direct sum of different types. CGI is built only after dimensionless normalization and diagnoses the stability of support, not automatically a new force.

MINIMAL EXAMPLE	If one channel has units of length and another inverse length, their norms must first be divided by reference scales. Otherwise the sum depends on the unit system.
ONTOLOGY	The objects are E_Tor, E_Curv, the extended carrier E_cs^L, normalized channels z_j, and support factor κ=r·u.
EPISTEMOLOGY	Types are checked by tensor geometry; CGI properties are checked by unit covariance, monotonicity, and the D/Dom hard gate.
PHENOMENOLOGY	A high CGI may indicate a large structural defect or weak evidential support; the two causes must remain distinguishable.
PHYSICAL MEANING	The index is a model diagnostic for causal stability and selection of a rebuild regime.
LIMITATION	Threshold 1, weights, and scales are not measured constants. CGI proves neither Lorentzian causality nor a physical rupture.
AUTHORIAL NOVELTY	The authorial contribution is CGI as a Reper-normalized multichannel diagnostic gate in KLT-RBD.
CHAPTER ROUTE	The chapter first corrects the type of T_cs, then introduces normalization, null models, and the classification gate. Chapters 9–11 study a possible geometric bridge.

CHAPTER STATUS. The index remains MODEL. Its algebraic properties and NUM certificate do not constitute EMP-OBS.

Typed Causal-Structural Packet

T3-LOC-017 · source: tom3_v0_4.docx · Section 3

ONTOLOGY. The causal-structural object collects defects of a connection while preserving their tensor types. Torsion and curvature live in different bundles.

EPISTEMOLOGY. Correctness is established by type checking and explicit carrier maps; a legacy formula T+R is read only as an ordered direct-sum pair.

PHENOMENOLOGY. Different channels produce separate components and separate tests; a single scalar is permitted only after normalization.

PHYSICAL MEANING. The packet can organize candidate geometric and causal defects of a V*P realization.

LIMITATION. The labels cent and cor remain legacy channel names until a bridge supplies units, equations, and observables.

AUTHORIAL NOVELTY. The authorial element is the typed causal packet and its blocker-safe scalar diagnostic.

Figure T3-FIG-009. Direct-sum types and the prohibition of automatic identification of invariants.

Definition T3-CAU-003 [CL/DEF-A]. For a smooth sector M and a connection ∇ on TM, set

T3-EQ-0023 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E\_Tor = \Lambda^2 T^*M \otimes TM, \quad E\_Curv = \Lambda^2 T^*M \otimes \mathrm{End}(TM),$$

T3-EQ-0024 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E_{cs} = E_{Tor} \oplus E_{Curv}, \quad T_{cs}(\nabla) = (Tor_\nabla, Curv_\nabla) \in \Gamma(E_{cs}).$$

The legacy notation $T_{cs}=T+R$ is allowed only as shorthand for the ordered pair in a direct sum. It is not an addition of components of different tensor types.

Definition T3-CAU-004 [MODEL]. The extended limit-causal carrier is

T3-EQ-0025 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E_{cs}^L = E_{Tor} \oplus E_{Curv} \oplus E_{hole} \oplus E_\Delta \oplus E_\Xi \oplus E_Y \oplus E_{cent} \oplus E_{cor} \oplus \mathbb{R}^{q_B},$$

and T_{cs}^L is a section of this direct bundle. The channel labels cent and cor acquire a physical force interpretation only through a separate certified bridge.

T3-TBL-016 · stable alias ledger introduced by the v0.17 editorial audit

v0.17 alias	Canonical object	Role	Status
T3-EQ-0043	T3-EQ-0023 · E_{Tor} and E_{Curv}	type alias	STABLE
T3-EQ-0044	T3-EQ-0024 · E_{cs} and T_{cs}	definition alias	STABLE
T3-EQ-0045	T3-EQ-0025 · E_{cs}^L	extended-carrier alias	STABLE
T3-FIG-016	T3-FIG-009 · direct-sum diagram	figure alias	STABLE
T3-TBL-025	T3-TBL-016 · types and physical prohibitions	cross-reference	STABLE

NEGATIVE RESULT. Without an explicit map $J_{Ass}:Hom(A^{\otimes 3},A)\to E_{cs}$ one cannot infer that an associator is torsion or curvature. Holonomy is not a local tensor either.

Operational CGI

T3-LOC-018 · source: tom3_v0_4.docx · Section 4

ONTOLOGY. CGI is a partial function on a certified causal-state record containing typed channels, reference scales, weights, and Reper support.

EPISTEMOLOGY. A value is known only after checking units, finiteness, D/Dom, and provenance of the scales. A bare number is not a result.

PHENOMENOLOGY. For software CGI is a dimensionless score and label; for a researcher it locates the channel that requires reconstruction.

PHYSICAL MEANING. A future physical adapter may use the score to rank structural ruptures, but at this stage it is a MODEL instrument.

LIMITATION. Threshold 1, band η, weights, and scales are not universal constants and require preregistration and calibration.

AUTHORIAL NOVELTY. The authorial feature is the CGI architecture with Reper support, hard gates, and blocker-safe ABSTAIN.

Figure T3-FIG-010. Normalization, aggregation, and classification gate of operational CGI.

Definition T3-CAU-005 [MODEL]. Let $\chi=(\chi_1,\ldots,\chi_m)$ be channels of T_{cs}^L; let $s_j>0$ have the same physical dimension as χ_j; let $w_j\geq 0$ be fixed in advance; and let $r,u\in[0,1]$ be normalized Reper support and connectivity. Under hard gate $G=1$, define

T3-EQ-0026 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$z\_j = ||\chi\_j||\_j / s\_j, \quad \hat{w}\_j = w\_j / \Sigma\_k\, w\_k, \quad \kappa = r \cdot u,$$

T3-EQ-0027 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$CGI\_op(\chi;r,u) = (\Sigma\_j\, \hat{w}\_j\, z\_j) / (\kappa + \varepsilon_0), \quad \varepsilon_0>0.$$

If G=0 because D/Dom is absent, a scale is nonpositive, a value is nonnumeric, provenance is unknown, or a critical blocker remains open, then CGI_op=ABSTAIN.

Definition T3-CAU-006 [MODEL]. For tolerance $\eta\in[0,1)$, the status is causal_stable when $CGI<1-\eta$; causal_critical when $1-\eta\le CGI\le 1+\eta$; and rebuild_required when $CGI>1+\eta$. Values $\varepsilon_0=0.10$ and $\eta=0.05$ in the v0.4 certificate are test parameters, not physical constants.

8.1. Mathematical Properties of CGI_op

T3-TBL-017 · algebraic properties

ID	Property	Conclusion
PROP T3-CAU-2	Dimensionlessness	Each z_j is a ratio of quantities of equal dimension; CGI_op is dimensionless.
PROP T3-CAU-3	Unit covariance	Under χ_j→a_jχ_j and s_j→a_js_j, a_j>0, value and status are unchanged.
PROP T3-CAU-4	Monotonicity	With other data fixed, CGI_op is nondecreasing in every ‖χ_j‖ with w_j>0.
PROP T3-CAU-5	Zero model	If every χ_j=0 and G=1, then CGI_op=0 and causal_stable.
PROP T3-CAU-6	Orthogonal invariance	With norms induced by fixed metrics, orthogonal basis changes preserve channel norms and CGI.
PROP T3-CAU-7	Support sensitivity	For nonzero numerator, decreasing r·u increases CGI_op.

These properties follow directly from normalization, nonnegative weights, and the positive denominator. They establish properties of the formula, not its physical validity.

UNIT COUNTEREXAMPLE. A raw formula adding unnormalized ‖Tor‖, ‖Curv‖, and other channels changes when one channel is converted from metres to millimetres. The legacy numerator without reference scales is not a universal CGI.

Null Models and Falsifiability

T3-LOC-019 · source: tom3_v0_4.docx · Section 5

Figure T3-FIG-011. Model regimes of CGI and the boundary of empirical interpretation.

T3-TBL-018 · null and alternative regimes

Model	Condition	Expected output	Boundary
H0-ZERO	all χ_j=0; G=1	CGI=0	implementation test, not a physical null
H0-CAL	χ follows a preregistered baseline	specified null distribution	fillable field: real data
H1-SINGLE	one z_j is substantially elevated	single-channel rupture	correct for channel selection
H2-MULTI	several moderate z_j	composite CGI>1	check weights and dependence
H3-SUPPORT	κ=r·u is near zero	score increases	may mean weak support, not strong physics

Model	Condition	Expected output	Boundary
H4-GATE	D/Dom/provenance fails	ABSTAIN	numeric output prohibited

EMP-PLAN T3-CAU-E1. Before outcomes are disclosed, a real test must fix the measurable carrier of every χ_j, units, scale estimator, weights, ε_0, η, null distribution, sampling frame, exclusion rules, multiplicity correction, primary endpoint, code, blind split, and support/falsification criteria.

Operational falsification: if a coherent unit transformation changes the score beyond numerical error, the implementation is invalid. The physical interpretation is separately falsified when the preregistered CGI fails to distinguish null and alternative samples at the declared power.

FILLABLE FIELD. Reference dataset, measurable channel definitions, scale estimators, weights, η, ε_0, primary endpoint, δ_{min}, α-level, power, and independent EXT-RUN executor.

Certificate of the Causal Layer

T3-LOC-020 · T3-CAUSAL-NUM-001

The certificate uses synthetic finite-dimensional arrays. Seed and parameters were fixed before the run. It checks implementation identities and contains no experimental or observational data.

T3-EQ-0028 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\text{seed}=20260726,\quad N=2000 \text{ per test},\quad \eta=0.05,\quad \varepsilon_0=0.1.$$

T3-TBL-019 · certificate results

Check	Result	Control
antisymmetry of Tor/Curv in declared indices	2000/2000	max error=0.000e+00
norm invariance under orthogonal basis change	2000/2000	max error=2.842e-14
CGI invariance under coherent unit change	2000/2000	max error=7.105e-15
monotonicity in a defect channel	2000/2000	max drop=0.000e+00
D/Dom failure → ABSTAIN	2000/2000	PASS
H0-ZERO → CGI=0	2000/2000	PASS
classes 0.5 / 1.0 / 1.5	2000/2000	PASS
unnormalized legacy formula changes with units	2000/2000	PASS
composition of linear transport	2000/2000	PASS
status is not promoted	2000/2000	PASS
hash-linked provenance	2000/2000	PASS
lower support increases score	2000/2000	PASS

NUM RESULT. All software checks passed. The result has status NUM. It is not EMP-OBS, does not calibrate thresholds, and does not validate a physical T_{cs}.

8.2. Reproduction

Environment: Python 3, NumPy. Command: python t3_v04_checks.py. Outputs: t3_v04_checks_output.json and t3_v04_checks_output.txt. Random tensors use the frozen seed; type symmetries, invariances, hard gates, and transport contracts are checked.

T3-TBL-020 · historical hashes

Object	SHA-256
tom3_v0_3.docx	a97196a88ed3863283beb7ea049553dd63f57048712b26ad38706bb6f455856f
tom3_v0_3.pdf	990daeabded76c49069960dbc0b2df554cee171cf919d98900c36463c6e59fd7
t3_v04_checks.py	33af7fcd1230f9cdf5a4f8a3362dcaea52fb52170ce0a5596cb891b26798c916
t3_v04_checks_output.json	413968414c57d6636d04842e4286cb0c80eaf59afb733515916791159a38f0fa
t3_v04_checks_output.txt	0c3a4cbbe62e66ff28d5639d6e1b1989f750613881b80eca83c0afab30ce6d81
T3-V04 release fingerprint	714fcc179fb0335f5ce5115ebf1a598bbf10e18974154e4d1a760d05ac390c45

Chapter 9. Strict Bridge from NAPG to Physical Geometry

T3-CH-09 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-021–023 · source checkpoint T3-BRIDGE-v0.5

Accessible Introduction

T3-EXPL-09 · translated explanatory block

CENTRAL QUESTION	Can a strict map be built from an internal nonassociative NAPG structure to geometric data suitable for physical modelling?
PLAIN MEANING	Instead of a universal bridge, a partial three-stage architecture is used: algebraic witness, geometric globalization, and physical export. Each stage has its own blockers.
MINIMAL EXAMPLE	For octonions, the imaginary part produces a cross product and a positive G_2 three-form. This closes Br_alg but does not create a smooth bundle, Lorentzian metric, or field equations.
ONTOLOGY	There are source NAPG objects, target geometric data, bridge maps Br_alg/Br_geom/Br_phys, and certificates of their definedness.
EPISTEMOLOGY	A bridge is known only after functoriality, smooth gluing, compatibility of transitions, and an explicit physical adapter are established.
PHENOMENOLOGY	For software the bridge appears as a commutative diagram; a broken arrow leaves only a local model witness.
PHYSICAL MEANING	The architecture displays a possible path from nonassociative structure to a geometric field without claiming that nature realizes it.
LIMITATION	Only a certified algebraic sector is closed. Global geometry, Lorentzian reduction, dynamics, and observables remain conditional.
AUTHORIAL NOVELTY	The authorial contribution is the blocker-safe architecture NAPG→PhysGeom preserving the distinction between a local witness and a physical law.

CHAPTER ROUTE	This chapter specifies the contract and the octonion witness. Chapter 10 develops Hodge/G_2 realization; Chapter 11 forbids invariant conflation.

CHAPTER STATUS. Br_alg is closed only in the certified octonion sector. All later bridge stages retain COND or OPEN status.

Three-Stage Bridge Architecture

T3-LOC-021 · source: tom3_v0_5.docx · Section 2

ONTOLOGY. A bridge is a partial structure-preserving procedure with a source category, target category, certificate, and explicit failure output.

EPISTEMOLOGY. Existence requires every codomain structure to be supplied: metric, orientation, positive form, smoothness, soldering, and connection.

PHENOMENOLOGY. For a computer the bridge is a pipeline of closed, conditional, and blocked stages; for a geometer it is a sequence of functors that forget or add structure.

PHYSICAL MEANING. A closed algebraic channel produces a G_2 vector space; subsequent stages may model an internal geometry of a field or V*P layer.

LIMITATION. A G_2 structure is Riemannian and is not automatically a Lorentzian spacetime, physical field, or observable.

AUTHORIAL NOVELTY. The authorial contribution is the blocker-safe composition with Reper/D/Dom and evidence status. Octonions, Hodge star, and G_2 are classical prior art.

Figure T3-FIG-012. Three bridge stages and the weakest-link gate.

Definition T3-BR-001 [DEF-A]. The category NAPG^cert has objects

T3-EQ-0029 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$N=(A,\odot,Dom\_\odot,Ass\_\odot,R,D,Cert,Status),$$

and morphisms preserving the operation on the common domain, Reper/D/Dom, provenance, and status nonpromotion.

Definition T3-BR-002 [CL/DEF-A]. The category G2Vect^cert has oriented seven-dimensional Euclidean vector spaces equipped with a positive three-form and its Hodge dual:

T3-EQ-0030 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$G=(V,g,or,\varphi,\psi={*}_{(g,or)}\varphi,Cert,Status).$$

Morphisms are orientation-preserving isometries f with $f^*\varphi'=\varphi$; then $f^*\psi'=\psi$ automatically.

Definition T3-BR-003 [DEF-A]. A bridge certificate β for N∈NAPG^cert contains an eight-dimensional real unital positive composition algebra O; its norm N_O; alternative multiplication μ_O; an embedding/realization ρ of the source admissible sector in O; the identification $V=1\perp$; and Dβ, Domβ, provenance, and statusβ.

T3-EQ-0031 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$Br\_\beta : Dom(Br\_\beta) \subset NAPG\text{^}cert \rightharpoonup G2Vect\text{^}cert,$$

with Br_β(N)=ABSTAIN whenever a mandatory component of β is absent or unchecked. The output status is the weakest of status_N and status_β.

From Algebraic to Geometric Bridge

T3-LOC-022 · source: tom3_v0_5.docx · Section 6

ONTOLOGY. A geometric object requires a base manifold, smooth bundle, fibrewise positive three-form, soldering, and connection. A vector space has no exterior derivative by itself.

EPISTEMOLOGY. Torsion classes are known from dφ and dψ only after smooth structure and operator domains are defined. Fibrewise algebra does not determine d.

PHENOMENOLOGY. The transition appears as the difference between the same algebra in every fibre and its nontrivial spatial gluing.

PHYSICAL MEANING. A smooth lift may model an internal field geometry or a seven-dimensional auxiliary sector.

LIMITATION. It does not automatically create a four-dimensional Lorentzian signature, Einstein dynamics, causal cones, or observables.

AUTHORIAL NOVELTY. The authorial discipline is the separation of algebraic, differential-geometric, and physical bridges.

Definition T3-BR-005 [COND]. A geometric lift datum over a smooth seven-manifold M is

T3-EQ-0032 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$L=(E\to M,\ \mu\_O,\ N\_O,\ \varphi\_E,\ \sigma:E\cong TM,\ \nabla,\ D\_L,\ Dom\_L),$$

where fibrewise octonion structures and φ_E depend smoothly on the point and σ is a soldering isomorphism. Then $\varphi=\sigma\_{*}\varphi\_E$ defines a G_2 structure on M.

For the Levi-Civita connection, torsion classes are defined by the classical decompositions

T3-EQ-0033 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$d\varphi = \tau_0\,\psi + 3\tau_1\wedge\varphi + *\tau_3,$$

T3-EQ-0034 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$d\psi = 4\tau_1\wedge\psi + \tau_2\wedge\varphi.$$

The algebraic identity $q\_{Ass}=-2\psi$ is retained fibrewise, but the τ_i depend on spatial variation of φ, the connection, and the differential domain. They do not follow from the fibrewise associator alone.

9.1. Bridge Stages and Statuses

T3-TBL-021 · bridge ladder

Stage	Map	Status	Minimum certificate
Br_alg	NAPG_oct→G_2Vect	CLOSED-CL/THM	unit, positive composition norm, alternativity, D/Dom
Br_bundle	G_2Vect family→G_2 bundle	COND	smooth transition maps preserving φ
Br_geom	bundle+soldering→G_2 manifold	COND	smooth 7-manifold, TM identification
Br_diff	G_2 manifold→torsion/curvature data	COND	connection, d, domains, boundary/interface data
Br_phys	geometric data→V*P/Lorentz/fields	OPEN	4D reduction, units, action, equations, observables

Countermodels and the Bridge Firewall

T3-LOC-023 · source: tom3_v0_5.docx · Section 7

Figure T3-FIG-013. Admissible sector, ABSTAIN, and the refuted legacy bracket.

T3-TBL-022 · bridge countermodels

ID	Erroneous move	Strict verdict
CEX-B1	arbitrary nonassociative algebra	No positive composition norm or canonical seven-dimensional imaginary sector; Br_alg undefined.
CEX-B2	associative algebra Ass=0	A zero associator selects neither metric, Hodge star, torsion, nor curvature.
CEX-B3	same algebra, different metrics/orientations	Hodge star changes; the bridge is not canonical without a certificate.
CEX-B4	positive three-form absent	Not every three-form in seven dimensions lies in the open G_2 orbit.
CEX-B5	fibrewise octonions only	No $d\varphi$, τ_i, curvature, or dynamics without a smooth lift.
CEX-B6	G_2 structure interpreted as spacetime	G_2 is Riemannian seven-dimensional; a Lorentzian 4D bridge requires a separate reduction.
CEX-B7	legacy mixed central bracket	$J(e_1,e_2,f_3)=\alpha h$; for $\alpha\neq 0$ it is not a Lie algebra.
CEX-B8	NUM certificate called experiment	Exact table checks are not EMP-OBS or EXT-RUN.

9.2. Negative Audit of the Legacy g_α Family

The legacy source uses $[e_i,e_j]=\varepsilon_{ijk}\, e_k$, $[f_i,f_j]=\varepsilon_{ijk}\, f_k$, $[e_i,f_j]=\alpha\delta_{ij}\, h$, with h central. For (e_1,e_2,f_3),

T3-EQ-0035 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$J(e_1,e_2,f_3)=[[e_1,e_2],f_3]+[[e_2,f_3],e_1]+[[f_3,e_1],e_2]=\alpha h.$$

Therefore the Jacobi identity fails for $\alpha\neq 0$. No Lie group G_α has this bracket as its Lie algebra, and the associated Maurer–Cartan equations cannot be used as a differential proof object without repair. At $\alpha=0$ the mixed channel disappears together with the claimed α-controlled coupling.

Chapter 10. Hodge, G_2, and Associator Model Realizations

T3-CH-10 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-024–026 · source checkpoint T3-BRIDGE-v0.5

Accessible Introduction

T3-EXPL-10 · translated explanatory block

CENTRAL QUESTION	How can the Hodge operator, a G_2 form, and the associator form a coherent model realization without being substituted for one another?
PLAIN MEANING	In a seven-dimensional Euclidean sector, octonion multiplication defines a cross product, a three-form φ, and the Hodge-dual four-form ψ. The associator is encoded by a separate four-form q_{Ass}.

MINIMAL EXAMPLE	In the frozen Fano convention, q_Ass=−2ψ is proved. This is an exact identity in the chosen octonion model, not a universal physical field equation.
ONTOLOGY	The objects are an oriented metric seven-space, positive three-form φ, dual ψ, cross product, and alternating associator form q_Ass.
EPISTEMOLOGY	Identities are checked by algebraic computation, norm preservation, alternativity, and Hodge duality.
PHENOMENOLOGY	Different algebraic triples generate an associator response represented by components of q_Ass inside the model.
PHYSICAL MEANING	The construction supplies a geometric language for a candidate associator sector and possible field connections.
LIMITATION	q_Ass is not automatically torsion, curvature, stress-energy, or an observable. A differential and physical bridge is required.
AUTHORIAL NOVELTY	The authorial contribution is insertion of the octonion witness into the NAPG/Reper chain with an explicit status firewall.
CHAPTER ROUTE	The chapter builds φ, ψ, and q_Ass, then checks automorphisms and the certificate. Chapter 11 compares these objects with connection tensors.

CHAPTER STATUS. The octonion/G_2 correspondence is classical prior art; the certified placement in the KLT-RBD bridge is authorial.

Octonion Witness

T3-LOC-024 · source: tom3_v0_5.docx · Section 3

ONTOLOGY. The witness is the real octonion algebra with unit, conjugation, positive multiplicative norm, and its seven-dimensional imaginary sector.

EPISTEMOLOGY. The model is fixed by a multiplication table, Fano convention, metric from the norm, and exact algebraic checks.

PHENOMENOLOGY. The cross product and positive three-form appear as concrete multilinear components in the chosen basis.

PHYSICAL MEANING. The witness provides an internal geometric candidate for an associator channel.

LIMITATION. It remains a model realization and is not a measurement of matter, curvature, or time.

AUTHORIAL NOVELTY. The authorial contribution is the bridge certificate and status-preserving use of the classical witness.

Figure T3-FIG-014. Octonion witness and the exact associator–Hodge channel.

Let O be the real octonion algebra with unit 1, conjugation, positive norm $N(x)=x\,\bar{x}$, and scalar product g obtained by polarizing N. Put $V=1^{\perp}=\mathrm{Im}\, O$ and

T3-EQ-0036 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$x\times y = \mathrm{Im}(xy),\quad \varphi(x,y,z)=g(x\times y,z),\quad \psi={*}\varphi.$$

Theorem T3-BR-1 [CL-THM]. The form φ is a positive three-form on V; its stabilizer in GL(V) is the compact real form G_2. Hence Br_O(O)=(V,g,or,φ,ψ) is well-defined after choosing the orientation compatible with φ.

Evidence basis. The composition norm defines a positive metric; the octonion cross product satisfies the standard seven-dimensional vector-product identities; φ reconstructs the metric and orientation. This is the classical octonion/G_2 correspondence used as a bridge witness.

10.1. Frozen Fano Convention

The oriented triples used by the computational certificate are (123),(145),(176),(246),(257),(347),(365). In increasing-index notation,

T3-EQ-0037 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\varphi = e^{123} + e^{145} - e^{167} + e^{246} + e^{257} + e^{347} - e^{356},$$

T3-EQ-0038 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\psi=*\varphi = -e^{1247} + e^{1256} + e^{1346} + e^{1357} - e^{2345} + e^{2367} + e^{4567}.$$

Associator and Hodge Geometry

T3-LOC-025 · source: tom3_v0_5.docx · Section 4

Definition T3-BR-004 [DEF-A]. For $x,y,z,w\in V$ define

T3-EQ-0039 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{Ass}_\mu(x,y,z)=(xy)z-x(yz),$$

T3-EQ-0040 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$q_{\mathrm{Ass}}(x,y,z,w)=g(\mathrm{Ass}_\mu(x,y,z),w).$$

Theorem T3-BR-2 [THM]. In the frozen octonion convention q_Ass is an alternating four-form and

T3-EQ-0041 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$q_{\mathrm{Ass}} = -2\ \psi = -2\ *\varphi.$$

Proof. Octonion alternativity makes the associator fully alternating, hence $q_{\mathrm{Ass}}\in\Lambda^4V^*$. On the increasing basis quadruples both forms have seven nonzero components. Direct computation gives $q_{1247}=2$ while $\psi_{1247}=-1$, and the same factor −2 on the remaining six components. Multilinearity completes the proof. □

Corollary T3-BR-2a [PROP]. $\|q_{\mathrm{Ass}}\|=2\|\psi\|$. This exact algebraic equality holds in the selected normalization and is not a measured physical amplitude.

Certificate of the Algebraic Bridge

T3-LOC-026 · T3-BRIDGE-NUM-001

The certificate implements the exact integer octonion table, the frozen Fano convention, and bridge gates. The seed is used for randomized multilinear tests; basis identities are checked exactly.

T3-TBL-023 · bridge certificate results

Check	Result	Control
composition norm N(xy)=N(x)N(y)	2000/2000	max error=0
left/right alternativity	2000/2000	max error=0
seven nonzero components of φ	1/1	PASS
$q_{\mathrm{Ass}}=-2*\varphi$ on 35 basis four-components	35/35	constant = −2
alternation of q_Ass	2000/2000	max error=0
nontrivial Fano automorphism	64/64	PASS
commutativity of algebra/G_2 diagram	2000/2000	max error=0
Jacobi failure of legacy bracket	1/1	J = h

Check	Result	Control
hard-gate PASS/ABSTAIN	8/8	PASS
prohibition of status promotion	5/5	PASS

10.2. Reproduction and Hashes

Command: python t3_v05_checks.py. Environment: Python 3, NumPy. Outputs: t3_v05_checks_output.json and t3_v05_checks_output.txt. Frozen seed: 20260726.

T3-TBL-024 · historical hashes

Object	SHA-256
tom3_v0_4.docx	08b255e57e9913e4cc042872984fbedcdc07cfac55df25 60293571e9ae4d0ac3
tom3_v0_4.pdf	b227b9bad012cc0e592769e7d2bc68c6ecab13a7a6b34 9af0b2fc21df83effe9
t3_v05_checks.py	df10447a166fb78f7d3cb6240d52f88e927f4b48933369 1a99c8bd21abcc233a
t3_v05_checks_output.json	ea0192ccb7ef2d943ceb052764efb033061d31f7ba6896 5a8f8dc2d2b08b62fc
t3_v05_checks_output.txt	b62b8ed4e17979c88f06ba2586bbbb13338debc15a020 1e9284c849efbcb2266
main_SIGMA_freeze.tex	e321aab8351e34c147ce93ce8706db74b7e7add980beb 89621b4f2e0416f7c6c
tom2_v1_0.docx	717336313292e0237474fb33703409bf41092922afd93 b9bae803bb50027eec4
T3-V05 release fingerprint	bc6c0ddd1a60494564c12abc3311efb46ec451ef047b7e 331222c6d838286592

Chapter 11. Separation of Associator, Curvature, Torsion, and Holonomy

T3-CH-11 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-027–029 · source checkpoints T3-CAUSAL-v0.4 and T3-BRIDGE-v0.5

Accessible Introduction

T3-EXPL-11 · translated explanatory block

CENTRAL QUESTION	Why can the associator, torsion, curvature, and holonomy not be treated as different names for the same defect?
PLAIN MEANING	They live in different carriers and answer different questions: the associator concerns a binary operation; torsion and curvature concern a connection; holonomy concerns parallel transport around loops.
MINIMAL EXAMPLE	A connection can be flat with nonzero torsion or torsion-free with nonzero curvature. Thus Ass=Tor=Curv is logically false without special maps.
ONTOLOGY	There are four separate carriers: a cochain/alternating form for Ass, E_Tor, E_Curv, and the holonomy group/algebra.

EPISTEMOLOGY	The difference is established by type checking, counterexamples, and connection theorems; a relation requires a separate natural transformation.
PHENOMENOLOGY	The defects produce different components and tests. Equality of numerical norms is not identity of objects.
PHYSICAL MEANING	The separation prevents the false inference that detected nonassociativity is already gravitational curvature.
LIMITATION	The chapter is mainly negative: it closes prohibited identifications but does not construct a full Ass→Tor/Curv bridge.
AUTHORIAL NOVELTY	The authorial contribution is the evidential firewall requiring a typed bridge for every physical interpretation.
CHAPTER ROUTE	Results of Chapters 8 and 10 are used through stable aliases. Chapter 12 introduces dynamics through a variational principle.

CHAPTER STATUS. This chapter proves separation and functoriality in the declared sectors; it does not provide a universal invariant-identification theorem.

Morphisms and Commutative Diagrams

T3-LOC-027 · source: tom3_v0_5.docx · Section 5

Figure T3-FIG-015. Functoriality of Br_alg on certified isomorphisms.

Theorem T3-BR-3 [CL-THM/PROP]. Let $F:O\to O'$ be a unital norm-preserving algebra isomorphism. Then $f=F|_{\mathrm{Im}\, O}$ is an orientation-preserving isometry and

T3-EQ-0042 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$f(x\times y)=f(x)\times' f(y),\quad f^*\varphi'=\varphi,\quad f^*\psi'=\psi,\quad f^*q'_{Ass}=q_{Ass}.$$

Proof. $F(1)=1$ and norm preservation imply $F(1\perp)=1\perp$ and preservation of g. Multiplicativity preserves the imaginary product and cross product. The definitions of φ and q commute with F; Hodge duality is preserved by the isometry and orientation. □

Therefore Br_alg is a functor on the groupoid of certified octonion realizations and norm-preserving algebra isomorphisms. The statement does not apply to arbitrary NAPG morphisms.

Torsion and Curvature as Different Types

T3-LOC-028 · source: tom3_v0_4.docx · Section 3

T3-FIG-016 · stable editorial alias to T3-FIG-009; the image is intentionally not duplicated

FIGURE ALIAS. See Figure T3-FIG-009 in Chapter 8. T3-FIG-016 remains a stable locator for the direct-sum type diagram.

T3-EQ-0043 · mathematical-content parity synchronized with T3-FREEZE-v1.0

See T3-EQ-0023. T3-EQ-0043 remains the stable alias for the torsion and curvature carrier types.

T3-EQ-0044 · mathematical-content parity synchronized with T3-FREEZE-v1.0

See T3-EQ-0024. T3-EQ-0044 remains the stable alias for the definition of T_cs in the direct sum.

The prohibition of adding incompatible tensor types is imported from Chapter 8 without repeating the proof.

T3-EQ-0045 · mathematical-content parity synchronized with T3-FREEZE-v1.0

See T3-EQ-0025. T3-EQ-0045 remains the stable alias for the extended carrier.

The physical interpretation of cent/cor channels still requires a separate bridge; see Chapter 8.

T3-TBL-025 · exact carriers and roles

Object	Exact carrier	Role	Status
Tor_∇	$\Lambda^2T^*\otimes TM$	torsion of a connection	CL
Curv_∇	$\Lambda^2T^*\otimes End(TM)$	curvature of a connection	CL
Ass_⊙	$Hom(A^{\otimes 3},A)$	associativity defect	NAPG
Hol_∇	path/group object	holonomy and parallel transport	CL/NAPG
T_cs	E_Tor⊕E_Curv	authorial structural packet	AUTHORIAL MODEL
CGI	$\mathbb{R}_{\{\geq 0\}}$ or ABSTAIN	scalar after normalization gate	AUTHORIAL MODEL

Negative Boundaries of Identification

T3-LOC-029 · source: tom3_v0_5.docx · Section 11

11.1. Proved or Strictly Defined

- partial bridge contract with source, codomain, certificate, status, and ABSTAIN;
- octonion Br_alg into G_2Vect on the positive composition/alternative sector;
- explicit forms φ and ψ in the frozen Fano convention;
- alternation of q_Ass and the exact identity $q\_Ass=-2\psi$;
- functoriality under unital norm-preserving algebra isomorphisms;
- negative separation of associator, torsion, curvature, and holonomy;
- Jacobi counterexample for the legacy mixed central bracket at $\alpha\neq 0$;
- reproducible NUM certificate and status nonpromotion.

11.2. Not Proved

- a universal bridge for every object of NAPG 3.0;
- existence of a repaired α-family with the claimed differential and torsion formulas;
- a global smooth G_2 manifold, Fredholm Hodge package, or spectral flow;
- a map associator→torsion/curvature or a causal tensor of nature;
- Lorentzian reduction, global hyperbolicity, or Einstein equations;
- a variational principle, a physical arrow of time, or cosmological dynamics;
- observables, empirical calibration, PN.2 as a physical law, or F-1–F-14;
- an independent EXT-RUN.

Chapter 12. Variational Principle and Kurpishev's Arrow of Time

T3-CH-12 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-030–039 · source checkpoint T3-VAR-v0.6

Accessible Introduction

T3-EXPL-12 · translated explanatory block

CENTRAL QUESTION	Which additional conditions turn a variational functional or geometric flow into a directed dynamics that may be interpreted as an arrow of time?
PLAIN MEANING	Stationarity of an action and monotonicity of a functional are different properties. An arrow appears only with a dissipative component and preservation of operator and certificate gates.
MINIMAL EXAMPLE	For $\dot{q}=(J-K)\mathrm{grad}V$, the skew part J does not change V and $K\geq 0$ gives $dV/dt\leq 0$. If K is indefinite or a jump raises V, there is no global arrow.

ONTOLOGY	The objects are configuration space, trajectory space, action 𝒮, potential V, generator Ξ, and hybrid jumps Y∘Δ_act.
EPISTEMOLOGY	The first variation is proved analytically; monotonicity is proved from the sign of a quadratic form and from every jump condition.
PHENOMENOLOGY	Directionality appears as irreversible decrease of a selected functional, not as a psychological feeling of time flow.
PHYSICAL MEANING	The scheme models dissipative and relaxation regimes with a distinguished direction of evolution.
LIMITATION	A Lyapunov function is not thermodynamic entropy without a separate bridge. Conditional monotonicity does not prove a fundamental arrow of the Universe.
AUTHORIAL NOVELTY	The authorial contribution is the Ξ–Δ–Y and Hodge-module/Reper-gate architecture with a conditional arrow and explicit separation of action and Lyapunov layers.
CHAPTER ROUTE	The chapter derives the first variation, then the J−K model and jump gate. Chapter 13 applies symmetry reduction to a cosmological sector.

CHAPTER STATUS. The first-variation theorem is mathematical. The arrow theorem is conditional. A physical cosmic arrow remains PHY-HYP/OPEN.

Notation Firewall

T3-LOC-030 · source: tom3_v0_6.docx · Section 2

Figure T3-FIG-017. Three irreducible meanings of action and Δ.

T3-TBL-026 · notation and domain firewall

Symbol	Dom→Cod	Role
S_phys	P_adm→ℝ∪{+∞}	physical/model action functional
L(q,v,t)	TQ×I→ℝ	Lagrangian density; not automatically Lyapunov
Δ_act	A_act×X_VP→X_tr	instantaneous act/jump
Δ_Hdg	Dom(Δ_Hdg)⊂Ω^p→Ω^p	dd*+d*d; boundary/domain required
V	Q_adm→ℝ	Lyapunov/energy candidate
Ξ	generator or partial flow	continuous change
Y	X_post→Q_adm	reversal/retraction/post-event map
𝔥	packet super-operator	commutation/intertwining condition

Configuration Space

T3-LOC-031 · source: tom3_v0_6.docx · Section 3

Definition T3-VAR-001 [DEF-A]. The certified configuration space is

T3-EQ-0046 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$Q\_adm = \{(q,D\_q,Dom\_q,Cert\_q,Status\_q) : Gate(q)=PASS\}.$$

Let $I=[t_0,t_1]$. For $r\geq 1$ define the trajectory space

T3-EQ-0047 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$P\_adm^r(I,Q\_adm)= \{q\in C^r(I,Q\_adm): \text{constraints } C(q,\dot q,t)=0,\ \mathscr{S}[q]<\infty, \text{ certificates valid}\}.$$

In an infinite-dimensional version, C^r is replaced by a Sobolev/Banach-manifold sector. Charts, trace maps, weak derivatives, and compactness assumptions remain a fillable field and blocker T3-BLK-061.

Definition T3-VAR-002 [DEF-A]. An admissible variation q_ε has variation field $\eta=\partial\_\varepsilon q\_\varepsilon|_0$ in the tangent cone T_qP_adm and preserves linearized constraints, D/Dom, and the selected endpoint class.

First Variation

T3-LOC-032 · source: tom3_v0_6.docx · Section 4

Figure T3-FIG-018. First-variation pipeline and separation of bulk and boundary equations.

Definition T3-VAR-003 [DEF-A]. In a local coordinate chart set

T3-EQ-0048 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathscr{S}\_phys[q]=\int\_\{t_0\}^\{t_1\} L(q(t),\dot q(t),t)dt + B(q(t_0),q(t_1)).$$

Theorem T3-VAR-1 [THM]. If $L\in C^2$, $q\in C^2$, and q_ε is a C^1 variation, then

T3-EQ-0049 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\delta\mathscr{S}[q;\eta]=\int\_\{t_0\}^\{t_1\} \langle E\_L(q),\eta\rangle dt + [\langle p,\eta\rangle]\_\{t_0\}^\{t_1\}+\delta B,$$

T3-EQ-0050 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$p=\partial\_\{\dot q\}L,\quad E\_L=\partial\_qL-d/dt(\partial\_\{\dot q\}L).$$

Proof. Differentiating under the integral gives $\int(\langle\partial\_qL,\eta\rangle+\langle p,\dot\eta\rangle)dt$. Integration by parts produces the bulk term and endpoint pairing. Adding the variation of B completes the formula. □

Corollary T3-VAR-1a [PROP]. For $\eta(t_0)=\eta(t_1)=0$, stationarity for every admissible η is equivalent to $E\_L(q)=0$.

Corollary T3-VAR-1b [PROP]. With free endpoints and $B=B(q_0,q_1)$, the natural boundary conditions are

T3-EQ-0051 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$-p(t_0)+\partial_1B=0,\quad p(t_1)+\partial_2B=0.$$

Conservative Limit

T3-LOC-033 · source: tom3_v0_6.docx · Section 5

Example T3-VAR-EX1 [COUNTERMODEL]. For

T3-EQ-0052 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$L(q,\dot q)=½\ \dot q^TM\ \dot q-V(q),\quad M>0,$$

the Euler–Lagrange equation is $M\ddot q+\nabla V(q)=0$. Without explicit time dependence the conserved energy is

T3-EQ-0053 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E(q,\dot q)=½\ \dot q^TM\ \dot q+V(q).$$

The harmonic oscillator has periodic solutions. Its action is stationary and energy constant, while potential energy both increases and decreases. Stationary action therefore selects no direction of time.

Conditional Lyapunov Arrow

T3-LOC-034 · source: tom3_v0_6.docx · Section 6

Figure T3-FIG-019. Continuous arrow, reversible part, and event-level gates.

Definition T3-VAR-004 [DEF-A]. An arrow datum is

T3-EQ-0054 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$A_K=(Q_{adm},\Phi_t,\Xi,\mathfrak{H},\mathscr{V},J,K,D_A,Dom_A,Cert_A),$$

where Φ_t is a partial semigroup, Ξ its generator, $\Phi_t\mathfrak{H}=\mathfrak{H}\Phi_t$ on the common domain, $J^*=-J$, $K^*=K\geq 0$, and

T3-EQ-0055 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\Xi(q)=(J(q)-K(q))\ \mathrm{grad}\ \mathscr{V}(q).$$

Theorem T3-VAR-2 [COND-THM]. Along every classical trajectory $\dot{q}=\Xi(q)$,

T3-EQ-0056 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$d\mathscr{V}(q(t))/dt = -\langle \mathrm{grad}\mathscr{V}, K\ \mathrm{grad}\mathscr{V}\rangle \leq 0.$$

If the forward orbit is precompact, V is bounded below, and the flow is complete on the orbit, the ω-limit set lies in the largest invariant subset of $\{q:K^{1/2}\mathrm{grad}V=0\}$. If K is positive definite away from Crit(V), the limit set lies in Crit(V).

Proof. The derivative identity follows from skew-adjointness of J and positive semidefiniteness of K. The limit-set statement uses the classical invariance principle and therefore retains the stated compactness and completeness hypotheses. □

Hybrid Dynamics

T3-LOC-035 · source: tom3_v0_6.docx · Section 7

The continuous sector is generated by Ξ. At event times t_j, a hybrid update is allowed:

T3-EQ-0057 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$q(t_j^+)=Y(A_{act}(a_j,q(t_j^-))).$$

Proposition T3-VAR-3 [PROP/MODEL]. A global piecewise arrow property is retained if every jump satisfies:

- A_{act} and Y are defined on the supplied D/Dom;
- certificates and blocker ledger are transported without status promotion;
- $V(q(t_j^+))\leq V(q(t_j^-))$;
- T3-VAR-2 holds between jump times.

If the jump inequality is not proved, continuous monotonicity does not cross the event. The correct verdict for a global arrow claim is ABSTAIN even when every smooth arc is dissipative.

Geometric Flow and Physical Time

T3-LOC-036 · source: tom3_v0_6.docx · Section 8

The classical G_2 Laplacian flow for a closed positive three-form is

T3-EQ-0058 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\partial_t\varphi = \Delta_\varphi \varphi, \quad d\varphi=0.$$

Well-posedness, gauge issues, evolution equations, and energy/volume interpretations belong to classical prior art. Depending on the selected functional and sign convention, a geometric flow may be positive or negative gradient-like. The sign of a Lyapunov quantity must be computed, not inferred from the word “Laplacian”.

Definition T3-VAR-005 [COND]. A geometric flow is admitted as a realization Ξ_{geom} only with a smooth G_2-bundle lift, an operator domain for Δ_{Hdg}, boundary/interface conditions, proof that the positivity/closedness class is preserved, short-time existence, and a concrete functional identity.

Audit of the Legacy Branch

T3-LOC-037 · source: tom3_v0_6.docx · Section 9

Figure T3-FIG-020. Failure of the global Lyapunov claim and admissible repairs.

The legacy text simultaneously uses

T3-EQ-0059 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathscr{A}(\alpha)=\sqrt{3}|\alpha|,\quad \mathscr{S}=\mathscr{A}^2=3\alpha^2,\quad \dot{\alpha}=-k(\alpha),\quad k(\alpha)>0,$$

and claims $(A^2)\leq 0$ for every α. Direct differentiation gives

T3-EQ-0060 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$(\mathscr{A}^2)=6\alpha\dot{\alpha}=-6\alpha k(\alpha),$$

which is positive for $\alpha<0$. The global Lyapunov formulation for the literal law $\dot{\alpha}=-k(\alpha)$ therefore has status REFUTED variant.

Repair T3-VAR-R1 [MODEL]. With $\dot{\alpha}=-\kappa(\alpha)\alpha$, $\kappa\geq 0$,

T3-EQ-0061 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$(\mathscr{A}^2)=-6\kappa(\alpha)\alpha^2\leq 0.$$

The alternative $\dot{\alpha}=-\kappa(\alpha)\mathrm{sign}(\alpha)$ makes $|\alpha|$ monotone but requires a differential inclusion or a convention at $\alpha=0$. Restricting the domain to $\alpha\geq 0$ also restores the sign of the original ODE, but the domain restriction must be explicit.

Counterexamples

T3-LOC-038 · source: tom3_v0_6.docx · Section 10

T3-TBL-027 · hidden-monotonicity counterexamples

ID	Assumption	Countermodel	Conclusion
C1	stationary action	harmonic oscillator is periodic	$\delta\mathscr{S}=0$ does not select direction
C2	wrong sign	$\dot{q}=(J+K)\mathrm{grad}V$	V increases
C3	indefinite K	K has a negative eigenvalue	sign of dV/dt is lost
C4	time-dependent V	$\partial_t V$ may dominate	gradient term is insufficient
C5	commutation only	$\Phi_t\mathfrak{H}=\mathfrak{H}\Phi_t$	does not imply Lyapunov inequality
C6	jump Δ_{act}	instantaneous intervention	may increase V
C7	arbitrary Y	retraction without nonexpansive proof	may increase V
C8	legacy α law	$\dot{\alpha}=-k(\alpha)$, $\alpha<0$	A^2 increases

Certificate of the Variational Layer

T3-LOC-039 · T3-VAR-NUM-001

The certificate uses synthetic finite-dimensional models with seed=20260726. It checks formula algebra and gates, not the physical Universe.

T3-TBL-028 · variational certificate results

Check	Result	Interpretation
Δ_{act} increase witnesses	1978/2000	WITNESSES/EXPECTED
Y projection model	2000/2000	PASS
D/Dom gate	2000/2000	PASS
conservative action countermodel	2000/2000	PASS
Euler–Lagrange residual	2000/2000	PASS
first variation + integration by parts	2000/2000	PASS
indefinite-K counterexample	2000/2000	PASS
legacy α negative-domain witnesses	1037/2000	WITNESSES/EXPECTED

Check	Result	Interpretation
linear semigroup	2000/2000	PASS
Lyapunov identity J−K	2000/2000	PASS
repaired α law	2000/2000	PASS
$\mathfrak{H}$ commutation	2000/2000	PASS
time-dependent counterexample	2000/2000	PASS
weakest-link status	2000/2000	PASS
wrong-sign counterexample	2000/2000	PASS

T3-TBL-029 · maximum numerical errors

Numerical check	Maximum error
Upsilon_ball_projection_nonincrease	0.000e+00
conservative_action_not_arrow	4.263e-14
euler_lagrange_harmonic_solution	0.000e+00
first_variation_and_boundary	4.862e-06
linear_semigroup_property	2.266e-14
lyapunov_identity_J_minus_K	7.276e-12
repaired_alpha_flow_monotone	0.000e+00
super_operator_commutation	0.000e+00

NUM LIMITATION. The certificate checks implemented identities and countermodels. It is not an independent EXT-RUN and does not establish a fundamental physical arrow of time.

Chapter 13. Reduced Isotropic Packet Cosmology

T3-CH-13 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-040–045 · source checkpoint T3-ISO-v0.7

Accessible Introduction

T3-EXPL-13 · translated explanatory block

CENTRAL QUESTION	When is it legitimate to extract a homogeneous and isotropic sector from the full packet dynamics and obtain scalar cosmological equations?
PLAIN MEANING	Reduction is valid not because a symmetric formula is convenient, but because the full dynamics preserves the set of symmetric states.
MINIMAL EXAMPLE	If $h=a^2\gamma\_k$ and the evolution field is G_k-equivariant, isotropic initial data remain in Q_iso. An anisotropic forcing immediately destroys the reduction.
ONTOLOGY	There are a symmetry datum, a fixed-point sector Q_iso, a projector P_iso, a scale factor a, a lapse N, and a model packet correction C_pack.
EPISTEMOLOGY	Sector preservation is proved by equivariance and uniqueness; constraint propagation by a differential identity and a conservation law.

PHENOMENOLOGY	A cosmological history is compressed to a(t), H(t), and effective density/pressure functions.
PHYSICAL MEANING	The model describes a reduced homogeneous-isotropic regime and possible packet corrections.
LIMITATION	Symmetric reduction does not prove that the real Universe is exactly isotropic, and C_pack is not automatically dark energy or dark matter.
AUTHORIAL NOVELTY	The authorial contribution is the V*P→packet-cosmology reduction gateway, with no projection unless tangency is proved and with blocker-safe status.
CHAPTER ROUTE	The chapter defines Q_iso, proves the preservation theorem, and derives scalar equations. Chapter 14 maps them to observables.

CHAPTER STATUS. All statements retain their original THM/PROP/COND/MODEL/NUM/PHY-HYP/OPEN status. The translation creates no stronger claim.

Reduction Gate

T3-LOC-040 · source: tom3_v0_7.docx · Section 1

ONTOLOGY. The isotropic sector is the fixed-point set of a spatial-symmetry group acting on configuration space.

EPISTEMOLOGY. Reduction requires a declared group action, projection, tangency, and well-posedness. An ansatz without a preservation theorem is only a guess.

PHENOMENOLOGY. For computation the sector is a lower-dimensional manifold; for an observer it has no preferred spatial direction inside the model.

PHYSICAL MEANING. The model represents a homogeneous-isotropic background compatible with FLRW geometry and scalar observables.

LIMITATION. Model symmetry does not prove cosmic symmetry and does not exclude perturbations, anisotropy, or topology effects.

AUTHORIAL NOVELTY. The authorial node is a blocker-safe gateway NAPG/V*P → invariant sector → PredRep-ready scalar model.

*Figure T3-FIG-021. Four-stage gate from the full V*P carrier to an authorized isotropic scalar model.*

T3-TBL-030 · source audit and reduction gate

Source	Imported meaning	Status
Volume II T2-FREEZE-v1.0	partial operator; weakest-link rule; physical export needs an adapter	CANONICAL
v32_v196cc, Appendix C	I_iso=Span{φ_0}; a preserving linear operator acts by a scalar	VALID ALGEBRAIC IMPORT
Compilation 10.0, reduced packet cosmology	four-stage reduction; G_cl+C_pack=T_eff; pre-comparison	LEGACY ARCHITECTURE
T3-BRIDGE-v0.5	legacy differential family failed the Jacobi test	NEGATIVE LOCK

Source	Imported meaning	Status
T3-VAR-v0.6	continuous/jump dynamics and status firewall	UPSTREAM

Isotropic Sector

T3-LOC-041 · source: tom3_v0_7.docx · Section 2

Definition T3-ISO-001 [DEF-A]. A spatial symmetry datum is

T3-EQ-0062 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$S\_k=(\Sigma,\gamma\_k,G\_k,\rho\_k),\quad k\in\{-1,0,1\},$$

where (Σ,γ_k) is a connected three-dimensional Riemannian manifold of constant sectional curvature k, G_k acts transitively by isometries, and the isotropy subgroup at each point acts as SO(3) on the tangent space.

Definition T3-ISO-002 [DEF-A]. For an action $\rho\_k:G\_k\times Q\_adm\to Q\_adm$,

T3-EQ-0063 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$Q\_iso := Fix(G\_k)\cap Q\_adm = \{q\in Q\_adm : \rho\_k(g)q=q \text{ for all } g\in G\_k\}.$$

In the metric-only sector the invariant data have the form

T3-EQ-0064 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$h\_t=a(t)\^2\gamma\_k,\quad \beta\_t=0,\quad N=N(t),\quad a(t)>0.$$

Scalar packet fields may depend on t. Non-scalar fields require a separate invariant template or must vanish; otherwise they do not belong to Q_iso.

Figure T3-FIG-022. Isotropic projection, trace-free anisotropy witness, and preservation/countermodel branches.

Definition T3-ISO-003 [DEF-A]. For $A\in Sym^2(T^*\Sigma)$,

T3-EQ-0065 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$P\_iso(A)=(tr\_\gamma\ A\ /\ 3)\gamma,\quad P\_iso^2=P\_iso.$$

The trace-free part $A\^TF=A-P\_iso(A)$ is a local anisotropy witness. For mixed fields, the projector is defined componentwise only after the representation type is fixed.

Preservation of the Invariant Sector

T3-LOC-042 · source: tom3_v0_7.docx · Section 3

Theorem T3-ISO-1 [THM]. Let a Banach manifold Q carry a smooth G-action. Let $F:Dom(F)\subset Q\to TQ$ be G-equivariant, suppose the initial-value problem $\dot q=F(q)$ is locally unique, and let a constraint submanifold C be G-invariant with F tangent to C. Then $Fix(G)\cap C$ is preserved by the local flow.

Proof. For $q_0\in Fix(G)\cap C$ and $g\in G$, both $q(t)$ and $g\cdot q(t)$ solve the same IVP because $F(g\cdot q)=g\_*F(q)$ and $g\cdot q_0=q_0$. Uniqueness gives $g\cdot q(t)=q(t)$, while tangency preserves C. □

Corollary T3-ISO-1a [PROP]. The reduced vector field

T3-EQ-0066 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$F\_iso = P\_iso \circ F \circ \iota\_iso$$

is correctly defined only if $F(Q\_iso)\subset TQ\_iso$. Projection without tangency can hide a discarded anisotropic residual and is not a proof of reduction.

SYMMETRIC CRITICALITY. When F comes from a variational principle, reducing the action and reducing the Euler–Lagrange equations agree only under the hypotheses of symmetric criticality. This is a gate, not an automatic courtesy.

Fixed-Phase Sector

T3-LOC-043 · source: tom3_v0_7.docx · Section 4

Only the algebraic result from Appendix C is imported:

T3-EQ-0067 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$I\_iso^{G2} = \mathrm{Span\_R}\{\varphi_0\}, \quad \varphi_0 = z\wedge\omega + \mathrm{Re}\,\Omega.$$

Proposition T3-ISO-2 [PROP]. If a linear operator L preserves I_iso^{G2}, then $L\varphi_0=\kappa\_L\varphi_0$ for a scalar κ_L. For $\Phi(t)=\lambda(t)\varphi_0$, the reduced equation $\partial\_t\Phi=L\Phi$ becomes $\dot\lambda=\kappa\_L\lambda$ when L is fixed. The statement follows from one-dimensionality and has no automatic physical interpretation.

> **LEGACY FIREWALL.** A concrete $k(\alpha)$ from the early differential family is not imported: T3-BRIDGE-v0.5 proved Jacobi failure for the unchanged bracket at $\alpha\neq0$. Only the conditional logic “preservation ⇒ scalar action” remains.

If α is dynamic, $\Phi(t)=\lambda(t)\varphi\_\{\alpha(t)\}$ adds the tangent term $\lambda\dot\alpha\partial\_\alpha\varphi\_\alpha$. It cannot be discarded without a proof that $\partial\_\alpha\varphi\_\alpha$ vanishes in the selected trivialization or without enlarging the reduced coordinates to (λ,α).

FLRW MODEL Realization

T3-LOC-044 · source: tom3_v0_7.docx · Section 5

Figure T3-FIG-023. Geometric scalarization and packet-corrected bookkeeping.

Definition T3-ISO-004 [MODEL]. On $M=I\times\Sigma$ set

T3-EQ-0068 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$g\_s=-N(t)^2dt^2+a(t)^2\gamma\_k, \quad H=(1/N)(\dot a/a).$$

Proposition T3-ISO-3 [PROP]. For signature $(-+++)$ and unit normal $n=N^{-1}\partial\_t$, the Einstein tensor reduces to

T3-EQ-0069 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$G\_0 := G(n,n)=3(H^2+k/a^2),$$

T3-EQ-0070 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$G\_s := (1/3)a^{-2}\gamma^{\{ij\}}G\_\{ij\}=-(2\dot H/N+3H^2+k/a^2).$$

H is invariant under monotone reparameterization of time when the lapse transforms as a one-form coefficient, so it is a valid scalar coordinate of the reduced background sector.

Isotropic-Reduction Certificate

T3-LOC-045 · T3-ISO-NUM-001

A local synthetic certificate used seed=20260726 and N=2000 per randomized family. It checks algebraic and reduction identities, not observational data.

T3-TBL-031 · isotropic-reduction certificate

Check	Result	Max error	Note
SO(3) invariance of $h=a^2I$	2000/2000	2.409e−13	
projector idempotence/equivariance	2000/2000	1.831e−15	
equivariant dynamics tangent to Q_iso	2000/2000	6.153e−15	
anisotropic forcing countermodel	2000/2000	0	expected departure
fixed-phase projector	2000/2000	5.875e−16	
scalar action on a preserved 1D sector	2000/2000	0	

Check	Result	Max error	Note
lapse reparameterization invariance of H	2000/2000	1.421e−14	
FLRW constraint identity	2000/2000	3.411e−13	
effective-variable bookkeeping	2000/2000	1.421e−14	
reduction gate / weakest link / provenance	6000/6000	0	PASS

CERTIFICATE STATUS. NUM. It verifies implemented formulas and gates in the selected finite-dimensional model. It does not validate V*P, packet cosmology, field equations, or observational agreement.

Chapter 14. Dynamical Equations, Constraints, and Observables

T3-CH-14 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-046–051 · source checkpoints T3-ISO-v0.7 and T3-OBS-v0.8

Accessible Introduction

T3-EXPL-14 · translated explanatory block

CENTRAL QUESTION	How are model functions H(t), a(t), and packet corrections translated into quantities that occur in astronomical catalogues and likelihoods?
PLAIN MEANING	An observational adapter is required: redshift map, distances, units, nuisance parameters, selection function, covariance, and provenance.
MINIMAL EXAMPLE	Supernovae measure a relative distance-modulus scale and exhibit the H_0–M_B degeneracy; BAO measures ratios to r_d. Absolute H_0 is not identified without external calibration.
ONTOLOGY	The objects are Obs_D, a data vector y, model vector m(θ), covariance C, calibration/selection data, and a certificate.
EPISTEMOLOGY	Model–data comparison is defined only after unit, covariance, mask, identifiability, and frozen-likelihood checks.
PHENOMENOLOGY	The theory appears through H(z), D_M/r_d, D_H/r_d, μ(z), C_ℓ, and residuals.
PHYSICAL MEANING	The chapter establishes a path from geometry to testable cosmological signatures.
LIMITATION	No real-data fit is performed and no EMP-OBS is created. Agreement also does not identify a unique causal mechanism.
AUTHORIAL NOVELTY	The authorial object is an Observational Reper adapter in which data, calibration, covariance, licence, and status form one proof packet.
CHAPTER ROUTE	Scalar equations and constraint propagation are followed by H(z), the observable matrix, and identifiability. Chapter 15 attaches PN.2.

CHAPTER STATUS. The observable layer is an EMP-PLAN interface. It contains no real-data fit and no empirical status promotion.

Reduced Scalar Equations

T3-LOC-046 · source: tom3_v0_7.docx · Section 6

Definition T3-ISO-005 [MODEL]. Let the selected field equation be

T3-EQ-0071 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$G_{\mu\nu}+C^{pack}_{\mu\nu}=\kappa T^{eff}_{\mu\nu}.$$

Only two independent scalar projections are admissible in the isotropic sector:

T3-EQ-0072 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$C_0=C^{pack}(n,n),\quad C_s=(1/3)a^{-2}\gamma^{ij}C^{pack}_{ij},$$

T3-EQ-0073 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\rho=T^{eff}(n,n),\quad p=(1/3)a^{-2}\gamma^{ij}T^{eff}_{ij}.$$

The reduced equations are

T3-EQ-0074 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$3(H^2+k/a^2)+C_0=\kappa\rho,$$

T3-EQ-0075 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$-(2\dot{H}/N+3H^2+k/a^2)+C_s=\kappa p.$$

For bookkeeping define

T3-EQ-0076 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\rho_{tot}=\rho-C_0/\kappa,\quad p_{tot}=p-C_s/\kappa,$$

This is a change of variables, not evidence for dark matter, dark energy, or a new substance.

CLOSURE BLOCKER. The system is not closed until constitutive or field equations for C_0, C_s, ρ, and p—or an independent evolution law for packet variables—are supplied. Without closure, PredRep must return a candidate family or ABSTAIN.

Constraint Propagation

T3-LOC-047 · source: tom3_v0_7.docx · Section 7

T3-EQ-0077 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\dot{\rho}_{tot}/N+3H(\rho_{tot}+p_{tot})=0.$$

Theorem T3-ISO-4 [THM/IDENTITY]. Define

T3-EQ-0078 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$C_F=3(H^2+k/a^2)-\kappa\rho_{tot}$$

T3-EQ-0079 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E_A=2\dot{H}/N+3H^2+k/a^2+\kappa p_{tot}$$

Then

T3-EQ-0080 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$(1/N)\, dC_F/dt = 3H\, E_A.$$

Hence continuity together with $E_A=0$ preserves an initial constraint $C_F=0$ on every connected interval of existence. The proof is direct differentiation, using $(1/N)d(a^{-2})/dt=-2Ha^{-2}$ and the continuity equation. □

LIMITATION. For a packet equation, the conservation law must follow from a generalized Bianchi/Noether identity. A nonzero divergence requires a source term and an explicit exchange law.

H(z) Parameterization and Closure

T3-LOC-048 · source: tom3_v0_8.docx · Section 4

T3-EQ-0081 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E(z)^2 = \Omega_r(1+z)^4 + \Omega_m(1+z)^3 + \Omega_k(1+z)^2 + \Omega_{DE} F_{DE}(z),$$

T3-EQ-0082 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$H(z)=H_0E(z), \quad F_{DE}(z)=\exp\{3\int_0^z[1+w(z')]dz'/(1+z')\}.$$

This is a prior-art comparison family. A V*P model must derive its own $H(z;\theta_{VP})$ or define a status-labelled map from packet variables to effective Ω/w parameters.

CLOSURE BLOCKER. Fillable field: an explicit closed equation for C_0^{pack}, C_s^{pack}, and $H(z;\theta_{VP})$. Until it is supplied, a unique observational prediction is unavailable.

Observable Matrix

T3-LOC-049 · source: tom3_v0_8.docx · Section 5

T3-TBL-032 · observable matrix

Object	Units	Measurement channel	Main nuisance/bridge	Status
H(z)	km s^{-1} Mpc^{-1}	cosmic chronometer / reconstruction	clock + population model	EMP-PLAN
D_H/r_d	dimensionless	radial BAO	sound-horizon calibration	EMP-PLAN
D_M/r_d	dimensionless	transverse BAO	fiducial mapping + r_d	EMP-PLAN
D_V/r_d	dimensionless	isotropic BAO	compressed covariance	EMP-PLAN
μ(z)	mag	Type Ia supernovae	M_B, calibration, peculiar velocities	EMP-PLAN
D_A	Mpc	standard ruler / lensing	source model and duality assumptions	EMP-PLAN
C_ℓ / likelihood	survey-specific	CMB	beam, foregrounds, likelihood code	EMP-PLAN
packet residual Δ_{obs}	survey-specific	KLT-RBD comparison layer	all upstream gates	OPEN

Identifiability and Covariance Discipline

T3-LOC-050 · source: tom3_v0_8.docx · Section 8

Figure T3-FIG-024. Two calibration degeneracies and admissible routes for resolving them.

For data y, model m(θ,ν), and positive-definite covariance C,

T3-EQ-0083 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$-2\log L(\theta,\nu)=r^T C^{-1}r + \log\det C + \text{const}, \quad r=y-m(\theta,\nu).$$

If C depends on parameters, log det C cannot be dropped. Singular or rank-deficient covariance requires a declared pseudoinverse or subspace treatment; silent inversion is prohibited.

Definition T3-OBS-003 [DEF-A]. A parameter θ_i is locally identifiable when its Jacobian column is not in the span of the remaining columns after nuisance transformations and data support are accounted for. Rank/Fisher diagnostics are practical gates, not proofs of global identifiability.

MULTIPLE COMPARISONS. Packet signatures, redshift bins, data combinations, and nuisance variants must be listed before results are revealed. Otherwise a nominal p-value or Bayes factor does not count as an independent test.

Observational-Adapter Certificate

T3-LOC-051 · T3-OBS-NUM-001

A synthetic, nonempirical test of formulas and gate logic used seed=20260726 and N=2000 per test. No external catalogue was loaded or fitted.

T3-TBL-033 · observational-adapter certificate

Check	Result	Max error	Status
redshift–scale relation	2000/2000	2.220e−16	PASS
dD_C/dz=c/H	2000/2000	1.176e−11	PASS
distance duality	2000/2000	2.910e−11	PASS
curvature flat limit	2000/2000	3.508e−06	PASS
distance-modulus roundtrip	2000/2000	2.204e−15	PASS
D_V identity	2000/2000	1.855e−15	PASS
covariance whitening	2000/2000	1.243e−13	PASS
analytic nuisance stationarity	2000/2000	7.105e−09	PASS
SN H_0–M_B degeneracy	2000/2000	1.066e−14	PASS
BAO H_0–r_d degeneracy	2000/2000	1.421e−14	PASS
unit consistency	2000/2000	3.375e−16	PASS
adapter / weakest-link / provenance gates	6000/6000	—	PASS

Total: 28000/28000. Certificate status NUM. Empirical status: NO EMP-OBS; no external data set was fitted.

Chapter 15. PN.2 in the Physical and Cosmological Interface

T3-CH-15 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-052–056 · source checkpoint T3-PN2-v0.9

Accessible Introduction

T3-EXPL-15 · translated explanatory block

CENTRAL QUESTION	How can the proved minimax theorem PN.2 be used in a physics volume without turning it into an unproved universal law of nature?
PLAIN MEANING	The mathematical core limits one estimator under a hidden bracketing alternative. Physical applicability requires an apparatus realization and a measurable carrier for the associator.
MINIMAL EXAMPLE	The protocols $(x\odot y)\odot z$ and $x\odot(y\odot z)$ are compared in pairs. The theorem gives a model error bound; a physical conclusion requires maps Φ and K_phys.
ONTOLOGY	Abstract state u, hidden branch, observables S/D/R, physical implementation Φ, and experimental carrier are distinct objects.

EPISTEMOLOGY	THM follows from the minimax proof; PHY-HYP requires operationalization; EMP-OBS requires a blind independent run.
PHENOMENOLOGY	The hypothesis appears as a preregistered contrast between two procedures with controls for memory, drift, and ordinary nonlinearity.
PHYSICAL MEANING	PN.2 may limit joint recovery of size and structural coordinate in systems with a hidden nonassociative alternative.
LIMITATION	F-1–F-14 remain PHY-HYP. A local positive effect does not prove the full V*P cosmology; a null result refutes only the declared realization and Ω.
AUTHORIAL NOVELTY	The authorial contribution is the mathematical PN.2 core and its status-preserving embedding into a falsifiable physical protocol.
CHAPTER ROUTE	The theorem is imported, its dimensions are registered, and its certificate is reproduced. Chapter 16 formalizes inverse reconstruction.

CHAPTER STATUS. The minimax theorem is imported as THM. Physical implementations remain PHY-HYP/EMP-PLAN; no EXT-RUN has been executed.

Import of the Mathematical Core

T3-LOC-052 · source: tom3_v0_9.docx · Section 1

ONTOLOGY. PN.2 is a minimax theorem for a single estimator facing two hidden bracketing alternatives.

EPISTEMOLOGY. The result follows from a metric lemma and axioms A1–A6. Physical knowledge additionally needs a representation, units, and a measurement protocol.

PHENOMENOLOGY. Uncertainty appears as the impossibility of one estimate hitting two separated results and two structural coordinates exactly.

PHYSICAL MEANING. A candidate realization uses two reproducible protocols with the same elementary actions and a hidden branch index.

LIMITATION. The theorem is not a Robertson–Schrödinger variance relation and establishes no universal physical law.

AUTHORIAL NOVELTY. The authorial contribution is PN.2, its packet-Reper context, and its physical operationalization programme; the two-point metric lemma is prior art.

Figure T3-FIG-025. Geometric core of the local minimax PN.2 bound.

Exact Minimax Theorem

T3-LOC-053 · source: tom3_v0_9.docx · Section 2

Let A be a normed real or complex linear space with bilinear operation $\odot$, $\Omega \subset A^3$, and $B=\{b\_L, b\_R\}$:

T3-EQ-0084 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$r\_L(u)=(x\odot y)\odot z, \quad r\_R(u)=x\odot(y\odot z), \quad K(u)=r\_L(u)-r\_R(u).$$

A structural coordinate $D:B\to R$ distinguishes the protocols; $S:A\to R$ is a scalar observable. The true branch b is hidden from the common estimator.

T3-EQ-0085 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$e\_S=\max\{|\hat{s}-S(r\_L)|,|\hat{s}-S(r\_R)|\},\quad e\_D=\max\{|\hat{d}-\mathfrak{D}(b\_L)|,|\hat{d}-\mathfrak{D}(b\_R)|\}.$$

T3-EQ-0086 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$e\_R=\max\{||\hat{r}-r\_L||,||\hat{r}-r\_R||\},\quad \Delta\_S=|S(r\_L)-S(r\_R)|,\quad \Delta\_D=|\mathfrak{D}(b\_L)-\mathfrak{D}(b\_R)|.$$

Import axioms: A1 normed bilinear carrier; A2 two admissible hidden alternatives; A3 $\Delta\_D>0$; A4 one estimator; A5-S scalar separation; A6 positive uniform coercivity only for a global constant.

Theorem T3-PN2-1 [THM, imported]. For every $u\in\Omega$ and every estimator pair that does not use b,

T3-EQ-0087 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$e\_S(u;\hat{s})e\_D(u;\hat{d}) \geq \tfrac{1}{4}\,\Delta\_S(u)\Delta\_D. \qquad \text{(PN.2-S)}$$

T3-EQ-0088 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$e\_R(u;\hat{r})e\_D(u;\hat{d}) \geq \tfrac{1}{4}\,||K(u)||\Delta\_D. \qquad \text{(PN.2-R)}$$

If S is c-separating, $\Delta\_S(u)\geq c||K(u)||$, then

T3-EQ-0089 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$e\_S(u;\hat{s})e\_D(u;\hat{d}) \geq (c/4)||K(u)||\Delta\_D. \qquad \text{(PN.2-K)}$$

Proof. Apply $\max\{d(q,a),d(q,b)\}\geq d(a,b)/2$ to each pair of alternatives. Multiplying the two nonnegative lower bounds produces the factor 1/4. □

Uniform Form and Negative Boundaries

T3-LOC-054 · source: tom3_v0_9.docx · Section 3

T3-EQ-0090 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$e\_R\ e\_D \geq (\varepsilon_-\Delta\_D/4)m(u);\quad \text{under c-separation: } e\_S\ e\_D \geq (c\varepsilon_-\Delta\_D/4)m(u).$$

COUNTEREXAMPLES. A positive universal constant is impossible on a domain containing K=0. If $\Delta\_D=0$, the bound degenerates. A fixed result norm may miss a nonzero associator. An estimator told b in advance lies outside the theorem domain.

Proposition T3-PN2-2 [PROP, status non-transfer]. A physical claim h added to axioms A without derivation or empirical validation cannot inherit THM status. Citation preserves provenance, not truth-layer strength.

Figure T3-FIG-026. Evidence gates from the imported theorem to a possible empirical observation.

Operationalization of Quantities

T3-LOC-055 · source: tom3_v0_9.docx · Section 4

T3-TBL-034 · dimensional and operational registry

Quantity	Unit	Operational meaning	Mandatory boundary
S, Δ_S, e_S	Q_S	unit of the chosen observable	instrument + independent calibration
r, K, e_R	Q_R	coordinate of the physical result	abstract A_2 sets no physical unit
D, Δ_D, e_D	1	structural coordinate	not spatial dimension without a bridge
c	Q_S/Q_R	separation factor	fixed for S and Ω
m	Q_M	scale in uniform form	declared before analysis
ε_-	Q_R/Q_M	lower coercivity	proved on Ω
α_K	J·s/Q_R	calibration of K to action	required before comparison with ħ

Quantity	Unit	Operational meaning	Mandatory boundary
θ_F12	Q_Y	material residual contrast	defined by primary readout

DIMENSION GATE. Any comparison of ||K|| with ħ without α_K is dimensionally meaningless. Structural constants, norms, basis elements, and instrument outputs need units before the V3 freeze.

PN.2 Certificate

T3-LOC-056 · T3-PN2-NUM-001

Only synthetic checks of the mathematical inequalities, status firewall, and preregistration logic were performed. Seed=20260726; N=2000. No material data were generated or analysed.

T3-TBL-035 · PN.2 numerical certificate

Check	Result	Max error	Status
two-point minimax lemma	2000/2000	0	PASS
PN.2-S product bound	2000/2000	0	PASS
PN.2-R state-space bound	2000/2000	0	PASS
c-separating corollary	2000/2000	0	PASS
uniform coercive form	2000/2000	0	PASS
associative sector K=0	2000/2000	—	PASS
degenerate Δ_D=0	2000/2000	—	PASS
revealed b outside Dom	2000/2000	—	PASS
truth-layer firewall	2000/2000	—	PASS
V3 freeze completeness	2000/2000	—	PASS
support / falsification rules	4000/4000	—	PASS
Holm order / blind split / provenance	6000/6000	0	PASS

Total: 30000/30000. Status NUM. NO EMP-OBS; EXT-RUN-000 was not executed.

Chapter 16. PredRep: Deterministic Reper Reconstruction

T3-CH-16 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-057–065 · source checkpoint T3-PRED-v0.10

Accessible Introduction

T3-EXPL-16 · translated explanatory block

CENTRAL QUESTION	How can a state be reconstructed from data when the inverse problem may have several solutions, be unstable, or have no solution?
PLAIN MEANING	PredRep returns the full set of candidates compatible with data, constraints, and evidence gates, not an obligatory point.
MINIMAL EXAMPLE	For $M(x)=x^2$ and y=1, x=±1 are admissible. The correct output is two candidates or the quotient class |x|, not an arbitrary positive branch.

ONTOLOGY	There are a state space X, data space Y, partial forward map M, discrepancy set C_{ε,τ}, quotient symmetry, and candidate Reper bundle.
EPISTEMOLOGY	Compactness and stability require explicit hypotheses; identifiability is controlled by c_M or Jacobian rank.
PHENOMENOLOGY	The user receives SINGLETON, SET-VALUED, or ABSTAIN with residuals, diameter, and blockers.
PHYSICAL MEANING	The method models reconstruction of a hidden physical state from incomplete and noisy observations.
LIMITATION	Regularization selects a stable representative but does not prove that nature selected it. A model future remains distinct from an observed event.
AUTHORIAL NOVELTY	The authorial contribution is a proof-carrying, set-valued PredRep operator with D/Dom, provenance, blockers, and weakest-link status.
CHAPTER ROUTE	Forward maps and candidate sets are followed by compactness, identifiability, regularization, forecasting, and counterexamples.

CHAPTER STATUS. PredRep is a deterministic model/inverse-problem operator. Its point or set output is not an empirical event.

Spaces and Forward Map

T3-LOC-057 · source: tom3_v0_10.docx · Section 2

T3-EQ-0091 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$x\_cert=(x,\ Rep\_x,\ Dom\_x,\ D\_x,\ Cert\_x,\ Status\_x),\quad Rep\_x=(R\_x,I\_x,U\_x;D\_x).$$

T3-EQ-0092 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$X\_adm=\{x\in X : Dom(x)=PASS,\ D(x)=PASS,\ Ob(x)=0,\ Bridge(x)=PASS,\ Status(x)\neq ABSTAIN\}.$$

T3-EQ-0093 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$M: Dom(M)\subseteq X\_adm \rightharpoonup Y\_cert.$$

T3-TBL-036 · certified spaces and forward map

Object	Type	Meaning
X	state space	physical/geometric state, parameters, fields, or trajectory
Y	data space	measurements, features, or aggregated observables
M	forward map	predicts data from a state; not an inverse map
Γ	regularizer/prior functional	selects a stable branch under a declared rule
ε	data tolerance	noise/systematic budget in d_Y
τ	regularization gate	prefrozen Γ threshold
G	symmetry group	state equivalence invisible to data

Definition of PredRep

T3-LOC-058 · source: tom3_v0_10.docx · Section 3

T3-EQ-0094 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$C\_\{\varepsilon,\tau\}(y)=\{x\in Dom(M): d\_Y(Mx,y)\le\varepsilon,\ \Gamma(x)\le\tau,\ Gate(x)=PASS\}.$$

T3-EQ-0095 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{PredRep}(y)=(C_{\varepsilon,\tau}(y),\ \mathrm{diam}_G\, C,\ \text{residuals},\ \text{components},\ \text{blockers},\ \mathrm{Cert}_{pred},\ \mathrm{Status}_{pred}).$$

T3-TBL-037 · deterministic PredRep outputs

Output	Condition	Authorized interpretation
SINGLETON	one quotient class and stability passed	point reconstruction inside the declared model
SET-VALUED	several compatible classes, diameter≤d_max	return the full set; no hidden selection
ABSTAIN-EMPTY	candidate set empty	model/data/threshold incompatible
ABSTAIN-WIDE	diameter>d_max or unbounded	insufficient identifiability
ABSTAIN-GATE	D/Dom/bridge/provenance/status damaged	computation unauthorized

Figure T3-FIG-027. PredRep fibers over certified data packets.

Compactness and Closed Graph

T3-LOC-059 · source: tom3_v0_10.docx · Section 4

Theorem T3-PRED-1 [THM-COND]. If X_{adm} is compact, M is continuous on X_{adm}, Γ is lower semicontinuous, and Gate=PASS is closed, then $C_{\varepsilon,\tau}(y)$ is compact or empty. Proof: it is an intersection of closed subsets of compact X_{adm}. Nonemptiness is separate. □

Theorem T3-PRED-2 [THM-COND]. Under the same hypotheses the graph of $(y,\varepsilon,\tau)\mapsto C_{\varepsilon,\tau}(y)$ is closed. Compact X_{adm} then gives upper semicontinuity in the standard metric sense.

LIMITATION. Upper semicontinuity excludes sudden appearance of remote candidates under small perturbations, but not disappearance of a branch at a constraint boundary.

Identifiability

T3-LOC-060 · source: tom3_v0_10.docx · Section 5

T3-EQ-0096 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$Mx=Mx' \;\Rightarrow\; [x]_G=[x']_G.$$

T3-EQ-0097 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$d_Y(Mx,Mx') \ge c_M\, d_{X/G}([x],[x']) \quad \text{for } x,x' \text{ in the declared sector.}$$

Theorem T3-PRED-3 [THM-COND]. For every y,

T3-EQ-0098 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{diam}_{X/G}\, C_\varepsilon(y) \le 2\varepsilon/c_M.$$

If x^* generates $y^*=Mx^*$, $d_Y(y,y^*)\le\delta$, and $x\in C_\varepsilon(y)$, then

T3-EQ-0099 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$d_{X/G}([x],[x^*]) \le (\varepsilon+\delta)/c_M.$$

Both inequalities follow from the triangle inequality in Y and the quantitative lower bound for M. □

Figure T3-FIG-028. Ordinary, quotient, and quantitative identifiability.

Regularization

T3-LOC-061 · source: tom3_v0_10.docx · Section 6

T3-EQ-0100 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$R_\alpha(y)=\operatorname{argmin}_{x\in X_{adm}} \{ d_Y(Mx,y)^2 + \alpha\, \Gamma(x) \},\quad \alpha>0.$$

R_α remains set-valued when the minimum is not unique. In a linear Hilbert sector with $\Gamma(x)=\|x\|^2$,

T3-EQ-0101 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$x_\alpha=(A^* A+\alpha I)^{-1}A^* y.$$

The parameters α and Γ encode a stability, smoothness, or prior choice. They do not establish that the minimizer is the unique state of nature.

REGULARIZATION FIREWALL. Store the raw candidate set, the regularized selector, and sensitivity to α. Publishing one selected curve without its alternatives is prohibited.

Deterministic tie-break. A single identifier may be exposed only through a prefrozen lexicographic rule after the full maximizer set is stored. Its status is SELECTED-REPRESENTATIVE, not IDENTIFIED-STATE.

Candidate Reper Bundle

T3-LOC-062 · source: tom3_v0_10.docx · Section 7

T3-EQ-0102 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\pi_{Rep}:E_{Rep}\to X_{adm},\quad E_{Rep,x}=Rep_x\times Dom_x\times D_x\times Cert_x\times Status_x.$$

- source-card and immutable input hashes;
- Dom of the forward map and active physical units;
- Reper(R,I,U;D), λ defect, and CGI only on defined domains;
- residual, regularizer value, obstruction/blocker list;
- identifiability class, quotient representative, and diameter contribution;
- status vector (math, model, num, emp) by the weakest-link principle.

Proposition T3-PRED-4 [PROP]. Removing D, Dom, or provenance from a mandatory candidate cannot silently delete only that candidate unless an exclusion rule was frozen in advance; otherwise the inverse problem itself changes.

From Reconstruction to Forecast

T3-LOC-063 · source: tom3_v0_10.docx · Section 8

T3-EQ-0103 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$P_t(y_0)=Obs(E_t(C_{\varepsilon,\tau}(y_0))).$$

T3-EQ-0104 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\operatorname{diam} E_t(C) \le L_t \operatorname{diam} C.$$

The estimate transports uncertainty; it does not erase it.

Figure T3-FIG-029. Inverse reconstruction, evolution, and observation adapter as three independent steps.

PHYSICAL BOUNDARY. $P_t(y_0)$ is a model set of future observables. A physical event exists only as an actual EMP-OBS after preregistration and independent execution.

Counterexamples

T3-LOC-064 · source: tom3_v0_10.docx · Section 9

T3-TBL-038 · prohibited shortcuts

Counterexample	Failure	Correct output
$M(x_1,x_2)=x_1$	x_2 completely invisible	SET/ABSTAIN; add a measurement
$M(x)=x^2$ on R	x and $-x$ indistinguishable	quotient $\lvert x\rvert$ or two branches
rank-deficient A	$\ker A\neq 0$	no finite c_M; point estimate forbidden

Counterexample	Failure	Correct output
overstrong Γ	smooth but wrong branch selected	sensitivity analysis; MODEL
C_ε(y)=∅	data incompatible with model/threshold	ABSTAIN, not a convenient nearest history
disconnected candidates	several causal regimes	retain all components
post-hoc tie-break	branch chosen after viewing data	invalid postselection
future singleton	one model trajectory	not EMP-OBS without measurement

Deterministic PredRep Certificate

T3-LOC-065 · T3-PRED-NUM-001

The certificate uses synthetic finite-dimensional models. It checks formulas and gates, not V*P, a physical forward map, or future events.

T3-TBL-039 · deterministic PredRep certificate

Check	Result	Max error
true state in discrepancy set	2000/2000	0
diameter bound 2ε/c_M	2000/2000	0
error bound (ε+δ)/c_M	2000/2000	0
nullspace ⇒ ABSTAIN	2000/2000	—
quotient x∼−x	2000/2000	4.998e−13
sequential closedness	2000/2000	0
Lipschitz stability	2000/2000	0
Tikhonov normal equations	2000/2000	1.608e−13
tie-break / empty / diameter gates	6000/6000	—
flow diameter transport	2000/2000	0
set composition / weakest link / provenance	6000/6000	—

T3-EQ-0105 · mathematical-content parity synchronized with T3-FREEZE-v1.0

Total: 30000/30000; status=NUM; EMP-OBS absent.

CERTIFICATE BOUNDARY. It proves implemented finite-dimensional identities and gate logic under seed 20260726. It does not prove a physical V*P state, the correctness of a concrete forward model, or the probability of a future event.

Chapter 17. Stochastic PredRep and Path Spaces

T3-CH-17 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-066–073 · source checkpoint T3-STOCH-v0.11

Accessible Introduction

T3-EXPL-17 · translated explanatory block

CENTRAL QUESTION	How can PredRep be extended to random paths without presenting a chosen probability model as causal truth?

PLAIN MEANING	Stochastic PredRep stores a family of admissible path laws, transition kernels, and filters. Nonuniqueness remains SET-LAW.
MINIMAL EXAMPLE	For a finite Markov chain, Q gives P_t=exp(tQ). If data do not distinguish two admissible Q, both laws and their probability envelopes must be retained.
ONTOLOGY	Objects are a filtered probability space, kernels K_t, path measures P, generator L, martingale problem, and observation likelihood.
EPISTEMOLOGY	Existence and uniqueness come from a well-posed martingale problem; update from evidence normalization; calibration from held-out or external tests.
PHENOMENOLOGY	The output is a predictive distribution, interval/envelope, and posterior family, not one guaranteed trajectory.
PHYSICAL MEANING	The layer represents noise, random transitions, parameter uncertainty, and partial observability.
LIMITATION	A posterior depends on model and prior; calibration does not establish a causal mechanism; probability is not physical necessity.
AUTHORIAL NOVELTY	The authorial object is StochPredRep with separated aleatoric, epistemic, and structural uncertainty and weakest-link status.
CHAPTER ROUTE	Path laws, martingale problems, filtering, and calibration are built first. Chapter 18 isolates rare transitions.

CHAPTER STATUS. The probability carrier is mathematical/model-level. No probability is authorized for empirical use without calibration and a declared external protocol.

Probability Carrier

T3-LOC-066 · source: tom3_v0_11.docx · Section 2

Let (E,E) be a standard Borel state space, Ω=D([0,T],E) or E^{0,…,n}, X_t(ω)=ω(t), and F_t=σ(X_s:s≤t). A certified stochastic datum contains the deterministic candidate set, Θ_adm with Reper/Dom/D, transition kernels or generators, observation kernels and calibration contract, and immutable provenance/seed/status data.

T3-EQ-0106 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathscr{P}\_\{0:T\}(y_0) = \{\ P\_\{x,\theta\} : x\in C\_\{\varepsilon,\tau\}(y_0),\ \theta\in\Theta\_adm,\ Gate(x,\theta)=PASS\ \}.$$

T3-EQ-0107 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$StochPredRep(y_0) = (\mathscr{P}\_\{0:T\},\ \underline{p},\ \bar{p},\ \text{predictive sets, filter, calibration diagnostics, blockers, } Cert\_stoch,\ Status\_stoch).$$

T3-TBL-040 · stochastic outputs

Output	Condition	Authorized interpretation
SINGLE-LAW	one law with proved well-posedness	unique model law; not EMP-OBS
SET-LAW	several laws or unidentified parameters	return family and envelopes
ABSTAIN-EMPTY	no admissible law	model/data/bridge incompatible
ABSTAIN-ILLPOSED	existence, measurability, or normalization missing	inference forbidden

Output	Condition	Authorized interpretation
ABSTAIN-UNCAL	calibration required but absent	probability unauthorized for empirical use

Figure T3-FIG-030. End-to-end contract of stochastic PredRep.

Transition Kernels and Path Laws

T3-LOC-067 · source: tom3_v0_11.docx · Section 3

T3-EQ-0108 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$P(X_0\in dx_0,\dots,X_n\in dx_n)=\mu_0(dx_0)\prod_{k=0}^{n-1}K_k(x_k,dx_{k+1}).$$

Theorem T3-STOCH-1 [THM-PRIOR/IMPORT]. On standard measurable spaces, an initial probability and measurable probability kernels define a unique measure on sequence space with the stated finite-dimensional distributions (Ionescu–Tulcea construction). Here it supplies only the mathematical path-law carrier.

T3-EQ-0109 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$K^{m+n}(x,B)=\int_E K^m(x,dz)K^n(z,B).$$

Proposition T3-STOCH-2 [PROP]. For probability measures μ,ν and a Markov kernel K,

T3-EQ-0110 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$||\mu K-\nu K||_{TV} \le ||\mu-\nu||_{TV}.$$

T3-EQ-0111 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$||\mu K-\nu K||_{TV} \le \delta(K)||\mu-\nu||_{TV}.$$

LIMITATION. Distributional contraction is a property of the selected kernel and total-variation metric. It does not establish causal forgetting of history.

Family of Laws, Not a Hidden Mixture

T3-EQ-0112 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\underline{p}(A)=\inf_{P\in\mathscr{P}}P(A),\quad \bar{p}(A)=\sup_{P\in\mathscr{P}}P(A).$$

A unique mixture $\int P_\theta w(d\theta)$ is allowed only under a separately justified and frozen weight w. Otherwise epistemic uncertainty is silently replaced by a prior choice.

Martingale Problem

T3-LOC-068 · source: tom3_v0_11.docx · Section 4

T3-EQ-0113 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$M_t^f = f(X_t) - f(X_0) - \int_0^t Lf(X_s)\, ds$$

A law solves the martingale problem (L,μ) when $X_0\sim\mu$ and M^f is a martingale for each $f\in D(L)$. Well-posedness means existence and uniqueness in law for each admissible initial measure.

Theorem T3-STOCH-3 [THM-FINITE]. If E is finite and Q has nonnegative off-diagonal entries with $q_{ii}=-\Sigma_{j\neq i}q_{ij}$, then $P_t=\exp(tQ)$ is the unique stochastic semigroup and the martingale problem is well-posed. The proof is the finite-dimensional Kolmogorov system and uniqueness of the matrix exponential.

In general state spaces, existence and uniqueness are separate obligations. No solution gives ABSTAIN; multiple solutions give SET-LAW or a preregistered Markov selection.

Figure T3-FIG-031. Martingale problem as the existence and uniqueness gate for a path law.

PHYSICAL BOUNDARY. A generator L encodes local stochastic dynamics inside a model. Mathematical well-posedness does not show that nature realizes that process.

Stochastic Filtering

T3-LOC-069 · source: tom3_v0_11.docx · Section 5

T3-EQ-0114 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\pi_t^{-}(dx)=\int K_t(x',dx)\pi_{t-1}(dx'),$$

T3-EQ-0115 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$Z_t=\int g_t(y_t|x)\pi_t^{-}(dx), \quad \pi_t(dx)=g_t(y_t|x)\pi_t^{-}(dx)/Z_t.$$

Proposition T3-STOCH-4 [PROP]. If Z_t∈(0,∞), the update is a probability. If Z_t=0, infinite, or the likelihood is uncertified on the active Dom, the correct output is ABSTAIN. Each admissible model is updated separately; post-result prior changes are postselection.

Figure T3-FIG-032. Prediction-update cycle and the zero-evidence gate.

Three Channels of Uncertainty

T3-TBL-041 · uncertainty channels

Channel	Meaning	Stored object
Aleatoric	variation inside a fixed P	Var_P or conditional entropy
Epistemic	difference among P∈P	probability envelope / model spread
Structural	Dom, bridge, likelihood, or causal adapter undefined	blocker / ABSTAIN

T3-EQ-0116 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\bar{p}(1-\bar{p})=E[p(1-p)] + Var(p).$$

This decomposition uses a selected mixing law. Without an authorized mixing law, retain an interval/envelope rather than one number.

Calibration and Proper Scores

T3-LOC-070 · source: tom3_v0_11.docx · Section 6

T3-EQ-0117 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E[O\_i \mid p\_i=p]=p.$$

Empirical calibration requires preregistered held-out data, bins or a calibration model, confidence procedure, and multiplicity control. Simulation from the same model tests code, not external calibration.

T3-EQ-0118 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$BS(p,o)=(p-o)^2.$$

For a Bernoulli truth p, the expected Brier score reported as q is uniquely minimized at q=p. Strict propriety promotes honest probabilities but does not establish causal mechanism.

T3-TBL-042 · calibration levels

Level	Requirement	Status
MODEL-CAL	identity inside the generative model	NUM/MODEL
INTERNAL-CAL	held-out split from the same source	EMP-PLAN / limited
TEMPORAL-CAL	later data under frozen protocol	EMP-OBS candidate
EXTERNAL-CAL	independent site/instrument/population	stronger EMP-OBS candidate
CAUSAL-VALID	intervention or identified causal bridge	separate proof obligation

Figure T3-FIG-033. Probability, calibration, and causal interpretation are separate layers.

Counterexamples

T3-LOC-071 · source: tom3_v0_11.docx · Section 7

T3-TBL-043 · stochastic counterexamples

Counterexample	False shortcut	Correct output
two generators fit the same data	average them silently	SET-LAW + envelopes
Z_t=0	normalize anyway	ABSTAIN
posterior under arbitrary prior	report objective probability	prior-sensitive family
good in-sample calibration	claim external validity	held-out/external test needed
simulation frequency	call it physical frequency	NUM only
law contraction	claim causal memory loss	model property only
ill-posed martingale problem	choose one solution	SET-LAW or ABSTAIN
probability one	claim logical necessity	almost sure under P only

Stochastic PredRep Certificate

T3-LOC-072–073 · T3-STOCH-NUM-001

Synthetic finite Markov/HMM models test kernel algebra, path laws, martingale identities, filtering gates, proper scores, and the status firewall. No physical or cosmological data were used.

T3-TBL-044 · stochastic certificate

Check	Result	Control
kernel stochasticity / Chapman–Kolmogorov	4000/4000	≤1e−12
Ionescu–Tulcea finite product law	2000/2000	exact normalization
TV contraction / Dobrushin bound	4000/4000	PASS
finite-state martingale identity	2000/2000	≤1e−12
filter normalization / zero-evidence gate	4000/4000	PASS
uncertainty decomposition	2000/2000	≤1e−12
Brier propriety	2000/2000	grid error≤4.999e−4
set-law envelopes / weakest link / provenance	6000/6000	PASS
Total	32000/32000	status NUM

CERTIFICATE BOUNDARY. The certificate verifies implemented stochastic identities and gates. It does not establish empirical calibration, a causal mechanism, or a physical path law.

Chapter 18. Rare Transitions, Action Barriers, and Metastability

T3-CH-18 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-074–079 · source checkpoint T3-RARE-v0.12

Accessible Introduction

T3-EXPL-18 · translated explanatory block

CENTRAL QUESTION	How can exponentially rare transitions be characterized and simulated without confusing an asymptotic exponent, a numerical path, and an observed event?
PLAIN MEANING	Large-deviation theory assigns an action cost to paths. Low-action paths are candidates, while finite-noise probability and physical realization require separate certificates.
MINIMAL EXAMPLE	For a double-well diffusion the climb from −1 to the saddle has action 1/4, while the downhill path has zero action. This is a model barrier, not a measured cosmic transition.
ONTOLOGY	Objects are small-noise laws P_ε, topology, speed, rate function I, quasipotential, instanton set, and finite-sample estimator.
EPISTEMOLOGY	LDP gives logarithmic bounds under tightness assumptions; simulation is validated by likelihood-ratio identities and second moments; observation requires an external protocol.
PHENOMENOLOGY	A rare regime appears as exponential suppression, long residence time, and a small set of dominant transition paths.
PHYSICAL MEANING	The layer models metastability and noise-driven switching between long-lived regimes.
LIMITATION	The exponent alone is not a finite-ε probability; an instanton is not a future causal history; zero hits do not imply zero probability.
AUTHORIAL NOVELTY	The authorial contribution is a Rare-event Reper certificate connecting action, path sets, finite-sample bounds, blockers, and status.
CHAPTER ROUTE	LDP and action are followed by the double-well witness, exit times, importance sampling, and the empirical firewall.

CHAPTER STATUS. Classical large-deviation and metastability results are imported conditionally. The V*P rare-transition bridge remains OPEN/PHY-HYP.

LDP Carrier

T3-LOC-073 · source: tom3_v0_12.docx · Section 2. LDP carrier and rare-event inference ladder

T3-LOC-074 · source: tom3_v0_12.docx · Section 2

T3-EQ-0119 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$-\inf_{x\in A^\circ} I(x) \le \liminf_{\varepsilon\downarrow 0} \varepsilon \log P(Z_\varepsilon\in A) \le \limsup_{\varepsilon\downarrow 0} \varepsilon \log P(Z_\varepsilon\in A) \le -\inf_{x\in \mathrm{cl}\, A} I(x).$$

T3-EQ-0120 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$J(y)=\inf\{I(x):F(x)=y\},\ \ \inf \varnothing=\infty.$$

The scaling convention is fixed once: the diffusion noise is $\sqrt{\varepsilon}$ and the LDP speed is $1/\varepsilon$. Replacing $\sqrt{\varepsilon}$ by ε changes the speed and rate normalization.

T3-TBL-045 · rare-event inference ladder

Level	Verdict	Authorized meaning
L0	IMPOSSIBLE-IN-MODEL	event is unreachable inside the declared carrier
L1	FINITE-SAMPLE-RISK-BOUND	coverage-valid finite-sample bound

Level	Verdict	Authorized meaning
L2	EXPONENTIALLY-SUPPRESSED-IN-MODEL	positive action barrier; no finite-ε guarantee
L3	CANDIDATE-RARE-TRANSITION	minimizing path or path set
L4	EMPIRICAL-EVENT	independently observed event

Figure T3-FIG-034. Large-deviation pipeline and non-substitutable inference ladder L0–L4.

Action Functional

T3-EQ-0121 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$dX_t^\varepsilon = b(X_t^\varepsilon)dt + \sqrt{\varepsilon}\,\sigma(X_t^\varepsilon)dW_t, \quad a(x)=\sigma(x)\sigma(x)^T.$$

T3-EQ-0122 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$I_{0T}(\varphi)= 1/2 \inf \{\int_0^T ||u_t||^2dt : \dot\varphi_t=b(\varphi_t)+\sigma(\varphi_t)u_t \text{ a.e.}\}.$$

If no admissible control exists, $I_{0T}(\varphi)=\infty$. For nondegenerate $a=\sigma\sigma^T$,

T3-EQ-0123 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$I_{0T}(\varphi)=1/2\int_0^T \langle\dot\varphi-b(\varphi), a(\varphi)^{-1}(\dot\varphi-b(\varphi))\rangle dt.$$

A full path-space LDP still requires hypotheses on b, σ, initial data, topology, and exponential tightness. Degenerate a must be treated by the control representation, not by blind inversion.

Quasipotential and Instanton Set

T3-EQ-0124 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$V_A(x)=\inf_{T>0} \inf\{I_{0T}(\varphi): \varphi(0)\in A, \varphi(T)=x\}.$$

T3-EQ-0125 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$c_D=\inf_{y\in\partial D} V_A(y), \quad \mathcal{M}_D=\operatorname{argmin}_{y\in\partial D,\varphi} I_{0T}(\varphi).$$

Equal-cost paths yield SET-PATH. For a model family $\theta\in\Theta_{adm}$, retain the barrier envelope $c_D(\theta)$ rather than an arbitrary average.

TYPE GATE. Associator amplitude, CGI, and λ are not automatically actions. A map to state variables, drift, diffusion metric, and physical units is required.

Double-Well Witness

T3-LOC-075 · source: tom3_v0_12.docx · Section 4

T3-EQ-0126 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$dX_t^\varepsilon = -V'(X_t^\varepsilon)dt + \sqrt{2\varepsilon}\,dW_t, \quad V(x)=(x^2-1)^2/4.$$

T3-EQ-0127 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$I_{0T}(\varphi)=1/4\int_0^T (\dot\varphi_t+V'(\varphi_t))^2dt.$$

T3-EQ-0128 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$I_{up} = \int_{-1}^{0} V'(x)dx = V(0)-V(-1)=1/4.$$

The reverse-gradient path climbs from −1 to the saddle at action 1/4; the downhill gradient path has zero action.

Figure T3-FIG-035. Double-well witness: metastable minima, saddle, and barrier ΔV=1/4.

T3-EQ-0129 · mathematical-content parity synchronized with T3-FREEZE-v1.0

Figure 2. Double well: metastable minimum, saddle, and barrier ΔV=1/4.

Metastability

T3-LOC-076 · source: tom3_v0_12.docx · Section 5

T3-EQ-0130 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\lim_{\varepsilon\downarrow 0} \varepsilon \log E_a \tau_D^\varepsilon = c_D.$$

T3-EQ-0131 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E_{-1} \tau_D^\varepsilon \sim [2\pi / \sqrt{|V''(0)|V''(-1)}] \exp(\Delta V/\varepsilon) = (2\pi/\sqrt{2}) \exp(1/(4\varepsilon)).$$

FINITE-E LIMITATION. The symbol ~ is asymptotic. Without a remainder, an ε range, and discretization control, it is not a guaranteed bound for a concrete run.

V*P Rare-Transition Bridge

T3-TBL-046 · fillable physical bridge

Component	Value	Evidence requirement
physical state x	[FILLABLE]	which V*P configuration is encoded
small parameter ε	[FILLABLE]	units and noise calibration
drift b / potential V	[FILLABLE]	derived from a variational principle, not post-hoc fit
diffusion σ	[FILLABLE]	noise model and covariance
target A / exit domain D	[FILLABLE]	operational event and boundary
observation adapter	[FILLABLE]	how a hidden transition becomes a measurement
independent run	[FILLABLE]	EXT-RUN and blind protocol

Until these fields are filled, the double well is a mathematical witness, not a physical model of a specified process.

Zero Observations

T3-EQ-0132 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$p_U = 1-\alpha^{1/N}.$$

With zero events in N independent trials, this is the exact one-sided upper bound of confidence $1-\alpha$. Zero count does not prove $p=0$; dependence, adaptive stopping, or weighted simulation requires a different calculation.

Importance Sampling

T3-LOC-077 · source: tom3_v0_12.docx · Section 6

T3-EQ-0133 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\hat{p}_N = (1/N) \Sigma_{i=1}^N 1_A(Y_i)L(Y_i), \quad Y_i\sim Q,$$

The estimator is unbiased when the likelihood ratio is correct and integrable and Q covers the event support. The zero-variance proposal $P(\cdot|A)$ is normally unknown.

Gaussian Tail Witness

T3-EQ-0134 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$L(y)=\exp(-ay+a^2/2), \quad E_Q[1_{Y\geq b}L(Y)]=\Phi(b).$$

T3-EQ-0135 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$E_Q[(1_{Y\geq b}L(Y))^2]=\exp(a^2)\ \Phi(b+a).$$

Choosing $a=b$ reduces the second moment for $b\geq 2$ in the certificate. This proves the scheme only for the Gaussian witness, not for an arbitrary V*P target.

Figure T3-FIG-036. Change of measure, likelihood ratio, and mandatory support/design gates.

Efficiency contract

- freeze proposal and target event before the confirmatory run;
- compute likelihood ratios in log-domain and test support;
- store variance, second moment, effective sample size, and weight diagnostics;
- use a separate pilot for adaptive tilting or preserve sequential validity;
- use a justified mixture or dynamic scheme for nonunique instantons;
- retain NUM status until an independent EMP-OBS exists.

Rare-Event Firewall

T3-LOC-078 · source: tom3_v0_12.docx · Section 7

Figure T3-FIG-037. Asymptotic, simulation, and physical observation are separate proof layers.

T3-TBL-047 · asymptotic and empirical firewall

Scenario	Incorrect conclusion	Correct output
positive barrier	event declared impossible	EXPONENTIALLY-SUPPRESSED-IN-MODEL
instanton found	path called future cause	CANDIDATE-RARE-TRANSITION
one Monte Carlo path	simulation called EMP-OBS	NUM
zero hits	p=0	use exact upper bound
LDP without exponential tightness	full upper bound claimed	ABSTAIN-LDP
discontinuous observable	contraction applied silently	ABSTAIN-CONTRACTION
post-hoc proposal	weights tuned after result	unauthorized analysis
two equal-cost instantons	one selected for convenience	SET-PATH
small action	large finite-ε probability claimed	need prefactor/remainder
good variance reduction	physical mechanism confirmed	efficiency ≠ causality

Rare-Event Reper Certificate

T3-EQ-0136 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{Cert\_RARE}=(\mathscr{X},\tau,\varepsilon,P\_\varepsilon,I,A,c\_A,\mathscr{M}\_A,R\_\varepsilon,Q,L,FS,D,Dom,src,code,hash,status).$$

R_ε records a finite-ε remainder or its explicit absence; Q/L is the proposal/likelihood pair; FS is the finite-sample certificate. Missing mandatory fields create ABSTAIN and a blocker list, not a numeric zero.

T3-TBL-048 · rare-event verdicts

Verdict	Authorized meaning
IMPOSSIBLE-IN-MODEL	unreachability proved inside the carrier
FINITE-SAMPLE-RISK-BOUND	coverage-valid bound exists
EXPONENTIALLY-SUPPRESSED-IN-MODEL	LDP and c_A>0, no finite-ε bound
CANDIDATE-RARE-TRANSITION	low-action path or instanton set
ABSTAIN	mandatory interface unresolved

Rare-Transition Certificate

T3-LOC-079 · T3-RARE-NUM-001

The synthetic certificate checks Gaussian LDP scaling, contraction, control/action identities, the double well, logarithmic Eyring–Kramers scale, Gaussian importance sampling, set-valued instantons, and blocker-safe status. No physical data are used.

T3-TBL-049 · rare-event certificate

Check	Result	Control
Gaussian rate nonnegativity	2000/2000	—
Gaussian tail exponent	2000/2000	gap 8.570e−02
linear contraction principle	2000/2000	7.105e−15
deterministic zero action	2000/2000	0
positive perturbed action	2000/2000	PASS
control/action equivalence	2000/2000	0
double-well barrier	2000/2000	0.250
reverse-gradient action	2000/2000	2.500e−05
downhill zero action	2000/2000	0
Eyring–Kramers log scale	2000/2000	gap 5.963e−02
likelihood normalization / unbiasedness	4000/4000	≤2.220e−16
IS second-moment reduction	2000/2000	log gain≥2.577
finite-ε / set-path / abstain / weakest-link / provenance	10000/10000	PASS
Total	36000/36000	status NUM

CERTIFICATE BOUNDARY. It proves implemented identities and gate logic in Gaussian, linear-control, and double-well witnesses. It does not prove a physical V*P small parameter, a true potential/noise model, finite-ε accuracy, causality, independent calibration, or EMP-OBS.

Chapter 19. Observational Adapters and External Physical Data

T3-CH-19 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-080–087 · source checkpoint T3-OBS-v0.8

Accessible Introduction

T3-EXPL-19 · translated explanatory block

CENTRAL QUESTION	Which technical and evidentiary conditions are required before external physical data become an admissible KLT-RBD input?
PLAIN MEANING	Downloading a table is insufficient. Version, licence, units, masks, selection, covariance, calibration, and hashes must be frozen and every field must be connected to a model observable.
MINIMAL EXAMPLE	A catalogue with diagonal errors cannot replace the published full covariance. Dropping correlations changes the likelihood and may create false significance.
ONTOLOGY	The objects are a data source-card, raw artifact, schema adapter, observable map, covariance object, selection/mask object, and provenance certificate.

EPISTEMOLOGY	Data become known only after no-loss ingest, documentation and unit checks, checksums, and a reproducible transformation.
PHENOMENOLOGY	For computation, an external project becomes typed arrays with explicit missing values and systematics.
PHYSICAL MEANING	The adapter connects V*P/packet predictions to actual measurement channels.
LIMITATION	Public data do not imply that a test has been performed. Samples, bins, and the primary statistic may not be changed after viewing the result.
AUTHORIAL NOVELTY	The authorial contribution is a Reper-based ingest architecture in which observable, source, covariance, licence, D, and blockers form one typed record.
CHAPTER ROUTE	Adapters and provenance are formalized first; then a preregistration-ready input is defined. Chapter 20 describes independent hypothesis testing.

CHAPTER STATUS. All THM/PROP/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/OPEN/REFUTED/ABSTAIN labels are inherited from the frozen Russian master. Translation creates no status promotion.

Observational Interface

T3-LOC-080 · source: tom3_v0_8.docx · Section 1

ONTOLOGY. An observable is an element of data space obtained from a model state through a typed adapter; it is not the model state itself.

EPISTEMOLOGY. The relation is known only after map, units, calibration, selection, covariance, and provenance are defined. Without them the formula remains MODEL.

PHENOMENOLOGY. For an experimenter the adapter appears as a catalogue, mask, error table, and likelihood; for a computer it is a partial function with failure states.

PHYSICAL MEANING. The path from a background solution to measured redshift-distance summaries is modelled.

LIMITATION. The adapter does not prove the mechanism that generated H(z), and a fit is not a causal explanation.

AUTHORIAL NOVELTY. The authorial contribution is a blocker-safe Obs operator embedded in KLT-RBD with weakest-link status and mandatory ABSTAIN.

Figure T3-FIG-038. End-to-end observational adapter and its PASS/FAIL gates.

Definition T3-OBS-001 [DEF-A]. An observational adapter is the partial map

T3-EQ-0137 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\mathrm{Obs}\_\mathscr{D} : \mathrm{Dom}(\mathrm{Obs}\_\mathscr{D}) \subset \mathrm{Q\_model} \times \mathrm{Cal}\_\mathscr{D} \times \mathrm{Sel}\_\mathscr{D} \times \mathrm{Prov}\_\mathscr{D} \rightharpoonup \mathrm{Y}\_\mathscr{D} \times \mathrm{Cov}\_\mathscr{D} \times \mathrm{Cert}\_\mathscr{D}.$$

Here $\mathscr{D}$ is an observing programme, Y_$\mathscr{D}$ the space of data summaries, Cov_$\mathscr{D}$ the covariance object, and Cert_$\mathscr{D}$ the units, version, mask, licence, hashes, and source-card. If a mandatory argument is absent, Obs_$\mathscr{D}$ is undefined.

Redshift Map

T3-LOC-081 · source: tom3_v0_8.docx · Section 2

Definition T3-OBS-002 [DEF-A/COND]. For a photon wave-vector k and emitter/observer four-velocities u_e,u_o,

T3-EQ-0138 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$1+z = (-g(u_e,k_e))/(-g(u_o,k_o)).$$

For comoving emitter and observer in an FLRW background this reduces to

T3-EQ-0139 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$1+z = a(t_o)/a(t_e).$$

The reduction is conditional on metric light propagation, the chosen congruence, a valid separation of peculiar-velocity and gravitational contributions, and a clock convention. These assumptions belong in the V*P bridge certificate.

FILLABLE FIELD. Exact V*P photon/clock adapter, frame convention, and peculiar-velocity correction rules.

Hierarchy of Cosmological Distances

T3-LOC-082 · source: tom3_v0_8.docx · Section 3

Figure T3-FIG-039. From H(z) to radial, transverse, angular, and photometric distances.

Assume H(z)>0 on the observing interval. Define

T3-EQ-0140 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$D\_H(z)=c/H(z), \quad D\_C(z)=\int_0^z c\, dz'/H(z').$$

For constant spatial curvature K,

T3-EQ-0141 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$D\_M(z)=S\_K(D\_C),$$

T3-EQ-0142 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$S\_K(\chi)=\sin(\sqrt{K}\chi)/\sqrt{K}\ \ (K>0), \quad \chi\ \ (K=0), \quad \sinh(\sqrt{-K}\chi)/\sqrt{-K}\ \ (K<0).$$

T3-EQ-0143 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$D\_A=D\_M/(1+z), \quad D\_L=(1+z)D\_M, \quad \mu=5\log_{10}(D\_L/\mathrm{Mpc})+25.$$

Proposition T3-OBS-1 [COND-PROP]. Under metric null propagation and photon-number conservation,

T3-EQ-0144 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$D\_L=(1+z)^2 D\_A.$$

A duality violation may reflect a propagation-assumption failure, selection bias, or calibration failure; it does not by itself identify a new V*P mechanism.

Supernova Adapter

T3-LOC-083 · source: tom3_v0_8.docx · Section 6

T3-EQ-0145 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$m\_model(z;\theta,M\_B)=5\log_{10}[D\_L(z;\theta)/\mathrm{Mpc}]+25+M\_B.$$

T3-EQ-0146 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\chi^2\_SN=(y\_SN-m\_model)^T\, C\_SN^{-1}\, (y\_SN-m\_model).$$

Proposition T3-OBS-2 [PROP]. For $D\_L=H_0^{-1}d\_L(z;\theta)$, the transformation

T3-EQ-0147 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$H_0\to\lambda H_0, \quad M\_B\to M\_B+5\log_{10}\lambda$$

leaves m_model invariant. An uncalibrated SN sample therefore does not separately identify H_0 and absolute luminosity. For a linear nuisance intercept M,

T3-EQ-0148 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\hat{M} = [1^T C^{-1}(y-m_0)]/[1^T C^{-1}1].$$

DATA GATE. For Pantheon+, freeze the exact data file, full covariance, duplicate-light-curve policy, redshift column, calibrator subset, and repository commit/hash. No missing value is filled by invention.

BAO Adapter

T3-LOC-084 · source: tom3_v0_8.docx · Section 7

T3-EQ-0149 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$D_V(z)=[z\, D_M(z)^2\, D_H(z)]^{1/3}.$$

Typical BAO summaries use D_M/r_d, D_H/r_d, or D_V/r_d. If $H(z)=H_0E(z)$, both geometric distances scale as H_0^{-1}. The transformation

T3-EQ-0150 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$H_0 \to \lambda H_0, \quad r_d \to r_d/\lambda$$

preserves D_M/r_d and D_H/r_d. An absolute scale requires an external r_d calibration or another independent ruler.

LIMITATION. DESI BAO products can test expansion shape and distance ratios, but a good fit does not confirm a packet mechanism. Covariance, fiducial corrections, and look-elsewhere/post-selection control remain mandatory.

Map of External Data

T3-LOC-085 · source: tom3_v0_8.docx · Section 9

Figure T3-FIG-040. Official data sources and the prohibition of automatic status promotion.

T3-TBL-050 · current external-data map

Source	State	Verified fact	Role in Volume III	Source status
DESI DR1	19 Mar 2025; public	18.7 million new spectra; CC BY 4.0	spectra/redshift adapter tests	support / empirical data
DESI DR2 cosmology	19 Mar 2025 papers; chains public	BAO results from first 3 years; raw DR2 spectra/redshifts not public	BAO likelihood planning	comparison / empirical summaries
Pantheon+	2022 paper + public repository	1701 light curves / 1550 SNe; distances and covariance	SN adapter and nuisance audit	empirical data
Planck 2018	final full-mission legacy	CMB likelihoods and parameter chains	early-Universe calibration/comparison	prior art / empirical data
Euclid Q1	19 Mar 2025	63.1 deg^2; about 30 million objects; not a cosmology release	catalogue/selection adapter tests	support / empirical data

IMPORTANT. Euclid Q1 is not a completed cosmology validation set; the official release is a quick data release intended mainly for early astrophysical studies.

Preregistration Card

T3-LOC-086 · source: tom3_v0_8.docx · Section 10

T3-TBL-051 · EMP-PLAN preregistration card

Field	Content
Dataset/version	[FILLABLE]
Immutable locator + SHA-256	[FILLABLE]
Primary observable	[FILLABLE: H(z), D_M/r_d, D_H/r_d, μ, or other]
Model family	[FILLABLE: ΛCDM comparison + exact V*P closure]
Primary parameter/signature	[FILLABLE]
Null model	[FILLABLE]
Nuisance parameters	[FILLABLE]
Covariance treatment	[FILLABLE]
Selection/masks	[FILLABLE]
Blinding split	[FILLABLE]
Multiplicity correction	[FILLABLE]
Support/refutation criterion	[FILLABLE]
Independent executor	[FILLABLE]
EXT-RUN status	NOT EXECUTED

EMPIRICAL STATUS. This card is EMP-PLAN. Until the fields are complete and an independent executor runs the frozen code/data package, no EMP-OBS exists.

Observational Source-Cards

T3-LOC-087 · source: tom3_v0_8.docx · Section 14

T3-TBL-052 · observational bibliography cards

Author	Title	Year / ID	Role	Relation to Volume III
Hogg, D. W.	Distance measures in cosmology	1999; arXiv:astro-ph/9905116	prior art / formulas	D_C, D_M, D_A, D_L, μ
Planck Collaboration	Planck 2018 results. VI. Cosmological parameters	2020; DOI 10.1051/0004-6361/201833910	comparison / empirical data	CMB likelihood and parameter framework
Brout et al.	The Pantheon+ Analysis: Cosmological Constraints	2022; DOI 10.3847/1538-4357/ac8e04	empirical data / comparison	SN covariance and likelihood
PantheonPlusSH0ES	DataRelease repository	public repository; exact commit required	empirical data	distances, covariance, chains
DESI Collaboration	DESI DR2 Results II	2025; arXiv:2503.14738	empirical summaries / comparison	D_M/r_d, D_H/r_d, covariance
ESA & Euclid Consortium	Euclid Q1 documentation	2025/2026; official Q1 documents	support / adapter	catalogue, masks, photometry/spectroscopy

Chapter 20. Verification Protocols for F-1–F-14 and Independent EXT-RUN

T3-CH-20 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-088–094 · source checkpoint T3-PN2-v0.9

Accessible Introduction

T3-EXPL-20 · translated explanatory block

CENTRAL QUESTION	How can F-1–F-14 be converted from physical conjectures into falsifiable protocols with decisions fixed in advance?
PLAIN MEANING	Each hypothesis receives a measurable object, null model, primary statistic, minimum effect, systematic budget, blinding, multiplicity correction, and conclusion boundary.
MINIMAL EXAMPLE	For F-12 two bracketing protocols, the sign s_0, δ_min, and a paired statistic are selected before the freeze. Post-data alteration is forbidden.
ONTOLOGY	The object is the preregistration card EXT-RUN-000 containing the hypothesis, Ω, code/data hashes, decision rules, and independent executor.
EPISTEMOLOGY	Support or falsification appears only after V3 freeze, V4 blind run, V5 independent replication, and a bounded V6 conclusion.
PHENOMENOLOGY	The experimenter receives an exact action list; the reader sees which decisions preceded unblinding.
PHYSICAL MEANING	The protocol separates a locally testable signature from a global metaphysical interpretation of V*P.
LIMITATION	No EXT-RUN is performed in this volume. Platform, δ_min, power, and executor remain fillable fields and blockers.
AUTHORIAL NOVELTY	The authorial contribution is the translation of F-1–F-14 into one Reper-based falsification framework with explicit ABSTAIN.
CHAPTER ROUTE	The hypothesis, observable, and falsification matrices are consolidated; then the first test card is built. Chapter 21 defines the memory that stores all proof objects.

CHAPTER STATUS. All THM/PROP/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/OPEN/REFUTED/ABSTAIN labels are inherited from the frozen Russian master. Translation creates no status promotion.

F-1–F-14 Matrix

T3-LOC-088 · source: tom3_v0_9.docx · Section 5
T3-TBL-053 · canonical F-1–F-14 matrix

ID	Canonical meaning	Priority	Candidate observable	Null model	Status
F-1	R⋆R as a physical algebra of time	P1/P4	repeatable bracket contrast	associative / known-memory model	PHY-HYP

ID	Canonical meaning	Priority	Candidate observable	Null model	Status
F-2	PN.2 is more fundamental than PN.1	P4	new held-out prediction + derivation of standard limits	standard quantum theory	PHY-HYP
F-3	PN.2 ⇒ PN.1	P0	operator identity and dispersion bound	commutator independent of K	OPEN bridge
F-4	regime α_K||K|| ≈βħ exists	P0	cross-platform action scale	no universal β	PHY-HYP
F-5	associator induces an operator commutator	P0	matrix elements and identities	ternary bracket is not a commutator	OPEN bridge
F-6	seven-component structure of time	P3	seven identifiable modes	1–6 components + noise	PHY-HYP
F-7	FOS/V*P has an observable realization	P3	invariant residual to SR/GR	SR/GR + standard matter	PHY-HYP
F-8	T defines physical temporal evolution	P2	blind trajectory predictions	standard generator	PHY-HYP
F-9	dC/dτ≥0	P2	sign of derivative C	nonmonotonicity / ordinary dissipation	PHY-HYP
F-10	∇_T K=J_T is a field equation	P0/P3	well-posed field solution and source	no separate K-field	OPEN bridge
F-11	K dynamics determines the early Universe	P3	predeclared CMB/LSS template	ΛCDM / extensions	PHY-HYP
F-12	K localizes in matter	P1	controlled residual bracket contrast	standard material/memory model	SELECTED PLAN
F-13	observer branch is finite	P2/P4	resource-invariant cutoff	technical limit grows with resources	PHY-HYP
F-14	gravity/ cosmology corrections	P3	explicit waveform/spectrum correction	GR/QFT/ΛCDM + extensions	PHY-HYP

Canonical registry-line checksum: 87665008c2cf5b84faceaa669c4a70b2e8a2de7f8bcddea1ced3198578e63ddc

Figure T3-FIG-041. Formal bridges precede broad physical conclusions.

Selection of F-12

T3-LOC-089 · source: tom3_v0_9.docx · Section 6

Selection criteria: direct measurable contrast; controlled preparation; matched null; independent apparatus; no mandatory cosmological inversion; predeclared units and δ_min; falsifiability of one specific realization.

T3-TBL-054 · first-test selection

Candidate	Decisive argument	Decision
F-3/F-4/F-5/F-10	unclosed formal bridge, not an experiment	BLOCKED

DECISION. EXT-RUN-000 selects F-12 in a weak operational form: residual contrast between two predeclared bracketed material protocols after standard memory, hysteresis, order, and drift adjustment. Ontological localization of K is not established by this test.

EXT-RUN-000/F12 Card

T3-LOC-090 · source: tom3_v0_9.docx · Section 7

Figure T3-FIG-042. Stages V3–V6 and the admissible conclusion boundary for the first test.

T3-TBL-055 · frozen-card schema

Field	Content
Registration ID	EXT-RUN-000/F12
Hypothesis	F-12 weak operational realization
Physical platform	[FILLABLE: material/device/batch/instrument]
Elementary operations x,y,z	[FILLABLE: pulse/load/field protocols with units]
Bracketed protocols	$b_L=(x\odot y)\odot z$; $b_R=x\odot(y\odot z)$; exact timing/reset rules [FILLABLE]
Domain Ω	[FILLABLE: amplitudes, durations, temperature, initial state, admissible batch range]
Primary readout Y	[FILLABLE: scalar or state-space measurement and unit Q_Y]
Primary estimand θ	paired residual $E[Y_L-Y_R]$ after declared adjustment
Predicted sign	[FILLABLE: + or −; cannot be selected after data]
Minimum effect δ_{min}	[FILLABLE: Q_Y and scientific justification]
Null model H0	known nonlinearities + memory/hysteresis + order + drift; residual $\theta=0$
Alternative H1	predeclared $\text{sign}\cdot\theta \geq \delta_{min}$ on Ω
Independent executor	[FILLABLE: group/institution; no model-tuning role]
Status	DRAFT EMP-PLAN; NOT FROZEN; NOT EXECUTED

Decision Rules

T3-LOC-091 · source: tom3_v0_9.docx · Section 8

For a paired design use $d_i=Y_{L,i}-Y_{R,i}$ after a predeclared correction model. A planning sample size may use a non-confirmatory pilot estimate σ_d:

T3-EQ-0151 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$n \geq [(z_{1-\alpha^*/2}+z_{1-\beta})\, \sigma_d / \delta_{min}]^2,$$

The global multiplicity level α^*, target power $1-\beta$, σ_d, and any clustering inflation must be frozen before the confirmatory sample.

T3-TBL-056 · support/falsification rules

Outcome	Rule
Support for the specific realization	adjusted lower confidence bound for predicted $\text{sign}\cdot\theta > \delta_{min}$; quality gates PASS; V5 independent replication PASS

Outcome	Rule
Falsification of a mandatory effect	99% upper confidence bound for $\|\theta\| < \delta\_min$ after the full systematic budget
Opposite sign	reproducible sign opposite to the universal prediction falsifies that version
Intermediate / wide interval	INCONCLUSIVE / ABSTAIN; not support
Best fit only	insufficient without predeclared sign, scale, controls, and replication

MULTIPLICITY. One primary contrast is tested without hidden search. All secondary endpoints, Ω ranges, platforms, and subgroups are listed in advance; a justified Holm or other procedure remains a fillable field.

Blinding and Systematics

T3-LOC-092 · source: tom3_v0_9.docx · Section 9

T3-TBL-057 · blind split and systematic controls

Element	Frozen requirement
Calibration set	instrument and correction-model tuning only; excluded from confirmatory inference
Exploratory set	systematics-model selection; labels may be open; results non-confirmatory
Confirmatory set	b_L/b_R labels hidden until data lock; immutable analysis script
Exclusion rule	[FILLABLE: saturation, failed reset, temperature excursion, missing log]; applied blind
Controls	associative simulator; known noncommutative-associative system; sham; order swap; washout; drift monitor
Randomization	balanced order, batch and time blocks; seed/schedule hashed before run
Systematics	hysteresis, fatigue, drift, non-equivalent operations, residual memory, thermal coupling, analyst feedback

Stages V3–V6

T3-LOC-093 · source: tom3_v0_9.docx · Section 10

T3-TBL-058 · stage status

Stage	Requirement	Current status
V3 preregistration	model version, Ω, primary estimand, δ_min, exclusions, multiplicity, code/data manifest, hashes	OPEN: mandatory fields remain
V4 blind confirmation	separate calibration/exploration/confirmation; hidden labels; no filter tuning	NOT STARTED
V5 independent reproduction	different group and device/batch or independent array	NOT STARTED
V6 limited conclusion	claim limited to platform, Ω, precision, null, and protocol	RULE CLOSED; result absent

EXT-RUN STATUS. The card is not FROZEN while any mandatory V3 field is empty. An internal run by the authorial pipeline does not count as V5.

Code, Data, and Hashes

T3-LOC-094 · source: tom3_v0_9.docx · Section 11

T3-TBL-059 · future-run manifest

Object	Control
protocol.pdf/docx	[FILLABLE: SHA-256]
analysis code repository/commit	[FILLABLE]
environment/container	[FILLABLE]
raw data manifest	[FILLABLE]
calibration data hash	[FILLABLE]
confirmatory data hash	created after sealed acquisition
randomization schedule hash	[FILLABLE]
exclusion log	append-only hash chain [FILLABLE]
independent report	[FILLABLE]

Chapter 21. KLT-RBD/RPD as Computational Memory of Physics

T3-CH-21 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-095–104 · source checkpoint T3-RBD-v0.13

Accessible Introduction

T3-EXPL-21 · translated explanatory block

CENTRAL QUESTION	How can sources, formulas, proofs, blockers, versions, and forecast candidates be stored without losing the provenance of any conclusion?
PLAIN MEANING	KLT-RBD/RPD is a typed graph: a raw artifact becomes a source-card, Reper, scientific object, proof object, blocker, and forecast candidate.
MINIMAL EXAMPLE	A formula with no exact locator or an open mandatory blocker may be stored and indexed, but the publication/forecast gate returns ABSTAIN.
ONTOLOGY	Objects include immutable artifacts, typed nodes and edges, append-only versions, manifests, a status vector, and provenance activities.
EPISTEMOLOGY	Integrity is checked by raw/semantic hashes, foreign keys, no-loss levels, and reproducible restoration.
PHENOMENOLOGY	The researcher sees not only a result but its dependency graph, alternatives, gaps, and repair history.
PHYSICAL MEANING	The database is the computational memory of physical research and prevents mixing model, numerical, and observational layers.
LIMITATION	A database entry, hash, or state registration does not prove mathematical or physical truth.

AUTHORIAL NOVELTY	The authorial contribution is the Reper-oriented KLT-RBD schema with D/Dom, blockers, proof objects, and a status vector as primary fields.
CHAPTER ROUTE	Node/edge contracts, no-loss ingest, and provenance exports are defined. Chapter 22 converts these records into reproducible computational certificates.

CHAPTER STATUS. All THM/PROP/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/OPEN/REFUTED/ABSTAIN labels are inherited from the frozen Russian master. Translation creates no status promotion.

Typed Memory Graph

T3-LOC-095 · source: tom3_v0_13.docx · Section 2

CORE DEFINITION. G_RBD=(V,E,τ_V,τ_E,provenance,status-vector), with disjoint node types Artifact, SourceCard, Reper, ScientificObject, ProofObject, Blocker, and Forecast; truth_layer_promotion=0.

Definition T3-RBD-1 [DEF-A]. Node types are not mixed and every edge has declared semantics.

Figure T3-FIG-043. The end-to-end physical-memory chain. A blocker limits authorization rather than deleting the object.

The graph stores content, provenance, domain, and negative knowledge. A blocker-node records a reason for refusal, which is stronger than an empty result or arbitrary score. Branching is normal; every admissible interpretation remains until a selector is proved.

Nodes and Status Vector

T3-LOC-096 · source: tom3_v0_13.docx · Section 3

Figure T3-FIG-044. Minimal typed profile; Version/Provenance accompanies every level.

T3-TBL-060 · mandatory node contracts

Type	Minimal contract	Function
Artifact	raw bytes, media type, size, raw SHA-256, source path	byte identity
SourceCard	author, title, year, ID, exact locator, role, licence	verifiable reference
Reper	R, I, U, D, Dom, λ/CGI, status	sufficient foundation
ScientificObject	type, formula/data, Dom, Cod, units, assumptions	type correctness
ProofObject	method, assumptions, conclusion, scope, hash, status	proof-carrying claim
Blocker	code, mandatory, state, reason, target	negative knowledge
ForecastCandidate	horizon, observable, candidate set, status vector	partial forecast

STATUS FIREWALL. s=(s_math,s_model,s_num,s_emp,s_legal). NO-EMP-OBS cannot be replaced by NUM; the vector is not scalarized.

Source-Card and Reper

T3-LOC-097 · source: tom3_v0_13.docx · Section 4

A source-card records an addressable foundation: exact title, author, year, identifier, page/formula/section, source role, access rights, acquisition date, and local-copy hash. exact_locator is mandatory.

T3-TBL-061 · source-card fields

Field	Content	Constraint
source_id	stable content ID	not a filename
identifier	DOI, arXiv, RFC, official ID	[FILLABLE] if absent
exact_locator	page, equation, section, table	no whole-work citation for a specific claim
source_role	prior art / support / comparison / empirical data	does not determine truth
licence/access	use and privacy conditions	unknown rights ⇒ restricted gate
raw_sha256	hash of a specific copy	fixity, not authorship or truth

REPER CONTRACT. Rep(c)=(R_c,I_c,U_c;D_c), Dom(c)≠∅; ScientificObject=(type,carrier,Dom,Cod,units,assumptions,content,status). D must point to a typed source, proof, or data contract.

λ and CGI may be stored as diagnostics. They are not truth primary keys and do not cancel source locators, proof scope, or the status vector.

Proof Object and Blocker

T3-LOC-098 · source: tom3_v0_13.docx · Section 5

A proof object is a node, not a Boolean proved flag. It stores method, all assumptions, conclusion, scope, optional machine certificate, hash, and exact status.

GATE. OPEN mandatory blocker ⇒ ABSTAIN-BLOCKER; absent proof ⇒ ABSTAIN-PROOF; absent typed lineage ⇒ ABSTAIN-LINEAGE; otherwise PASS-MODEL while EMP-OBS is absent.

Proposition T3-RBD-4 [PROP-SCHEMA]. An open mandatory blocker excludes candidate authorization.

T3-TBL-062 · blocker states

State	Effect	Discipline
OPEN + mandatory	ABSTAIN	conclusion prohibited
OPEN + optional	recorded	remark retained without hidden veto
CLOSED	gate may continue	new event closes; history is not rewritten
WAIVED	conditional continuation	person, reason, and scope required

SET-VALUED FORECAST. Forecast(y_0)={c∈CandidateSpace: all mandatory gates PASS}. An empty authorized set yields ABSTAIN, not an invented best candidate.

No-Loss Ingest

T3-LOC-099 · source: tom3_v0_13.docx · Section 6

Figure T3-FIG-045. Strong ingest preserves raw bytes, normalized representation, transformation activities, and versions.

T3-TBL-063 · no-loss levels

Level	Contract	Boundary
NL0	description or filename only	object cannot be restored
NL1	external link + hash	fixity if the source remains available
NL2	local raw bytes + raw hash	byte restoration
NL3	NL2 + normalized copy + provenance + version ledger	reproducible ingest
NL4	NL3 + independent replica, signature/time, external audit	long-term independent preservation

IDENTITIES. ArtifactID(B)=urn:klt:artifact:sha256:SHA256(B); Retrieve(Store(B))=B. Normalize(B) is a derived artifact and never replaces B.

Proposition T3-RBD-2 [PROP-SCHEMA]. Byte-for-byte round-trip is executable for the certificate BLOB store.

SHA-256 LIMITATION. A hash detects change under a cryptographic assumption; it does not certify author, creation time, correctness, or physical truth.

Versions and Provenance

T3-LOC-100 · source: tom3_v0_13.docx · Section 7

APPEND-ONLY LEDGER. Version_{n+1}=(entity_id,parent_version_id,content_hash,change_set,timestamp); UPDATE or DELETE of an old version is forbidden.

Proposition T3-RBD-3 [PROP-SCHEMA]. History changes by adding an event, not by editing the past. Status change is likewise a new event with responsible agent, foundation, date, and reference to the closed blocker or new proof.

T3-TBL-064 · SHA-256 boundary

T3-TBL-065 · provenance profile

PROV layer	KLT-RBD mapping	Question
Entity	artifact, dataset, code, proof object, report	what existed
Activity	ingest, normalization, calculation, review, export	what happened
Agent	author, computer, independent reviewer	who was responsible
Relations	used, generated, attributed, derived, invalidated	how objects are connected

MANIFEST. Manifest(P)={(logical_path_i,size_i,SHA256(bytes_i))}. Raw manifest, semantic metadata, and scientific status remain distinct. A release self-hash must be detached because embedding it changes the file.

T3-TBL-066 · canonical JSON profile

CANONICAL JSON. KLT-CANON-JSON-v1 forbids floats and permits null/bool/int/string/list/dict with string keys. This is a restricted project profile, not a full RFC 8785 compliance claim.

Legal Firewall

T3-LOC-101 · source: tom3_v0_13.docx · Section 8

Figure T3-FIG-046. Object identification and scientific validation belong to different channels.

NON-IMPLICATIONS. registered(object)=1 ⇏ status_math=THM; registered(object)=1 ⇏ status_emp=EMP-OBS; hash_valid(object)=1 ⇏ claim_true(object).

Proposition T3-RBD-5 [PROP-SCHEMA]. legal_records does not participate in forecast authorization. Registration documents may establish that a program or database was registered or deposited, but not that a theorem, physical principle, or cosmological model was validated.

Before publication every object receives a privacy class, rights statement, and dissemination channel. Unknown licence is not permission; personal data, secret keys, confidential measurements, and restricted materials remain RESTRICTED.

Audit of Internal Databases

T3-LOC-102 · source: tom3_v0_13.docx · Section 9

T3-TBL-067 · audited SQLite packages

Package	Schema	Key counts	Check
Interdisciplinary Atlas v2.1	28 tables / 0 views	236 sources; 1145 works; 2212 Repers; 2478 edges	integrity=ok
Global RBD v2.2 RUN 016	230 tables / 2 views	26 domains; 267 crosswalks; 36 named candidates	integrity=ok
Real-data import v1.0	14 tables / 10 views	45 artifacts; 42 λ audits; privacy/legal queues	integrity=ok

T3-TBL-068 · local-copy hashes

Object	SHA-256
Atlas v2.1	63ff4a32089acdceb84ff113527158e2c12beb8daa4a942cd003e1d3a330d9ae
Global v2.2	9b1906d6a3410f3d9e68d179301477c6d7b51b9eac984b8cb9059703120493e9
Real import v1.0	d89cda1d645e4645d9a58ec754bdb26bb2252d621e0f2c3df7428a5d89053df9

- The v2.1 and v2.2 core graph counts agree: 236 / 1145 / 2212 / 2478.
- v2.2 adds parallel domain/audit tables and views without destroying the v2.1 core.
- RUN 016 names 36 candidates, but its README explicitly forbids treating them as proved theorems.
- Real-data import includes privacy/legal queues; completeness has not been independently audited.
- The 230-table history needs a compact canonical core profile for stable implementation.

Interoperability Standards

T3-LOC-103 · source: tom3_v0_13.docx · Section 10

T3-TBL-069 · external standards map

ID	Source / version	Identifier	Role	Status
E1	W3C PROV-O (2013)	W3C Recommendation	Entity/Activity/Agent provenance	prior art / mapping
E2	BagIt v1.0 (2018)	RFC 8493	payload, manifests, fixity	packaging prior art
E3	RO-Crate 1.3 (2026)	DOI 10.5281/zenodo.20720080	research-object metadata	comparison / export
E4	DataCite 4.7 (2026)	DOI 10.14454/qdd3-ps68	citation metadata	publication adapter

ID	Source / version	Identifier	Role	Status
E5	FAIR Principles (2016)	DOI 10.1038/sdata.2016.18	stewardship goals	design support
E6	JCS (2020)	RFC 8785	canonical JSON	comparison; not full compliance
E7	NIST SHA standard	FIPS 180-4	SHA-256	integrity prior art
E8	SQLite file format	official docs	single-file relational carrier	storage prior art
E9	Time-Stamp Protocol	RFC 3161	trusted proof-of-existence time	future signing gate

EXPORT PROFILE. KLT-RBD core → PROV graph + RO-Crate metadata + BagIt fixity + DataCite citation layer. Mappings are optional adapters; internal KLT statuses and blockers remain authoritative.

RBD Certificate

T3-LOC-104 · source: tom3_v0_13.docx · Section 11

CERTIFICATE. seed=20260726; 25 test families; 37500/37500 assertions; status NUM ≠ EMP-OBS.

T3-TBL-070 · T3-RBD-NUM-001 checks

Family A	Result	Family B	Result
canonical-key-order	1500/1500	raw-mutation-detected	1500/1500
duplicate-ingest-idempotent	1500/1500	raw-byte-roundtrip	1500/1500
raw-vs-semantic-hash	1500/1500	canonical-float-firewall	1500/1500
artifact-append-only	1500/1500	artifact-delete-rejected	1500/1500
version-append-only	1500/1500	foreign-key-gate	1500/1500
mandatory-blocker-abstain	1500/1500	optional-blocker-recorded-no-veto	1500/1500
closed-blocker-pass-model	1500/1500	legal-firewall	1500/1500
proof-object-required	1500/1500	lineage-required	1500/1500
manifest-coverage	1500/1500	manifest-tamper-detected	1500/1500
status-vector-preserved	1500/1500	source-locator-gate	1500/1500
provenance-activity-linked	1500/1500	content-id-stable	1500/1500
content-id-change-sensitive	1500/1500	sqlite-integrity / foreign-key	3000/3000

T3-TBL-071 · certificate non-claims

CERTIFICATE BOUNDARY. The certificate does not prove completeness of all KLT-RBD data, universal collision resistance, correctness of external sources, physical truth of V*P, PredRep calibration, or execution of EXT-RUN.

Chapter 22. Computational Certificates, Code, and Reproducibility

T3-CH-22 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-105–113 · source checkpoint T3-CERT-v0.14

Accessible Introduction

T3-EXPL-22 · translated explanatory block

CENTRAL QUESTION	What must be frozen so that another researcher can repeat a computation and distinguish byte identity from semantic identity?
PLAIN MEANING	A certificate includes source snapshot, environment/dependency locks, instructions, test vectors, artifact, manifest, provenance, and an external rerun receipt.
MINIMAL EXAMPLE	Two ZIP files with identical payloads may differ because of timestamps and member order. A deterministic build normalizes them and can obtain SAME-BYTES.
ONTOLOGY	The object is Cert_build and the verdict set SAME-BYTES/SAME-SEMANTICS/DIVERGED/ABSTAIN.
EPISTEMOLOGY	Local reproducibility is established by repeated builds and hashes; independence requires a separate signed receipt from another runner.
PHENOMENOLOGY	A user runs the declared procedure and obtains a comparable artifact and machine-readable verdict.
PHYSICAL MEANING	The certificate repeats model calculations and detects supply-chain drift.
LIMITATION	A NUM certificate is not EXT-RUN and creates no EMP-OBS. A signature certifies provenance, not theory correctness.
AUTHORIAL NOVELTY	The authorial contribution is the inclusion of the capsule and rerun receipt in the Reper/D/Dom/status chain.
CHAPTER ROUTE	Formal build model, deterministic build, provenance, and package audit are introduced. Chapter 24 uses this layer in the end-to-end gate.

CHAPTER STATUS. All THM/PROP/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/OPEN/REFUTED/ABSTAIN labels are inherited from the frozen Russian master. Translation creates no status promotion.

Formal Build Model

T3-LOC-105 · source: tom3_v0_14.docx · Section 2

BUILD RELATION. Build:S×E×I→A, with source S, environment E, instructions I. Reproducible(A) means equal bytes for all runs with the same (S,E,I).

Definition T3-CERT-1 [DEF]. Partiality preserves ABSTAIN when an input is incomplete. Environment E includes runtime/compiler, dependencies, architecture, locale, timezone, variables, build-path policy, file modes, and the time source.

Figure T3-FIG-047. The verdict is selected by the weakest mandatory criterion.

T3-TBL-072 · verdict lattice

Verdict	Condition	Authorized conclusion
SAME-BYTES	SHA-256 and size match	strict local artifact reproducibility
SAME-SEMANTICS	bytes differ; frozen comparator confirms equivalence	only under the declared semantic contract

Verdict	Condition	Authorized conclusion
DIVERGED	mandatory output or digest differs	difference requiring diagnosis
ABSTAIN	missing lock, Dom, input hash, command, or receipt	conclusion prohibited

Reproducibility Capsule

T3-LOC-106 · source: tom3_v0_14.docx · Section 3

Figure T3-FIG-048. The capsule binds all inputs and results through the subject hash.

T3-TBL-073 · mandatory capsule contract

Component	Minimum field	Purpose
source	immutable snapshot + SHA-256	exact input bytes
build	entrypoint, commands, flags, working directory	no oral steps
environment	OS/runtime/architecture/locale/TZ/ variables	environment lock
dependencies	exact versions + artifact hashes	lockfile or vendored bundle
test vectors	input, expected output, tolerances	frozen before run
artifact	name, media type, bytes, digest	certificate subject
provenance	builder, parameters, dependencies, byproducts	unsigned metadata is not a trust receipt
status	NUM / EXT-RUN / EMP-OBS channels	nonscalar firewall

FORMAL TUPLE. Cert_build=(S,E,I,D,T,A,H,P,R,Status). Missing mandatory component ⇒ ABSTAIN. D is dependency ledger, T test vectors, P provenance, R external receipt.

Deterministic Build

T3-LOC-107 · source: tom3_v0_14.docx · Section 4

Figure T3-FIG-049. Variable inputs are normalized before the digest is computed.

T3-TBL-074 · variability controls

Variability source	Repair	Gate
Time	SOURCE_DATE_EPOCH; fixed ZIP timestamp	hidden current time forbidden
Order	lexical input/output list	filesystem traversal order not used
Locale/TZ	C.UTF-8 and UTC	machine-independent number/date formats
Path	${BUILD_ROOT} and path mapping	absolute path excluded
Permissions	fixed file modes	umask cannot alter digest
Randomness	frozen seed or fixed entropy input	random test remains reproducible
JSON	sorted keys, UTF-8, reject NaN/Inf	stable bytes

In T3-CERT-NUM-001 the same capsule was built under different source orders and synthetic build roots: all 1000 pairs were identical. A naive ZIP differing only in timestamps diverged in 1000/1000 controls.

Dependency and Environment Locks

T3-LOC-108 · source: tom3_v0_14.docx · Section 5

LOCKS. E_lock=(runtime,os,arch,locale,timezone,env-vars,build-path-policy); D_lock={(package_i,version_i,source_i,digest_i)}. A range constraint is not a lock.

T3-TBL-075 · observed dependency-lock state

Corpus	Observation	Verdict
KLT 4.14 Python	8 requirements with >=; no exact ==, pylock, or hashes	ABSTAIN-DEPLOCK
KLT 4.14 Flutter	7 caret constraints; pubspec.lock absent	ABSTAIN-DEPLOCK
KLT 5.1 Flutter	9 caret constraints; pubspec.lock absent	ABSTAIN-DEPLOCK
T3-CERT capsule	Python standard library only; runtime 3.13.5 frozen	PASS-LOCAL

T3-TBL-076 · SBOM adapters

Profile	Used layer	Limitation
SPDX 3.0.1	component, relationship, licence, identifiers	dependency-ledger export
CycloneDX 1.7	components, dependencies, formulation, citations	build/BOM export
KLT-RBD status vector	math/model/num/emp/legal channels	not replaced by confidence

Provenance and Attestation

T3-LOC-109 · source: tom3_v0_14.docx · Section 6

ATTESTATION. Attestation=(subject,predicateType,buildDefinition,runDetails); subject.digest binds the artifact, while builder.id identifies the asserted trust base.

T3-TBL-077 · provenance layers

Layer	Function	T3-v0.14 status
SLSA v1.2	where, when, and how artifact was produced	field model and checks
in-toto Statement	subject + predicateType + predicate	attestation container
Sigstore	signature + identity + transparency log	future external-receipt signing
T3 local provenance	builder=local-untrusted; signed=false; independent=false	NUM metadata only

BOUNDARY. A signature binds an identity/key to bytes under a verification procedure. It does not prove algorithm correctness, theorem truth, or physical validity. No SLSA level is claimed.

Audit of KLT Packages

T3-LOC-110 · source: tom3_v0_14.docx · Section 7

T3-TBL-078 · archive audit

Archive	Entries	Distinct timestamps	Lockfiles	SHA-256 prefix
KLT 4.14	73	14	none	5d48e7ce184527fb...
KLT 5.1	81	25	none	d373e55bab5e63fa...
KLT6 root v50	36	4	none	0854a90a12148620...
KLT2 v63	37	15	none	748513c418e5ba8c...
Android release v4.80	22	7	none	36412edaa2276bf8...

- The two KLT 4.14 archive copies are byte-identical.
- The two KLT 5.1 archive copies are byte-identical.
- No pubspec.lock was found in KLT 4.14 or 5.1; Flutter resolution is not frozen.
- KLT 4.14 uses eight lower bounds >= without exact versions or hashes.
- KLT2 v63 has a file manifest but no digest per entry.
- klt6_root_v50 has no unified environment/dependency lock.

AUDIT BOUNDARY. The audit describes the supplied archives only. It does not claim that no separate repository or CI environment contains additional lockfiles.

Manifest Blocker v4.80

T3-LOC-111 · source: tom3_v0_14.docx · Section 8

RESULT. 17 records; 16 verified; 1 mismatch; verdict ABSTAIN-MANIFEST until repaired.

T3-TBL-079 · mismatch record

Object	Declared	Observed	Status
KLT_v4_80_FINAL_INTERNAL_RELEASE_CLOSURE_DELIVERY_MANIFEST.csv	MANIFEST_v4_80.json declares bytes=0 and empty-file SHA-256	archive contains 2620 bytes and a different SHA-256	OPEN BLOCKER
Other 16 records	size and SHA-256 match	local integrity confirmed	PASS-LOCAL

The mismatch is not silently repaired. A new MANIFEST_v4_80.json or a new delivery manifest with consistent bytes and digest is required.

T3-TBL-080 · archive hash map

Archive	SHA-256
KLT 4.14	5d48e7ce184527fb7650ba5f5cd0ad33196d05d36f3b962f22d8a2bdbbcaefa6
KLT 5.1	d373e55bab5e63fa4c5b68688527efd6b53d30b2f71e8182716004b290f999fe
KLT6 v50	0854a90a12148620bff7e4e4cf2bd56e773692d36d9e1cc6480b7879db330e1a
KLT2 v63	748513c418e5ba8c89a8a5b931f161230f82e5be2dc95afba03aa6decb4feda7
release v4.80	36412edaa2276bf82a3b0146b49746dde0c310f1ad5d71df89d915351ac56763

Reproducibility Certificate

T3-LOC-112 · source: tom3_v0_14.docx · Section 9

CERTIFICATE. seed=20260726; 20 test families; 20000/20000 passed; capsule SHA-256 d9edc37c9884ff6fb0c7665acf36bbf38e227c082a2bd6b402bb54977c3b3518.

T3-TBL-081 · selected certificate checks

ID	Check	Result
C01	Canonical JSON independent of insertion order	1000/1000
C02	Bit-for-bit identical capsule across roots/source order	1000/1000
C03	Stable artifact SHA-256	1000/1000
C04	Timestamp variance changes naive ZIP bytes	1000/1000
C05	Stable lexical member order	1000/1000
C06	Path normalization without root escape	1000/1000
C07	Path traversal rejected	1000/1000
C08	Non-finite floats rejected	1000/1000
C09	One-byte tampering changes digest	1000/1000
C10	Embedded manifest verifies all entries	1000/1000

STATUS. All results are NUM/PROP in the declared synthetic carrier. They are not an independent EXT-RUN.

Independent Rerun Protocol

T3-LOC-113 · source: tom3_v0_14.docx · Section 10

Figure T3-FIG-050. Independence appears only after crossing the trust boundary.

T3-TBL-082 · EXT-RUN sequence

Step	Action	Output
ER-1	obtain capsule and source snapshot from immutable channel	input hashes
ER-2	verify SHA256SUMS and subject digest before unpacking	verification log
ER-3	deploy a clean VM/container from environment lock	environment digest
ER-4	install only authorized dependency artifacts	dependency receipt
ER-5	run the frozen command without author consultation	stdout/stderr hashes
ER-6	compare bytes and semantic test vectors	verdict
ER-7	sign rerun receipt and publish builder identity	signed receipt
ER-8	on divergence preserve both artifacts and diff report	blocker / change-set

RECEIPT CONTRACT. R_ext=(runner_id,independence_statement,input_hashes,env_digest,commands,outputs,verdict,signature,timestamp). If R_ext is absent, EXT-RUN remains OPEN.

Chapter 23. Ontology, Epistemology, and Phenomenology of Physical Knowledge

T3-CH-23 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7
RU source: T3-FREEZE-v1.0 · T3-LOC-114–116 · cross-cutting source and checkpoint T3-END2END-v0.15

Accessible Introduction

T3-EXPL-23 · translated explanatory block

CENTRAL QUESTION	How can the objects of Volume III be interpreted philosophically without allowing ontology or phenomenology to replace proof and measurement?
PLAIN MEANING	The chapter separates what a model treats as existing, how it is known, how it appears to an observer, and which physical meaning is only hypothesized.
MINIMAL EXAMPLE	One formula may be THM as a model identity, MODEL as a chosen dynamical equation, and PHY-HYP as a claim about nature. Every layer change needs a new certificate.
ONTOLOGY	Ontological status concerns the object type inside a declared model, not automatic existence in nature.
EPISTEMOLOGY	Sources of knowledge are separated into proof, computation, measurement, model assumption, and open question.
PHENOMENOLOGY	Appearance is determined by the observer interface, instrument, coordinates, and reconstruction limits.
PHYSICAL MEANING	The philosophical layer explains why one mathematical carrier may admit several physical interpretations and how a testable one is selected.
LIMITATION	Philosophical persuasiveness does not promote truth status, close Dom, or replace independent replication.
AUTHORIAL NOVELTY	The authorial contribution is the systematic inclusion of ontological, epistemological, and phenomenological passports in KLT-RBD.
CHAPTER ROUTE	Key nodes are reread through evidence boundaries. Chapter 24 composes them into one operator and publication gate.

CHAPTER STATUS. All THM/PROP/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/OPEN/REFUTED/ABSTAIN labels are inherited from the frozen Russian master. Translation creates no status promotion.

Map of Authorial Concepts

T3-LOC-114 · source: tom3_v0_1.docx · Section 8
T3-TBL-083 · authorial concepts and prior-art boundary

Concept	Function	Authorial component	Boundary
KURPISHEV LOGIC 2	project architecture	authorial programme	no priority claim over classical components
KLT-RBD / RPD	Reper computational memory and proof graph	authorial composition	knowledge graphs/databases are prior art
NAPG	packet-Reper nonassociative geometry	authorial architecture	nonassociative algebra/deformation theory are prior art

Concept	Function	Authorial component	Boundary
V*P / Time*Space	time as primary packet support; space as admissible section	authorial bridge	GR and Lorentz geometry are prior art
Reper(R,I,U;D)	typed quadruple with sufficient foundation	authorial typing	cross-ratio is prior art
D/Dom barrier	no truth status without domain and foundation	authorial proof firewall	domain conditions are general mathematics
Desargues–Kurpishev	construction of a fourth support point	authorial line	classical Desargues theorem not reattributed
PN.2	minimax structural uncertainty in fixed model	authorial theorem architecture	Robertson–Heisenberg is distinct
Ξ, Δ, Υ	change/action/reversal triad	authorial architecture	general evolution operators are prior art
PredRep	constrained Reper reconstruction	authorial composition	stochastic analysis/causal inference are prior art

Map of Classical Prior Art

T3-LOC-115 · source: tom3_v0_1.docx · Section 9

T3-TBL-084 · selected classical prior art

ID	Source	Identifier	Role
GR-01	A. Einstein, general relativity (1916)	DOI 10.1002/andp.19163540702	field geometry and covariance
CAUS-01	Hawking & Ellis (1973)	Cambridge University Press	causal structure and singularities
STRAT-01	Goresky & MacPherson (1988)	Springer Ergebnisse 14	standard stratified envelope
HODGE-01	W. V. D. Hodge (1941)	Cambridge University Press	Hodge theory
G2-01	R. L. Bryant (1987)	DOI 10.2307/1971360	G_2 geometry
NONASSOC-01	J. C. Baez, The Octonions (2002)	DOI 10.1090/S0273-0979-01-00934-X	comparison
VAR-01	E. Noether (1918)	EuDML 59024; no DOI	variational symmetries
COSMO-01	A. Friedmann (1922)	DOI 10.1007/BF01332580	homogeneous cosmology
PERT-01	Mukhanov–Feldman–Brandenberger (1992)	DOI 10.1016/0370-1573(92)90044-Z	cosmological perturbations
MART-01	Stroock & Varadhan (1979)	Springer	martingale problems
LDP-01	Freidlin & Wentzell, 3rd ed. (2012)	DOI 10.1007/978-3-642-25847-3	large deviations / metastability
CAUSINF-01	J. Pearl, Causality, 2nd ed. (2009)	Cambridge University Press	causal inference
REPRO-01	Wilkinson et al. FAIR (2016)	DOI 10.1038/sdata.2016.18	data stewardship
OBS-PLANCK	Planck Collaboration VI (2020)	DOI 10.1051/0004-6361/201833910	empirical baseline
OBS-DESI	DESI Data Release 1	official DR1, released 19 Mar 2025	spectra/redshift data
OBS-EUCLID	Euclid Q1	official Q1 documentation	catalogues and masks

BIBLIOGRAPHIC BLOCKER. A full source-card pass across all external directions remains separate. Unverified DOI and page fields must not be filled from memory.

Cross-Cutting Philosophical Interpretation

T3-LOC-116 · source: tom3_v0_15.docx · Section 10

Ontological result

A physical object is not identified with a database record. It is represented by a sequence: mathematical carrier, model state, observational image, and documented evidence object. The end-to-end operator preserves these distinctions.

Epistemological result

Knowledge has an address: a proof belongs to a theorem and Dom; computation to code and environment; measurement to apparatus and protocol; causal interpretation to a separate bridge. The publication gate blocks transfer between addresses without a proof object.

Phenomenological result

For an observer the theory appears as distinguishable modes: proved formula, model trajectory, forecast range, refusal to conclude, or empirical observation. ABSTAIN is a positive phenomenon of discipline, not an absence of result.

Authorial boundary

Classical theories supply modules. Kurpishev's authorial architecture connects them through Reper(R,I,U;D), the D/Dom barrier, packet transitions, blocker-safe KLT-RBD memory, and a nonscalar publication gate.

Chapter 24. End-to-End Physical Operator, Conclusion Boundaries, and Publication Gate

T3-CH-24 · stable identifier preserved · English derivative T3-EN-FREEZE-CANDIDATE-v0.7

RU source: T3-FREEZE-v1.0 · T3-LOC-117–126 · source checkpoint T3-END2END-v0.15

Accessible Introduction

T3-EXPL-24 · translated explanatory block

CENTRAL QUESTION	How can all partial modules of Volume III be composed while preserving types, branching, blockers, and weakest-link status?
PLAIN MEANING	The final route is a graph of compatible partial operators. It publishes only the result class supported by every mandatory link.
MINIMAL EXAMPLE	Even with THM mathematics and NUM reproducibility, absence of an observational adapter or EXT-RUN leaves the physical verdict ABSTAIN.
ONTOLOGY	The objects are a typed graph G_T3, routes ρ, partial compositions Φ_ρ, set-valued branches, a status product, and publication gates.
EPISTEMOLOGY	Soundness follows from local contracts and compatible composition; the output status is the componentwise meet.
PHENOMENOLOGY	The reader receives an end-to-end map: source → model → reconstruction → observable → certificate → authorized conclusion.

PHYSICAL MEANING	The operator is a disciplined programme for turning NAPG/V*P hypotheses into testable candidates without claiming a completed theory of everything.
LIMITATION	The monograph is conditionally publication-ready, but the physical gate remains ABSTAIN because independent validation is absent.
AUTHORIAL NOVELTY	The authorial contribution is the blocker-safe synthesis NAPG→V*P→PredRep→Obs→KLT-RBD with channelwise status and publication firewall.
CHAPTER ROUTE	Module graph and soundness are followed by weakest-link and branch semantics, then the publication gate. Appendices will freeze T3-PO, blockers, sources, and manifest.

CHAPTER STATUS. All THM/PROP/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/OPEN/REFUTED/ABSTAIN labels are inherited from the frozen Russian master. Translation creates no status promotion.

Module Graph

T3-LOC-117 · source: tom3_v0_15.docx · Section 2

A single linear chain would be incorrect because some branches are alternatives or optional, and the observational and preregistration paths have different domains. Volume III therefore uses a finite directed acyclic graph.

T3-EQ-0152 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$G\_T3 = (M, E, \mathrm{Dom}, \mathrm{Cod}, \mathrm{Gate}, \mathrm{Status}, \mathrm{Provenance}).$$

Figure T3-FIG-051. Typed DAG of the end-to-end Volume III operator.

T3-TBL-085 · module-interface registry

Module	Dom	Cod	Current status
I_12	Volumes I–II freeze	CanonicalImport	THM / FROZEN
VP	CanonicalImport	VPState	MODEL / local PROP
Op	VPState	VPTransition	PARTIAL-CLOSED
Caus	VPTransition	CausalPacket	MODEL / NUM
Br	CausalPacket	PhysGeom	COND
Var	PhysGeom	FlowPacket	COND-THM
Iso	FlowPacket	ReducedCosmo	MODEL / THM reduction
PN2	ModelState	HypothesisPacket	THM abstract / PHY-HYP
Pred	model or data packet	CandidateSet / LawFamily	COND / NUM
Rare	LawFamily	RareEventPacket	COND / NUM
Obs	Model/CandidateSet	ObservablePacket	MODEL / EMP-PLAN
RBD	Scientific packet	RBDRecord	DEF-A / NUM
Cert	RBDRecord	CertifiedRecord	NUM / LOCAL
PubGate	CertifiedRecord	GateVerdict	DEF-A / AUDIT

End-to-End Operator

T3-LOC-118 · source: tom3_v0_15.docx · Section 3

Definition T3-END2END-1 [DEF]. A route ρ is a finite sequence $m_i:X_i \to X_{i+1}$. It is admissible when $Cod(m_i)$ is compatible with $Dom(m_{i+1})$, all mandatory inputs exist, and every local Gate returns PASS.

T3-EQ-0153 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\rho = (m_1, \ldots, m_k), \qquad \Phi_\rho = m_k \circ \ldots \circ m_1.$$

T3-EQ-0154 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$Dom(\Phi_\rho) = \{x \in Dom(m_1) : m_i \ldots m_1(x) \in Dom(m_{i+1}) \text{ for all } i\}.$$

Theorem T3-END2END-2 [THM-FINITE]. If every m_i is correct on its Dom, each postcondition satisfies the next precondition, and mandatory blocker sets are empty, then Φ_ρ is correct on $Dom(\Phi_\rho)$. Otherwise the blocker-safe extension returns ABSTAIN with the first break locator.

Proof. Induct on route length. The base k=1 is local soundness. At $k \to k+1$ the first k postcondition supplies the final input. Type, domain, or gate mismatch makes the composition undefined; by definition its blocker-safe extension returns ABSTAIN. □

T3-EQ-0155 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\Phi(x) = \{ \Phi_{\rho_j}(x) : j \in J_{adm}(x) \}.$$

When several routes are admissible, all compatible branches are retained. Selecting one silently is prohibited without a selector contract.

Weakest-Link Status

T3-LOC-119 · source: tom3_v0_15.docx · Section 4

T3-EQ-0156 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$S_{T3} = S_{math} \times S_{model} \times S_{num} \times S_{emp} \times S_{repro} \times S_{legal}.$$

Figure T3-FIG-052. Componentwise weakest-link transfer of status.

Proposition T3-END2END-3 [PROP]. For an admissible route,

T3-EQ-0157 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$S(\Phi_\rho(x)) = \mathrm{meet}_{i=1..k}\, S(m_i; x).$$

T3-EQ-0158 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\text{THM} \not\Rightarrow \text{EMP-OBS}, \qquad \text{NUM} \not\Rightarrow \text{EXT-RUN}, \qquad \text{REGISTERED} \not\Rightarrow \text{THM}.$$

Proof. The componentwise meet is not greater than any operand in the same coordinate. Different evidence channels are incomparable, so cross-channel promotion is impossible. □

Blocker Propagation

T3-LOC-120 · source: tom3_v0_15.docx · Section 5

T3-EQ-0159 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$B_\rho(x) = \bigcup_i B_i(x).$$

T3-EQ-0160 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$B_\rho^{mandatory}(x) \neq \emptyset \;\Rightarrow\; \Phi_\rho(x) = \text{ABSTAIN}.$$

Proposition T3-END2END-4 [PROP]. A mandatory blocker is inherited by every downstream object until a new version explicitly closes it with a proof object, repair, or independent observation. Deleting the node is not closure.

T3-TBL-086 · ABSTAIN codes

Code	Condition	Authorized action
ABSTAIN-TYPE	previous Cod not in next Dom	repair interface or select another route
ABSTAIN-DOM	domain not declared	fill Dom and verify closure
ABSTAIN-D	insufficient foundation D	add source/proof/measurement object

Code	Condition	Authorized action
ABSTAIN-BRIDGE	bridge map unproved	retain conditional status or prove bridge
ABSTAIN-IDENT	nonidentifiable branch silently scalarized	return set or quotient class
ABSTAIN-EMP	no EMP-OBS or EXT-RUN	limit claim to EMP-PLAN
ABSTAIN-MANIFEST	hashes or package composition disagree	issue explicit change-set

Route Families

T3-LOC-121 · source: tom3_v0_15.docx · Section 6

T3-TBL-087 · route families

Route	Path	Authorized output	Status
R-GEOM	I–II → VP → Br → Var → Iso	reduced physical-geometric MODEL	COND
R-OBS	R-GEOM → Obs	H(z), distances, likelihood inputs	EMP-PLAN
R-PN2	PN.2 → F-1–F-14 → protocol	preregistration card	EMP-PLAN
R-PRED	PredRep → StochPredRep → Rare	set-valued trajectories and risks	COND / NUM
R-RBD	Source → Reper → proof/blocker → candidate	certified memory record	DEF-A / NUM
R-CERT	R-RBD → deterministic build → receipt	LOCAL reproducibility verdict	NUM / LOCAL
R-PUB	any certified route → PubGate	PUBLISH-* or ABSTAIN	AUDIT

Lemma T3-END2END-5 [PROP]. At branch merge, the result status is the meet of branch statuses and the blocker list is the union of mandatory blockers. A strong branch cannot mask a weak one.

Publication Gate

T3-LOC-122 · source: tom3_v0_15.docx · Section 7

The publication gate does not select truth; it selects the strongest wording permitted by the current evidence passport. A record may be publishable as a model or numerical result while blocked as an empirical conclusion.

Figure T3-FIG-053. Publication targets and authorized verdicts.

$$\mathrm{PubGate}(z,\mathrm{target})\in\{\mathrm{PUBLISH\text{-}MATH},\mathrm{PUBLISH\text{-}MODEL},\mathrm{PUBLISH\text{-}NUM},\mathrm{PUBLISH\text{-}EMP\text{-}PLAN},\mathrm{PUBLISH\text{-}EMP},\mathrm{ABSTAIN}\}.$$

T3-TBL-088 · publication targets

Target	Minimum obligations	Forbidden substitution
MATH	PROP/THM, Dom, proof, counterexamples	COND or NUM as THM
MODEL	explicit axioms, bridge status, units, boundaries	MODEL as physical law
NUM	code, inputs, environment, LOCAL rerun	NUM as EXT-RUN
EMP-PLAN	frozen protocol, null, effect, exclusions	plan as obtained result

Target	Minimum obligations	Forbidden substitution
EMP	EMP-OBS, systematics, multiplicity, EXT-RUN	one internal run as confirmation
MONOGRAPH	all statuses and OPEN items listed	editorial readiness as physical validation

T3-EQ-0161 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\text{Gate\_T3\^{}monograph} = \text{CONDITIONAL-PUBLICATION-READY.}$$

T3-EQ-0162 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\text{Gate\_T3\^{}physical} = \text{ABSTAIN.}$$

Figure T3-FIG-054. Current integrated verdict of the Volume III operator.

Integration Certificate

`T3-LOC-123 · source: tom3_v0_15.docx · Section 8`

Synthetic certificate T3-END2END-NUM-001 checks route semantics and checkpoint-manifest integrity. No physical or observational data were created or analysed.

T3-EQ-0163 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\text{seed} = 20260727, \quad \text{24 test families}, \quad \text{1000 trials per family.}$$

T3-EQ-0164 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$\text{result} = 24000 / 24000.$$

`T3-TBL-089 · integration checks`

Group	Content	Result
Types and Dom	compatible route, mismatch, mandatory omission, optional branch	PASS
Blockers	mandatory blocker → ABSTAIN; optional retained	PASS
Statuses	meet, empirical/reproducibility/legal firewalls	PASS
Publication gate	MATH/MODEL/NUM/EMP-PLAN/EMP and REFUTED cases	PASS
Multiplicity	CandidateSet, branch merge, empty set → ABSTAIN	PASS
Provenance	canonical receipt, mutation detection, one digest/module	PASS
Checkpoint corpus	SHA-256 of releases v0.1–v0.14	PASS

T3-EQ-0165 · mathematical-content parity synchronized with T3-FREEZE-v1.0

$$(\text{math=COND, model=MODEL, num=NUM, emp=EMP-PLAN, repro=LOCAL, legal=REGISTERED}).$$

The publication gate is CONDITIONAL-PUBLICATION-READY, the physical gate ABSTAIN, and the certificate status NUM rather than EXT-RUN or EMP-OBS.

Manifest of Prior Checkpoints

`T3-LOC-124 · source: tom3_v0_15.docx · Section 9`

`T3-TBL-090 · checkpoint manifest`

Release	Subject	Pages	PDF SHA-256 prefix
v0.1	source map and skeleton	18	48d50653a070...

Release	Subject	Pages	PDF SHA-256 prefix
v0.2	notation lock and Definition Core	16	f77496265192...
v0.3	V*P and stratified time	13	990daeabded7...
v0.4	Reper, T_cs, CGI	13	b227b9bad012...
v0.5	NAPG → PhysGeom bridge	13	69312c902980...
v0.6	variational principle and arrow	13	bb6c4aac7275...
v0.7	isotropic reduction	11	934649f1429f...
v0.8	observational adapters	10	4d158363f772...
v0.9	PN.2 and EXT-RUN-000/F12	11	99f4315a0e3f...
v0.10	deterministic PredRep	11	83a35957b9da...
v0.11	stochastic PredRep	12	51b4ddfa4814...
v0.12	large deviations / rare events	13	12af9f6c5292...
v0.13	KLT-RBD/RPD schema	16	2b4a8c975291...
v0.14	computational certificates	15	5b17641ed340...

T3-EQ-0166 · mathematical-content parity synchronized with T3-FREEZE-v1.0

Total checkpoint corpus v0.1-v0.14 = 185 pages.

The combined control container tom3_v01_v014.pdf has SHA-256 473424067df2014404dba7e20cc3544fb05a0c1fdc0b8f652dd06fbccd2bc5bb. It does not replace the individual versions.

Final Evidence Boundary

T3-LOC-125 · source: tom3_v0_15.docx · Section 11

T3-TBL-091 · proved and unproved layers

Layer	Fixed result	Status
Route mathematics	typed finite composition and Dom	THM-FINITE
Status discipline	componentwise meet; no cross-channel promotion	PROP
Blocker semantics	mandatory blocker propagates to ABSTAIN	PROP
Integration code	24000/24000 synthetic checks	NUM
Checkpoint integrity	14 PDF hashes and 185 pages confirmed	NUM-AUDIT
Physical bridge	complete NAPG → V*P → observable link	OPEN/COND
PN.2/F-1–F-14	physical realizations and effects	PHY-HYP
EXT-RUN	independent run	OPEN
EMP-OBS	independent observation	ABSENT
Physical validation	universal or cosmological law	NOT VALIDATED

CONCLUSION BOUNDARY. T3-END2END proves soundness of the formal integration layer only in the declared finite model. It does not prove physical existence of V*P, truth of F-1–F-14, or observational adequacy of packet cosmology.

Publication Plan

T3-LOC-126 · source: tom3_v0_15.docx · Section 15

T3-TBL-092 · publication sequence

Checkpoint	Task	Prohibition
T3-ASSEMBLY-v0.16	assemble 24 chapters, appendices, T3-PO, bibliography	no silent status/formula changes
T3-QA-v0.17	audit notation, cross-references, sources, figures, formulas, page map	no OPEN closure without proof object
T3-FREEZE-v1.0	freeze Russian authorial master and manifest	no physical-validation claim
T3-EN / T3-ZH	translations after RU freeze and glossary lock	no translation of unstable notation

Appendix A. Unified T3-PO Evidence-Obligation Register

T3-EN-APP-A · canonical IDs and statuses imported from T3-FREEZE-v1.0 · truth_layer_promotion=0

READING RULE. CLOSED in an editorial, model, or numerical channel does not close a separate physical or empirical channel. The register must be read componentwise.

A.1. T3-PO register 1–52

ID	Obligation	Current status	Scope note	Last source
T3-PO-001	Canonical import of Volumes I–II	PARTIAL-CLOSED	Available masters are hashed; the global legacy manifest remains open	tom3_v0_2.docx
T3-PO-002	Freeze manifest and non-overwrite rule	CLOSED	T3-CS-001–006; separate v0.2 release	tom3_v0_2.docx
T3-PO-003	Notation collision ledger	CLOSED	NTL-001–030 and the collision matrix	tom3_v0_2.docx
T3-PO-004	Carrier/state space V*P	CLOSED-MODEL	X_VP and the local fibre are defined; physical realization OPEN	tom3_v0_3.docx
T3-PO-005	Standard stratified envelope	CLOSED-MATH	T_str imported and typed	tom3_v0_3.docx
T3-PO-006	Space as an admissible section	PARTIAL-CLOSED	Local nonemptiness and Dev; global gluing OPEN	tom3_v0_3.docx
T3-PO-007	Ξ, Δ_act, Y	PARTIAL-CLOSED	Local models; global dynamics OPEN	tom3_v0_3.docx
T3-PO-008	Preservation of D/Dom	CLOSED-PROP+	Dynamic transport theorem; empirical validity OPEN	tom3_v0_4.docx
T3-PO-009	T_cs and CGI	OPEN	Notation slots only	tom3_v0_2.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-010	NAPG→PhysGeom bridge	PARTIAL-CLOSED	Br_alg closed on octonionic sector; Br_phys OPEN	tom3_v0_5.docx
T3-PO-011	Hodge/G_2 realization	CLOSED-ALG/COND-GEOM	φ,ψ,q exact; smooth lift conditional	tom3_v0_5.docx
T3-PO-012	Bridge functor and morphisms	CLOSED-GROUPOID	Norm-preserving octonion isomorphisms only	tom3_v0_5.docx
T3-PO-013	Associator geometric channel	PARTIAL-CLOSED	Ass→Λ^4 closed; Ass→Tor/Curv OPEN	tom3_v0_5.docx
T3-PO-014	Separation Ass/Tor/Curv/Hol	CLOSED-NEG	No automatic identifications	tom3_v0_5.docx
T3-PO-015	Variational principle and first variation	PARTIAL-CLOSED	finite-dimensional smooth sector	tom3_v0_6.docx
T3-PO-016	Reduced isotropic cosmology	PARTIAL-CLOSED / MODEL		tom3_v0_7.docx
T3-PO-017	PN.2 in the physical interface	CLOSED-IMPORT / PHY OPEN		tom3_v0_9.docx
T3-PO-018	Deterministic PredRep	PARTIAL-CLOSED / COND	Types, set-valued inverse, and gates are specified; real physical M is absent	tom3_v0_10.docx
T3-PO-019	Stochastic PredRep	PARTIAL-CLOSED / COND	Types, family of laws, and gates are specified; physical stochastic carrier is absent	tom3_v0_11.docx
T3-PO-020	Rare transitions and metastability	PARTIAL-CLOSED / COND	Mathematical carrier constructed; physical bridge OPEN	tom3_v0_12.docx
T3-PO-021	Observational adapters	PARTIAL	Obs contract defined; real adapters OPEN	tom3_v0_2.docx
T3-PO-022	F-1–F-14 matrix and testability	CLOSED-PLAN		tom3_v0_9.docx
T3-PO-023	independent EXT-RUN	OPEN		tom3_v0_9.docx
T3-PO-024	KLT-RBD/RPD as computational memory of physics	PARTIAL-CLOSED / DEF-A		tom3_v0_13.docx
T3-PO-025	computational certificates and reproducibility	PARTIAL-CLOSED / NUM		tom3_v0_14.docx
T3-PO-026	Epistemic firewall	CLOSED-PROP	PROP T3-CORE-1	tom3_v0_2.docx
T3-PO-027	End-to-end status soundness	PARTIAL	Compositional PROP; physical modules OPEN	tom3_v0_2.docx
T3-PO-028	Epistemic status propagation	PROP	Status lattice theorem	tom3_v0_1.docx
T3-PO-029	End-to-end soundness	COND	Composition theorem	tom3_v0_1.docx
T3-PO-030	Publication/legal gate	CLOSED-SPEC	Registration does not prove truth	tom3_v0_2.docx
T3-PO-031	Stability of import IDs	OPEN	outside the scope of v0.3	tom3_v0_3.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-032	Nonempty class of V*P sections	CLOSED-LOCAL	PROP T3-VP-2	tom3_v0_3.docx
T3-PO-033	Construct Br preserving D/Dom and obstructions	OPEN		tom3_v0_2.docx
T3-PO-034	Local existence of Ξ	CLOSED-FINITE-DIM	from v0.3; retained	tom3_v0_6.docx
T3-PO-035	Typing of Δ_act	CLOSED-MODEL	T3-VP-008	tom3_v0_3.docx
T3-PO-036	Y	PARTIAL	energy-reducing property is not general	tom3_v0_6.docx
T3-PO-037	Bundle E_cs and the type of T_cs	CLOSED-MATH/ MODEL	Direct-sum carrier defined	tom3_v0_4.docx
T3-PO-038	Operationalization of CGI	CLOSED-MODEL	Dimensionless formula and hard gates; calibration OPEN	tom3_v0_4.docx
T3-PO-039	First observational adapter	OPEN	no model-to-data map	tom3_v0_3.docx
T3-PO-040	Soundness PredRep	OPEN	downstream	tom3_v0_3.docx
T3-PO-041	Global gluing V*P-sections	OPEN	requires a sheaf/stack theorem and obstruction analysis	tom3_v0_3.docx
T3-PO-042	Topology-changing layers	OPEN	groupoid/stack sector not constructed	tom3_v0_3.docx
T3-PO-043	Field equations on X_VP	OPEN	v0.3 specifies kinematics, not dynamics	tom3_v0_3.docx
T3-PO-044	Global hyperbolicity of reductions	OPEN	causal hypotheses are required	tom3_v0_3.docx
T3-PO-045	Physical units	PARTIAL-CLOSED	Unit discipline closed; assignment of channels to data OPEN	tom3_v0_4.docx
T3-PO-046	Reference scales s_j	OPEN	preregistered data/estimators are required	tom3_v0_4.docx
T3-PO-047	Weights and thresholds	OPEN	statistical calibration is required	tom3_v0_4.docx
T3-PO-048	Map Ass→E_cs	PARTIAL	J_Ass lands in Λ^4; differential map to E_cs not built	tom3_v0_5.docx
T3-PO-049	Relation of CGI to Lorentz causality	OPEN	a separate physical bridge is required	tom3_v0_4.docx
T3-PO-050	Field equations for T_cs	OPEN	Kinematics does not define dynamics	tom3_v0_4.docx
T3-PO-051	Identifiability of CGI channels	OPEN	Obs and data are required	tom3_v0_4.docx
T3-PO-052	Independent EXT-RUN	OPEN	Not executed	tom3_v0_4.docx

A.2. T3-PO register 53–104

ID	Obligation	Current status	Scope note	Last source
T3-PO-053	Repaired differential family	OPEN	not closed by the variational layer	tom3_v0_6.docx
T3-PO-054	Smooth octonion bundle lift	OPEN/COND	Need transition cocycle and soldering	tom3_v0_5.docx
T3-PO-055	Lorentzian reduction	OPEN	G_2 Riemannian carrier is not spacetime	tom3_v0_5.docx
T3-PO-056	Bridge observables	OPEN	No measurement adapter	tom3_v0_5.docx
T3-PO-057	Independent bridge reproduction	OPEN	EXT-RUN not executed	tom3_v0_5.docx
T3-PO-058	First variation + boundary terms	CLOSED-THM	new	tom3_v0_6.docx
T3-PO-059	Hybrid jump monotonicity	COND	new	tom3_v0_6.docx
T3-PO-060	Legacy α Lyapunov claim	REFUTED variant	new negative result	tom3_v0_6.docx
T3-PO-061	Infinite-dimensional action manifold	OPEN	new blocker	tom3_v0_6.docx
T3-PO-062	G_2 functional identity on repaired family	OPEN	new blocker	tom3_v0_6.docx
T3-PO-063	Prove/verify preservation under repaired dynamics	T3-PO-063		tom3_v0_6.docx
T3-PO-064	Thermodynamic/ entropy bridge	OPEN	new blocker	tom3_v0_6.docx
T3-PO-065	Define symmetry datum and group action	CLOSED-MODEL		tom3_v0_7.docx
T3-PO-066	Construct P_iso and the invariant sector	CLOSED-PROP		tom3_v0_7.docx
T3-PO-067	Prove preservation under equivariant flow	CLOSED-THM		tom3_v0_7.docx
T3-PO-068	Verify symmetric criticality for the selected action	OPEN/COND		tom3_v0_7.docx
T3-PO-069	Scalarize FLRW geometry	CLOSED-PROP		tom3_v0_7.docx
T3-PO-070	Specify C_pack and field equations from the upstream theory	OPEN		tom3_v0_7.docx
T3-PO-071	Prove the generalized conservation/exchange law	OPEN		tom3_v0_7.docx
T3-PO-072	Close the constitutive system	OPEN		tom3_v0_7.docx
T3-PO-073	Construct the perturbation sector	OPEN		tom3_v0_7.docx
T3-PO-074	H(z), D_L, μ adapter	PARTIAL-CLOSED / MODEL		tom3_v0_8.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-075	likelihood and identifiability	PARTIAL-CLOSED		tom3_v0_8.docx
T3-PO-076	independent EXT-RUN	OPEN		tom3_v0_9.docx
T3-PO-077	redshift bridge V*P → photon clock	OPEN		tom3_v0_8.docx
T3-PO-078	distance-duality assumptions	CLOSED-COND		tom3_v0_8.docx
T3-PO-079	SN nuisance degeneracy	CLOSED-PROP		tom3_v0_8.docx
T3-PO-080	BAO scale degeneracy	CLOSED-PROP		tom3_v0_8.docx
T3-PO-081	dataset provenance and licensing	PARTIAL-CLOSED		tom3_v0_8.docx
T3-PO-082	full covariance ingestion	OPEN		tom3_v0_8.docx
T3-PO-083	global identifiability of V*P parameters	OPEN		tom3_v0_8.docx
T3-PO-084	multiple-comparison control	OPEN		tom3_v0_8.docx
T3-PO-085	frozen observational preregistration	PARTIAL: hypothesis selected		tom3_v0_9.docx
T3-PO-086	canonical import of PN.2-S/R/K	CLOSED-THM		tom3_v0_9.docx
T3-PO-087	status non-transfer theorem	CLOSED-PROP		tom3_v0_9.docx
T3-PO-088	canonical hash of F-1–F-14	CLOSED-CERT		tom3_v0_9.docx
T3-PO-089	selection of the first test	CLOSED-DECISION: F-12		tom3_v0_9.docx
T3-PO-090	physical map Φ and K_phys for F-12	OPEN		tom3_v0_9.docx
T3-PO-091	δ_min, σ_d, power and sample size	OPEN		tom3_v0_9.docx
T3-PO-092	independent executor	OPEN		tom3_v0_9.docx
T3-PO-093	code/data/container hashes	OPEN		tom3_v0_9.docx
T3-PO-094	V3 freeze	OPEN		tom3_v0_9.docx
T3-PO-095	V4 blind run	OPEN		tom3_v0_9.docx
T3-PO-096	V5 replication	OPEN		tom3_v0_9.docx
T3-PO-097	V6 limited-conclusion rule	CLOSED-RULE		tom3_v0_9.docx
T3-PO-098	State/data spaces and partial M	CLOSED-MODEL	Finite-dimensional/ metric interface	tom3_v0_10.docx
T3-PO-099	Compactness and closed graph of C	CLOSED-THM	For compact X with continuity/lsc/closed gates	tom3_v0_10.docx
T3-PO-100	Quantitative identifiability	CLOSED-COND	Requires c_M>0	tom3_v0_10.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-101	Quotient identifiability	PARTIAL-CLOSED	The symmetry group must be physically specified	tom3_v0_10.docx
T3-PO-102	Stability/error bounds	CLOSED-COND	Only in the quantitative sector	tom3_v0_10.docx
T3-PO-103	Tikhonov selector	CLOSED-MODEL	Not a truth authorization	tom3_v0_10.docx
T3-PO-104	Tie-break contract	CLOSED-ALG	The full candidate set is preserved	tom3_v0_10.docx

A.3. T3-PO register 105–156

ID	Obligation	Current status	Scope note	Last source
T3-PO-105	ABSTAIN gates	CLOSED-PROP	Empty/wide/damaged fibres	tom3_v0_10.docx
T3-PO-106	Reper certificate bundle	PARTIAL-CLOSED	Schema specified; production schema OPEN	tom3_v0_10.docx
T3-PO-107	Evolution composition	PARTIAL-CLOSED	Lipschitz theorem; real E_t OPEN	tom3_v0_10.docx
T3-PO-108	Physical event adapter	OPEN	Requires EMP-OBS and an independent run	tom3_v0_10.docx
T3-PO-109	Independent benchmark	OPEN	No external corpus	tom3_v0_10.docx
T3-PO-110	Filtered space and canonical path space	CLOSED-MODEL	Standard Borel/Skorokhod sectors	tom3_v0_11.docx
T3-PO-111	Kernel-to-path-law construction	CLOSED-THM-IMPORT	Ionescu–Tulcea prior art	tom3_v0_11.docx
T3-PO-112	Martingale-problem definition	CLOSED-DEF	General operator interface	tom3_v0_11.docx
T3-PO-113	Existence/uniqueness finite-state	CLOSED-THM	Generator Q and exp(tQ)	tom3_v0_11.docx
T3-PO-114	General well-posedness	OPEN/COND	Conditions for the V*P generator are required	tom3_v0_11.docx
T3-PO-115	Filtering update and zero-evidence gate	CLOSED-PROP	For a certified likelihood and Z_t>0	tom3_v0_11.docx
T3-PO-116	Aleatoric/epistemic split	CLOSED-PROP	The mixing law must be justified	tom3_v0_11.docx
T3-PO-117	Probability envelopes	CLOSED-PROP	For a nonempty family P	tom3_v0_11.docx
T3-PO-118	Calibration protocol	PARTIAL-CLOSED	Defined; external data are absent	tom3_v0_11.docx
T3-PO-119	Proper-score evaluation	CLOSED-PRIOR	Brier/log-score layer	tom3_v0_11.docx
T3-PO-120	Causal bridge	OPEN	Probability is not promoted to causality	tom3_v0_11.docx
T3-PO-121	Independent stochastic benchmark	OPEN	No external executor/data	tom3_v0_11.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-122	Rare-event interface	PARTIAL-CLOSED	Linked to StochPredRep and the verdict ladder	tom3_v0_12.docx
T3-PO-123	LDP carrier, speed, topology	CLOSED-DEF	A concrete V*P topology is absent	tom3_v0_12.docx
T3-PO-124	Contraction principle	CLOSED-THM-IMPORT	Continuity of every adapter is required	tom3_v0_12.docx
T3-PO-125	Freidlin-Wentzell action	CLOSED-COND	Under standard SDE hypotheses	tom3_v0_12.docx
T3-PO-126	Quasipotential/ instanton set	CLOSED-DEF	Existence/ compactness is model-specific	tom3_v0_12.docx
T3-PO-127	Double-well barrier	CLOSED-MODEL	$\Delta V=1/4$ in the fixed model	tom3_v0_12.docx
T3-PO-128	Exit-time asymptotic	CLOSED-PRIOR / COND	Not a finite-ε bound	tom3_v0_12.docx
T3-PO-129	Nonunique instantons	CLOSED-PROP	Returns SET-PATH	tom3_v0_12.docx
T3-PO-130	Importance-sampling unbiasedness	CLOSED-PROP	Under P restricted to A absolutely continuous with respect to Q and a correct likelihood ratio L	tom3_v0_12.docx
T3-PO-131	Importance efficiency	PARTIAL-CLOSED	Gaussian witness; general V*P OPEN	tom3_v0_12.docx
T3-PO-132	Finite-sample firewall	CLOSED-PROP	Zero count ≠ zero probability	tom3_v0_12.docx
T3-PO-133	Finite-ε remainder	OPEN	Sharp model-specific bounds are required	tom3_v0_12.docx
T3-PO-134	Physical V*P rare-event bridge	OPEN	State, ε, b, σ, A, Obs are absent	tom3_v0_12.docx
T3-PO-135	Independent rare-event benchmark	OPEN	No external executor/data	tom3_v0_12.docx
T3-PO-136	RBD certificate schema	CLOSED-DEF / NUM		tom3_v0_13.docx
T3-PO-137	Source-card and exact locator contract	CLOSED-DEF		tom3_v0_13.docx
T3-PO-138	Typed graph and edge vocabulary	CLOSED-DEF		tom3_v0_13.docx
T3-PO-139	No-loss ingest levels NL0-NL4	PARTIAL-CLOSED; NL3 local		tom3_v0_13.docx
T3-PO-140	Provenance Entity/Activity/Agent profile	CLOSED-MAP		tom3_v0_13.docx
T3-PO-141	Append-only versioning	CLOSED-PROP-SCHEMA		tom3_v0_13.docx
T3-PO-142	Hash and manifest discipline	CLOSED-PROP / COND-CRYPTO		tom3_v0_13.docx
T3-PO-143	Non-scalar status vector	CLOSED-DEF		tom3_v0_13.docx
T3-PO-144	Blocker-safe forecast authorization	CLOSED-PROP-SCHEMA		tom3_v0_13.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-145	Legal/registration firewall	CLOSED-PROP-SCHEMA		tom3_v0_13.docx
T3-PO-146	Backward-compatible migration core	PARTIAL-CLOSED		tom3_v0_13.docx
T3-PO-147	Independent external DB audit	OPEN		tom3_v0_13.docx
T3-PO-148	Digital signature and trusted timestamp	OPEN		tom3_v0_13.docx
T3-PO-149	full reproducibility capsule	CLOSED-LOCAL / NUM		tom3_v0_14.docx
T3-PO-150	deterministic reference build	CLOSED-PROP / NUM		tom3_v0_14.docx
T3-PO-151	environment lock schema	CLOSED-DEF		tom3_v0_14.docx
T3-PO-152	dependency lock for KLT 4.14/5.1	OPEN		tom3_v0_14.docx
T3-PO-153	SBOM export SPDX/CycloneDX	PARTIAL-MAP		tom3_v0_14.docx
T3-PO-154	SLSA/in-toto provenance	PARTIAL: unsigned local		tom3_v0_14.docx
T3-PO-155	artifact signature / trusted timestamp	OPEN		tom3_v0_14.docx
T3-PO-156	independent EXT-RUN receipt	OPEN		tom3_v0_14.docx

A.4. T3-PO register 157–208

ID	Obligation	Current status	Scope note	Last source
T3-PO-157	manifest repair v4.80	OPEN BLOCKER		tom3_v0_14.docx
T3-PO-158	full KLT deterministic build	OPEN		tom3_v0_14.docx
T3-PO-159	End-to-end integration of modules	PARTIAL-CLOSED / NUM		tom3_v0_15.docx
T3-PO-160	Typed signatures and interface registry	CLOSED-DEF		tom3_v0_15.docx
T3-PO-161	Soundness of a finite admissible route	CLOSED-THM		tom3_v0_15.docx
T3-PO-162	Weakest-link status	CLOSED-PROP		tom3_v0_15.docx
T3-PO-163	Mandatory blocker propagation	CLOSED-PROP		tom3_v0_15.docx
T3-PO-164	Publication gate matrix	CLOSED-DEF / AUDIT		tom3_v0_15.docx
T3-PO-165	Current monograph verdict	CLOSED-AUDIT		tom3_v0_15.docx
T3-PO-166	Branch/merge semantics	PARTIAL-CLOSED		tom3_v0_15.docx
T3-PO-167	Checkpoint hash-manifest v0.1-v0.14	CLOSED-NUM		tom3_v0_15.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-168	Assembly of Chapters 1–24 into a unified master	CLOSED-DOC	24 chapters and Appendices A–D	tom3_v0_16.docx
T3-PO-169	End-to-end formulas, figures, and references	PARTIAL-CLOSED	Global locators assigned; semantic cross-reference audit remained open at v0.16	tom3_v0_16.docx
T3-PO-170	Full source-locator audit	PARTIAL-CLOSED	Every imported section received a T3-LOC; exact external pages required the later source pass	tom3_v0_16.docx
T3-PO-171	Independent integration rerun	OPEN		tom3_v0_15.docx
T3-PO-172	Physical validation / EMP-OBS	OPEN		tom3_v0_15.docx
T3-PO-173	RU/EN/ZH terminology lock	OPEN		tom3_v0_15.docx
T3-PO-174	Unified bibliography/source-card ledger	PARTIAL-CLOSED	Source cards unified; DOI/page normalization remained open at v0.16	tom3_v0_16.docx
T3-PO-175	Static contents and chapter locators	CLOSED-DOC	24 chapters and pages fixed after a two-pass build	tom3_v0_16.docx
T3-PO-176	Visual and searchable QA of the unified master	CLOSED-NUM-QA	DOCX/PDF render, text and page audit	tom3_v0_16.docx
T3-PO-177	Explanatory blocks for all 24 chapters	CLOSED-DOC	T3-EXPL-01–T3-EXPL-24; formal statuses unchanged	tom3_v0_17.docx
T3-PO-178	Specification of ontology/epistemology/phenomenology	CLOSED-DOC	Each block is tied to the objects and limitations of its chapter	tom3_v0_17.docx
T3-PO-179	Semantic deduplication of the repeated T_cs cluster	CLOSED-EDIT	The repetition in Chapter 11 was replaced by stable aliases to Chapter 8	tom3_v0_17.docx
T3-PO-180	Cross-reference continuity audit	CLOSED-NUM	T3-CH/LOC/EQ/FIG/TBL sequences are complete and gap-free	tom3_v0_17.docx
T3-PO-181	Formula/figure/table/locator index audit	CLOSED-NUM	166 EQ, 54 FIG, 92 TBL, 126 LOC preserved	tom3_v0_17.docx
T3-PO-182	Bibliography normalization	PARTIAL-CLOSED	Years and DOI/arXiv formatting partly normalized; exact pages required the source pass	tom3_v0_17.docx
T3-PO-183	Exact external source locators	OPEN/PARTIAL	Unchecked pages and versions remained a blocker at v0.17	tom3_v0_17.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-184	Visual/search QA v0.17	CLOSED-NUM-QA	172 pages; DOCX/PDF render, text, page, TOC and locator audit	tom3_v0_17.docx
T3-PO-185	Primary-source metadata audit	CLOSED-AUDIT	81 source cards classified by evidence type and locator quality	tom3_v0_18.docx
T3-PO-186	DOI/arXiv/official-ID normalization	CLOSED-AUDIT	Detected erroneous or incomplete records corrected; the false Noether DOI removed	tom3_v0_18.docx
T3-PO-187	Exact page/formula locator completeness	CLOSED-SCOPE	All formula/protocol imports received exact section/page/file locators; general prior art remains bibliographic	tom3_v0_19.docx
T3-PO-188	Current observational-source check	CLOSED-CURRENT	DESI DR1/DR2, Euclid Q1, and Pantheon+ checked as of 27 July 2026	tom3_v0_18.docx
T3-PO-189	Standards version lock	CLOSED-SNAPSHOT	9 normalized immutable snapshots with SHA-256; raw external services remain independently re-fetchable	tom3_v0_19.docx
T3-PO-190	Source-to-claim matrix 24 chapters	CLOSED-DOC	Each chapter is linked to a primary/internal source set and a source role	tom3_v0_18.docx
T3-PO-191	RU bibliography/source-card ledger freeze	CLOSED-RU-LEDGER	Russian source-card ledger fixed for the freeze candidate	tom3_v0_19.docx
T3-PO-192	Freeze-candidate decision	ACCEPTED-CANDIDATE	RU FREEZE-CANDIDATE ACCEPTED; final frozen release is next version	tom3_v0_19.docx
T3-PO-193	Normalized source snapshot manifest	CLOSED-SNAPSHOT	9 snapshots; canonical URL, access date, byte count and SHA-256	tom3_v0_19.docx
T3-PO-194	Critical exact-locator audit	CLOSED-SCOPE	Formula/protocol claims mapped to exact section, page, equation or file path	tom3_v0_19.docx
T3-PO-195	Global cross-reference audit	CLOSED-NUM-QA	T3-CH/EQ/FIG/TBL/LOC/PO sequences and TOC checked	tom3_v0_19.docx
T3-PO-196	Typography and searchable-PDF audit	CLOSED-NUM-QA	DOCX render, PDF text, fonts, tables, page breaks and preflight checked	tom3_v0_19.docx

ID	Obligation	Current status	Scope note	Last source
T3-PO-197	Detached release receipt	CLOSED-MANIFEST	Self-hashes recorded outside self-referential artifacts after final build	release receipt v0.19
T3-PO-198	Source blocker classification	CLOSED-PROP	Mandatory freeze blockers separated from external-review and physical blockers	tom3_v0_19.docx
T3-PO-199	RU freeze-candidate gate	ACCEPTED-CANDIDATE	Authorial RU master may proceed to T3-FREEZE-v1.0 without status promotion	tom3_v0_19.docx
T3-PO-200	Independent bibliography audit	OPEN NON-VETO	Required for external review receipt; not claimed as completed	future external receipt
T3-PO-201	RU frozen master	CLOSED-FREEZE	Russian master fixed as T3-FREEZE-v1.0; no overwriting permitted	tom3_v1_0.docx
T3-PO-202	Post-freeze change-set policy	CLOSED-PROP	Every change requires new version, affected-ID ledger, rationale, tests and backward synchronization	Appendix H.3
T3-PO-203	Final cross-reference and locator retention	CLOSED-NUM-QA	All T3-CH/EQ/FIG/TBL/LOC/EXPL/SRC/SNAP identifiers retained from v0.19	Appendix H.6
T3-PO-204	Detached release receipt protocol	CLOSED-MANIFEST	Final DOCX/PDF self-hashes are published outside the self-referential artifacts	Appendix H.5
T3-PO-205	RU/EN/ZH derivative map	CLOSED-DOC	Derivative hierarchy and authority rules fixed; translations cannot change theorem status	Appendix H.4
T3-PO-206	Archive naming and version derivation	CLOSED-DOC	Canonical filenames and non-overwrite rule fixed for all future releases	Appendix H.2
T3-PO-207	Independent EXT-RUN	OPEN	No independent physical or computational execution receipt exists	future external receipt
T3-PO-208	Physical validation of V*P and F-1-F-14	OPEN / ABSTAIN	No EMP-OBS or independent replication has been introduced by the freeze	future empirical program

Appendix B. Open Blockers and Fillable Fields

T3-EN-APP-B · blockers are retained as first-class negative knowledge

BLOCKER RULE. A mandatory open blocker authorizes ABSTAIN. A blocker may be closed only by a new version carrying the proof, repair, data, or independent receipt that closes it.

B.1. Blocker ledger 1–24

Code	Blocker	Channel	State / consequence	Source
BLK-001	No complete byte-level manifest of all legacy editions of Volume III	source/provenance	Does not block the core; blocks historical completeness	tom3_v0_2.docx
BLK-002	Editable DOCX of Volume I v197 RU is absent from the local set	source	Imported from PDF; exact OOXML comparison is impossible	tom3_v0_2.docx
BLK-003	Global carrier with topology change has not been constructed	mathematical	Local atlas accepted	tom3_v0_3.docx
BLK-004	Br:NAPG_adm→Phys Geom absent	bridge	Physical export is blocked	tom3_v0_3.docx
BLK-005	No global section theorem for the full T_str	geometry	Only LOCAL/COND is authorized	tom3_v0_3.docx
BLK-006	No global Ξ dynamics or field equations	dynamics	Kinematics does not become physics	tom3_v0_3.docx
BLK-007	T_cs and CGI are not typed	causality	Next checkpoint	tom3_v0_3.docx
BLK-008	No Obs with units/covariance/provenance	empirical	No testable cosmological claims	tom3_v0_3.docx
BLK-009	EXT-RUN has not been executed	empirical	F-1–F-14 remain PHY-HYP	tom3_v0_3.docx
BLK-010	No physical PredRep code path	software	The NUM certificate is local	tom3_v0_3.docx
BLK-011	Global hyperbolicity of the reduced models has not been proved	causal geometry	A well-posed causal universe cannot be claimed	tom3_v0_3.docx
BLK-012	Source coupling is not specified	physics	No Einstein-type field equation	tom3_v0_3.docx
T3-BLK-061	Charts, tangent spaces, traces and compactness for infinite-dimensional P_adm	Chapter 12/22		tom3_v0_6.docx
T3-BLK-062	Concrete repaired G_2 differential family with $d^2=0$	Chapters 10/12	OPEN	tom3_v0_6.docx
T3-BLK-063	Proof that chosen G_2 flow preserves admissible ansatz	Chapter 12/13		tom3_v0_6.docx
T3-BLK-064	Clock observable and physical units for flow parameter	Chapter 14/19		tom3_v0_6.docx
T3-BLK-065	[FILLABLE FIELD] topology and global geometry of Σ	Chapter 13		tom3_v0_7.docx

Code	Blocker	Channel	State / consequence	Source
T3-BLK-066	[FILLABLE FIELD] exact G_k action on all packet fields	Chapter 13		tom3_v0_7.docx
T3-BLK-067	[FILLABLE FIELD] repaired differential carrier for G_2 branch	canonical channel		tom3_v0_7.docx
T3-BLK-068	[FILLABLE FIELD] explicit C^pack_{μν}	Chapter 14		tom3_v0_7.docx
T3-BLK-069	[FILLABLE FIELD] matter/packet closure and units	Chapter 14		tom3_v0_7.docx
T3-BLK-070	[FILLABLE FIELD] generalized Bianchi/Noether identity	Chapter 14		tom3_v0_7.docx
T3-BLK-071	[FILLABLE FIELD] perturbation variables and gauge fixing	Chapter 14/19		tom3_v0_7.docx
T3-BLK-072	[FILLABLE FIELD] observational data adapter and covariance	Chapter 19		tom3_v0_7.docx

B.2. Blocker ledger 25–45

Code	Blocker	Channel	State / consequence	Source
T3-BLK-073	[FILLABLE FIELD] preregistered EXT-RUN	Chapter 20		tom3_v0_7.docx
T3-BLK-159	The general physical bridge NAPG → V*P → observable is not closed	physical gate	OPEN	tom3_v0_15.docx
T3-BLK-160	The packet correction C_pack has not been derived from a unified action	cosmology	OPEN	tom3_v0_15.docx
T3-BLK-161	Observational dataset, covariance, and hashes are not frozen	EMP-PLAN freeze	OPEN	tom3_v0_15.docx
T3-BLK-162	EXT-RUN-000/F12 is neither frozen nor executed	F-12 / EMP	OPEN	tom3_v0_15.docx
T3-BLK-163	Independent executor and apparatus are not designated	EXT-RUN	OPEN	tom3_v0_15.docx
T3-BLK-164	Dependency locks KLT 4.14/5.1 are absent	Reproducibility		tom3_v0_15.docx
T3-BLK-165	MANIFEST_v4_80 contains one mismatch out of 17 records	release integrity	OPEN BLOCKER	tom3_v0_15.docx

Code	Blocker	Channel	State / consequence	Source
T3-BLK-166	Signature and trusted timestamp are absent	external trust	OPEN	tom3_v0_15.docx
T3-BLK-167	The unified 24-chapter master had not yet been assembled	book assembly	CLOSED by v0.16	tom3_v0_15.docx
T3-BLK-168	Stable-locator source audit was incomplete	citation QA	CLOSED-SCOPE by v0.19	tom3_v0_15.docx
T3-BLK-169	RU/EN/ZH glossary was not frozen	translations	PARTIAL: EN terminology lock established; ZH future	tom3_v0_15.docx
T3-BLK-170	Independent scientific and editorial review is absent	publication review	OPEN NON-VETO	tom3_v0_15.docx
T3-BLK-174	Semantic deduplication after mechanical assembly	editorial	PARTIAL-CLOSED: the literal T_cs repetition was removed; full semantic pass continues	v0.17
T3-BLK-175	Full normalization of DOI, pages, formulas, and bibliography styles	bibliography	PARTIAL-CLOSED: DOI/arXiv format and some years normalized; exact-page/version freeze completed in v0.19	v0.17
T3-BLK-176	Independent rerun and physical EXT-RUN	empirical	OPEN	v0.16
T3-BLK-177	Full RU/EN/ZH terminology lock	translations	PARTIAL: RU and EN controlled; ZH remains future	v0.16
T3-BLK-178	Pantheon+ reproducible locator: revision 7fc6805 plus frozen file paths and normalized snapshots	Source/data	CLOSED-LOCATOR	v0.19
T3-BLK-179	Exact page/formula completeness for claims that import a formula or protocol	Source locator	CLOSED-SCOPE	v0.19
T3-BLK-180	Normalized immutable snapshots of live official specifications and observational documentation	Provenance	CLOSED-SNAPSHOT	v0.19
T3-BLK-181	Independent external audit of bibliography/source-card ledger	Independent audit	OPEN NON-VETO	future external receipt

CURRENT VETO. Independent EXT-RUN and EMP-OBS remain absent. This blocks a general physical validation claim but does not prevent publication of the mathematical, model, numerical, and preregistration layers under their exact labels.

Appendix C. Unified Bibliography and Source-Card Ledger

T3-EN-APP-C · 81 cards · original-language publication titles may be retained as bibliographic metadata

SOURCE BOUNDARY. A correct DOI, catalogue entry, page, or file path establishes provenance and supports an import. It does not prove the imported theorem, physical mechanism, or empirical claim.

C.1. Source-card ledger 1–30

Author / source	Title / section	Year	Identifier	Role	Status
GR-01	A. Einstein, Die Grundlage der allgemeinen Relativitätstheorie	1916	Annalen der Physik; doi:10.1002/andp.19163540702	prior art	tom3_v0_1.docx
CAUS-01	S.W. Hawking, G.F.R. Ellis, The Large Scale Structure of Space-Time	1973	Cambridge University Press	prior art	tom3_v0_1.docx
STRAT-01	M. Goresky, R. MacPherson, Stratified Morse Theory	1988	Springer, Ergebnisse 14	prior art	tom3_v0_1.docx
HODGE-01	W.V.D. Hodge, The Theory and Applications of Harmonic Integrals	1941	Cambridge University Press	prior art	tom3_v0_1.docx
G2-01	R.L. Bryant, Metrics with exceptional holonomy	1987	Annals of Mathematics 126; doi:10.2307/1971360	prior art	tom3_v0_1.docx
G2-02	D.D. Joyce, Compact Manifolds with Special Holonomy	2000	Oxford University Press	prior art	tom3_v0_1.docx
NONASSOC-01	J.C. Baez, The Octonions	2002	Bull. AMS 39; doi:10.1090/S0273-0979-01-00934-X	comparison	tom3_v0_1.docx
VAR-01	E. Noether, Invariante Variationsprobleme	1918	Nachr. Ges. Wiss. Göttingen, Math.-Phys. Kl. 1918, 235-257; EuDML 59024; DOI absent from the primary catalogue	prior art	tom3_v0_1.docx
COSMO-01	A. Friedmann, Über die Krümmung des Raumes	1922	Z. Phys. 10; doi:10.1007/BF01332580	prior art	tom3_v0_1.docx
PERT-01	V. Mukhanov, H. Feldman, R. Brandenberger, Theory of cosmological perturbations	1992	Physics Reports 215; doi:10.1016/0370-1573(92)90044-Z	prior art	tom3_v0_1.docx

Author / source	Title / section	Year	Identifier	Role	Status
QFTC-01	N.D. Birrell, P.C.W. Davies, Quantum Fields in Curved Space	1982	Cambridge University Press	prior art	tom3_v0_1.docx
MART-01	D.W. Stroock, S.R.S. Varadhan, Multidimensional Diffusion Processes	1979	Springer	prior art	tom3_v0_1.docx
LDP-01	M.I. Freidlin, A.D. Wentzell, Random Perturbations of Dynamical Systems	2012	Springer, 3rd ed.; doi:10.1007/978-3-642-25847-3	prior art	tom3_v0_1.docx
CAUSINF-01	J. Pearl, Causality, 2nd ed.	2009	Cambridge University Press	prior art	tom3_v0_1.docx
REPRO-01	M. Wilkinson et al., The FAIR Guiding Principles...	2016	Scientific Data 3, 160018; doi:10.1038/sdata.2016.18	support	tom3_v0_1.docx
OBS-PLANCK	Planck Collaboration VI, Cosmological Parameters	2020	A&A 641 A6; arXiv:1807.06209; doi:10.1051/0004-6361/201833910	empirical data	tom3_v0_1.docx
OBS-DESI	DESI Collaboration, Data Release 1	2026	arXiv:2503.14745; official DESI DR1 data release, 19 March 2025	empirical data	tom3_v0_1.docx
OBS-EUCLID	ESA/Euclid Consortium, Euclid Q1 Data Release, 19.03.2025	2025	ESA/Euclid Consortium, Q1 Explanatory Supplement, documentation release 1, 19.03.2025	empirical data	tom3_v0_1.docx
Nigel Hitchin	Stable forms and special metrics	2001	arXiv:math/0107101; doi:10.1090/conm/288/04818	prior art	tom3_v0_6.docx
Spiro Karigiannis	Flows of G_2-structures, I	2009	arXiv:math/0702077; doi:10.1093/qmath/han020	prior art	tom3_v0_6.docx
Robert Bryant; Feng Xu	Laplacian Flow for Closed G_2-Structures: Short Time Behavior	2011	arXiv:1101.2004	prior art	tom3_v0_6.docx
Hartmut Weiss; Frederik Witt	Energy functionals and soliton equations for G_2-forms	2012	arXiv:1201.1208; doi:10.1007/s10455-012-9328-y	prior art	tom3_v0_6.docx
Jason D. Lotay; Yong Wei	Laplacian flow for closed G_2 structures: Shi-type estimates, uniqueness and compactness	2017	arXiv:1504.07367; doi:10.1007/s00039-017-0395-x	prior art	tom3_v0_6.docx

Author / source	Title / section	Year	Identifier	Role	Status
J. P. LaSalle	Some Extensions of Liapunov’s Second Method	1960	doi:10.1109/ TCT.1960.1086720	prior art	tom3_v0_6.docx
Ivan Borisovich Kurpishev	Volume I v197 RU	2026	project canonical release	prior art	tom3_v0_6.docx
Ivan Borisovich Kurpishev	Volume II T2-FREEZE-v1.0	2026	project canonical release	prior art	tom3_v0_6.docx
Hogg, D. W.	Distance measures in cosmology	1999	arXiv:astro-ph/ 9905116	prior art / formulas	Sections on D_C, D_M, D_A, D_L, μ
Planck Collaboration	Planck 2018 results. VI. Cosmological parameters	2020	doi:10.1051/0004-6361/201833910; arXiv:1807.06209	comparison / empirical data	CMB likelihood and parameter framework
Brout et al.	The Pantheon+ Analysis: Cosmological Constraints	2022	doi:10.3847/1538-4357/ac8e04; arXiv:2202.04077	empirical data / comparison	SN covariance and cosmological likelihood
PantheonPlusSH0ES	DataRelease repository	2022; frozen revision selected 2026	GitHub PantheonPlusSH0ES/DataRelease; frozen adapter revision 7fc6805; paths 4_DISTANCES_AND_COVAR/Pantheon+SH0ES.dat and STAT+SYS.cov	empirical data	VERIFIED-LOCATOR / SNAPSHOT

C.2. Source-card ledger 31–60

Author / source	Title / section	Year	Identifier	Role	Status
DESI Collaboration	DESI DR2 Results II: BAO and cosmological constraints	2025	arXiv:2503.14738 ; Phys. Rev. D 112, 083515; doi:10.1103/tr6y-kpc6	empirical summaries / comparison	D_M/r_d, D_H/r_d and covariance products
ESA & Euclid Consortium	Euclid Q1 Explanatory Supplement / Overview	2025/2026	Official Q1 docs; A&A; doi:10.1051/0004-6361/202554610	support / data adapter	Catalog, masks, photometry/spectroscopy; not cosmology validation
Kurpishev, I. B.	Kurpishev Uncertainty Principle PN.2. Canonical Edition v1.0	2026	internal canonical source	prior art	tom3_v0_9.docx
Kurpishev, I. B.	Independent Verification Protocol for PN.2 Physical Hypotheses v1.0	2026	internal protocol	prior art	tom3_v0_9.docx
Le Cam, L.	Asymptotic Methods in Statistical Decision Theory	1986	Springer, doi:10.1007/978-1-4612-4946-7	prior art	tom3_v0_9.docx

Author / source	Title / section	Year	Identifier	Role	Status
Neyman, J.; Pearson, E. S.	On the Problem of the Most Efficient Tests of Statistical Hypotheses	1933	Phil. Trans. Roy. Soc. A 231	prior art	tom3_v0_9.docx
Holm, S.	A Simple Sequentially Rejective Multiple Test Procedure	1979	Scand. J. Stat. 6:65–70	prior art	tom3_v0_9.docx
Dwork et al.	The Reusable Holdout	2015	Science 349; doi:10.1126/science.aaa9375	prior art	tom3_v0_9.docx
Kurpishev I. B.	Basic KLT-RBD Project. Volume I. v197 RU	2026	internal freeze	PredRep, ABSTAIN, predictive corridors	canonical import
Kurpishev I. B.	Volume II. Strict NAPG 3.0. T2-FREEZE-v1.0	2026	internal freeze	partial end-to-end operator	canonical import
A.N. Tikhonov	Solution of Incorrectly Formulated Problems and the Regularization Method	1963	Soviet Math. Dokl. 5, 1035–1038	regularization	prior art
J.-P. Aubin, H. Frankowska	Set-Valued Analysis	2009	Birkhäuser; doi:10.1007/978-0-8176-4848-0	multifunction continuity/selections	prior art
R.T. Rockafellar, R.J.-B. Wets	Variational Analysis	1998	Springer; doi:10.1007/978-3-642-02431-3	set/variational convergence	prior art
H.W. Engl, M. Hanke, A. Neubauer	Regularization of Inverse Problems	1996	Kluwer/Springer; doi:10.1007/978-94-009-1740-8	ill-posed inverse problems	prior art
R. Bellman, K.J. Åström	On Structural Identifiability	1970	Mathematical Biosciences 7, 329–339; doi:10.1016/0025-5564(70)90132-X	structural identifiability	prior art
R.E. Kalman	On the General Theory of Control Systems	1960	IFAC Proceedings 1, 491–502; doi:10.1016/S1474-6670(17)70094-8	observability	prior art
Kurpishev I. B.	Volume I v197 RU	2026	internal freeze	PredRep, ABSTAIN, status firewall	canonical import
Kurpishev I. B.	Volume II. NAPG 3.0. T2-FREEZE-v1.0	2026	internal freeze	blocker-safe operator	canonical import
D.W. Stroock; S.R.S. Varadhan	Multidimensional Diffusion Processes	1979/2006	doi:10.1007/3-540-28999-2; pp.136–207	martingale formulation and uniqueness	prior art
S.N. Ethier; T.G. Kurtz	Markov Processes: Characterization and Convergence	1986	doi:10.1002/9780470316658; Ch.4, pp.155–274	generators and martingale problems	prior art

Author / source	Title / section	Year	Identifier	Role	Status
O. Kallenberg	Foundations of Modern Probability, 3rd ed.	2021	doi:10.1007/978-3-030-61871-1; kernels pp.55–77; Markov pp.233–253	kernels, disintegration, Markov structures	prior art
G.W. Brier	Verification of Forecasts Expressed in Terms of Probability	1950	doi:10.1175/1520-0493(1950)078<0001:VOFEIT>2.0.CO;2; pp.1–3	quadratic probability score	prior art
A.P. Dawid	The Well-Calibrated Bayesian	1982	doi:10.1080/01621459.1982.10477856; pp.605–610	calibration concept	prior art
T. Gneiting; A.E. Raftery	Strictly Proper Scoring Rules, Prediction, and Estimation	2007	doi:10.1198/016214506000001437; pp.359–378	proper scoring rules	prior art
Kurpishev I. B.	Volume I v197 RU	2026	internal freeze	D/Dom, PredRep, status firewall	canonical import
Kurpishev I. B.	Volume II T2-FREEZE-v1.0, Ch. 23	2026	internal freeze	LDP ladder, Cert_LD, finite-sample firewall	canonical import
Kurpishev I. B.	T3-STOCH-v0.11	2026	internal checkpoint	family of path laws, martingale/filter gates	canonical import
S.R.S. Varadhan	Asymptotic Probabilities and Differential Equations	1966	doi:10.1002/cpa.3160190303	variational asymptotics	prior art
M.D. Donsker; S.R.S. Varadhan	Asymptotic Evaluation of Certain Markov Process Expectations I	1975	doi:10.1002/cpa.3160280102	Markov large deviations	prior art
M.I. Freidlin; A.D. Wentzell	Random Perturbations of Dynamical Systems, 3rd ed.	2012	doi:10.1007/978-3-642-25847-3; Ch.2-6	action, quasipotential, exit	prior art

C.3. Source-card ledger 61–81

Author / source	Title / section	Year	Identifier	Role	Status
A. Dembo; O. Zeitouni	Large Deviations Techniques and Applications, 2nd ed.	2010	doi:10.1007/978-3-642-03311-7	LDP, contraction, path LDP	prior art
H.A. Kramers	Brownian Motion in a Field of Force...	1940	doi:10.1016/S0031-8914(40)90098-2	barrier crossing	prior art
H. Eyring	The Activated Complex in Chemical Reactions	1935	doi:10.1063/1.1749604	transition-state rate	prior art

Author / source	Title / section	Year	Identifier	Role	Status
P. Dupuis; H. Wang	Subsolutions of an Isaacs Equation and Efficient Schemes for Importance Sampling	2007	doi:10.1287/moor.1070.0266	efficient dynamic importance sampling	prior art
E1	W3C PROV-O	2013	W3C Recommendation	Entity/Activity/Agent provenance	prior art / mapping
E2	Kunze et al., BagIt v1.0	2018	RFC 8493; doi:10.17487/RFC8493	payload, manifests, fixity	packaging prior art
E3	RO-Crate Metadata Specification 1.3	2026	RO-Crate Metadata Specification 1.3.0; doi:10.5281/zenodo.20720080	research object metadata and workflows	comparison / export
E4	DataCite Metadata Schema 4.7	2026	DataCite Metadata Schema 4.7; doi:10.14454/qdd3-ps68	citation metadata; RAiD/SWHID relations	publication adapter
E5	Wilkinson et al., FAIR Principles	2016	doi:10.1038/sdata.2016.18	data stewardship goals	design support
E6	Rundgren et al., JCS	2020	RFC 8785; doi:10.17487/RFC8785	canonical JSON for hashing/signing	comparison; not yet full compliance
E7	NIST Secure Hash Standard	2015	FIPS 180-4; doi:10.6028/NIST.FIPS.180-4	SHA-256 definition	integrity prior art
E8	SQLite Database File Format	current	SQLite official documentation; exact snapshot hash [FILLABLE FIELD]	single-file relational carrier	storage prior art
E9	Adams et al., Time-Stamp Protocol	2001	RFC 3161	trusted proof-of-existence time	future signing gate
Reproducible Builds	Definitions: “When is a build reproducible?”	current	Reproducible Builds, official definition; snapshot date 27.07.2026	prior art / definition	tom3_v0_14.docx
SLSA v1.2	Provenance and Build Provenance	current	SLSA specification v1.2, Approved; snapshot date 27.07.2026	provenance mapping	tom3_v0_14.docx
in-toto	Supply-chain integrity framework	current	in-toto specification / CNCF project; snapshot hash [FILLABLE FIELD]	attestation container	tom3_v0_14.docx
SPDX	Specification 3.0.1	2024-current	SPDX Specification 3.0.1	SBOM adapter	tom3_v0_14.docx

Author / source	Title / section	Year	Identifier	Role	Status
CycloneDX	Specification 1.7, Formulation and Dependencies	2025-current	CycloneDX Specification 1.7 / ECMA-424	SBOM and build formulation	tom3_v0_14.docx
Sigstore	Overview: signing, identity, transparency log	current	Sigstore official documentation; snapshot hash [FILLABLE FIELD]	signature plan	tom3_v0_14.docx
PyPA	pylock.toml Specification, lock-version 1.0	2025/2026	PyPA pylock.toml Specification; lock-version 1.0	Python dependency lock	tom3_v0_14.docx
Dart	Glossary: application packages should commit lockfiles	current	Dart official package/lockfile guidance; snapshot hash [FILLABLE FIELD]	Flutter lock requirement	tom3_v0_14.docx

Appendix D. Publication Manifest, Hashes, and Page Map

T3-EN-APP-D · detached self-hashes are issued outside the self-referential DOCX/PDF artifacts

D.1. Predecessor release manifest

Release	DOCX	SHA-256 DOCX	PDF	SHA-256 PDF
v0_1	tom3_v0_1.docx	3f5a4dea4747ef2aba403cfa9873dd132da2e48def1cf74a0762b6807eb5a4c2	tom3_v0_1.pdf	48d50653a070c792a5c529eae164b4f292c88f71b9c30f4db15d540f93d16bc2
v0_2	tom3_v0_2.docx	b4fb598ec2b8f0a2ecf518b44b1dd12e33e1933b16ba40c199d953fc0e40907f	tom3_v0_2.pdf	f77496265192e3fbe777938135e81e0d99c40834004e26504bb9496f0094d665
v0_3	tom3_v0_3.docx	a97196a88ed3863283beb7ea049553dd63f57048712b26ad38706bb6f455856f	tom3_v0_3.pdf	990daeabded76c49069960dbc0b2df554cee171cf919d98900c36463c6e59fd7
v0_4	tom3_v0_4.docx	08b255e57e9913e4cc042872984fbedcdc07cfac55df2560293571e9ae4d0ac3	tom3_v0_4.pdf	b227b9bad012cc0e592769e7d2bc68c6ecab13a7a6b349af0b2fc21df83effe9
v0_5	tom3_v0_5.docx	a71fd15ba476557bb3fdbab5e7d66157dad61683c2160cbbf58abe0543d734dc	tom3_v0_5.pdf	69312c9029803398b85191beb5cfc094bc7d186303c00d86025d2d6dd6c61173
v0_6	tom3_v0_6.docx	98539a9cd9bcedf27f5a54514e5815540ab39ebee570974c228c3dacb00c6ed1	tom3_v0_6.pdf	bb6c4aac72750e0042b5d53e917906a0bd5eed04426d7ecffbd8dc9d46e1a060
v0_7	tom3_v0_7.docx	978e188c3c1149a5a5620caa5a5c01acf54505abdfe13792bdb1bdc4b2817e9e	tom3_v0_7.pdf	934649f1429fe84efe7409fac0aa2fddb0feede16e6ff43afd36af3e198bdb31
v0_8	tom3_v0_8.docx	f353d88803b555e976d403e184f089980e717a77ac774092f6228f88aabff9ed	tom3_v0_8.pdf	4d158363f772885be50908e7056646155aae10e80741c8baeb675c7681b6fd12

Release	DOCX	SHA-256 DOCX	PDF	SHA-256 PDF
v0_9	tom3_v0_9.docx	5f506637be656d1fa19fca7db07c3af4fb25c7abf489e2cf5c95e1a9407d97aa	tom3_v0_9.pdf	99f4315a0e3f625941edc6354205b7ae86e0f0a9b0f6847789f82720d0430fc3
v0_10	tom3_v0_10.docx	222cdac0dfb3d9221172b7f6c5cb7dde23abd50b03b9debea7bed19eb5cbce8c	tom3_v0_10.pdf	83a35957b9da6061c20fec85c58fc70e209059f99752efe058d68e3510875743
v0_11	tom3_v0_11.docx	bff7b603c3d2a27a1522aa3fb2b8e412666d8f0405d9cc6d51d60d0ea3a12ed8	tom3_v0_11.pdf	51b4ddfa48142627bcf86018ff1e79b16aeee211262079b632a87fdb4e305197
v0_11(1)	tom3_v0_11(1).docx	bff7b603c3d2a27a1522aa3fb2b8e412666d8f0405d9cc6d51d60d0ea3a12ed8	tom3_v0_11(1).pdf	51b4ddfa48142627bcf86018ff1e79b16aeee211262079b632a87fdb4e305197
v0_12	tom3_v0_12.docx	7f52c932100940e1c477fe4f81b46643746f5c25c9014892ee95d1a5f0a1a76f	tom3_v0_12.pdf	12af9f6c52920c20fe39e6249c9e9b6d90dcf2fc78ebe4f0077ffa645d156019
v0_13	tom3_v0_13.docx	26e9232dbfcc0ce1eed0fdca9a88129b408bf622c0a11d07f23c6e428a03b0b4	tom3_v0_13.pdf	2b4a8c9752916cc17e6e459e037a3b15368269620385f361f7e4a2a1255ad04e
v0_14	tom3_v0_14.docx	44fbdc2e08b3357de2414161e8e2b0abf5fafad62c1b7edd1c8829866e054b43	tom3_v0_14.pdf	5b17641ed3402fb3343346e83b55a3d7c2c64310ad39011c1715f6bc36650e12
v0_15	tom3_v0_15.docx	2279ffaee2098fb4f16cf9c519177d872029086303bd5164aff6215ce29c449b	tom3_v0_15.pdf	3279b77f469a27ad8c0ce76f19eca63a1b7a371133096963676330229091da14
v0_16	tom3_v0_16.docx	935ee9c40095a6932c0d95a0410b83d00aa34cedc9aa596932fc7c456ec489cb	tom3_v0_16.pdf	ea3b5be43e8b7fee70b1a21fafd9e7475ccc641a880716329079303dd1a3bbd8
v0_17	tom3_v0_17.docx	84f3226476d15e6ef4e3c8c4045b86e62a79552017f45d0964425af1d3fe2569	tom3_v0_17.pdf	daacbbd1e1202677f49cb8a0d3663fd5493920fdbcdc9cab03bb6e186b6d4131
v0_18	tom3_v0_18.docx	2b7bcfc8f1ea53d89dddd30785d12a60c37e906f75933ebbb3711692a86bfc3e	tom3_v0_18.pdf	10fa49d663c8ba591cc7aa9c956c293a51ea9ba8805f9a9370277e5c5b0f71e5
v0_19	tom3_v0_19.docx	e6b6884b74266c7ea0a8fae698e883eaa267ab8efcb8193d90cf7c656b3329d2	tom3_v0_19.pdf	123f2a114f3e6c5937d16aab8914032d23ea19567d880f83034112079f4b067d
v1_0	tom3_v1_0.docx	8c3c7024f24d68b27a4ce863217e4abbf6dda20e27eebba3cbc39e9d429775d5	tom3_v1_0.pdf	dd94ff3511a7e0d506906668477717cb793bb9bff83713b6f8b330f9ed837156
en_v0_1	tom3_en_v0_1.docx	878d93d7e8bb841208398e2b43108a768e5cf0afb2a2f70266609ed8b6dd4307	tom3_en_v0_1.pdf	393c01c4ba520d4f8b844535e40ca513356d8f546e99c68eb883a38196261ece
en_v0_2	tom3_en_v0_2.docx	c292f3ef255a018f6ad19a9187b84e3991bb8aa4bbb45a084eb6ad07fd80039c	tom3_en_v0_2.pdf	7583604265ebdfc33a751edd1bd4c6e877f181a492f82bdf15ed089eca01448d

Release	DOCX	SHA-256 DOCX	PDF	SHA-256 PDF
en_v0_3	tom3_en_v0_3.docx	accdd1e97603828f23e7a009f31fb0487e79723c8e13d2c0cdcc3d97f83c47ae	tom3_en_v0_3.pdf	287640a38ff30995aca90d6c65ab61f87fd9863f9ab7d4ad9dc61895dbe8aba0
en_v0_4	tom3_en_v0_4.docx	09cd99d0c9e07a3b293ab5a59d324758029bee32403e50a3743779b66d2ccce8	tom3_en_v0_4.pdf	c257168c75ee2a6bffd065ad3231e8e8b6cea6e07faf1b64b2a107fa6960cbc9
en_v0_5	tom3_en_v0_5.docx	ebf51e48832ec8bbd0f596a199bce62e1a40c67b3db9e21e7241d7ba3e751869	tom3_en_v0_5.pdf	a136d604d5188adbe9162ce39aea801464a7ee870dee2bf6d91d9986864f496b

D.2. Frozen object inventory

Class	Range	Count
Chapters	T3-CH-01–T3-CH-24	24
Explanatory blocks	T3-EXPL-01–T3-EXPL-24	24
Formulas	T3-EQ-0001–T3-EQ-0166	166
Figures	T3-FIG-001–T3-FIG-054	54
Scientific tables	T3-TBL-001–T3-TBL-092	92
Source locators	T3-LOC-001–T3-LOC-126	126
Evidence obligations	T3-PO-001–T3-PO-208	208
Source cards	SRC-001–SRC-081	81
Normalized snapshots	SNAP-001–SNAP-009	9

D.3. Page map

Item	Stable ID	Page
Chapter 1	T3-CH-01	5
Chapter 2	T3-CH-02	8
Chapter 3	T3-CH-03	14
Chapter 4	T3-CH-04	16
Chapter 5	T3-CH-05	18
Chapter 6	T3-CH-06	21
Chapter 7	T3-CH-07	23
Chapter 8	T3-CH-08	25
Chapter 9	T3-CH-09	30
Chapter 10	T3-CH-10	33
Chapter 11	T3-CH-11	36
Chapter 12	T3-CH-12	38

SELF-HASH RULE. The SHA-256 of tom3_en_v0_7.docx and tom3_en_v0_7.pdf is computed after the final render and published as a detached receipt. It is not inserted into the artifact whose hash it defines.

Appendix E. Explanatory-Block Register and Editorial Audit

T3-EN-APP-E · every chapter contains an accessible introduction and an evidence boundary

ID	Chapter	Function	Status
T3-EXPL-01	1	Interface with Volumes I–II and Evidence Boundaries	CLOSED-DOC
T3-EXPL-02	2	Frozen Physico-Mathematical Notation Registry	CLOSED-DOC
T3-EXPL-03	3	Ontology of V*P: Time as a Primary Packet Structure	CLOSED-DOC

ID	Chapter	Function	Status
T3-EXPL-04	4	Standard Mathematical Model of Stratified Time	CLOSED-DOC
T3-EXPL-05	5	Space as an Admissible Section of Temporal Connectivity	CLOSED-DOC
T3-EXPL-06	6	Time Packet and the Operators of Change, Action, and Reversal: Ξ, Δ, Υ	CLOSED-DOC
T3-EXPL-07	7	Dynamic Reper and Preservation of D/Dom	CLOSED-DOC
T3-EXPL-08	8	Causal Tensor T_cs and the Causal Gap Index CGI	CLOSED-DOC
T3-EXPL-09	9	Strict Bridge from NAPG to Physical Geometry	CLOSED-DOC
T3-EXPL-10	10	Hodge, G_2, and Associator Model Realizations	CLOSED-DOC
T3-EXPL-11	11	Separation of Associator, Curvature, Torsion, and Holonomy	CLOSED-DOC
T3-EXPL-12	12	Variational Principle and Kurpishev's Arrow of Time	CLOSED-DOC
T3-EXPL-13	13	Reduced Isotropic Packet Cosmology	CLOSED-DOC
T3-EXPL-14	14	Dynamical Equations, Constraints, and Observables	CLOSED-DOC
T3-EXPL-15	15	PN.2 in the Physical and Cosmological Interface	CLOSED-DOC
T3-EXPL-16	16	PredRep: Deterministic Reper Reconstruction	CLOSED-DOC
T3-EXPL-17	17	Stochastic PredRep and Path Spaces	CLOSED-DOC
T3-EXPL-18	18	Rare Transitions, Action Barriers, and Metastability	CLOSED-DOC
T3-EXPL-19	19	Observational Adapters and External Physical Data	CLOSED-DOC
T3-EXPL-20	20	Verification Protocols for F-1–F-14 and Independent EXT-RUN	CLOSED-DOC
T3-EXPL-21	21	KLT-RBD/RPD as Computational Memory of Physics	CLOSED-DOC
T3-EXPL-22	22	Computational Certificates, Code, and Reproducibility	CLOSED-DOC
T3-EXPL-23	23	Ontology, Epistemology, and Phenomenology of Physical Knowledge	CLOSED-DOC
T3-EXPL-24	24	End-to-End Physical Operator, Conclusion Boundaries, and Publication Gate	CLOSED-DOC

E.1. Editorial audit

Check	Result	Status
Chapter explanations	24/24 chapters contain specific explanatory blocks	PASS
Status firewall	No philosophical or accessible explanation raises a truth layer	PASS
Duplicate cluster	Repeated T_cs definitions replaced by stable aliases in the Russian master and preserved in English	PASS
Identifier continuity	CH/EXPL/EQ/FIG/TBL/LOC ranges complete	PASS
Negative results	REFUTED and ABSTAIN statements retained	PASS
Terminology	Reper, D/Dom, sufficient foundation, event@state, and Time@Space locked	PASS

Appendix F. Primary-Source Audit and Source-to-Claim Matrix

T3-EN-APP-F · source verification is distinct from mathematical proof and physical validation

F.1. Source verdict policy

Verdict	Criterion	Authorized conclusion
VERIFIED-PRIMARY	Primary text or official publisher record checked	May be cited as verified prior art in the declared role
VERIFIED-OFFICIAL	Official programme, standard, or repository documentation checked	May support the stated current-version metadata
INTERNAL-CANONICAL	Frozen internal KLT-RBD master or certificate	May support canonical project definitions and statuses
METADATA-CARRIED	Bibliographic metadata retained but exact locator not independently rechecked in this checkpoint	Use as bibliography; no exact-formula claim
PARTIAL-LOCATOR	Source known but exact section/page/version incomplete	Cannot support a critical imported formula
BLOCKED	Missing or inconsistent source record	No downstream authorization

F.2. Audited source-card ledger

F.2.1. Audit cards 1–27

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-001	GR-01. A. Einstein, Die Grundlage der allgemeinen Relativitätstheorie (1916)	Annalen der Physik; doi:10.1002/andp.19163540702	prior art	VERIFIED-PRIMARY
SRC-002	CAUS-01. S.W. Hawking, G.F.R. Ellis, The Large Scale Structure of Space-Time (1973)	Cambridge University Press	prior art	METADATA-CARRIED

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-003	STRAT-01. M. Goresky, R. MacPherson, Stratified Morse Theory (1988)	Springer, Ergebnisse 14	prior art	METADATA-CARRIED
SRC-004	HODGE-01. W.V.D. Hodge, The Theory and Applications of Harmonic Integrals (1941)	Cambridge University Press	prior art	METADATA-CARRIED
SRC-005	G2-01. R.L. Bryant, Metrics with exceptional holonomy (1987)	Annals of Mathematics 126; doi:10.2307/1971360	prior art	VERIFIED-PRIMARY
SRC-006	G2-02. D.D. Joyce, Compact Manifolds with Special Holonomy (2000)	Oxford University Press	prior art	METADATA-CARRIED
SRC-007	NONASSOC-01. J.C. Baez, The Octonions (2002)	Bull. AMS 39; doi:10.1090/S0273-0979-01-00934-X	comparison	VERIFIED-PRIMARY
SRC-008	VAR-01. E. Noether, Invariante Variationsprobleme (1918)	Nachr. Ges. Wiss. Göttingen, Math.-Phys. Kl. 1918, 235-257; EuDML 59024; DOI absent from the primary catalogue	prior art	VERIFIED-PRIMARY
SRC-009	COSMO-01. A. Friedmann, Über die Krümmung des Raumes (1922)	Z. Phys. 10; doi:10.1007/BF01332580	prior art	VERIFIED-PRIMARY
SRC-010	PERT-01. V. Mukhanov, H. Feldman, R. Brandenberger, Theory of cosmological perturbations (1992)	Physics Reports 215; doi:10.1016/0370-1573(92)90044-Z	prior art	VERIFIED-PRIMARY
SRC-011	QFTC-01. N.D. Birrell, P.C.W. Davies, Quantum Fields in Curved Space (1982)	Cambridge University Press	prior art	METADATA-CARRIED
SRC-012	MART-01. D.W. Stroock, S.R.S. Varadhan, Multidimensional Diffusion Processes (1979)	Springer	prior art	METADATA-CARRIED
SRC-013	LDP-01. M.I. Freidlin, A.D. Wentzell, Random Perturbations of Dynamical Systems (2012)	Springer, 3rd ed.; doi:10.1007/978-3-642-25847-3	prior art	METADATA-CARRIED
SRC-014	CAUSINF-01. J. Pearl, Causality, 2nd ed. (2009)	Cambridge University Press	prior art	METADATA-CARRIED

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-015	REPRO-01. M. Wilkinson et al., The FAIR Guiding Principles... (2016)	Scientific Data 3, 160018; doi:10.1038/sdata.2016.18	support	METADATA-CARRIED
SRC-016	OBS-PLANCK. Planck Collaboration VI, Cosmological Parameters (2020)	A&A 641 A6; arXiv:1807.06209; doi:10.1051/0004-6361/201833910	empirical data	METADATA-CARRIED
SRC-017	OBS-DESI. DESI Collaboration, Data Release 1 (2026)	arXiv:2503.14745; official DESI DR1 data release, 19 March 2025	empirical data	VERIFIED-OFFICIAL
SRC-018	OBS-EUCLID. ESA/Euclid Consortium, Euclid Q1 Data Release, 19.03.2025 (2025)	ESA/Euclid Consortium, Q1 Explanatory Supplement, documentation release 1, 19.03.2025	empirical data	VERIFIED-OFFICIAL
SRC-019	Nigel Hitchin. Stable forms and special metrics (2001)	arXiv:math/0107101; doi:10.1090/conm/288/04818	prior art	VERIFIED-PRIMARY
SRC-020	Spiro Karigiannis. Flows of G_2-structures, I (2009)	arXiv:math/0702077; doi:10.1093/qmath/han020	prior art	VERIFIED-PRIMARY
SRC-021	Robert Bryant; Feng Xu. Laplacian Flow for Closed G_2-Structures: Short Time Behavior (2011)	arXiv:1101.2004	prior art	METADATA-CARRIED
SRC-022	Hartmut Weiss; Frederik Witt. Energy functionals and soliton equations for G_2-forms (2012)	arXiv:1201.1208; doi:10.1007/s10455-012-9328-y	prior art	METADATA-CARRIED
SRC-023	Jason D. Lotay; Yong Wei. Laplacian flow for closed G_2 structures: Shi-type estimates, uniqueness and compactness (2017)	arXiv:1504.07367; doi:10.1007/s00039-017-0395-x	prior art	METADATA-CARRIED
SRC-024	J. P. LaSalle. Some Extensions of Liapunov’s Second Method (1960)	doi:10.1109/TCT.1960.1086720	prior art	VERIFIED-PRIMARY
SRC-025	Ivan Borisovich Kurpishev. Volume I v197 RU (2026)	project canonical release	prior art	INTERNAL-CANONICAL
SRC-026	Ivan Borisovich Kurpishev. Volume II T2-FREEZE-v1.0 (2026)	project canonical release	prior art	INTERNAL-CANONICAL
SRC-027	Hogg, D. W.. Distance measures in cosmology (1999)	arXiv:astro-ph/9905116	prior art / formulas	METADATA-CARRIED

F.2.2. Audit cards 28–54

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-028	Planck Collaboration. Planck 2018 results. VI. Cosmological parameters (2020)	doi:10.1051/0004-6361/201833910; arXiv:1807.06209	comparison / empirical data	METADATA-CARRIED
SRC-029	Brout et al.. The Pantheon+ Analysis: Cosmological Constraints (2022)	doi:10.3847/1538-4357/ac8e04; arXiv:2202.04077	empirical data / comparison	VERIFIED-OFFICIAL
SRC-030	PantheonPlusSH0ES. DataRelease repository (2022-current)	commit SHA [FILLABLE FIELD]	empirical data	BLOCKED
SRC-031	DESI Collaboration. DESI DR2 Results II: BAO and cosmological constraints (2025)	arXiv:2503.14738; Phys. Rev. D 112, 083515; doi:10.1103/tr6y-kpc6	empirical summaries / comparison	VERIFIED-OFFICIAL
SRC-032	ESA & Euclid Consortium. Euclid Q1 Explanatory Supplement / Overview (2025/2026)	Official Q1 docs; A&A; doi:10.1051/0004-6361/202554610	support / data adapter	VERIFIED-OFFICIAL
SRC-033	Kurpishev, I. B.. Kurpishev Uncertainty Principle PN.2. Canonical Edition v1.0 (2026)	internal canonical source	prior art	INTERNAL-CANONICAL
SRC-034	Kurpishev, I. B.. Independent Verification Protocol for PN.2 Physical Hypotheses v1.0 (2026)	internal protocol	prior art	INTERNAL-CANONICAL
SRC-035	Le Cam, L.. Asymptotic Methods in Statistical Decision Theory (1986)	Springer, doi:10.1007/978-1-4612-4946-7	prior art	VERIFIED-PRIMARY
SRC-036	Neyman, J.; Pearson, E. S.. On the Problem of the Most Efficient Tests of Statistical Hypotheses (1933)	Phil. Trans. Roy. Soc. A 231	prior art	PARTIAL-LOCATOR
SRC-037	Holm, S.. A Simple Sequentially Rejective Multiple Test Procedure (1979)	Scand. J. Stat. 6:65–70	prior art	PARTIAL-LOCATOR
SRC-038	Dwork et al.. The Reusable Holdout (2015)	Science 349; doi:10.1126/science.aaa9375	prior art	METADATA-CARRIED
SRC-039	Kurpishev I. B.. Basic KLT-RBD Project. Volume I. v197 RU (2026)	internal freeze	PredRep, ABSTAIN, predictive corridors	INTERNAL-CANONICAL
SRC-040	Kurpishev I. B.. Volume II. Strict NAPG 3.0. T2-FREEZE-v1.0 (2026)	internal freeze	partial end-to-end operator	INTERNAL-CANONICAL

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-041	A.N. Tikhonov. Solution of Incorrectly Formulated Problems and the Regularization Method (1963)	Soviet Math. Dokl. 5, 1035–1038	regularization	VERIFIED-PRIMARY
SRC-042	J.-P. Aubin, H. Frankowska. Set-Valued Analysis (2009)	Birkhäuser; doi:10.1007/978-0-8176-4848-0	multifunction continuity/selections	METADATA-CARRIED
SRC-043	R.T. Rockafellar, R.J.-B. Wets. Variational Analysis (1998)	Springer; doi:10.1007/978-3-642-02431-3	set/variational convergence	METADATA-CARRIED
SRC-044	H.W. Engl, M. Hanke, A. Neubauer. Regularization of Inverse Problems (1996)	Kluwer/Springer; doi:10.1007/978-94-009-1740-8	ill-posed inverse problems	METADATA-CARRIED
SRC-045	R. Bellman, K.J. Åström. On Structural Identifiability (1970)	Mathematical Biosciences 7, 329–339; doi:10.1016/0025-5564(70)90132-X	structural identifiability	VERIFIED-PRIMARY
SRC-046	R.E. Kalman. On the General Theory of Control Systems (1960)	IFAC Proceedings 1, 491–502; doi:10.1016/S1474-6670(17)70094-8	observability	VERIFIED-PRIMARY
SRC-047	Kurpishev I. B.. Volume I v197 RU (2026)	internal freeze	PredRep, ABSTAIN, status firewall	INTERNAL-CANONICAL
SRC-048	Kurpishev I. B.. Volume II. NAPG 3.0. T2-FREEZE-v1.0 (2026)	internal freeze	blocker-safe operator	INTERNAL-CANONICAL
SRC-049	D.W. Stroock; S.R.S. Varadhan. Multidimensional Diffusion Processes (1979/2006)	doi:10.1007/3-540-28999-2; pp.136–207	martingale formulation and uniqueness	VERIFIED-PRIMARY
SRC-050	S.N. Ethier; T.G. Kurtz. Markov Processes: Characterization and Convergence (1986)	doi:10.1002/9780470316658; Ch.4, pp.155–274	generators and martingale problems	VERIFIED-PRIMARY
SRC-051	O. Kallenberg. Foundations of Modern Probability, 3rd ed. (2021)	doi:10.1007/978-3-030-61871-1; kernels pp.55–77; Markov pp.233–253	kernels, disintegration, Markov structures	METADATA-CARRIED
SRC-052	G.W. Brier. Verification of Forecasts Expressed in Terms of Probability (1950)	doi:10.1175/1520-0493(1950)078<0001:VOFEIT>2.0.CO;2; pp.1–3	quadratic probability score	VERIFIED-PRIMARY
SRC-053	A.P. Dawid. The Well-Calibrated Bayesian (1982)	doi:10.1080/01621459.1982.10477856; pp.605–610	calibration concept	VERIFIED-PRIMARY

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-054	T. Gneiting; A.E. Raftery. Strictly Proper Scoring Rules, Prediction, and Estimation (2007)	doi:10.1198/016214506000001437; pp.359–378	proper scoring rules	VERIFIED-PRIMARY

F.2.3. Audit cards 55–81

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-055	Kurpishev I. B.. Volume I v197 RU (2026)	internal freeze	D/Dom, PredRep, status firewall	INTERNAL-CANONICAL
SRC-056	Kurpishev I. B. Volume II T2-FREEZE-v1.0, Ch. 23 (2026)	internal freeze	LDP ladder, Cert_LD, finite-sample firewall	INTERNAL-CANONICAL
SRC-057	Kurpishev I. B.. T3-STOCH-v0.11 (2026)	internal checkpoint	family of path laws, martingale/filter gates	INTERNAL-CANONICAL
SRC-058	S.R.S. Varadhan. Asymptotic Probabilities and Differential Equations (1966)	doi:10.1002/cpa.3160190303	variational asymptotics	VERIFIED-PRIMARY
SRC-059	M.D. Donsker; S.R.S. Varadhan. Asymptotic Evaluation of Certain Markov Process Expectations I (1975)	doi:10.1002/cpa.3160280102	Markov large deviations	VERIFIED-PRIMARY
SRC-060	M.I. Freidlin; A.D. Wentzell. Random Perturbations of Dynamical Systems, 3rd ed. (2012)	doi:10.1007/978-3-642-25847-3; Ch.2-6	action, quasipotential, exit	VERIFIED-PRIMARY
SRC-061	A. Dembo; O. Zeitouni. Large Deviations Techniques and Applications, 2nd ed. (2010)	doi:10.1007/978-3-642-03311-7	LDP, contraction, path LDP	METADATA-CARRIED
SRC-062	H.A. Kramers. Brownian Motion in a Field of Force... (1940)	doi:10.1016/S0031-8914(40)90098-2	barrier crossing	VERIFIED-PRIMARY
SRC-063	H. Eyring. The Activated Complex in Chemical Reactions (1935)	doi:10.1063/1.1749604	transition-state rate	VERIFIED-PRIMARY
SRC-064	P. Dupuis; H. Wang. Subsolutions of an Isaacs Equation and Efficient Schemes for Importance Sampling (2007)	doi:10.1287/moor.1070.0266	efficient dynamic importance sampling	VERIFIED-PRIMARY
SRC-065	E1. W3C PROV-O (2013)	W3C Recommendation	Entity/Activity/Agent provenance	VERIFIED-OFFICIAL

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-066	E2. Kunze et al., BagIt v1.0 (2018)	RFC 8493; doi:10.17487/RFC8493	payload, manifests, fixity	VERIFIED-OFFICIAL
SRC-067	E3. RO-Crate Metadata Specification 1.3 (2026)	RO-Crate Metadata Specification 1.3.0; doi:10.5281/zenodo.20720080	research object metadata and workflows	VERIFIED-OFFICIAL
SRC-068	E4. DataCite Metadata Schema 4.7 (2026)	DataCite Metadata Schema 4.7; doi:10.14454/qdd3-ps68	citation metadata; RAiD/SWHID relations	VERIFIED-OFFICIAL
SRC-069	E5. Wilkinson et al., FAIR Principles (2016)	doi:10.1038/sdata.2016.18	data stewardship goals	VERIFIED-OFFICIAL
SRC-070	E6. Rundgren et al., JCS (2020)	RFC 8785; doi:10.17487/RFC8785	canonical JSON for hashing/signing	VERIFIED-OFFICIAL
SRC-071	E7. NIST Secure Hash Standard (2015)	FIPS 180-4; doi:10.6028/NIST.FIPS.180-4	SHA-256 definition	VERIFIED-OFFICIAL
SRC-072	E8. SQLite Database File Format (current)	SQLite official documentation; exact snapshot hash [FILLABLE FIELD]	single-file relational carrier	VERIFIED-OFFICIAL
SRC-073	E9. Adams et al., Time-Stamp Protocol (2001)	RFC 3161	trusted proof-of-existence time	VERIFIED-OFFICIAL
SRC-074	Reproducible Builds. Definitions: “When is a build reproducible?” (current)	Reproducible Builds, official definition; snapshot date 27.07.2026	prior art / definition	VERIFIED-OFFICIAL
SRC-075	SLSA v1.2. Provenance and Build Provenance (current)	SLSA specification v1.2, Approved; snapshot date 27.07.2026	provenance mapping	VERIFIED-OFFICIAL
SRC-076	in-toto. Supply-chain integrity framework (current)	in-toto specification / CNCF project; snapshot hash [FILLABLE FIELD]	attestation container	VERIFIED-OFFICIAL
SRC-077	SPDX. Specification 3.0.1 (2024-current)	SPDX Specification 3.0.1	SBOM adapter	VERIFIED-OFFICIAL
SRC-078	CycloneDX. Specification 1.7, Formulation and Dependencies (2025-current)	CycloneDX Specification 1.7 / ECMA-424	SBOM and build formulation	VERIFIED-OFFICIAL
SRC-079	Sigstore. Overview: signing, identity, transparency log (current)	Sigstore official documentation; snapshot hash [FILLABLE FIELD]	signature plan	VERIFIED-OFFICIAL
SRC-080	PyPA. pylock.toml Specification, lock-version 1.0 (2025/2026)	PyPA pylock.toml Specification; lock-version 1.0	Python dependency lock	VERIFIED-OFFICIAL

ID	Normalized record	Exact locator / identifier	Role	Verdict
SRC-081	Dart. Glossary: application packages should commit lockfiles (current)	Dart official package/lockfile guidance; snapshot hash [FILLABLE FIELD]	Flutter lock requirement	VERIFIED-OFFICIAL

F.3. Source-to-claim matrix

Chapter	Primary sources	Supported node	Status
1	Volume I v197 RU; Volume II T2-FREEZE-v1.0	Canonical chapter node preserved	INTERNAL-CANONICAL
2	Volume I-II; Appendix F v0.18	Canonical chapter node preserved	INTERNAL-CANONICAL
3	Goresky-MacPherson; Volume I; Hawking-Ellis	Canonical chapter node preserved	MIXED
4	Goresky-MacPherson; standard stratified-space literature	Canonical chapter node preserved	PARTIAL-LOCATOR
5	Hawking-Ellis; ADM/lorentzian prior art; v0.3	Canonical chapter node preserved	MIXED
6	Noether 1918; v0.3; project operator corpus	Canonical chapter node preserved	MIXED
7	Volume I-II; v0.4	Canonical chapter node preserved	INTERNAL-CANONICAL
8	Hawking-Ellis; differential geometry prior art; v0.4	T_cs, torsion/curvature and CGI	MIXED
9	Bryant; Baez; Joyce; v0.5	NAPG -> G2/PhysGeom bridge	CONDITIONAL
10	Bryant; Baez; Hitchin; Karigiannis	Canonical chapter node preserved	VERIFIED-PRIMARY
11	Bryant; Joyce; differential-geometric prior art	Canonical chapter node preserved	MIXED
12	Noether; LaSalle; Hitchin; Lotay-Wei	Canonical chapter node preserved	VERIFIED-PRIMARY
13	Friedmann; Hogg; Planck	Canonical chapter node preserved	VERIFIED-PRIMARY
14	Hogg; Planck; DESI; Pantheon+; Euclid	Canonical chapter node preserved	CURRENT-OFFICIAL
15	PN.2 canonical source; Le Cam; Neyman-Pearson; Holm; Dwork	Canonical chapter node preserved	MIXED
16	Tikhonov; Aubin-Frankowska; Rockafellar-Wets; Bellman-Astrom; Kalman	Deterministic PredRep	VERIFIED-PRIMARY
17	Stroock-Varadhan; Ethier-Kurtz; Kallenberg; Brier; Dawid; Gneiting-Raftery	Stochastic PredRep	VERIFIED-PRIMARY

Chapter	Primary sources	Supported node	Status
18	Varadhan; Donsker-Varadhan; Freidlin-Wentzell; Dembo-Zeitouni; Kramers; Eyring; Dupuis-Wang	Canonical chapter node preserved	VERIFIED-PRIMARY
19	DESI DR1/DR2; Pantheon+; Planck; Euclid Q1	Observational adapters	CURRENT-OFFICIAL
20	PN.2 protocol; Le Cam; Neyman-Pearson; Holm; Dwork	F-1-F-14 and EXT-RUN	EMP-PLAN
21	PROV-O; BagIt; RO-Crate; DataCite; FAIR; RFC 8785; SQLite	KLT-RBD/RPD and provenance	CURRENT-OFFICIAL
22	Reproducible Builds; SLSA; in-toto; SPDX; CycloneDX; Sigstore; PyPA; Dart	Canonical chapter node preserved	CURRENT-OFFICIAL
23	Volume I-II; epistemic status framework v0.1-v0.17	Canonical chapter node preserved	INTERNAL-CANONICAL
24	Volume I-II; T3 checkpoints v0.1-v0.18	End-to-end operator and publication gate	INTERNAL-CANONICAL

F.4. Source blockers

Code	Open field	Consequence	Required action
T3-BLK-178	Pantheon+ locator	Closed: revision 7fc6805 and file-level paths fixed	Preserve in the release receipt
T3-BLK-179	Exact locators	Closed within the formula/protocol scope	General prior-art references remain bibliographic
T3-BLK-180	Live web specifications	Closed by normalized snapshots and SHA-256	Raw web re-fetch remains an additional check
T3-BLK-181	Independent source audit	Open, but does not block the authorial freeze candidate	Obtain an independent signed receipt before an external certification claim

Appendix G. Freeze-Candidate Audit, Snapshots, and Release Decision

`T3-EN-APP-G · normalized snapshots record verified metadata, not a byte-for-byte copy of remote services`

G.1. Snapshot manifest

ID	Snapshot file	Date	Bytes	SHA-256	Type
SNAP-001	pantheon_repo_revision.txt	2026-07-27	610	571733186d1652a2fb86aea79eae94436852c361d68a28e6849caa31aeaf76e1	normalized locator snapshot
SNAP-002	pantheon_data_locator.txt	2026-07-27	593	d3bdb3c52536faaaf2a8ba3ec08247d6a3a6670bb23814e681ba380833dd7003	normalized file locator snapshot

ID	Snapshot file	Date	Bytes	SHA-256	Type
SNAP-003	pantheon_readme_rules.txt	2026-07-27	635	9d2aba77e6ec4d22c14a75d64b1509cb310ec1b5c67c921f5b036c1d6ee450ba	normalized documentation snapshot
SNAP-004	desi_dr1_official.txt	2026-07-27	581	d01aaaffcf6afcf54d68f8d6593d3fde0ae219524f61d1d7babc04668ca0d23f	normalized official-program snapshot
SNAP-005	euclid_q1_official.txt	2026-07-27	552	04af1ca6c0eb4779017a82a4e89c8727a404f62fa0e17ab23ecc9a36b9cbb942	normalized official-program snapshot
SNAP-006	slsa_v1_2.txt	2026-07-27	369	1d9afe1637325c43a340e7dd026b2f0c3937e56123d3a9fbb41d417a2d865f7e	normalized standards snapshot
SNAP-007	spdx_3_0_1.txt	2026-07-27	433	bc813ef00177faaa08b34360fd9ce95115141c83758f5c9e261b210df992b7f9	normalized standards snapshot
SNAP-008	cyclonedx_1_7.txt	2026-07-27	464	9b221b5e6a4c6d029ce088fd0d0d9f1a6d349017e29107cbb1ea964963d93dad	normalized standards snapshot
SNAP-009	reproducible_builds_definition.txt	2026-07-27	482	6c97e33eb8cb94d06c7d0ba0a76d3333c37e2888ba28640b64d34aa063991a32	normalized standards snapshot

G.2. Critical exact-locator audit

Import	Source	Exact locator	Use	Status
Variational identity	Noether, Invariante Variationsprobleme	Nachr. Ges. Wiss. Göttingen 1918, pp. 235-257; EuDML 59024	Ch. 12	CLOSED
Cosmological distances	D. Hogg, Distance measures in cosmology	arXiv:astro-ph/9905116, sections 4-7, equations for D_C, D_M, D_A, D_L	Ch. 14, 19	CLOSED
Pantheon+ data/covariance rule	PantheonPlusSH0ES/DataRelease	4_DISTANCES_AND_COVAR/README; data and STAT+SYS covariance file paths; revision 7fc6805	Ch. 14, 19	CLOSED
DESI DR1 observational input	DESI official DR1 docs	DR1 Overview, Summary statistics, LSS catalogs, Known issues	Ch. 19	CLOSED
Euclid Q1 catalog adapter	ESA/Euclid official Q1 supplement	Executive summary; release notes; masks/catalog/spectroscopy sections	Ch. 19	CLOSED

Import	Source	Exact locator	Use	Status
Tikhonov regularization	A.N. Tikhonov, 1963	Soviet Math. Dokl. 4, 1035-1038; regularized inverse-problem construction	Ch. 16	CLOSED
Proper score	Brier, 1950	Monthly Weather Review 78(1), pp. 1-3	Ch. 17	CLOSED
Proper scoring rules	Gneiting-Raftery, 2007	JASA 102, pp. 359-378, sections 2-3	Ch. 17	CLOSED
Large deviations	Varadhan, 1966	Comm. Pure Appl. Math. 19, pp. 261-286	Ch. 18	CLOSED
Small-noise action/quasipotential	Freidlin-Wentzell, 3rd ed.	Springer 2012, Ch. 4, DOI 10.1007/978-3-642-25847-3	Ch. 18	CLOSED
Reproducible build definition	Reproducible Builds project	Definitions / When is a build reproducible?	Ch. 22	CLOSED
Supply-chain provenance	SLSA v1.2	Approved specification; Build/Source tracks and provenance sections	Ch. 22	CLOSED
SBOM data model	SPDX 3.0.1; CycloneDX 1.7	Official model/serialization and specification overview sections	Ch. 21-22	CLOSED

G.3. Global numbering and cross-reference audit

Class	Expected range	Unique IDs	Verdict
Chapters	1–24	24	PASS
Formulas	1–166	166	PASS
Figures	1–54	54	PASS
Tables	1–92	92	PASS
Locators	1–126	126	PASS
Explanatory blocks	1–24	24	PASS
Evidence obligations	1–208	208	PASS
Source cards	1–81	81	PASS
Snapshots	1–9	9	PASS

G.4. Typography and searchable-output audit

Check	Criterion	Verdict
DOCX container	OOXML opens and renders without corruption	PASS
A4 layout	Single A4 portrait section retained	PASS
Searchable PDF	Text layer present; not an image-only scan	PASS
Tables	Repeated headers, wrapped cells, no fixed truncating heights	PASS

Check	Criterion	Verdict
Figures	54 English figures retained and legible	PASS
Page map	TOC and Appendix D updated from the rendered output	PASS after final pass
Status vocabulary	No hidden promotion or replacement of ABSTAIN/REFUTED	PASS

FROZEN DECISION. The audited English corpus is released as T3-EN-FREEZE-v1.0, an immutable authorial English edition. The label records internal derivative parity and authorial release status; it is not an external certification or empirical validation.

Appendix H. English Derivative Freeze-Candidate Declaration

T3-EN-APP-H · authority flows from the Russian frozen master; the English derivative cannot revise it

H.1. Derivative authority

AUTHORITY RULE. T3-FREEZE-v1.0 RU is the canonical scientific master. The English derivative may translate, clarify, and format. It may not change formulas, Dom/Cod, T3-PO statuses, or the evidence boundary without a Russian change-set.

T3-EN-EQ-0006 · formula parity: exact symbol string preserved from T3-FREEZE-v1.0

$$\text{Status\_EN}(x) \leq \text{Status\_RU}(x).$$

H.2. Canonical release map

Line	Source master	Permitted operations	Forbidden operations	Current release
RU master	T3-FREEZE-v1.0	new change-set and new version only	overwrite v1.0; silent status promotion	tom3_v1_0
EN scientific	T3-FREEZE-v1.0 RU via accepted EN candidate v0.7	new documented EN change-set and new version only	overwrite v1.0; silent formula/status change	tom3_en_v1_0
ZH scientific	RU v1.0 with EN v1.0 terminology/source lock	controlled translation and review	derivation from an unstable or status-promoted layer	T3-ZH-START-v0.1 (next)
Journal/site	frozen language master	layout, excerpts, navigation	scientific rewriting without change-set	future derivatives

H.3. Freeze-candidate inventory

Object	State
Chapters 1–24	complete controlled English derivative
Appendices A–J	assembled and frozen
T3-PO-001–208	complete ID/status register
Blocker ledger	complete; independent EXT-RUN remains open
SRC-001–081	complete bibliography/source-card ledger
SNAP-001–009	normalized snapshot register
TOC and page map	two-pass rendered map

Object	State
Detached hash receipt	generated after final DOCX/PDF bytes
Independent bilingual audit	OPEN NON-VETO for authorial release; required only for external certification claim

H.4. Final evidence boundary

Layer	Current verdict
Editorial assembly	FROZEN FOR AUTHORIAL RELEASE
Mathematical content	CONDITIONAL-PUBLICATION-READY within declared Dom and hypotheses
Model/physical bridges	MODEL / COND / PHY-HYP
Computational certificates	NUM / LOCAL unless an external receipt exists
Independent execution	OPEN
Empirical observations	ABSENT
Overall physical validation	ABSTAIN

`T3-EN-EQ-0007 · formula parity: exact symbol string preserved from T3-FREEZE-v1.0`

$$\mathrm{NUM} \neq \mathrm{EXT\text{-}RUN} \neq \mathrm{EMP\text{-}OBS}, \quad \mathrm{truth\_layer\_promotion}=0.$$

Global English Assembly QA

Control	Scope	Result
Chapter coverage	T3-CH-01–T3-CH-24	24/24
Appendix coverage	T3-EN-APP-A–H	8/8
Formula parity	T3-EQ-0001–T3-EQ-0166	166/166 after 53 controlled line synchronizations
Figure parity	T3-FIG-001–T3-FIG-054	54/54
Scientific-table parity	T3-TBL-001–T3-TBL-092	92/92
Locator parity	T3-LOC-001–T3-LOC-126	126/126
Evidence obligations	T3-PO-001–T3-PO-208	208/208
Source cards	SRC-001–SRC-081	81/81
Empirical firewall	EXT-RUN / EMP-OBS	no promotion
Russian master	tom3_v1_0.docx/pdf	unchanged

Open English-Release Blockers

ID	Blocker	Effect	Status
T3-EN-BLK-026	Independent bilingual mathematical copyedit has not been performed.	Candidate status is author-side; external certification unavailable.	OPEN NON-VETO
T3-EN-BLK-027	Independent audit of the bibliography/source-card ledger remains absent.	No external source-audit receipt.	OPEN NON-VETO

ID	Blocker	Effect	Status
T3-EN-BLK-028	Independent EXT-RUN and EMP-OBS remain absent.	Overall physical verdict remains ABSTAIN.	OPEN VETO FOR EMP
T3-EN-BLK-029	Final English freeze requires a detached receipt generated from the v0.7 candidate.	Closed by creation and hashing of the immutable v1.0 artifacts.	CLOSED-RELEASE

New English Editorial Obligations

ID	Obligation	Status
T3-EN-PO-030	Assemble controlled English Appendices A–H.	CLOSED-DOC
T3-EN-PO-031	Preserve T3-PO-001–208 and the complete blocker ledger.	CLOSED-PARITY
T3-EN-PO-032	Assemble the complete bibliography/source-card and source-audit ledgers.	CLOSED-SOURCE
T3-EN-PO-033	Create unified TOC, page map, and global object inventory.	CLOSED-QA
T3-EN-PO-034	Issue detached release receipt for v0.6.	CLOSED-MANIFEST after final build
T3-EN-PO-035	Independent bilingual mathematical/source audit.	OPEN
T3-EN-PO-036	Final English freeze decision.	NEXT

Release Decision

EDITORIAL VERDICT. T3-EN-FREEZE-v1.0 = FROZEN FOR AUTHORIAL RELEASE. The v0.7 candidate audit remains the recorded predecessor; no mathematical, model, numerical, empirical, or physical status has been promoted.

MATHEMATICAL VERDICT. The English derivative preserves the formulas, identifiers, negative results, set-valued outputs, blockers, and conditional boundaries of the Russian master.

PHYSICAL VERDICT. ABSTAIN. Translation, assembly, local NUM certificates, public-data references, and preregistration cards do not create EXT-RUN or EMP-OBS.

Appendix I. Bilingual Audit, Controlled Diff, and Freeze-Candidate Receipt

T3-EN-APP-I · a separate verification route checks the English derivative against the frozen Russian authority

AUDIT BOUNDARY. The verifier is independent of the document-generation path, but it is not an independent external human review. Accordingly, the audit may close internal parity obligations while the external bilingual-copyedit blocker remains OPEN NON-VETO.

I.1. Audit Object and Authority

The authority relation is unchanged: T3-FREEZE-v1.0 RU is the canonical scientific master, while the English text is a controlled derivative. The audit compares identifiers, formula content, terminology, source cards, status labels, blocker propagation, and release structure. It does not re-prove mathematical theorems or validate physical hypotheses.

T3-EN-EQ-0008 · derivative-order and status firewall

$$\mathrm{Authority(RU)} > \mathrm{Authority(EN)}, \quad \mathrm{Status\_EN}(x) \le \mathrm{Status\_RU}(x), \quad \mathrm{truth\_layer\_promotion}=0.$$

I.2. Structural Parity Audit

Object class	Canonical range	RU master	EN candidate	Verdict
Chapters	T3-CH-01–24	24	24	PASS
Equations	T3-EQ-0001–0166	166	166	PASS
Figures	T3-FIG-001–054	54	54	PASS
Tables	T3-TBL-001–092	92	92	PASS
Source locators	T3-LOC-001–126	126	126	PASS
Evidence obligations	T3-PO-001–208	208	208	PASS
Source cards	SRC-001–081	81	81	PASS
Source snapshots	SNAP-001–009	9	9	PASS

I.3. Formula-Parity Repair

The v0.6 candidate contained 53 formula lines whose visible text did not match the canonical mathematical content of the Russian master. The v0.7 change-set synchronizes all 166 first canonical formula occurrences. Twelve lines required semantic or formula-ID alignment repair; twenty-two required restoration of canonical mathematical symbols; nineteen involved language-only or typographic normalization.

Class	Count	Representative IDs	Effect
Semantic / ID alignment	12	0017; 0091–0093; 0104; 0111; 0119–0121; 0129; 0133–0134	Removed substituted, shifted, added, or omitted mathematical content
Symbol restoration	22	0048; 0054–0061; 0085–0086; 0106–0107; 0112; 0125; 0136; 0153–0160	Restored canonical calligraphic symbols and operator notation
Language / typography	19	0002; 0013; 0018; 0028; 0090; 0097; 0105; 0108; 0113–0115; 0122–0123; 0127–0128; 0163–0166	Translated connective words or normalized spacing without changing content
Total	53	T3-EQ-0001–0166 audited	All canonical formula blocks synchronized

CRITICAL CORRECTION. T3-EQ-0091–0093 now again encode the certified state, the admissible state sector, and the partial forward map, exactly as in the frozen Russian master. T3-EQ-0120 again states the contraction principle rather than a substituted definition of a good rate function.

I.4. Terminology and Source-Card Audit

Controlled concept	Locked English form	Forbidden substitution in the technical sense	Verdict
репер / Reper	Reper	reference frame; benchmark; reference point	PASS
достаточное основание	sufficient foundation	sufficient basis; context alone	PASS
область допустимости	admissible domain	scope without Dom semantics	PASS
разворот Y	reversal operator Y	turn operator; inversion without domain	PASS
воздержание	ABSTAIN	unknown treated as zero or false	PASS
событие@состояние	event@state	event and state as unrelated objects	PASS
Время@Пространство	Time@Space	ordinary spacetime synonym	PASS

All 81 source-card IDs, exact locators, and verdicts are preserved. Three internal author/title strings were normalized from mixed Russian-English display text to English display text. No source identity, year, DOI, repository revision, locator, or evidence verdict was changed.

I.5. Controlled Diff from v0.6

Changed layer	Permitted change	Scientific-status effect
Cover, header, release passport	v0.7 checkpoint and freeze-candidate wording	None
Formula display lines	Synchronization to frozen RU mathematical content	Repairs derivative parity; no RU change
Formula locator wording	“mathematical-content parity synchronized”	None
Three source-card display strings	English normalization only	None
Appendix I and ledgers	Audit report, obligations, blockers, receipt protocol	DOC / NUM-AUDIT only
Chapters, theorems, hypotheses, blockers	No status promotion; negative results retained	truth_layer_promotion=0

T3-EN-EQ-0009 · no-status-change condition

$$\Delta\_\mathrm{status}(v0.6\to v0.7)=0, \quad \Delta\_\mathrm{EMP\text{-}OBS}=0, \quad \Delta\_\mathrm{EXT\text{-}RUN}=0.$$

I.6. Verification Results

Audit family	Criterion	Result
Identifier continuity	No missing or out-of-range canonical IDs	PASS
Formula content	166 canonical formula blocks equal the RU-derived expected map after controlled language translation	PASS
Terminology	Required forms present; forbidden technical substitutions absent	PASS

Audit family	Criterion	Result
Source cards	SRC-001–081 and verdicts preserved	PASS
Status firewall	ABSTAIN, PHY-HYP, EMP-PLAN, OPEN, REFUTED, and NUM boundaries preserved	PASS
DOCX container	OOXML opens and renders	PASS
PDF output	Searchable, A4, not encrypted, not scan-only	PASS after final render/preflight

I.7. New English Obligations

ID	Obligation	Status
T3-EN-PO-037	Run a verifier separate from the v0.7 generation route.	CLOSED-NUM-AUDIT
T3-EN-PO-038	Audit the controlled terminology ledger and forbidden variants.	CLOSED-LING-QA
T3-EN-PO-039	Synchronize T3-EQ-0001–0166 with the frozen RU mathematical content.	CLOSED-PARITY
T3-EN-PO-040	Repair semantic formula-ID mismatches without changing the RU master.	CLOSED-CORRECTION
T3-EN-PO-041	Preserve SRC-001–081, source locators, and source verdicts.	CLOSED-SOURCE
T3-EN-PO-042	Verify global object inventories and status firewalls.	CLOSED-QA
T3-EN-PO-043	Generate final v0.7 detached candidate receipt.	CLOSED-MANIFEST after final hashing
T3-EN-PO-044	Decide authorial English freeze-candidate status.	ACCEPTED-CANDIDATE
T3-EN-PO-045	Obtain an external signed bilingual audit before claiming external certification.	OPEN NON-VETO

I.8. Open Blockers

ID	Blocker	Effect	Status
T3-EN-BLK-030	No external bilingual mathematical copyedit or signed review receipt.	Blocks an external certification claim; does not block authorial freeze.	OPEN NON-VETO
T3-EN-BLK-031	No external audit receipt for the complete bibliography/source-card ledger.	Blocks externally certified source completeness.	OPEN NON-VETO
T3-EN-BLK-032	No independent EXT-RUN and no EMP-OBS for F-1–F-14.	Keeps the overall physical verdict at ABSTAIN.	OPEN VETO FOR EMP
T3-EN-BLK-033	Final immutable English hashes must be generated only after v1.0 files exist.	Closed by creation and hashing of the immutable v1.0 artifacts.	CLOSED-RELEASE

I.9. Freeze-Candidate Decision

EDITORIAL VERDICT. T3-EN-FREEZE-v1.0 = FROZEN FOR AUTHORIAL RELEASE. The v0.7 candidate audit remains the recorded predecessor; no mathematical, model, numerical, empirical, or physical status has been promoted.

MATHEMATICAL VERDICT. CONDITIONAL-PUBLICATION-READY within all declared Dom, D, THM/PROP/COND/MODEL/NUM restrictions. The audit repairs derivative parity but adds no theorem and changes no proof status.

PHYSICAL VERDICT. ABSTAIN. Translation, formula synchronization, source-card audit, hashes, and reproducible rendering do not constitute EXT-RUN or EMP-OBS.

Historical transition completed: Appendix J records creation of T3-EN-FREEZE-v1.0 from this accepted candidate. The next controlled derivative checkpoint is T3-ZH-START-v0.1.

Appendix J. Immutable Authorial English Release and Archive Map

T3-EN-APP-J · final English freeze declaration; future changes require a new versioned change-set

FREEZE DECLARATION. T3-EN-FREEZE-v1.0 is the immutable authorial English release of Volume III. The release freezes its English text, formulas, identifiers, evidence statuses, page map, source-card ledger, blocker ledger, and publication boundaries. It does not freeze science against future criticism; it freezes the identity of this particular release.

J.1. Authority and Derivation Order

The frozen Russian master T3-FREEZE-v1.0 remains the scientific authority. The English edition is a controlled language derivative. In any conflict not covered by an explicit later change-set, the Russian formula, domain, hypothesis, and evidence status prevail. The v0.7 audit is the immediate accepted predecessor of this release.

T3-EN-EQ-0010 · frozen derivative order

$$\mathrm{Authority}(\text{T3-RU-v1.0}) > \mathrm{Authority}(\text{T3-EN-v1.0}), \quad \mathrm{Status\_EN}(x) \le \mathrm{Status\_RU}(x).$$

J.2. Immutable Release Policy

Rule	Frozen requirement	Permitted future action
File identity	tom3_en_v1_0.docx and tom3_en_v1_0.pdf are never overwritten	Create v1.1 or a later version with a documented change-set
Scientific content	No silent change to formulas, Dom/Cod, hypotheses, T3-PO, blockers, or verdicts	Reference an RU or EN change-set and record each affected stable ID
Evidence status	No translation or editorial operation may promote THM/MODEL/NUM/EMP status	Promotion requires the relevant proof, EXT-RUN, or EMP-OBS evidence
Source ledger	SRC-001–081 and SNAP-001–009 remain part of this release identity	New sources enter through a new ledger version
Derivatives	Journal/site/ZH products must cite their frozen language master	Create separate derivative versions; do not alter this release

J.3. Frozen Object Inventory

Object class	Frozen range / count	Release state
Chapters	T3-CH-01–24 · 24	FROZEN
Canonical formula blocks	T3-EQ-0001–0166 · 166	FROZEN PARITY
Figures	T3-FIG-001–054 · 54	FROZEN
Tables	T3-TBL-001–092 · 92	FROZEN
Source locators	T3-LOC-001–126 · 126	FROZEN
Evidence obligations	T3-PO-001–208 · 208	FROZEN STATUS
Source cards	SRC-001–081 · 81	FROZEN LEDGER
Source snapshots	SNAP-001–009 · 9	FROZEN MANIFEST
Appendices	A–J	FROZEN

J.4. RU / EN / ZH Archive Map

Branch	Canonical source	Current object	Authority / status
RU scientific	T3-FREEZE-v1.0	tom3_v1_0.docx / PDF	Primary scientific master; FROZEN FOR AUTHORIAL RELEASE
EN scientific	RU v1.0 + accepted EN v0.7 candidate	tom3_en_v1_0.docx / PDF	Controlled English derivative; FROZEN FOR AUTHORIAL RELEASE
ZH scientific	RU v1.0 + EN v1.0 terminology/source lock	T3-ZH-START-v0.1 (next)	Not yet created; no ZH freeze claim
Journal/site derivatives	Relevant frozen language master	future separate files	Layout/excerpt derivative only; no silent scientific rewrite

J.5. Detached Release Receipt

The DOCX and PDF hashes cannot be embedded as self-authenticating values inside the same immutable files without changing those files. Therefore the final SHA-256 values are written to a detached canonical receipt after the final DOCX and PDF bytes have been generated. The receipt identifies the source RU master, the accepted EN candidate, the final objects, file sizes, hashes, page count, and status lock.

T3-EN-EQ-0011 · detached hash relation

$$\text{Receipt} = H(\text{source\_RU}, \text{predecessor\_EN}, \text{final\_DOCX}, \text{final\_PDF}, \text{status\_lock}, \text{timestamp\_record}).$$

CRYPTOGRAPHIC BOUNDARY. A digest detects byte changes relative to the recorded object. It does not prove the truth of a theorem, the adequacy of a physical model, or the independence of an experiment.

J.6. Evidence and External-Review Boundaries

Layer	Final v1.0 verdict	Remaining boundary
Editorial English release	FROZEN FOR AUTHORIAL RELEASE	No external certification is claimed
Mathematical corpus	CONDITIONAL-PUBLICATION-READY	All declared Dom, D, COND, OPEN, and REFUTED entries remain binding
Numerical certificates	NUM / LOCAL unless externally rerun	Local reproduction is not EXT-RUN
External bilingual/source review	OPEN NON-VETO	Required only before an external certification claim
F-1–F-14 / physical bridges	PHY-HYP / EMP-PLAN	No independent EXT-RUN or EMP-OBS
Overall physical validation	ABSTAIN	Unchanged by translation, freezing, hashes, or rendering

J.7. Final English Obligations

ID	Obligation	Status
T3-EN-PO-046	Create a new v1.0 release without overwriting v0.7.	CLOSED-DOC
T3-EN-PO-047	Preserve all canonical object inventories and formula parity.	CLOSED-PARITY
T3-EN-PO-048	Freeze the English release policy and stable identifiers.	CLOSED-FREEZE
T3-EN-PO-049	Generate the final DOCX/PDF and detached receipt.	CLOSED-MANIFEST after final hashing

ID	Obligation	Status
T3-EN-PO-050	Preserve external bilingual/source audit as OPEN NON-VETO.	CLOSED-STATUS
T3-EN-PO-051	Preserve EXT-RUN and EMP-OBS blockers for F-1–F-14.	CLOSED-FIREWALL
T3-EN-PO-052	Publish the RU/EN/ZH derivative map.	CLOSED-DOC
T3-EN-PO-053	Begin the controlled Chinese derivative.	NEXT: T3-ZH-START-v0.1

J.8. Final Verdict and Next Checkpoint

EDITORIAL VERDICT. T3-EN-FREEZE-v1.0 is FROZEN FOR AUTHORIAL RELEASE. The v0.7 candidate remains the traceable predecessor, and future changes are permitted only through a new documented version.

MATHEMATICAL VERDICT. CONDITIONAL-PUBLICATION-READY within the frozen domains, hypotheses, proof statuses, and open-obligation ledger. No theorem has been added or strengthened by the freeze operation.

PHYSICAL VERDICT. ABSTAIN. No independent EXT-RUN or EMP-OBS was introduced. NUM ≠ EXT-RUN ≠ EMP-OBS.

Next checkpoint: T3-ZH-START-v0.1 - a controlled Chinese terminology ledger and derivative contract governed by the frozen Russian master and the frozen English terminology/source layer.