MONOGRAPH
BASIC KLT-RBD PROJECT
VOLUME I

AXIOMATICS OF PACKET REPER LOGIC

Controlled English Derivative - Frozen Authorial Release

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CHECKPOINT. T1-EN-FREEZE-v1.0 is the immutable authorial English release of Volume I. It is issued exclusively from the accepted freeze candidate T1-EN-FC-v0.12 after final render, integrity, no-scientific-change, and visual-QA gates.
STATUS LOCK. truth_layer_promotion=0. Chapters 1-52, canonical Appendices A-G, derivative Appendices H-I, formulas F001-F086, negative results, and evidence statuses are unchanged from the accepted v0.12 candidate. This release is frozen; every later change requires a documented change-set and a new version. An external signed bilingual audit remains OPEN NON-VETO; independent EXT-RUN and EMP-OBS remain absent.

Field	Fixed value
Author	Ivan Borisovich Kurpishev
Project	KURPISHEV LOGIC 2 · Basic KLT-RBD Project
Volume	I · Axiomatics of Packet Reper Logic
Checkpoint	T1-EN-FREEZE-v1.0
Canonical Russian source	tom1_v197_ru.pdf · frozen edition v197 RU
Source SHA-256	5a2021c02428e3e395fe81e029c46cd26b4a0e06ceb7db fc89befddffd84a7d8
Source corpus	235 numbered RU source pages; 52 chapters; canonical Appendices A-G; derivative Appendices H-I; formula IDs F001-F086
Derivative authority	Authority(T1-RU v197) > Authority(T1-EN)
Mathematical status	DOC / DEF-A / LEM / PROP / THM / COND / MODEL / NUM-SOURCE / FROZEN-AUTHORIAL-RELEASE; Russian source statuses preserved
Physical status	PHY-HYP / EMP-PLAN where applicable; EMP-OBS absent
Next checkpoint	No in-place successor; changes only through a documented change-set and a new version

ID	Change	Status
T1-EN-CS-001	Fixed the immutable RU→EN authority relation and no-promotion rule.	DEF-A
T1-EN-CS-002	Prepared the English title, abstract, keywords, and evidence-status boundary.	EN-DRAFT
T1-EN-CS-003	Created a normative T1–T3 terminology ledger and notation safeguards.	DOC
T1-EN-CS-004	Mapped all 52 chapters and Appendices A–G to staged translation checkpoints.	DOC
T1-EN-CS-005	Preserved the continuous formula inventory F001–F086 with Russian source-page locators.	PARITY
T1-EN-CS-006	Created the status dictionary, blockers, evidence obligations, and QA protocol.	DOC
T1-EN-CS-013	Translated Chapters 9–16 with Russian source locators pp. 35–72.	EN-DRAFT
T1-EN-CS-014	Separated the classical Desargues theorem from the authorial conditional bridge obligations.	CL / COND

ID	Change	Status
T1-EN-CS-015	Normalized the FOS inverse-limit and early PN.2 model layer without promoting it to the later minimax theorem.	MODEL
T1-EN-CS-016	Translated the reduced NAPG deformation complex and explicit associator example.	DEF-A / PROP
T1-EN-CS-017	Translated PILOT-01, the FCOC carrier, first-gap theorem, and conditional Fano quotient.	THM / COND
T1-EN-CS-018	Specified RBD/RPD data, admissible future sets, matched-null, and ABSTAIN outputs.	DEF-A / EMP-PLAN
T1-EN-CS-019	Translated EX-CERT, notation/source passports, and the monotonicity rules for evidence status.	PROP
T1-EN-CS-020	Audited the classical prior-art boundary and authorial contribution classes CL/AD/IT/CT/OP/EMP.	AUDIT
T1-EN-CS-021	Translated Chapters 17–26 with Russian source locators pp. 73–146.	EN-DRAFT
T1-EN-CS-022	Added complex CP^1 cross-ratio, stability radius, harmonic involution, and real-reduction gate.	PROP / THM
T1-EN-CS-023	Added right operator cross-ratio with invertibility, order, conjugacy, and conditioning contracts.	DEF-A / COND
T1-EN-CS-024	Translated the proof-cleaned Desargues–Kurpishev theorem and its dependency certificate.	THM / COND
T1-EN-CS-025	Preserved the typed index, formula registry, and no-status-transfer rule.	DOC / PROP
T1-EN-CS-026	Translated the canonical PN.2 minimax theorem package, examples, tests, and limitations.	THM / NUM
T1-EN-CS-027	Integrated PN.2 into prediction, matched-null calibration, and subject-matter export gates.	PROP / EMP-PLAN
T1-EN-CS-028	Translated typed action/change/reversal operators and the algebra–NAPG duality.	THM / COND / OPEN
T1-EN-CS-029	Translated Chapters 27–31 with Russian source locators pp. 140–168.	EN-DRAFT
T1-EN-CS-030	Integrated the canonical PN.2 v1.0 theorem package and conservative closure of PO-11 and PO-12.	THM / NUM-SOURCE
T1-EN-CS-031	Translated internal Appendix A: four exact models, counterexamples, c=1, epsilon_minus=3, and sharp 1/4 bounds.	PROP / THM
T1-EN-CS-032	Translated internal Appendix B: A2 structural constants, expected/obtained values, tests, hashes, and scope exclusions.	NUM-SOURCE
T1-EN-CS-033	Preserved the complete F-1–F-14 physical-hypothesis register and the prohibition on status inheritance.	PHY-HYP / OPEN

ID	Change	Status
T1-EN-CS-034	Translated five typed forecast limits, robust margins, and the finite Reper horizon.	DEF-A / THM / COND
T1-EN-CS-035	Translated local versioned graph rebuilding, e-process alarm, leakage prohibition, and selective loss.	THM / COND
T1-EN-CS-036	Translated the predictive Reper bundle, partial adapters, transfer curvature, sheaf-conditional gluing, and PN.2 branch obstruction.	DEF-A / COND
T1-EN-CS-037	Translated certification levels R1–R3, deterministic replay, sequential validity, and immutable artifact status.	THM / NUM-SOURCE
T1-EN-CS-038	Added five English explanatory diagrams and a chapter-parity ledger for Chapters 27–31.	DOC / QA
T1-EN-CS-071	Converted the chapter and appendix maps into a verified static TOC and RU-to-EN page map.	DOC-QA
T1-EN-CS-072	Added Word-updateable TOC field, bookmarks, and internal hyperlinks.	DOC-NAV
T1-EN-CS-073	Added exact figure index and chapter-level table inventory.	DOC-INDEX
T1-EN-CS-074	Consolidated bibliography/source-card ledger with artifact hashes.	SOURCE
T1-EN-CS-075	Executed global cross-reference and object-count audit.	NUM-QA
T1-EN-CS-076	Preserved all evidence statuses and physical firewalls.	PARITY

The English Volume I is a controlled derivative of the frozen Russian edition v197 RU. It is not a replacement, correction, or independent mathematical edition. Every translated object remains bound to its Russian carrier, admissible domain, sufficient foundation, hypotheses, evidence status, and source-page locator.

The derivative contract is:

CONTRACT Authority(T1-RU v197) > Authority(T1-EN)

CONTRACT Status_EN(x) ≤ Status_RU(x)

CONTRACT Formula_EN(x) = Formula_RU(x)

CONTRACT ID_EN(x) = ID_RU(x)

A proposed English clarification that changes a definition, theorem hypothesis, proof step, formula, or evidence status must be separated from the translation and handled through a documented Russian change-set. Translation cannot be used as a covert revision channel.

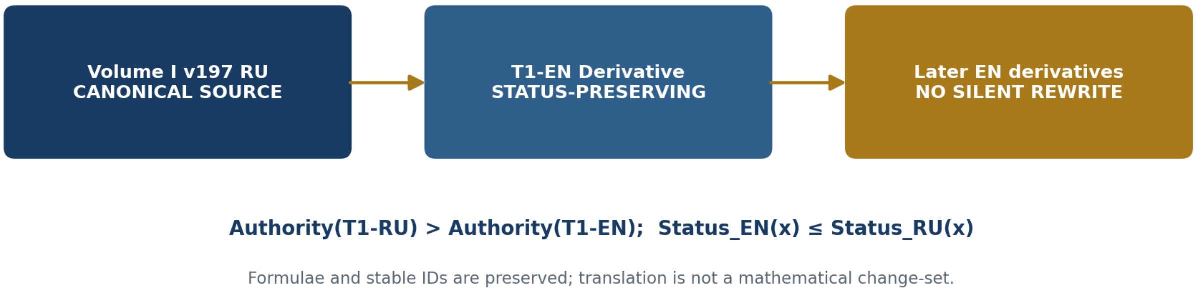

Figure T1-EN-START-001. Authority chain of the controlled English derivative.

Volume I establishes the axiomatic, geometric, and evidential foundation of packet Reper logic. Its primary ontological unit is Time@Space, within which an event is not separated from its state and is written as C@C. From this unit the text constructs packet objects and morphisms, Reper quadruples (R,I,U;D), projective-harmonic coordinates, rules of sufficient foundation, packet laws of logic, and the KLT-RBD evidence discipline. The volume develops a continuous line from the basic concepts to the Desargues–Kurpishev theorem, nonassociative packet geometry, Kurpishev Fundamental Support Connectivity, PILOT-01, and the Reper database.

The frozen Russian corpus includes the rigorous theorem package for Kurpishev PN.2: a local minimax lower bound under a hidden bracketing alternative, explicit examples, evidence obligations, and an internal computable certificate; typed operators Δ, Ξ, and Υ; the nonassociative packet Reper algebra $R\star R$ and its NAPG duality; domain adapters, preregistration, power analysis, cluster calibration, and a causal boundary; the mathematical deepening of Chapters 47–52 and Appendices A–G. The content and conclusion boundaries of the earlier corpus are preserved. The later chapters and appendices extend the mathematical and verification layer without raising the physical status of PN.2.

The authorial line belongs to Ivan Borisovich Kurpishev. Classical components—including the cross-ratio, Desargues' theorem, projectivisation, the Hodge operator, stratified spaces, and deformation theory—are treated as prior art. The claimed novelty lies in their packet-Reper synthesis, the C@C ontology, Reper(R,I,U;D), the D/Dom barrier, packet morphisms, FOS, PN.2, RBD/RPD, and the KLT computational contour.

Time@Space; event@state; C@C; packet; morphism; Reper; cross-ratio; harmonic quadruple; D/Dom; Desargues–Kurpishev theorem; Kurpishev FOS; NAPG; PILOT-01; RBD; RPD; KLT-RBD; Kurpishev PN.2; $R\star R$; hidden structural alternative; minimax lower bound; independent verification.

MATHEMATICAL BOUNDARY. PN2-7.1 has status D2 only inside the explicitly specified model; the uniform form PN2-9.1 has status D1 when a positive constant is proved. PO-11 and PO-12 are closed only at the abstract level; C1 concerns the auxiliary algebra A_2.

PHYSICAL BOUNDARY. F-1–F-14 retain D0/M0–M1/E0/R1. No experimental confirmation and no independent replication are present. EMP-PLAN is not EMP-OBS.

LEGAL / PROVENANCE BOUNDARY. A document, database registration, signature, or SHA-256 hash establishes provenance or integrity of an artefact; it does not establish mathematical or physical truth.

The ledger below is normative for the translation of Volumes I and II and must remain compatible with the frozen English Volume III. An alternative rendering is permitted only through an explicit alias→canonical entry and a recorded reason.

Russian canonical term	Normative English form	Translation safeguard
Время@Пространство	Time@Space	Authorial ontological order; not silently replaced by spacetime.
событие@состояние	event@state	Preserve the @ coupling.
C@C	C@C	Canonical symbol; never expanded into a Cartesian product.
пакет	packet	A typed structured object, not an ordinary data bundle.
пакетный объект	packet object	Retain declared carrier and additional structure.
пакетный морфизм	packet morphism	A typed map preserving declared packet structure.
Reper	Reper	Authorial term; never translated as frame/reference point.
Reper(R,I,U;D)	Reper(R,I,U;D)	Typed quadruple of reality, idea/invariant, possibilities, and foundation.
достаточное основание	sufficient foundation	Canonical rendering of D.
область допустимости	admissible domain	Canonical rendering of Dom.
D/Dom-барьер	D/Dom barrier	D and Dom are distinct and jointly required.
кросс-соотношение	cross-ratio	Classical prior art.
гармоническая четвёрка	harmonic quadruple	Projective quadruple satisfying the declared harmonic relation.
проективно-гармоническая координата	projective-harmonic coordinate	Not a physical constant or probability.
дефект истинности	truth defect	Diagnostic quantity; not a p-value.
ФОС Курпишева	Kurpishev Fundamental Support Connectivity (FOS)	Retain FOS as the project abbreviation.
Размер@Размерность	Size@Dimension	Authorial compound; preserve the @ sign.
НАПГ / NAPG	NAPG	Nonassociative Packet Geometry.
ассоциатор	associator	Do not translate as association.
неассоциативность	nonassociativity	Algebraic property only within the declared operation.
R⋆R	R⋆R	Quadratic packet object; distinct from Hodge star and binary multiplication.
оператор Ходжа	Hodge operator	Classical prior art; notation must follow local legend.

Russian canonical term	Normative English form	Translation safeguard
ПН.2 Курпишева	Kurpishev PN.2	Mathematical model theorem; physical export remains conditional.
скрытая скобочная альтернатива	hidden bracketing alternative	Structural alternative in the PN.2 model.
минимаксная граница	minimax lower bound	Preserve local/uniform hypotheses.
доказательное обязательство	evidence obligation	Use PO identifiers unchanged.
доказательный паспорт	evidence passport	Structured record of assumptions, domain, status, and result.
вычислительный сертификат	computational certificate	NUM evidence; not EMP-OBS.
формульная цепочка	formula chain	Typed chain of formula transitions.
gap-узел	gap node	Missing domain/foundation/bridge; not a theorem.
Fano barrier	Fano barrier	Classical Fano plane used within an authorial obstruction architecture.
RBD/RPD	RBD/RPD	Keep abbreviations; do not collapse database and method layers.
предсказательный Reper	predictive Reper	A certified candidate, not an oracle output.
прогнозный коридор	forecast corridor	Set-valued/interval output with coverage conditions.
conformal calibration	conformal calibration	Statistical prior art; preserve coverage qualifiers.
воздержание	ABSTAIN	Correct output under blockers; do not soften to “uncertain”.
blocker-safe	blocker-safe	A mandatory propagation rule.
E-процесс	e-process	Sequential evidence process.
неравенство Вилля	Ville’s inequality	Classical prior art.
необязательная остановка	optional stopping	Preserve the statistical technical meaning.
ковариатный сдвиг	covariate shift	Distributional shift in covariates.
постселекция	post-selection	Selection after observing outcomes.
transportability	transportability	Keep technical term; do not replace by transferability without review.
идентифицируемость	identifiability	Mathematical/statistical property.
причинная граница	causal boundary	Limit of causal inference, not geometric boundary unless specified.

Russian canonical term	Normative English form	Translation safeguard
независимая проверка	independent verification	Requires an independent runner or experiment.
EXT-RUN	EXT-RUN	Untranslated protocol identifier.
EMP-PLAN	EMP-PLAN	Empirical plan, not observation.
EMP-OBS	EMP-OBS	Independent empirical observation.
пять пределов	five limits	The declared admissibility lattice of the method.
метрика несоответствия	mismatch metric	Defined metric or pseudometric only where specified.
устойчивая перестройка	stable rebuilding	Controlled update of the Reper graph.
агрегирование ветвей	branch aggregation	Preserve branch structure and regret conditions.
граница сожаления	regret bound	Statistical/online-learning term.
source-card	source card	Exact provenance record.
происхождение	provenance	Data and claim lineage.
контрольный хеш	checksum / cryptographic hash	Integrity evidence, not truth evidence.
статус-замок	status lock	Prevents truth-layer promotion.

Symbol	Canonical reading	Prohibition / safeguard
C@C	event@state object	Not a Cartesian product and not an ordinary ordered pair without the source axioms.
⊙	declared packet or internal binary operation	Meaning is local; never replace by ⋆ or multiplication automatically.
$\star_h$ / Hodge star	Hodge duality operator	Classical operator; distinct from the quadratic NAPG object.
R⋆R	quadratic packet object	Not the Hodge star and not a generic product.
Ass⊙(x,y,z)	associator of the declared operation	Keep bracketing and operation label.
D	sufficient foundation	Not the same object as Dom.
Dom	admissible domain	Not a proof or sufficient foundation.
λ=cr(U,I;R,D)	projective-harmonic coordinate	Not a physical constant, p-value, or truth probability.
δ_truth=|λ+1|	truth defect	Diagnostic consistency coordinate only.
ABSTAIN	correct abstention verdict	Do not translate as failure, uncertainty, or refusal without the technical label.

Code	English meaning	Use in the derivative
CL	classical prior art	Established external mathematical background; authorial attribution remains external.
DEF-A	authorial definition	Defined object or rule; not a theorem.
LEM	lemma	Proved auxiliary statement within its hypotheses.
PROP	proposition	Proved statement within its domain.
THM	theorem	Proved mathematical result within declared assumptions.
COND	conditional result	Depends on an explicit bridge or hypothesis.
MODEL	model statement	Valid inside the selected model only.
NUM	computational certificate	Numerical or executable verification; not external experiment.
PHY-HYP	physical hypothesis	Falsifiable physical proposal without empirical confirmation.
EMP-PLAN	empirical plan	Pre-registered or specified test plan.
EMP-OBS	empirical observation	Independent observation or experimental result.
OPEN	open obligation	Not closed by the current corpus.
REFUTED	refuted statement	Counterexample or contradiction established.
ABSTAIN	correct abstention	Mandatory output when a required domain, foundation, bridge, or certificate is missing.

The chapter and appendix tables below are the verified static table of contents and RU-to-EN page map. Russian source pages remain the permanent authority locators; English pages are navigation locators for this release only. Linked English titles jump to bookmarked headings in DOCX and PDF.

ID	Russian canonical title	Controlled English title	RU p.	EN p.
A	Явные примеры и контрпримеры к РО-11 (§27.2.A)	Explicit Examples and Counterexamples for PO-11 (§27.2.A)	151	146
B	Вычислимый сертификат РО-12 (§27.2.B)	Computable Certificate for PO-12 (§27.2.B)	157	148
C	Полная генеалогия канонической конструкции	Complete Genealogy of the Canonical Construction	223	150
D	ПН.2: отрицательные утверждения и ремонт	PN.2: Negative Statements and Repairs	225	151
E	Исполнимый десятистадийный протокол Atlas	Executable Ten-Stage Atlas Protocol	226	152
F	Реестр формул редакции v196i14	Formula Register of Edition v196i14	227	153
G	Каноническая синхронизация ПН.2 и F-1–F-14	Canonical Synchronisation of PN.2 and F-1–F-14	231	157
H-I	Двуязычный аудит; кандидат заморозки и квитанция	Bilingual Audit; Freeze Candidate and Receipt	derivative	169 / 173

The formula inventory is continuous. Formula IDs are immutable. A future deletion is recorded as deprecated; the identifier is never reassigned. At this checkpoint the English purpose labels are navigation aids, not replacements for the formulae themselves.

ID	RU p.	Controlled English purpose
F001	205	raw observation object
F002	205	evidence extension
F003	205	D/Dom barrier
F004	205	canonical Reper quadruple
F005	205	Reper validity
F006	205	packet morphism
F007	205	Block absorption
F008	206	NAPG associator
F009	206	bracketing as a mandatory field
F010	207	Volume I cross-ratio
F011	207	harmonic defect
F012	207	homogeneous form
F013	207	projective equivariance of the invariant

ID	RU p.	Controlled English purpose
F014	207	harmonically conjugate point
F015	207	verification example for harmonicity
F016	207	Reper forecast set
F017	207	two forms of incompleteness: output=ABSTAIN and Block≠∅
F018	208	equivariance of the forecast set
F019	208	local stability away from poles
F020	209	lattice of predictive limits
F021	209	monotonicity of limits
F022	209	admissibility relative to a limit
F023	209	restriction of the forecast set
F024	209	monotonicity of prediction
F025	209	horizon of Reper action
F026	209	limit contract
F027	209	five limit coordinates
F028	210	mismatch metric
F029	210	calibrated risk
F030	211	rebuilding neighbourhood
F031	211	set of nearest Repers
F032	211	gap of the nearest candidate
F033	211	selection stability
F034	211	Lipschitz bound for rebuilding
F035	211	Reper versioning
F036	212	nonassociativity of sequential revision
F037	212	revision nonassociativity
F038	212	honest gain from rebuilding
F039	213	Atlas v2.1 counters
F040	213	RBD graph
F041	213	substochastic kernel
F042	213	abstention mass
F043	213	propagation operator
F044	213	contraction estimate
F045	213	fixed vector
F046	213	convergence rate
F047	213	perturbation of the fixed point
F048	214	interval operators
F049	214	fixed-point envelope
F050	215	conditional predictive coverage
F051	215	sequential budget

ID	RU p.	Controlled English purpose
F052	215	multiple-comparison budget
F053	215	operational criterion of gain
F054	216	union bound
F055	223	original Reper notation from monograph 5.0
F056	223	original harmonic criterion
F057	223	computable coordinate
F058	223	harmonicity defect
F059	223	architectural sum
F060	223	historical composition of change and action
F061	223	limit-dependent operator
F062	223	historical predictive chain
F063	225	PN.2-A core
F064	225	insufficiency of the triple
F065	225	repair by a fourth element
F066	225	packet hole
F067	225	repair operator
F068	225	completeness criterion
F069	226	stage coupling
F070	226	temporal monotonicity
F071	226	absorption before publication
F072	226	publication gate
F073	229	number of formulae in the new layer
F074	217	testable quadratic layer X^2_N
F075	217	quadratic obstruction O_B and quotient projection
F076	217	commutative computation square for an NAPG_q morphism
F077	217	degrees of the minimal cochain complex C_min•
F078	217	components of the differential δ_min
F079	218	canonical internal bridge Θ_min=id
F080	218	canonical identification H^3(C_min•)≅O_B
F081	218	naturality of the isomorphism κ
F082	219	chain equalities for the external bridge J
F083	219	naturality of the external-bridge components
F084	219	definition of the conditional external certificate Π_E
F085	219	naturality of Π_E with respect to morphisms

ID	RU p.	Controlled English purpose
F086	220	conditional associator class in external $H^3(E\bullet)$

FORMULA-REGISTRY-CERT. The range F001–F086 is continuous. F001–F073 retain earlier identifiers; F074–F086 are imported from §§52.9–52.14 without renumbering.

Checkpoint	Scope	Status
T1-EN-START-v0.1	Contract, abstract, terminology, chapter/appendix/formula maps	PREDECESSOR
T1-EN-FOUNDATIONS-v0.2	Chapters 1–8	PREDECESSOR
T1-EN-GEOMETRY-v0.3	Chapters 9–16	PREDECESSOR
T1-EN-OPERATORS-v0.4	Chapters 17–26	PREDECESSOR
T1-EN-PN2-v0.5	Chapters 27–31 and internal A–B synchronisation	PREDECESSOR
T1-EN-DATA-v0.6	Chapters 32–40	PREDECESSOR
T1-EN-VALIDATION-v0.7	Chapters 41–46	PREDECESSOR
T1-EN-CLOSURE-v0.8	Chapters 47–52	PREDECESSOR
T1-EN-APP-v0.9	Appendices A–G and indexes	PREDECESSOR
T1-EN-ASSEMBLY-v0.10	Unified English master and page map	PREDECESSOR
T1-EN-AUDIT-v0.11	Bilingual formula/status/source audit	AUDITED PREDECESSOR
T1-EN-FC-v0.12	Freeze candidate and detached receipt	ACCEPTED FREEZE PREDECESSOR
T1-EN-FREEZE-v1.0	Immutable authorial English release	CURRENT · FROZEN

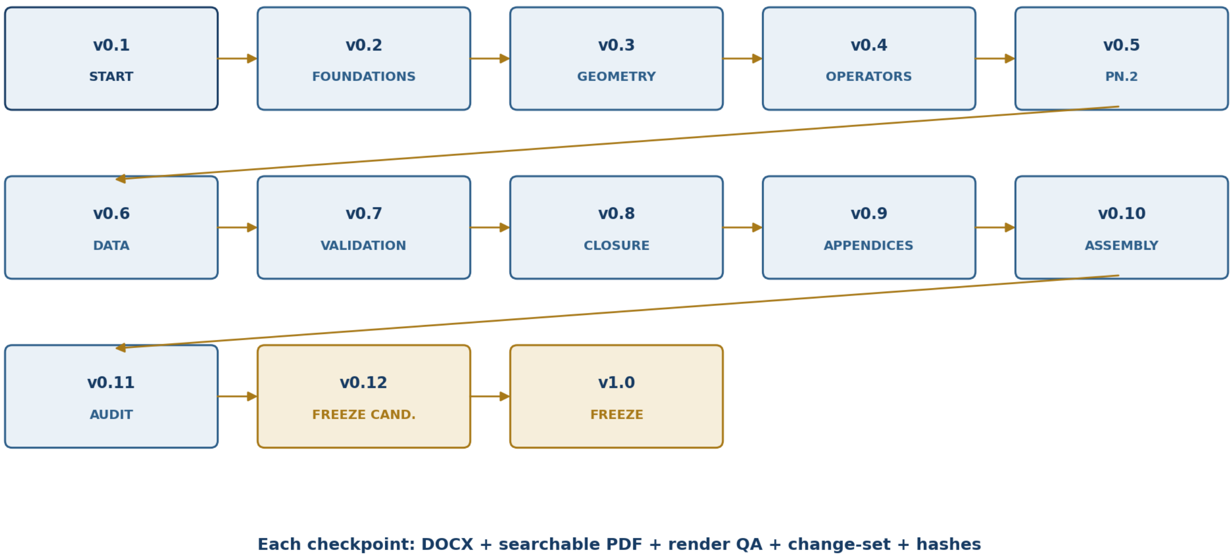

Figure T1-EN-START-002. Staged route from translation contract to frozen English release.

Obligation	Result / requirement	Status
T1-EN-PO-001	Canonical source and SHA-256 fixed	CLOSED-DOC

Obligation	Result / requirement	Status
T1-EN-PO-021	Freeze-candidate controlled diff and detached release receipt	CLOSED-v0.12

Blocker	Description	Status	Required handling
T1-EN-BLK-001	The active package contains the canonical Russian PDF but not an editable Russian DOCX master.	OPEN NON-VETO	Use PDF locators as authority; do not infer hidden Word structures.
T1-EN-BLK-002	Historical fragments use the symbol * with several local meanings.	OPEN	Require a local notation legend before every translated reuse.
T1-EN-BLK-003	Several authorial terms have legacy English variants across older publications.	OPEN	T1–T3 terminology ledger governs the translation; deviations require a recorded alias.
T1-EN-BLK-004	The English pagination will differ from the 235-page Russian source corpus.	CLOSED-v0.10	Static RU-to-EN page map and internal links installed; RU pages remain authoritative locators.
T1-EN-BLK-005	An external signed bilingual mathematical audit has not been performed.	OPEN NON-VETO	Required only before external certification claim, not before authorial drafting.

QA gate	Requirement
Structural parity	52 chapters, 7 appendices, F001–F086, stable source locators
Formula parity	No semantic or symbolic change; every changed rendering compared to RU source
Status parity	No definition/theorem/model/physical-status promotion
Terminology	Normative ledger; alias deviations recorded
Typography	A4, readable fonts, repeatable table headers, no clipped formulae or tables
DOCX QA	Render every page to PNG and visually inspect at 100%
PDF QA	Independent PDF render; searchable text; not encrypted; not image-only
Integrity	SHA-256 for DOCX/PDF and source records
Versioning	Never overwrite previous checkpoints

ESTABLISHED. T1-EN-FREEZE-v1.0 contains Chapters 1-52, canonical Appendices A-G, derivative audit Appendices H-I, the complete F001-F086 registry, verified navigation, source-card metadata, and the accepted no-scientific-change lineage from v0.11 through v0.12.
NOT ESTABLISHED. No external signed bilingual certification exists; EXT-RUN and EMP-OBS remain absent; hashes establish identity and integrity rather than mathematical or physical truth.

POST-FREEZE RULE. T1-EN-FREEZE-v1.0 is immutable. Any correction, extension, or metadata change requires a documented change-set and a new version; in-place editing is prohibited.

T1-EN-FOUNDATIONS-v0.2

CONTROLLED ENGLISH TRANSLATION OF CHAPTERS 1–8

TRANSLATION NOTE. The scientific content below is translated from Russian source pages 5–34. Repeated running headers, duplicated archival tables of contents, and obvious extraction artefacts are not reproduced as independent scientific claims. Their substantive formulas and status statements are retained in normalized archival subsections.

STATUS FIREWALL. The translation preserves the Russian hierarchy of definitions, axioms, lemmas, propositions, theorems, conditional statements, models, open obligations, counterexamples, and ABSTAIN verdicts. No English clarification changes the truth layer.

v0.2 Change-Set and Parity Scope

ID	Change	Status
T1-EN-CS-007	Translated Chapters 1–8 with Russian source-page locators.	EN-DRAFT
T1-EN-CS-008	Reconstructed eight diagrams with English labels while preserving the source mathematical roles.	DOC/FIG
T1-EN-CS-009	Preserved all explicit axioms C1–C6, R1–R8, typed morphism conditions, and status gates.	PARITY
T1-EN-CS-010	Preserved the harmonic-complement theorems, projective-invariance theorem, and conditioning statements.	THM-PARITY
T1-EN-CS-011	Preserved all negative results: no truth from C@C alone, no global inverse outside Dom, no status promotion from λ, and no empirical claim from formal soundness.	NEGATIVE-PARITY
T1-EN-CS-012	Added source-locator and translation-completeness matrix for Chapters 1–8.	QA

Chapter	English title	Russian locator	Status
1	Time@Space and Stratified Ontology	RU pp. 5–8	COMPLETE
2	C@C: event@state as the Minimal Object	RU pp. 9–12	COMPLETE
3	Packet Objects and the Category Pack	RU pp. 13–17	COMPLETE
4	Packet Morphisms, Reductions, and Conservation Laws	RU p. 18	COMPLETE
5	Reper(R,I,U;D): Definition and Axioms	RU pp. 19–22	COMPLETE
6	Projective-Harmonic Cross-Ratio	RU pp. 23–26	COMPLETE

Chapter	English title	Russian locator	Status
7	D/Dom and Sufficient Foundation	RU pp. 27–30	COMPLETE
8	Packet Laws of Logic and Rules of Inference	RU pp. 31–34	COMPLETE

Chapter 1. Time@Space and Stratified Ontology

Russian source locator: pp. 5–8

PLAIN-LANGUAGE MEANING	This chapter sets the initial scene of the theory: space is treated as a section of the more comprehensive object Time@Space, and dimensional levels are organised as strata.
MATHEMATICAL CORE	A standard stratified envelope, the concept of an admissible section, and the authorial project terms Hyparxis and Apeiron are introduced.
BOUNDARY OF THE CLAIM	This is an axiomatic ontology and a model language, not an independently confirmed experimental theory of physical spacetime.
STATUS	AXIOMATIC FOUNDATION

The term Time@Space is not introduced as a renaming of spacetime. It changes the order of ontological foundations. In the conventional notation, space and time are already given as a coordinate continuum. Here stratified temporal connectedness is taken as primary, while space arises as a stable section or layer of its realisation. Such a reversal requires a strict distinction between a philosophical thesis, an axiomatic model, and a physical interpretation.

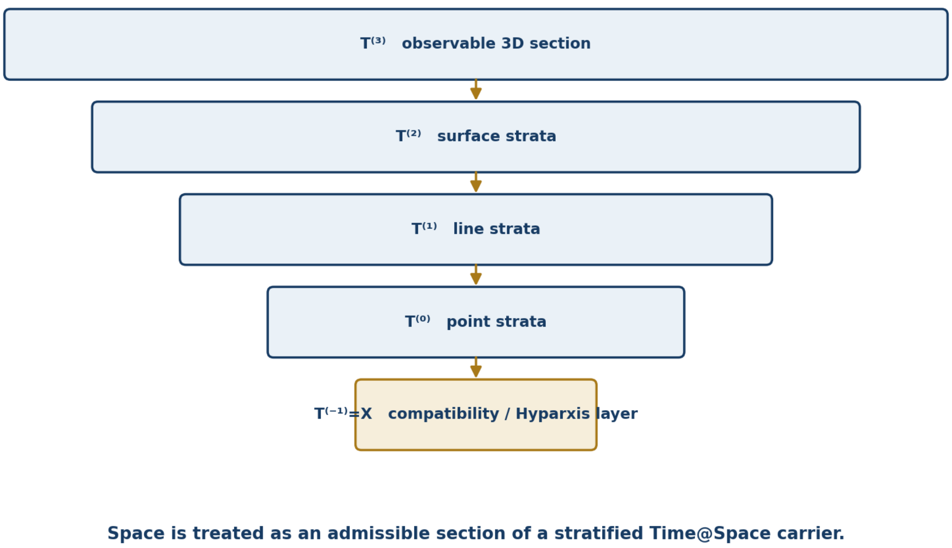

Figure 1.1. Stratified layers of Time@Space and their admissible reductions.

1.1. Standard Stratified Envelope

Let X be a Hausdorff paracompact space endowed with a finite filtration by smooth pure layers $X^{(k)}$, $k\in\{-1,0,1,2,3\}$. The authorial filtration $T^{(k)}$ is understood as a stratified envelope. The index -1 is retained as a special compatibility layer of transitions and need not be an independent smooth stratum.

$$T^{(3)} \subset T^{(2)} \subset T^{(1)} \subset T^{(0)} \subset T^{(-1)} = X \quad \text{[RU p. 6]}$$

1.2. Space as an Admissible Section

Observed three-dimensional space is interpreted as the outer layer $T^{(3)}$; surfaces, lines, and points coexist as deeper strata. Time is not reduced to an additional coordinate. It specifies an ordered compatibility of transitions, the domains of partial maps, and the preservation of structure under reduction.

1.3. Hyparxis and Apeiron

Hyparxis is a family of compatible transitions between adjacent filtration levels. Apeiron is a condition of global connectedness that prevents the transition system from decomposing into mutually inconsistent fragments. These terms acquire mathematical meaning only when maps, domains, and composition rules are stated explicitly.

Definition 1.1 [DEF-A]. A standard stratified envelope is a Hausdorff paracompact space X with a finite family of closed subsets and pure strata $X_k = T^{(k)} \setminus T^{(k-1)}$. Every nonempty X_k is a connected smooth manifold of pure dimension k. Near $x \in X_k$ one allows a conical local model $U \cong \mathbb{R}^k \times C(L_x)$.

The local dimension is a function $\dim_{loc}: X \to \{-1,0,1,2,3\}$. The formal level -1 is not declared to be a new geometric dimension; it encodes a compatibility layer of transitions. The envelope is a standard external carrier but does not replace the authorial packet formalism.

Definition 1.2 [DEF-A]. For k=3,2,1,0, partial smooth maps $L_k: \mathrm{Dom}(L_k) \subset T^{(k)} \to T^{(k-1)}$ are specified. On overlaps they must be compatible with stratum inclusions and satisfy $L_{k-1} \circ L_k = L_{k-1,k}$ whenever both sides are defined.

Definition 1.3 [DEF-A]. The stratified envelope is Apeiron-connected when there exists a global potential $\tau: X \to \mathbb{R}$, constant on each stratum and strictly decreasing along every admissible transition to a lower-dimensional layer, and when any two points can be connected by a finite admissible chain compatible with the direction of τ.

Functoriality is understood relative to one fixed envelope. Packet-category morphisms commute with restrictions to pure strata, with the Hyparxis maps, and with the relevant Hodge operators. Later constructions therefore do not silently introduce a new base carrier.

EVIDENCE BOUNDARY. Existence of the envelope and transition maps is an axiomatic or model input. A physical interpretation of Time@Space does not follow from a topological realisation alone.

1.4. Packet Flow and the Hodge–Kurpishev Superoperator

Let $\star$ be the Hodge operator on the k-th pure layer and suppose that L_k admits smooth local sections. The superoperator H is defined as a compatible composition of transfers and Hodge dualities between neighbouring layers. The expression is meaningful only on the intersection of the domains of all participating operators. The identity $\star^2 = (-1)^{p(k-p)}\mathrm{id}$ applies to p-forms for fixed metric and orientation.

A flow in Pack is a one-parameter family of automorphisms $\Phi_t: \mathrm{Pack} \to \mathrm{Pack}$ preserving the stratification and commuting with H and L_k. An inertial connection is such a flow I_t for which $I_t H = H I_t$. A Lyapunov functional S may, for example, be selected as the squared norm of an associator amplitude; its monotonicity is a separate hypothesis of a particular dynamical model.

$$A(\zeta)=\|d\zeta\|, \qquad dS(\Phi_t x)/dt \le 0 \text{ only under explicitly specified dynamics}$$ [RU p. 8]

Proposition 1.1 [PROP] The basic axiom system has a finite model if empty strata and partial transitions are permitted.

Proof. Take $X=\{x_{-1},x_0,x_1,x_2,x_3\}$, set $T^{(-1)}=X$ and $T^{(k)}=\{x_k,\dots,x_3\}$ for k=0,1,2,3. Define $L_k(x_k)=x_{k-1}$ on singleton domains and leave the maps undefined elsewhere. All inclusions, types, and admissible-composition conditions hold directly.

Corollary 1.2 [PROP]. The existence of a formal model proves compatibility of the axioms only. It does not prove that Time@Space is physical spacetime.

1.5. Evidence-Applicability Passport

The passport of a Chapter 1 claim records the axiom identifier, carrier X, pure strata, Dom(L_k), chosen metrics and orientations, sufficient foundation D, result type, and prohibited interpretations. A transition from axiomatic status to geometric or physical status requires a separate realisation morphism and independent evidence.

PHILOSOPHICAL BOUNDARY. A model demonstrates the possibility of a non-contradictory world of reasoning; it does not convert thinkability into observed actuality. The route from possibility to fact must remain visible in the evidence passport.

Chapter 2. C@C: event@state as the Minimal Object

Russian source locator: pp. 9–12

PLAIN-LANGUAGE MEANING	An event is not separated from the state in which it is recorded. The notation C@C prevents either component from being lost in logical or computational analysis.
MATHEMATICAL CORE	The minimal packet event@state is defined, together with its axioms, versioning rules, and elementary examples.
BOUNDARY OF THE CLAIM	Packaging an event with a state does not establish its truth. Reper, Dom, and a sufficient foundation D are required later.
STATUS	INTERNAL DEFINITION

An ordinary geometric point answers “where?” but does not contain the answer to “in what state?”. Packet Reper logic therefore takes a minimal object that simultaneously records an act of occurrence and the layer in which that act acquires meaning.

$$c = C@C = (e,s)$$ [RU p. 9]

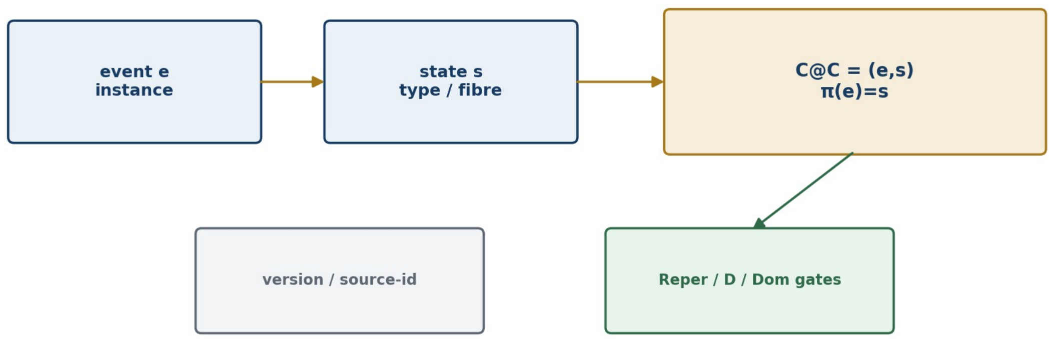

Figure 2.1. The C@C object, versioning, and the transition to evidence gates.

2.1. Early Content Axioms CC1–CC5

Axiom	Content
CC1	Every event is considered only together with a state.

Axiom	Content
CC2	A state without a carrier event does not form a completed object.
CC3	A change of state creates a new C@C object or a morphism.
CC4	Reduction of C@C to a point is permitted only through an explicit forgetful map.
CC5	Source, recording time, and domain belong to the evidence passport of the object.

EDITORIAL CONVENTION. CC1–CC5 are retained as the early content-level pre-axiomatics. The formal system of the frozen edition is C1–C6 below; if the two layers diverge, C1–C6 has priority.

Definition 2.1 [DEF-A]. Let S be a set or object of states, E a set of event instances, and $\pi:E\to S$ a typing map. The minimal C@C object is the dependent sum $C@C(\pi)=\Sigma_{s\in S}\, E_s=\{(e,s)\in E\times S \mid \pi(e)=s\}$, where $E_s=\pi^{-1}(s)$.

Formal axiom	Statement
C1 — Typing	The pair (e,s) belongs to C@C only when $\pi(e)=s$. Pairing an event with an arbitrary incompatible state does not create a Chapter 2 object.
C2 — Double distinguishability	$(e,s)=(e',s')$ if and only if $e=e'$ and $s=s'$. Neither coordinate absorbs the other.
C3 — Local non-emptiness	The packet line $L_s=E_s\times\{s\}$ is a nonempty layer only if $E_s\neq\varnothing$. An empty layer may represent a state of possibility but contains no occurred event.
C4 — Versioning	A change of state, timestamp, source, or coordinate convention creates a new C@C instance; the prior object is not overwritten retrospectively.
C5 — Status neutrality	Membership in C@C records an event in a state but establishes neither truth, causality, nor predictive strength. These statuses require Reper, D, Dom, and the relevant protocol.
C6 — Traceability	For evidential or empirical use, the pair carries a source-id and an immutable version identifier. Absence of the reference does not destroy the mathematical pair but blocks evidence-status promotion.

Lemma 2.2 [LEM] The projection $pr\_E:C@C(\pi)\to E$ is bijective, whereas $pr\_S:C@C(\pi)\to S$ is generally not injective. The substantive contribution of C@C is not an increase in the cardinality of E but the explicit preservation of the typing π and the state $\pi(e)$.

Proof. Every $e\in E$ corresponds to exactly one pair $(e,\pi(e))$, so pr_E has the inverse $e\mapsto(e,\pi(e))$. Distinct events may lie in one fibre E_s; hence pr_S may identify different pairs.

2.2. Examples

Domain	C@C interpretation
Mathematics	A formula without axioms and an admissible domain is merely an event of inscription; its state is supplied by the theory, notation, and proof chain.

Domain	C@C interpretation
Cost estimate / audit	A price line becomes an auditable object only together with the project section, stage, norm, and foundation document.
Physics	A numerical value requires units, experimental channel, uncertainty, and source.
Biology	A sequence requires an accession, organism, database version, and coordinate convention.

2.3. Normalized Archival Layer from Monograph 5.0

The preserved legacy layer described the project's minimal object as a packet point a=(e,s), where e is an event and s is a state. An event outside a state lacks geometric fixation; a state without an event remains an empty layer. The archival hierarchy was recorded as C@C → R@C@C → T_cs → Flag/Reper → transreper, serving as a rollback route when a computational, physical, or anthropological extension breaks connectedness.

$$\mathrm{Human\_R} = \mathrm{C@C} + \mathrm{Rep}(R,I,U;D) + (\Xi,\Delta,Y) + L + \lambda$$ [normalized legacy formula]

$$\mathrm{Rep}_i = (R_i,I_i,U_i;D_i), \qquad \mathrm{Truth}(\mathrm{Rep}) \Leftrightarrow \mathrm{cr}(U,I;R,D)=-1$$ [normalized legacy formula]

$$\lambda = ((U-R)(I-D))/((U-D)(I-R)), \qquad \delta\_\mathrm{truth} = |\lambda+1|$$ [normalized legacy formula]

The legacy corpus also used C@C as the unit of causality, memory, document, proof, forecast, and action. In the controlled English derivative this broad use is preserved as an architectural programme; it does not erase domain-specific typing or evidential requirements.

CHAPTER 2 PASSPORT. carrier=C@C(π); typing=π:E→S; identity=coordinatewise; versioning=immutable; source-id=required for evidence promotion; truth-status=neutral; downstream gates=Reper/D/Dom.

Chapter 3. Packet Objects and the Category Pack

Russian source locator: pp. 13–17

PLAIN-LANGUAGE MEANING	The chapter explains how packet objects and admissible transitions between them form one mathematical system.
MATHEMATICAL CORE	The category Pack is constructed; objects, labels, states, and morphisms are distinguished; preservation of packet structure is made explicit.
BOUNDARY OF THE CLAIM	Pack is a working category of the project, not a universal category of all events or all states.
STATUS	INTERNAL CONSTRUCTION

A packet combines an object with an additional structural layer that cannot be replaced by an ordinary pair of data without loss of meaning. In the basic Hodge-compatible realisation, the packet object contains a geometric carrier and a dual component defined by the Hodge operator on the relevant layer.

$$U \odot V := (U, \star_h V)$$ [RU p. 13]

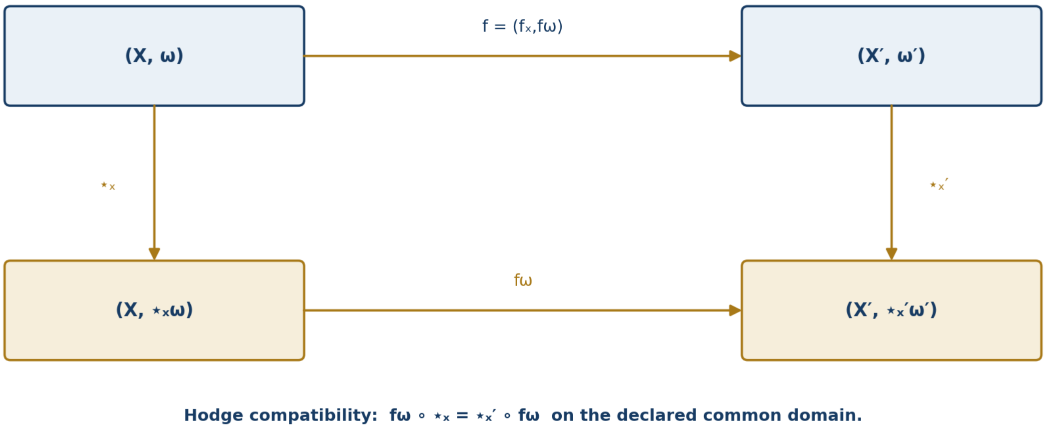

Figure 3.1. Commutative square for a Hodge-compatible packet morphism.

3.1. The Category Pack

An object of Pack is a typed pair (X,ω), where X is an admissible stratum and ω is a differential form in a declared space $\Omega^p(X)$. A morphism $f:(X,\omega)\to(X',\omega')$ consists of a smooth map f_X and a linear transfer f_ω, preserves stratification and the declared metrics, and commutes with the Hodge operators on the common domain.

$$f\_\omega \circ \star\_X = \star\_X' \circ f\_\omega \quad \text{[RU p. 14]}$$

3.2. Separation of Symbols

Symbol	Controlled meaning
$\star_h$ / ⋆_Hdg	Hodge operator
⊙	internal, generally nonassociative binary operation
R⋆R	quadratic packet object
Ass⊙(x,y,z)	trilinear defect $(x\odot y)\odot z - x\odot(y\odot z)$
* in archival formulas	interpreted only by the local legend; never imported automatically into the live notation

The normalized notation does not identify R⋆R with Hodge duality. Packets such as C⋆_HdgB, M⋆_HdgR, P⋆_HdgP, and C⋆_HdgC remain typed examples only on their declared domains.

3.3. Geometric Realisation of Packet Objects

Let $X=\bigcup X_k$ be a standard stratified envelope. The category Str(X) has the nonempty pure strata X_k as objects; a morphism $X_j\to X_k$ exists for a declared incidence with $j\geq k$. Locally X is modelled by $\mathbb{R}^k\times C(L_x)$.

Packet-realisation data on X_k consist of an oriented real vector bundle $E_k\to X_k$, a metric g_k, a Hodge operator $\star:\Lambda^p E_k^*\to\Lambda^{k-p}E_k^*$, and a class of admissible forms Γ_adm(E_k). For incident strata one specifies restriction maps r_{jk} compatible with composition.

$$r_{jk} \circ \star = \star \circ r_{jk} \quad \text{on } \mathrm{Dom}(r_{jk}\circ\star) \quad \text{[RU p. 15]}$$

The notation U⋆_HdgV denotes the pair (U,⋆_U V) only when V belongs to Dom(⋆_U). Object notation does not replace checks of form degree, layer dimension, metric, and orientation.

QUADRATIC-LAYER BOUNDARY. This realisation fixes the stratified and Hodge-theoretic environment only. The objects $R\star R$, their polarisation identities, and obstruction maps belong to the later NAPG layer and do not follow from Str(X) alone.

3.4. Pack Morphisms and Naturality

A morphism $f:(X,\omega)\to(X',\omega')$ contains a smooth map f_X and a linear operator f_ω. If f_X is an isometry, naturality of the Hodge operator is $f\_\omega(\star\_X\alpha)=\star\_X' f\_\omega(\alpha)$. Conformal maps require a separate dimension-and-degree factor; the word "compatible" is not a substitute for the exact formula.

Proposition 3.1 [PROP] Isometric Pack morphisms are closed under composition and preserve Hodge duality.

Proof. For $g\circ f$, one has $g\_\omega f\_\omega \star\_X = g\_\omega \star\_X' f\_\omega = \star\_X'' g\_\omega f\_\omega$. The identity morphism is also compatible with $\star$.

If the Hyparxis maps L_k are diffeomorphisms onto their images, their local sections induce mutually inverse transfers of differential forms on their domains. This is a local statement and does not create global invertibility outside the declared domains.

3.5. Superoperator, Flow, and Inertial Connection

The Hodge–Kurpishev superoperator H is built from the Hodge operators on the strata and selected lifts and restrictions. Any compact notation $H:=H(\star,L_k)$ is an abbreviation for a typed composition, not a self-sufficient definition without a domain.

A flow Φ_t:Pack→Pack preserves stratification when $\Phi_t(T^{(k)})\subset T^{(k)}$ and is compatible with H when $\Phi_t H=H\Phi_t$. An inertial connection is a flow that also preserves the admissible transitions L_k.

NEGATIVE STATEMENT. Existence of a Pack morphism does not imply that scalar "size" and "dimension" can be assigned simultaneously and independently without a sufficient foundation D and a type contract. This boundary later enters the mathematical form of PN.2.

3.6. Differential Example and Boundary of the Authorial Layer

In a seven-dimensional model with a G_2-structure φ, the associated metric defines a Hodge operator and a 4-form $\psi=\star\varphi$. The Laplacian flow is $\partial\varphi/\partial t=\Delta\_\varphi\varphi$ with $\Delta\_\varphi=dd^*+d^*d$. This classical geometric environment is a model realisation; it does not prove a physical interpretation of NAPG.

In the selected left-invariant ansatz, dφ and dψ are computed, and the associator amplitude is defined by the norm of a selected Hyparxis form ζ: $A(\varphi)=\|d\zeta\|$. The value depends on the metric, normalisation, and model domain.

The reduced deformation theory uses the tangent quotient $H^2\_red=\ker d^2/\mathrm{im}\, d^1$ and the primary obstruction $O^3\_red=C^3\_red/\mathrm{im}\, d^2$. The derivative of a parameterised family defines a distinguished tangent class; continuation to second order requires the corresponding obstruction to vanish. The converse is not accepted without additional hypotheses.

The authorial architecture lies in the connection of stratified time, packet formalism, PN.2, the superoperator H, the flow-module packet, the action/change/reversal operators, associator amplitude, and NAPG. Hodge theory, G_2 geometry, and deformation theory are cited as classical prior art and mathematical environment.

CHAPTER 3 PASSPORT. carrier=X; strata=$\{T^{(k)}\}$; internal operation=⊙; Hodge=$\star$_Hdg; quadratic object=$R\star R$; Dom=explicit; D=source-and-proof; physical transfer=OPEN; truth_layer_promotion=0.

3.7. Categorical Specification of Pack

Definition 3.7 [DEF-A]. A Pack object is $P=(|P|,\{P_j\}_{j\in J},s\_P)$, where $\{P_j\}$ is a finite or locally finite filtration of the carrier and s_P is additional packet structure compatible with restrictions to the strata.

Definition 3.8 [DEF-A]. A morphism $f:P\to Q$ consists of a carrier map and a family of stratum maps preserving indices, restrictions, and the canonical packet operation ⊙.

Theorem 3.9 [THM] With identity morphisms and componentwise composition, admissible packet objects form a category Pack.

Proof. Identity maps preserve the filtration and structure. The composition of two compatible squares is compatible; associativity follows from associativity of map composition, not from associativity of the internal NAPG operation.

Corollary 3.10 [THM]. Categorical composition of morphisms and the internal nonassociative operation ⊙ belong to different types and cannot substitute for one another.

PHILOSOPHICAL INSERT. A category retains not only things but also the admissible ways of moving between them. The meaning of an object is therefore revealed in a network of transformations that do not destroy its type.

Chapter 4. Packet Morphisms, Reductions, and Conservation Laws

Russian source locator: p. 18

PLAIN-LANGUAGE MEANING	The chapter specifies which transformations of packets are admissible and exactly what may be forgotten in a reduction.
MATHEMATICAL CORE	Conditions for admissible morphisms, reduction and forgetting operations, and projective preservation rules for labels and relations are stated.
BOUNDARY OF THE CLAIM	A conservation law applies only after the relevant category of objects is specified and does not automatically become a physical conservation law.
STATUS	AXIOMS AND RULES

A packet morphism transfers an object between layers or domains while preserving not only the form of notation but also its evidential meaning. A morphism that preserves a geometric picture but loses D, Dom, source, or status does not transport authorization.

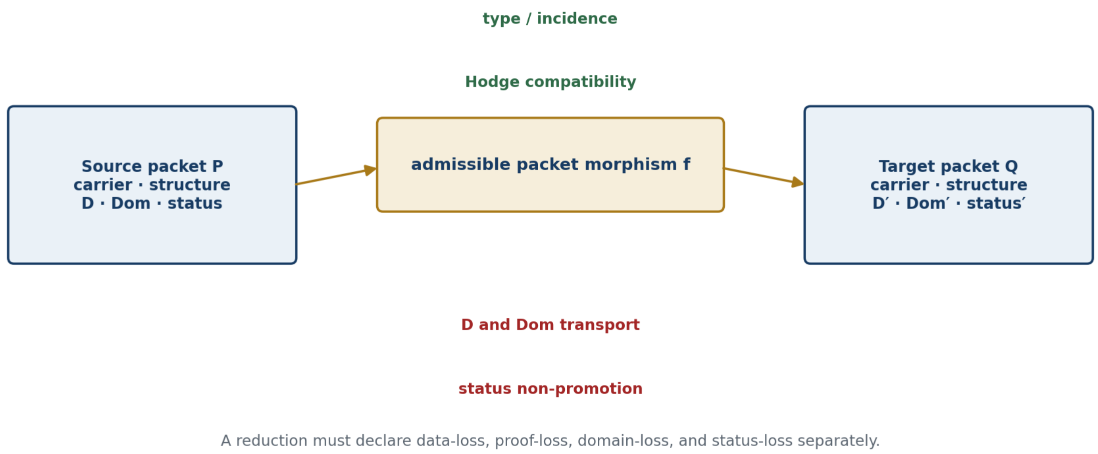

Figure 4.1. Packet/Reper morphism and the components that must be preserved or explicitly transformed.

4.1. Admissibility Conditions

Condition	Required check
Typing	Source and target belong to the declared categories.
Incidence	Membership and intersection relations are preserved.
Hodge compatibility	The square with the Hodge operators commutes.
D/Dom	Foundation and admissible domain are preserved or transformed explicitly.
Status	A high status cannot arise from a lower one without a new evidence procedure.
Invertibility	If invertibility is claimed, an inverse morphism and the composition identities are exhibited.

4.2. Reduction and Forgetting

A reduction may be affine, projective, metric, physical, computational, or semantic. Every reduction must state which data are preserved and which are forgotten. Forgetting is not an error by itself; the error begins when the reduced result is used as though no loss had occurred.

4.3. Stability under Composition

Theorem 4.1 [THM] If $f:P\to Q$ and $g:Q\to R$ are admissible packet morphisms and their domains are compatible, then $g\circ f$ preserves every invariant preserved by both morphisms.

Proof. For an invariant I, $I\_Q\circ f=I\_P$ and $I\_R\circ g=I\_Q$. Hence $I\_R\circ g\circ f=I\_P$. The domain condition excludes application of the composition outside the common domain.

Corollary 4.2 [THM]. A chain of transformations is authorized only on the intersection of the domains of all its links.

Counterexample 4.3 [REFUTED GENERALISATION]. Two transformations that are separately computable need not compose when the image of the first does not lie in the domain of the second.

4.4. Loss of Data and Loss of Foundation

Definition 4.1 [DEF-A]. Data loss is the irreversible identification of distinct input records. Foundation loss is the deletion of D, or of the relation to D, while computed values are formally retained.

Proposition 4.4 [PROP] Foundation loss may occur without numerical data loss, and data loss may occur without immediate loss of a formal foundation; the defects are independent.

Proof. The projection $(x,D)\mapsto x$ preserves a number but removes its foundation. Hashing a document together with a signed protocol may preserve evidence that a version existed while losing the full document text.

REDUCTION RULE. Every reducing morphism separately records data-loss, proof-loss, domain-loss, and status-loss.

Chapter 5. Reper(R,I,U;D): Definition and Axioms

Russian source locator: pp. 19–22

PLAIN-LANGUAGE MEANING	A Reper is an object passport: what is actually given, which idea or invariant is selected, which possibilities are admissible, and on what foundation the conclusion is made.
MATHEMATICAL CORE	The quadruple (R,I,U;D) is defined, the semantics of its components is explained, and axioms of a complete Reper are formulated.
BOUNDARY OF THE CLAIM	The triple (R,I,U) without D is not a complete foundation and does not automatically receive truth status.
STATUS	BASIC DEFINITION

Reper is the central structure of Volume I. It connects established content, an idea or invariant, a field of possibilities, and a sufficient foundation. The semicolon before D marks the special evidential role of the foundation: D completes the flag and separates a structural hypothesis from an authorized object.

$$\mathrm{Rep}(x) = (R_x, I_x, U_x; D_x) \quad \text{[RU p. 19]}$$

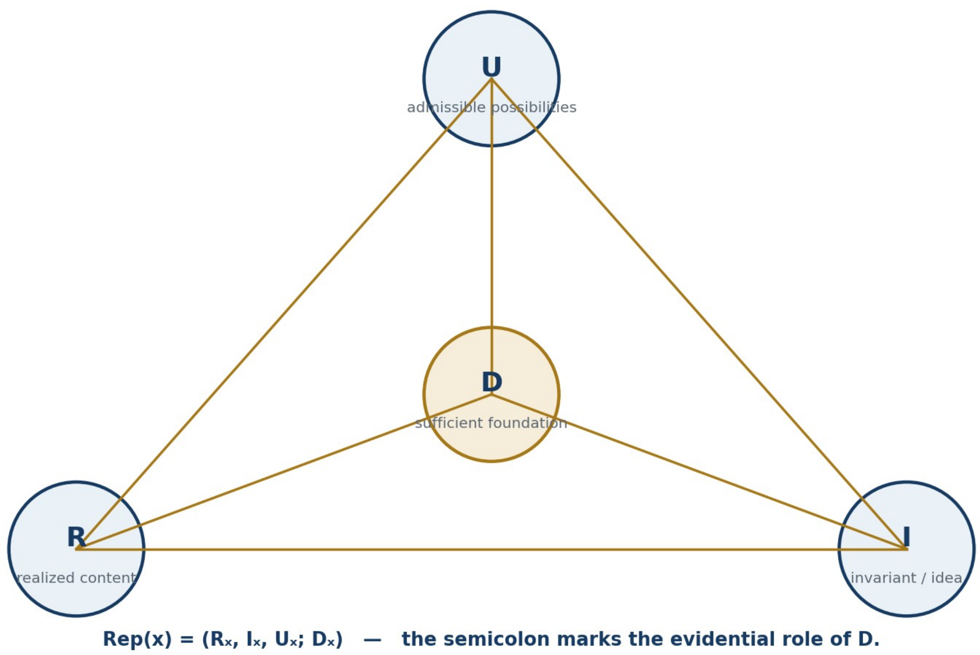

Figure 5.1. Reper tetrahedron: realised content R, invariant I, possibilities U, and sufficient foundation D.

5.1. Semantics of the Components

Component	Mathematical meaning	Applied meaning
R	Established content; realised object	Fact, measurement, record, event
I	Invariant, idea, direction of assembly	Norm, function, purpose, model
U	Class of admissible possibilities	Alternatives, variants, neighbouring states
D	Sufficient foundation	Source, proof, act, calculation, responsibility

5.2. Reper Axioms R1–R8

Axiom	Statement
R1	Every Reper is attached to a particular C@C object.
R2	R, I, and U are typed in one Dom or connected by explicit morphisms.
R3	D contains a verifiable reference to a foundation and is not replaced by verbal confidence.
R4	A change of any component creates a new Reper version.
R5	A Reper without D has status incomplete flag or review seed.
R6	Two Repers are comparable only after domains and scales have been aligned.
R7	Composition of Reper morphisms preserves the declared invariants.

Axiom	Statement
R8	Reper status is part of the object and is recorded in the protocol.

5.3. Normalized Legacy Layer

The archived Monograph 5.0 defined Reper as a local projective-harmonic structure retaining the relation among reality, idea, the universe of possibilities, and sufficient foundation. R records what is actually given; I specifies the internal axis and assembly idea; U specifies the field of possibilities; D supplies evidential, documentary, and causal closure. Without D the object remains an incomplete flag rather than a truth-authorized quadruple.

$$\mathrm{Rep}_i=(R_i,I_i,U_i;D_i),\qquad \mathrm{Truth}(\mathrm{Rep}) \Leftrightarrow \mathrm{cr}(U,I;R,D)=-1$$ [normalized legacy formula]

5.4. Typed Reper and the Foundation-Forgetting Morphism

Let Ω be an admissible domain; let X_R(Ω), X_I(Ω), and X_U(Ω) be typed spaces of realised content, idea, and admissible possibilities; and let E(Ω) be the set of verifiable foundations. A typed Reper of x is

$$\mathrm{Rep\_}\Omega(x)=(R_x,I_x,U_x;D_x),\quad R_x\in X\_R(\Omega),\ I_x\in X\_I(\Omega),\ U_x\in X\_U(\Omega),\ D_x\in E(\Omega)$$ [RU p. 21]

The predicate Dom_Ω(Rep)=1 means simultaneously that all components are defined, all maps are type-correct, denominators and inverse operators exist, and the reference D_x resolves to a verifiable object. Dom and D are therefore not interchangeable: Dom controls mathematical definedness; D controls sufficiency of foundation.

Proposition 5.1 — Monotonicity under Forgetting D [PROP] Let π_D(R,I,U;D)=(R,I,U) be the foundation-forgetting morphism and let σ be an evidence status monotone under inclusion of verifiable evidence. Then σ(π_D Rep)≤σ(Rep). If the target status requires D by definition, π_D causes a strict downgrade.

Proof. The morphism π_D adds no evidence and removes D. Monotonicity of σ under the evidence order prevents an increase. If D belongs to the mandatory gates of the target status, those gates fail after forgetting and the stronger status cannot be retained.

EDITORIAL BOUNDARY. Proposition 5.1 belongs to the internal KLT-RBD evidence discipline. It does not assert that one universal status ladder applies to every science; each domain specifies its own gates.

5.5. Phenomenology of Foundation and Typed Horizon

PHILOSOPHICAL INSERT. A Reper is not a label attached to an already completed object. It records that the object is given together with a horizon of admissible interpretations and a foundation that distinguishes what is asserted from what is merely conceivable. Forgetting D changes not only the record but the epistemic mode in which the object is present in reasoning.

Example. Two packets may have identical (R,I,U) components but different foundations D_1 and D_2: the first leads to a reproducible measurement, while the second leads to an unverifiable report. After applying π_D the packets become indistinguishable at the data level although their evidential statuses differ.

5.6. Typed Reper and Its Morphisms

Definition 5.2 [DEF-A]. A typed Reper is Rep_X=(R_X,I_X,U_X;D_X,Dom_X), where R_X is realised content, I_X an invariant or selected idea, U_X a space of admissible alternatives, D_X a sufficient foundation, and Dom_X the domain on which all components and relations are defined.

Definition 5.3 [DEF-A]. A morphism F:Rep_X→Rep_Y is a quintuple (F_R,F_I,F_U,F_D,F_Dom). F_Dom sends admissible inputs of Dom_X to Dom_Y; F_D transports foundations and preserves every verifiable dependency used for status authorization.

Theorem 5.4 — Category of Typed Repers [THM] Identity quintuples are morphisms. If F:Rep_X→Rep_Y and G:Rep_Y→Rep_Z are type-compatible, F_Dom(Dom_X)⊆Dom_Y, and G_Dom(Dom_Y)⊆Dom_Z, then componentwise composition G∘F is a Reper morphism. Composition is associative.

Proof. Every component of the composition is defined by the domain conditions. Preservation of D-dependencies follows by successive application of F_D and G_D. Identity and associativity are inherited from the component maps.

Corollary 5.5 [THM]. The forgetful functor Z:Reper→Pack that removes D does not reflect evidential status: an isomorphism Z(Rep_X)≅Z(Rep_Y) does not imply equivalence of foundations D_X and D_Y.

5.7. Independence of D and Dom

Lemma 5.6 [LEM] D and Dom are logically independent: Dom may be nonempty while D is absent, and a formal D may be specified while Dom is empty.

Proof. In the first case a formula is computable on a nonempty set but lacks a foundation for the required interpretation. In the second case axioms D are written down but no object satisfies the joint domain constraints. Neither situation entails the other.

Counterexample 5.7. Let f(x)=1/x. With Dom=ℝ∖{0}, f(1) is computable; without D connecting f to an observable quantity, an empirical conclusion is unauthorized. Conversely, a physical theory may provide D for an idealized object while experimental restrictions make the selected sample domain empty.

REPER GATE. Status promotion is permitted only when compatible D and Dom are both present. “The formula was computed” is not equivalent to “the conclusion is justified.”

PHENOMENOLOGICAL INSERT. Dom answers where a thought can occur without contradicting its own conditions. D answers why that completed thought is entitled to count as a conclusion. The space of possibility and the foundation of actuality meet in Reper but do not dissolve into one another.

Chapter 6. Projective-Harmonic Cross-Ratio

Russian source locator: pp. 23–26

PLAIN-LANGUAGE MEANING	The chapter introduces a numerical invariant comparing four Reper components and selecting the harmonic configuration λ=−1.
MATHEMATICAL CORE	Scalar, complex, homogeneous/projective, and matrix/operator regimes are distinguished; the admissible domain and deviation from harmonicity are recorded.
BOUNDARY OF THE CLAIM	Projective invariance of λ does not replace Dom and D, and λ is not by itself an empirical criterion of truth.
STATUS	CLASSICAL INVARIANT + AUTHORIAL INTERPRETATION

The cross-ratio is a classical projective invariant of four collinear points. In packet Reper logic it is used as a coordinate of consistency among the four Reper roles. The authorial contribution is not the cross-ratio itself but its inclusion in a typed structure containing D/Dom, proof status, and an RBD route.

$$\lambda = \mathrm{cr}(U,I;R,D) = ((U-R)(I-D))/((U-D)(I-R))$$ [RU p. 23]

$$\delta\_truth = |\lambda+1|$$ [RU p. 23]

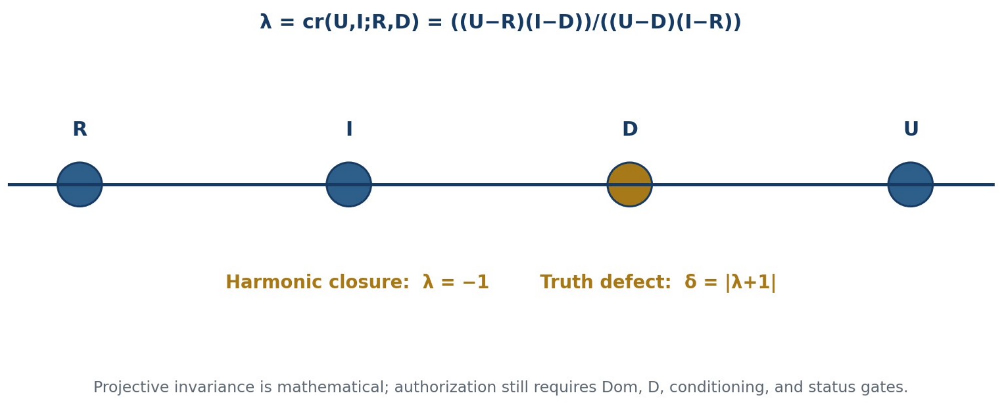

Figure 6.1. Harmonic Reper quadruple and the value λ=−1.

6.1. Harmonic Closure

The value $\lambda=-1$ corresponds to a harmonic quadruple. In the project it is interpreted as structural closure of a Reper. Structural closure is not identical to proved truth: it is one necessary but insufficient gate.

6.2. Complex, Matrix, and Operator Forms

For complex coordinates the formula remains valid when all denominators are nonzero. In noncommutative, matrix, or operator regimes the order of factors must be fixed, and invariance requires a separate theorem. The scalar formula may not be copied mechanically into a matrix domain and then treated as proved.

6.3. Calibration and Numerical Error

Numerical analysis requires tolerances, sensitivity to point permutations, and uncertainty intervals. A value close to -1 is labelled a harmonic-near hit, not a theorem. This is essential for KMA ratios, spectral data, and economic series.

The truth defect δ_truth measures geometric-logical proximity to the selected harmonic normalisation. It does not replace a mathematical proof, a legal document, an engineering inspection, or an empirical null-model analysis. Every RPD/RBD formula or computational output therefore receives both a numerical coordinate and a Reper/evidence map.

6.4. Unique Finite Harmonic Complement

Theorem 6.1 — Reconstruction of D [THM] Let K be a field of characteristic not equal to 2, and let $R,I,U\in K$ be pairwise distinct. For $\lambda=((U-R)(I-D))/((U-D)(I-R))$, if $I+U-2R\neq 0$ there exists a unique finite D such that $\lambda=-1$: $D=[2UI-R(I+U)]/[I+U-2R]$.

Proof. The equation $\lambda=-1$ is equivalent to $(U-R)(I-D)=-(U-D)(I-R)$. Collecting the terms containing D gives $D[(U-R)+(I-R)]=(U-R)I+U(I-R)$. Division by $I+U-2R$ yields the formula. Linearity in D gives uniqueness. Pairwise distinctness ensures the resulting D is not U, so the original denominator remains nonzero.

If $I+U-2R=0$, there is no finite solution in that affine chart; in the projective completion the degenerate case is $D=\infty$. For $R=0$, $I=1$, $U=2$ the formula gives $D=4/3$ and exactly $\lambda=-1$.

6.5. Sensitivity of the Harmonic Complement

Put $Q=I+U-2R$. On the region $Q\neq 0$, $D(R,I,U)$ is differentiable and

$$\partial D/\partial R = -(I-U)^2/Q^2, \quad \partial D/\partial I = 2(U-R)^2/Q^2, \quad \partial D/\partial U = 2(I-R)^2/Q^2$$ [RU p. 26]

Corollary 6.2 [THM]. For small perturbations $\delta R,\delta I,\delta U$, $|\delta D|$ is bounded by $(|I-U|^2|\delta R|+2|U-R|^2|\delta I|+2|I-R|^2|\delta U|)/|Q|^2 + o(\|\delta\|)$. Thus $Q\to 0$ is a poorly conditioned region and must be recorded as a blocker rather than as increased predictive strength.

KLT-RBD CONSEQUENCE. A computational certificate stores Q, a sensitivity estimate, and the precision of all inputs. Nearness of λ to -1 without conditioning control does not promote truth status.

PHENOMENOLOGICAL INSERT. Near $Q=0$, the formula may return one apparently precise D while tiny changes in the input cause a large displacement. This is the phenomenon of a “precise answer without a stable object.” Experienced clarity is not mathematical conditioning.

6.6. Homogeneous Formula and Projective Invariance

Let K be a field of characteristic not equal to 2 and let $P^1(K)$ be the projective line. For homogeneous representatives $x,y\in K^2$ write $[x,y]=\det(x,y)$. For pairwise distinct U,I,R,D and nonzero denominators define

$$cr(U,I;R,D) = [U,R][I,D] / ([U,D][I,R])$$ [RU p. 26]

Theorem 6.3 — Cross-Ratio Invariance [THM] For every $A\in GL_2(K)$, $cr(AU,AI;AR,AD)=cr(U,I;R,D)$. Hence the cross-ratio is well defined with respect to the action of $PGL_2(K)$.

Proof. For any x,y, $[Ax,Ay]=\det(A)[x,y]$. The numerator and denominator each acquire two equal factors $\det(A)$, which cancel. Independent scaling of homogeneous representatives also cancels pairwise.

6.7. Complete Projective Harmonic Complement

Theorem 6.4 — Existence and Uniqueness [THM] Let $U,I,R\in P^1(K)$ be pairwise distinct. There exists a unique $D\in P^1(K)$ such that $cr(U,I;R,D)=-1$.

Proof. A projective transformation sends U,I,R to $0,\infty,1$. The equation $cr=-1$ determines the image of D uniquely; the inverse transformation returns one point of the original line. In an affine chart, $D^*=[2UI-R(I+U)]/[U+I-2R]$ when the denominator is nonzero; otherwise D is the point at infinity of that chart.

SINGULARITY NOTE. A zero affine denominator does not mean that the harmonic complement is absent from $P^1(K)$. It means that the complement lies at infinity in the chosen chart. A numerical implementation must return projective-infinity rather than an arbitrary large number.

6.8. Conditioning of D* and the HARM-CERT Passport

Proposition 6.5 [PROP] In an affine chart with $Q=U+I-2R\neq 0$, $\partial D^*/\partial R=-(U-I)^2/Q^2$.

Proof. Differentiate N/Q with $N=2UI-R(I+U)$, $Q=U+I-2R$. The numerator simplifies to $4UI-(U+I)^2=-(U-I)^2$.

Corollary 6.6 [PROP]. As $Q\to 0$, sensitivity grows as $|Q|^{-2}$. Proximity to the singular chart must therefore be stored as a conditioning number and blocker. Even $\lambda=-1$ with small δ does not establish stability of the reconstructed D*.

Mandatory HARM-CERT field	Content
Field K and characteristic	algebraic base and the condition char(K)≠2
Homogeneous coordinates	representatives of U,I,R,D
Affine chart	selected chart and projective-infinity policy
Determinants / denominators	all four determinants and nonzero-domain checks
λ and δ	cross-ratio and harmonic defect
Q and conditioning	Q=U+I−2R and sensitivity estimate
Dom and D	admissible domain and sufficient foundation
Precision and status	input precision; singular/projective/finite status

Chapter 7. D/Dom and Sufficient Foundation

Russian source locator: pp. 27–30

PLAIN-LANGUAGE MEANING	The chapter separates the question “is the expression defined?” from the question “is there sufficient foundation for the claim?”.
MATHEMATICAL CORE	Types of D, domain predicates Dom, and evidence-status ladders from a candidate to a verified result are distinguished.
BOUNDARY OF THE CLAIM	Neither Dom nor D may be reconstructed from an elegant formula or numerical coincidence without separate evidence.
STATUS	EVIDENCE DISCIPLINE

D answers “what supports the claim?”; Dom answers “where is it applicable?”. Confusing or omitting them is a major source of false status promotion. In KLT-RBD, an attractive numerical coincidence without D/Dom becomes a gap node, not a discovery.

Authorization(x) requires D(x) complete and Dom(x) admissible [RU p. 27]

7.1. Types of D

Type of D	Examples
Axiomatic	Axiom system, definitions, inference rules
Proof-theoretic	Lemmas, proof object, formal verification
Experimental	Protocol, instrument, units, uncertainty, raw data
Documentary	Contract, project, act, norm, registration record
Computational	Code, version, hash, configuration, reproducible run
Historical-philosophical	Exact source, context, and limits of interpretation

7.2. Status Ladder and Forbidden Jumps

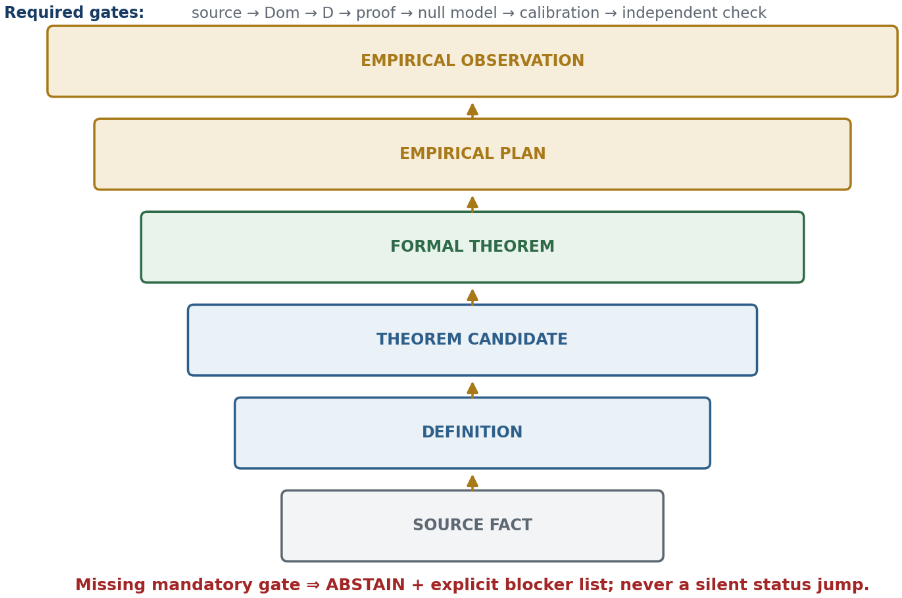

Figure 7.1. Evidence-status ladder and the mandatory gates between levels.

The working ladder distinguishes source fact, definition, lemma candidate, theorem candidate, formal theorem under axioms, empirical review signal, and publication-verified status. Transitions occur only through specified gates. A user interface has no authority to promote a status by itself.

7.2.A. Normalized Documentary Layer: PILOT-01

PILOT-01 is a narrow-domain test of the Reper-Projective Database. A mathematical text is modelled as a graph of sources, formulas, assumptions, Reper nodes, gap nodes, obstruction carriers, and theorem candidates. Projective-harmonic geometry, packet incidence, OB notation, and Fano-type carriers are used as mathematical objects; novelty of the cross-ratio, projectivisation, projective spaces, or the Fano plane is not claimed.

Definition [DEF-A]. A formula-chain step is a typed transition $s=(F_i,F_j,\tau,A,Dom,D)$, where τ is the transition type, A the support set, Dom the admissible domain, and D the sufficient foundation. Reper is written $Rep=(R,I,U;D)$.

Formula-Chain Gap Theorem [THM] If a step authorizes truth status through $cr(U,I;R,D)=-1$ but lacks an admissible Dom or a sufficient D, the RPD audit creates GAP-DOMAIN-MISSING or GAP-ASSUMP-MISSING.

Proof. This follows directly from the independent rules AUDIT-DOMAIN and AUDIT-FOUNDATION.

ID	Object	Status
T-PH-001	Formula-chain gap theorem	proved inside the RPD method
T-PH-002	Projectivisation dimension lemma	classical fact / prior art
T-PH-003	Fano / RP^2 consequences	conditional on field and dimension
T-PH-004	FCOC carrier theorem	proved in the internal model
T-PH-005	Nontrivial packet-obstruction theorem	proved in the internal model
T-PH-006	Fano local line extension	proved in the internal model

ID	Object	Status
T-PH-007	Fano direct-sum carrier	proved in the internal model
T-PH-008	Conditional Fano carrier	conditional on the identification axiom
T-PH-009	Reper harmonic method lemma	method lemma; not classical novelty

FANO BOUNDARY. The Fano plane is an ontological barrier only inside the declared RPD model. Local obstruction carriers do not globalise automatically to $P^2(\mathbb{F}_2)$. A carrier transition requires explicit compatibility maps; an external open obstruction result is not inherited without a separate morphism.

7.3. Algebra of Evidence Gates

For a branch of inquiry define a binary evidence vector e=(d_Dom,d_D,d_prf,d_null,d_ind), recording domain admissibility, sufficient foundation, proof object, matched null, and independent evidence. A formal theorem branch uses Dom, D, and the proof object; an empirical-predictive branch additionally uses the matched null, CGI<1, and independent verification.

$$\mathrm{Gate\_form}(e)=d\_Dom\cdot d\_D\cdot d\_prf$$ [RU p. 30]

$$\mathrm{Gate\_pred}(e)=d\_Dom\cdot d\_D\cdot d\_prf\cdot d\_null\cdot d\_ind\cdot 1[CGI<1]$$ [RU p. 30]

Proposition 7.1 — No Status Jump [PROP] If Gate(e)=0, the authorization operator must return status≤candidate. Adding evidence may preserve or increase an admissible status; removing evidence cannot increase it.

Proof. The functions Gate_form and Gate_pred are monotone in the componentwise order on $\{0,1\}^5$. A zero mandatory gate makes the product zero, prohibiting authorization of a stronger status.

7.4. ABSTAIN as a Positive Operator Result

PHILOSOPHICAL INSERT. ABSTAIN is not an empty computation. It states positively that no candidate in the current evidence horizon has passed all mandatory gates. It preserves the distinction among possibility, plausibility, and an authorized claim.

When Gate_pred(e)=0, the result contains ABSTAIN together with the set of unfulfilled gates. This trace turns abstention into a diagnostic message: it identifies which new evidence could change the status without promising that the evidence will necessarily promote the claim.

7.5. Lattice of Evidence Gates

Definition 7.2 [DEF-A]. The gate vector of a claim c is $G(c)=(s,dom,d,p,n,k,i)\in\{0,1\}^7$, where s is a traceable source, dom a satisfied Dom, d a sufficient D, p a proof object, n a null-model check, k calibration, and i independent verification. The componentwise order defines evidence inclusion.

Theorem 7.3 — Status Monotonicity [THM] Let status σ(G) be monotone in the componentwise order, and let every level require a fixed set of gates. A transformation that adds no newly verified gate cannot increase σ.

Proof. If the transformation leaves G unchanged or produces $G'\leq G$, monotonicity gives $\sigma(G')\leq\sigma(G)$. Strict promotion requires at least one new coordinate 0→1 and satisfaction of all gates of the new level.

Corollary 7.4 [THM]. Projective normalization, editorial renaming, visualization, or export to another domain does not promote a status without new D, an enlarged Dom, a proof object, null-model verification, calibration, or independent evidence.

7.6. Conjunctive Authorization and the ABSTAIN Principle

Definition 7.5 [DEF-A]. Authorization of level L is $\mathrm{Auth\_L}(c)=\wedge_j\in J\_L\ G_j(c)$, where J_L is the set of mandatory gates. If any mandatory value is zero or unknown, the result is ABSTAIN rather than negation of c.

Theorem 7.6 — Safety of Abstention [THM] If Auth_L(c)=0 because a gate is missing, assigning status L without new evidence violates the level specification. Retaining the prior status or returning ABSTAIN does not violate it.

Proof. The level is defined conjunctively. Replacing a missing factor 0 with a declarative 1 without evidence creates a false positive. Abstention preserves the actual gate vector.

7.7. Mathematical, Computational, and Empirical Ladders

The mathematical ladder uses definitions, axioms, theorems, and counterexamples. The computational ladder adds code, test vectors, precision, and reproducibility. The empirical ladder additionally requires data, a matched null, calibration, CGI<1, and independent verification. Movement between these ladders is not automatic.

CHAPTER 7 PASSPORT. D and Dom occupy different gate coordinates. λ and δ are computable invariants, not independent-evidence coordinates. KMA values remain search labels and do not alter G(c).

PHILOSOPHICAL INSERT. The status ladder measures not the greatness of an idea but the length of the verified path to it. ABSTAIN keeps that path visible: it does not deny possible truth but forbids presenting possibility as an already completed foundation.

Chapter 8. Packet Laws of Logic and Rules of Inference

Russian source locator: pp. 31–34

PLAIN-LANGUAGE MEANING	The classical laws of logic are translated into packet language, where state, possibility, domain, and sufficient foundation are explicit.
MATHEMATICAL CORE	Packet forms of identity, non-contradiction, excluded middle, sufficient reason, and syllogism are formulated, together with a three-valued D/Dom semantics.
BOUNDARY OF THE CLAIM	Formal validity of inference does not prove the truth of its premises; truth status requires a separate Reper and domain check.
STATUS	FORMAL SYSTEM

The classical laws of logic receive a packet-Reper interpretation. Identity retains the invariant axis I; non-contradiction controls realised content R; excluded middle constrains the field U within Dom; sufficient reason introduces D. In this sense the first three laws form a flag, while the fourth completes the Reper.

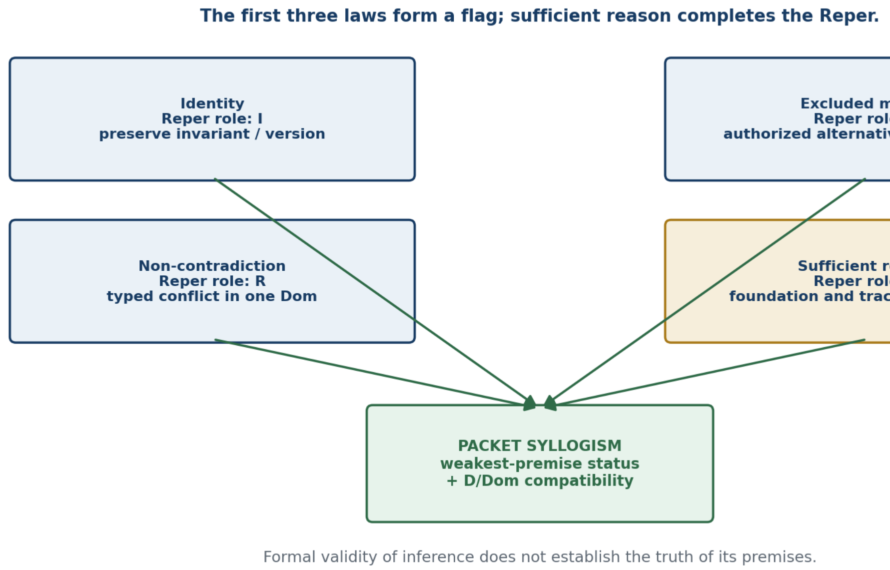

Figure 8.1. Packet correspondence of the logical laws to Reper components and the packet syllogism.

8.1. Law of Identity

An object preserves identity relative to the declared invariant set and version. When the source version, unit of measurement, or domain changes, identity requires a new object card.

8.2. Law of Non-Contradiction

A contradiction is recorded as a typed conflict between claims belonging to the same Dom and the same version. A difference of domains is not a logical contradiction; it requires a comparison morphism.

8.3. Excluded Middle and the Field U

The field of possibilities U is not arbitrarily infinite; it is determined by the problem type, constraints, and boundary conditions. Packet logic may allow many alternatives at the U level but requires binary authorization of a concrete claim relative to D and Dom.

8.4. Sufficient Reason

D is not reducible to a citation. The foundation must be relevant, verifiable, connected to the claim, and sufficient for the declared status.

8.5. Packet Syllogism

A syllogism is admissible when the premises are typed, the middle term is preserved by the morphisms, the domains are compatible, and the conclusion receives no status higher than the weakest premise permits.

8.5.A. Normalized Archival Logic Layer

The preserved FOS article mapped the four logical laws to the Reper roles as follows: non-contradiction selects one realised event-state and therefore fixes R; excluded middle couples the state with its admissible complement and therefore structures U; identity preserves the event invariant and therefore fixes I; sufficient reason closes cause, domain, and support and therefore supplies D. The first three laws form a flag; the fourth supplies the harmonic point that completes a Reper.

Law	Packet function	Reper role
Non-contradiction	selection of one event-state	R
Excluded middle	coupling with admissible complement	U

Law	Packet function	Reper role
Identity	preservation of event invariant	I
Sufficient reason	closure of cause, domain, and support	D

CROSS-DOMAIN BOUNDARY. A chemical world cannot be inferred from a financial world, nor a cultural world from a physical world, without an explicit functor and sufficient foundation. FOS permits typed reductions; it prohibits hidden reductions.

8.6. Three-Valued D/Dom Semantics

Let $V_3=\{1,0,\perp\}$, where $\perp$ means not falsity but non-authorization because Dom is not satisfied or D is absent.

Definition 8.1 [DEF-A]. For a formula φ, set $v(\varphi)=\perp$ when φ is undefined in the current Dom or its truth status requires a missing D. Values 1 and 0 are permitted only after both gates have been passed.

Implication is evaluated classically on $\{0,1\}$. If evaluation requires a non-authorized operand, the result is $\perp$. This separates negation from the absence of entitlement to infer.

8.7. Soundness of Packet Modus Ponens

Theorem 8.2 [THM] If $v(\varphi)=1$, $v(\varphi\to\psi)=1$, and both premises are evaluated in one Dom with compatible D, then $v(\psi)=1$.

Proof. Within a satisfied Dom the premise values belong to $\{0,1\}$. The classical truth table for implication excludes $v(\psi)=0$ when $v(\varphi)=v(\varphi\to\psi)=1$. Compatibility of D authorizes transfer of the status to the conclusion.

Corollary 8.3 [THM]. If either premise has value $\perp$, the rule returns ABSTAIN together with the list of unclosed gates.

PHENOMENOLOGICAL INSERT. The third value is not a vague midpoint between truth and falsity. It is an exact pointer to a missing condition without which the judgment has not yet become a completed act of proof.

Foundations Checkpoint: Result and Next Route

Obligation	Result / requirement	Status
T1-EN-PO-011	Full translation of Chapters 1–8	CLOSED-v0.2
T1-EN-PO-013	Axioms C1–C6 and R1–R8 preserved	CLOSED-PARITY
T1-EN-PO-014	Pack and typed-Reper categorical statements preserved	CLOSED-PARITY
T1-EN-PO-015	Harmonic-complement theorems and conditioning results preserved	CLOSED-PARITY
T1-EN-PO-016	D/Dom gate algebra and ABSTAIN theorems preserved	CLOSED-PARITY
T1-EN-PO-017	Packet-logic semantics and modus ponens preserved	CLOSED-PARITY

Obligation	Result / requirement	Status
T1-EN-PO-018	Independent bilingual mathematical audit	OPEN NON-VETO
T1-EN-PO-019	Translation of Chapters 9–16	NEXT
T1-EN-PO-020	Frozen English release	FUTURE

Blocker	Description	Status	Handling
T1-EN-BLK-001	The editable Russian Word master is not available in the active package.	OPEN NON-VETO	The Russian PDF and source-page locators remain authoritative.
T1-EN-BLK-002	Legacy uses of * remain polysemous.	OPEN	Every live occurrence is governed by the local symbol ledger.
T1-EN-BLK-003	No external signed bilingual mathematical audit has been performed.	OPEN NON-VETO	Required before an external certification claim.
T1-EN-BLK-006	The English page map is provisional until unified assembly.	OPEN NON-VETO	RU source pages remain the stable locators.
T1-EN-BLK-007	Chapters 9–52 and Appendices A–G remain untranslated.	OPEN	Proceed by the approved checkpoint route.

CURRENT VERDICT. CONTROLLED ENGLISH FOUNDATIONS COMPLETE FOR CHAPTERS 1–8. Mathematical statements retain their Russian source statuses. Physical interpretation remains conditional or open; independent EXT-RUN and EMP-OBS are absent.

NEXT CHECKPOINT. T1-EN-GEOMETRY-v0.3: full controlled translation of Chapters 9–16, including the Desargues–Kurpishev theorem, Kurpishev FOS, seven Size@Dimensions, early PN.2 interfaces, NAPG, PILOT-01, the Fano barrier, RBD/RPD, examples, evidence passports, glossary material, and the prior-art boundary.

T1-EN-GEOMETRY-v0.3

CONTROLLED ENGLISH TRANSLATION OF CHAPTERS 9–16

DERIVATIVE BOUNDARY. The following chapters are a controlled translation of the frozen Russian source pages 35–72. Archival duplicates are normalized, but every normative definition, theorem, counterexample, formula, status restriction, and source role is preserved. No Russian source text is amended by this derivative.

Chapter parity map for the v0.3 checkpoint

Chapter	Russian locator	English title	Dominant status
9	35–38	The Desargues–Kurpishev Theorem	CL / COND
10	39–42	FOS, Seven Size@Dimensions, and PN.2	MODEL / DEF-A
11	43–46	NAPG: Nonassociative Packet Geometry	DEF-A / PROP / MODEL
12	47–50	PILOT-01, Formula Chains, and the Fano Barrier	THM / COND / OPEN
13	51–57	RBD/RPD and KLT-RBD as a Computational Architecture	DEF-A / NUM / EMP-PLAN
14	58–61	Examples, Counterexamples, and Evidence Passports	PROP / TEST
15	62–64	Glossary, Notation, Formulae, and Bibliography	DOC / AUDIT
16	65–72	Historical-Mathematical Prior Art and the Boundary of Authorial Contribution	CL / AD / AUDIT

Chapter 9. The Desargues–Kurpishev Theorem

Russian source locator: pp. 35–38

PLAIN-LANGUAGE EXPLANATION. The chapter asks when three constructions may legitimately identify one and the same projective point: a polar trace, the trace of a Desargues axis, and a harmonic complement. Classical projective geometry supplies each construction separately. The Kurpishev bridge is conditional because their coincidence requires explicit compatibility hypotheses.

CLAIM BOUNDARY. The classical Desargues theorem is prior art. The authorial construction lies in the typed Reper interpretation, the polar/Desargues/harmonic bridge, and the DK-CERT evidence passport. The bridge is not derived from two conics alone.

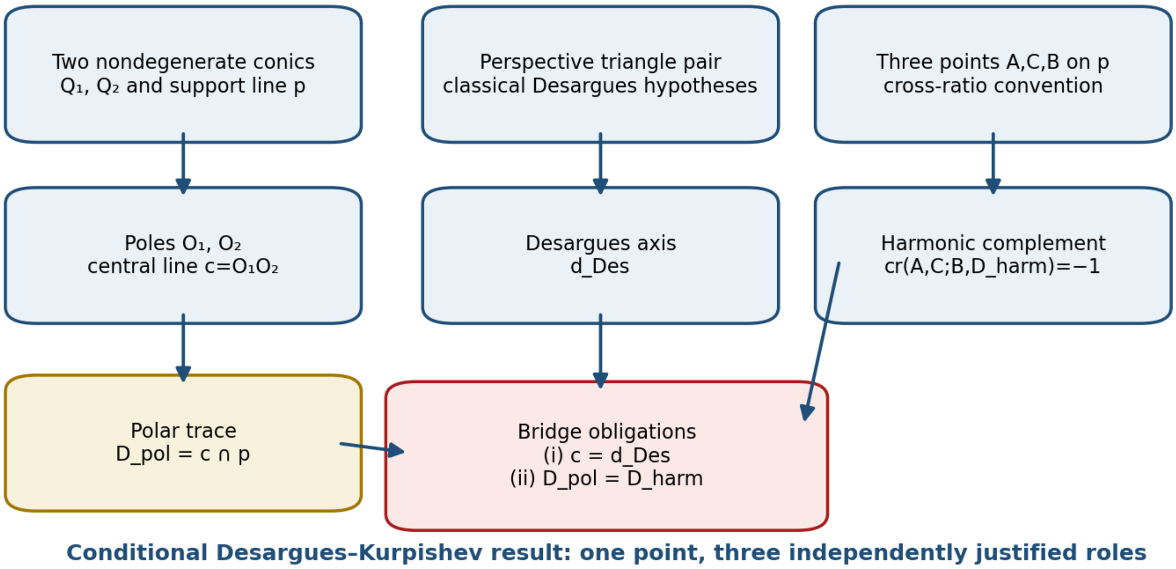

Figure 9.1. Three independently justified projective roles and the two bridge obligations.

9.1. Configuration Data

Work over a projective plane $\Pi=P^2(K)$ over a field K of characteristic different from 2. Let Φ_1 and Φ_2 be nondegenerate conics represented by invertible symmetric matrices Q_1 and Q_2. Let the support line p be represented by a nonzero covector ℓ. The poles of p are $O_i=[Q_i^{-1}\ell]$. A pair of triangles is specified separately, together with a point of perspectivity and the intersections of corresponding sides.

The three constructions must remain distinguishable: the polar line $c=O_1O_2$, the Desargues axis d_Des of the triangle pair, and the harmonic point D_harm on p. Their equality is a conclusion only after the required bridge hypotheses have been verified.

9.2. Working Formulation and Proof Architecture

Under nondegeneracy, compatibility of the polar correspondences, and perspectivity of the triangle pair, the central axis and the Desargues axis form projectively invariant data. A harmonic complement can complete a Reper quadruple, but its identification with the polar trace is a separate theorem obligation.

Stage	Required operation	Evidence object
1	Specify Q_1,Q_2 and the field/characteristic.	Matrix and field record
2	Construct poles and polars from the bilinear forms.	Polar computation

Stage	Required operation	Evidence object
3	Verify perspectivity of the two triangles.	Incidence proof
4	Invoke the classical Desargues node in an admissible model.	CL theorem reference
5	Check collinearity of side intersections.	Determinant or synthetic proof
6	Construct the harmonic complement.	Cross-ratio equation
7	Check invariance under admissible projective transformations.	PGL certificate
8	Record Dom, D, proof object, bridge status, and blockers.	DK-CERT-9

9.3. Coordinate Model of the Polar Node

$$O_i = [Q_i^{-1}\ell], \quad i\in\{1,2\}.$$ *[RU p. 38]*

Lemma 9.1 (well-defined pole) [CL/PROP]. If $\det Q_i\neq 0$ and $\ell\neq 0$, then O_i is a uniquely defined point of $P^2(K)$.

Proof. The vector $Q_i^{-1}\ell$ is nonzero. Replacing ℓ by $\alpha\ell$ or Q_i by βQ_i only rescales the representative by a nonzero scalar and therefore does not change its projective class.

Assume $O_1\neq O_2$ and $c=O_1O_2$ differs from p. The polar trace $D\_pol=c\cap p$ exists and is unique by the incidence axioms of the projective plane. No harmonic conclusion follows from this incidence statement alone.

Theorem 9.2 (polar node) [CL/PROP]. Under these hypotheses D_pol is independent of all nonzero matrix and coordinate representatives of Q_1,Q_2, and ℓ.

9.4. Harmonic Closure and Counterexample

$$cr(A,C;B,D\_harm)=-1.$$ *[RU p. 38]*

$$d\_harm = ((a+c)b-2ac)/(2b-a-c), \quad \text{if } 2b-a-c\neq 0.$$ *[RU p. 38]*

When the denominator is zero, D_harm is the point at infinity of the chosen affine chart. The construction depends on the ordered quadruple and on a declared cross-ratio convention.

> **COUNTEREXAMPLE 9.3.** For a=0, c=1, and b=2 one obtains d_harm=2/3. An arbitrary polar trace d_pol=3 is not harmonic because cr(0,1;2,3)=4/3. Thus polar intersection and harmonic closure are logically independent without a bridge hypothesis.

9.5. Canonical Conditional Desargues–Kurpishev Theorem

Theorem 9.4 [COND]. Suppose: (i) the hypotheses of Theorem 9.2 hold; (ii) two triangles are perspective from a point; (iii) their Desargues axis equals $c=O_1O_2$; and (iv) D_pol satisfies the harmonic criterion relative to A,C,B. Then D_pol is simultaneously the trace of the Desargues axis on p and the unique harmonic complement D_harm.

Proof. By the classical Desargues theorem, condition (ii) gives an axis of perspectivity. Condition (iii) identifies that axis with c, so its trace on p is D_pol. Condition (iv) and uniqueness of the solution of the fractional-linear equation give D_pol=D_harm.

> **OPEN OBLIGATIONS.** The theorem does not derive bridge conditions (iii) and (iv) from the data of two conics. Establishing them is recorded as DK-PO-1 and DK-PO-2. Without those obligations, the correct output is not a strengthened theorem but ABSTAIN or a weaker polar-node statement.

9.6. DK-CERT-9 Evidence Passport

Field group	Mandatory content
Carrier	field, characteristic, plane model, coordinate convention
Conics and polarity	Q_1,Q_2,p, O_1,O_2, nondegeneracy, c≠p
Desargues node	triangle pair, point of perspectivity, axis proof
Bridge	proof of c=d_Des; proof of harmonic criterion
Harmonic node	A,C,B, cross-ratio convention, D_pol, D_harm
Evidence	Dom, D, proof object, status, open obligations

Phenomenological note. A geometric point becomes a sufficient foundation not because several elegant lines happen to meet there, but because the law of each incidence is known. Polar, Desargues, and harmonic modes of givenness may coincide, but the coincidence must be proved rather than anticipated.

Chapter 10. FOS, Seven Size@Dimensions, and PN.2

Russian source locator: pp. 39–42

PLAIN-LANGUAGE EXPLANATION. FOS is treated as a compatibility condition for families of Reper structures, not as an undefined totality. The chapter distinguishes size from dimension, records the seven-layer model, and states the early PN.2 principle as a model bridge. The rigorous minimax theorem is postponed to Chapter 21.

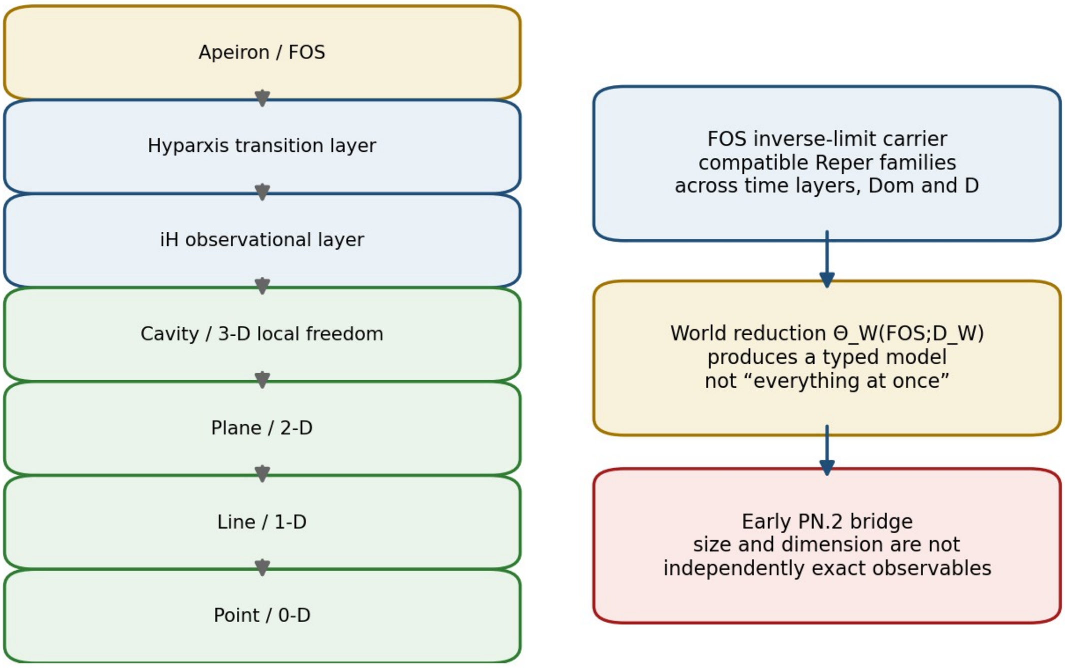

Figure 10.1. FOS as a compatible Reper carrier, world reduction, and the early PN.2 bridge.

10.1. FOS as a Reper Inverse Limit

$$\mathrm{FOS} = \lim\leftarrow_{\tau\in T} \prod_{c\in \mathrm{Ob}(C_\tau)} \mathrm{Reper}(c). \quad \textit{[RU p. 39]}$$

Kurpishev Fundamental Support Connectivity (FOS) is the inverse-limit compatibility of Reper-admissible event@states across packet-time layers. It is not the set of all objects. It records whether local Reper data can be glued through declared transition maps while preserving Dom and sufficient foundations D.

Definition 10.1 [DEF-A]. Let T be a small cofiltered category. For each $\tau\in T$, let C_τ be a small category and let $E_\tau=\prod_{c\in \mathrm{Ob}(C_\tau)}\mathrm{Reper}(c)$. If transition maps $\rho_{\sigma\tau}:E_\sigma\to E_\tau$ satisfy $\rho_{\tau\tau}=\mathrm{id}$ and $\rho_{\upsilon\tau}=\rho_{\sigma\tau}\circ\rho_{\upsilon\sigma}$, define $\mathrm{FOS}=\lim\leftarrow E_\tau$ as the subset of the product consisting of compatible families.

Proposition 10.2 [PROP]. The limit exists in Set. If each E_τ is Hausdorff and the transition maps are continuous, the same equalizer construction gives a closed subspace of the product.

10.2. World Reduction and Present Slice

$$W = \Theta_W(\mathrm{FOS};D_W). \quad \textit{[RU pp. 40–41]}$$

$$N_\omega = \sigma_\omega(\mathrm{FOS}), \quad \omega=(\mathrm{where},\mathrm{when},iH,D). \quad \textit{[RU p. 40]}$$

A world is a reduction only when an admissible functor Θ_W and a sufficient foundation D_W are specified. A present state is a slice selected by where, when, observer layer iH, and foundation D. This is a typed selection operator, not a claim that the whole FOS is simultaneously observed.

10.3. Seven Size@Dimensions

Size measures magnitude within a layer; dimension measures the type of local freedom. The packet notation keeps the two observables coupled. The seven-layer classification is model data, not a theorem about every physical ontology.

Class	Layer	Model role	Status
Nonlocal	Apeiron / FOS	global compatibility of admissible Reper families	MODEL
Nonlocal	Hyparxis	transition layer between local dimensional regimes	MODEL
Nonlocal	iH	observational/consciousness layer in the authorial ontology	PHY-HYP / MODEL
Local	cavity	three-dimensional local freedom	CL carrier / MODEL role
Local	plane	two-dimensional local freedom	CL carrier / MODEL role
Local	line	one-dimensional local freedom	CL carrier / MODEL role
Local	point	zero-dimensional local freedom	CL carrier / MODEL role

10.4. Early Kurpishev Uncertainty Principle PN.2

The early principle states that exact size and exact dimension of a packet object cannot be fixed independently while all transition data are preserved. At this checkpoint the statement is axiomatic-modelled. It is not the later quantitative minimax theorem and supplies no numerical uncertainty constant by itself.

> **STATUS FIREWALL.** Early PN.2 in Chapter 10 = MODEL/PHY-HYP bridge. Canonical mathematical PN.2 in Chapter 21 = a separate theorem package with a specified experiment, loss, parameter family, and lower bound. The two layers must not be conflated.

10.5. Size and Dimension as Distinct Observables

Let E be the set of packet states and let $s:E\to S$ be a size map and $d:E\to D\_dim$ a dimension map. The joint measurement map is $M=(s,d)$. An impossibility claim requires a declared admissible class of estimators, a noise or indistinguishability model, and a loss. Without them the chapter supplies a structural warning rather than a quantitative theorem.

The uncertainty fibre at observed value y is $C(y)=\{x\in E:M(x)=y\}$. If $C(y)$ contains states with different bracketings, dimensions, or transition data, a single observation does not identify the hidden structure. Prediction must therefore retain the set $C(y)$, add a bridge assumption, or return ABSTAIN.

10.6. FOS-PN2-CERT Passport

Field	Requirement
Index category	T, objects, arrows, cofilteredness
Layer family	C_τ, E_τ, carrier types
Transitions	ρ_{στ}, identity and composition checks
Limit witness	compatible family or explicit obstruction
World reduction	Θ_W, Dom, D_W, loss of information
PN.2 bridge	size map, dimension map, observation model, equivalence fibre

Field	Requirement
Status	MODEL / COND / THM only as justified; no automatic PHY confirmation

Phenomenological note. A world is not obtained by merely naming a totality. It appears through a compatible reduction. PN.2 records the cost of such reduction: a chosen slice may preserve some coordinates only by leaving others set-valued or structurally unresolved.

Chapter 11. NAPG: Nonassociative Packet Geometry

Russian source locator: pp. 43–46

PLAIN-LANGUAGE EXPLANATION. NAPG studies admissible binary operations while preserving the packet architecture and recording nonassociativity through explicit associators and obstruction classes. The chapter does not identify one model with all nonassociative geometries.

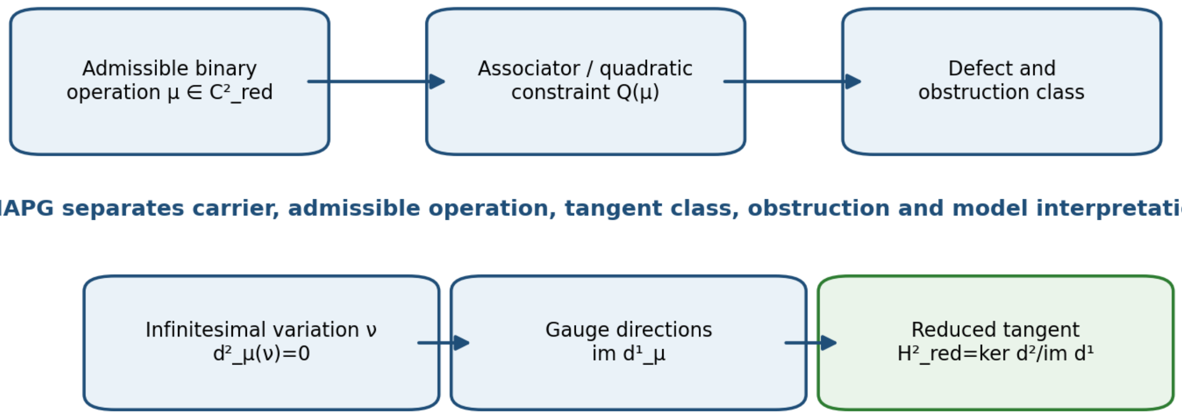

Figure 11.1. Reduced NAPG deformation complex: operation, constraint, tangent quotient, and obstruction.

11.1. Admissible Operations and Reduced Spaces

Let V be a finite-dimensional vector space with a fixed split architecture. An admissible operation is a bilinear map $\mu:V\times V\to V$ satisfying the declared grading, symmetry, carrier, and packet constraints. The ambient cochain spaces are reduced to subspaces C^1_red, C^2_red, and C^3_red compatible with those constraints.

$$\mathrm{Ass}\_\mu(x,y,z)=\mu(\mu(x,y),z)-\mu(x,\mu(y,z)).$$ *[RU p. 43]*

$$H^2\_red(\mu)=\ker d^2\_\mu \,/\, \mathrm{im}\, d^1\_\mu.$$ *[RU pp. 44–45]*

$$O^3\_red(\mu)=C^3\_red \,/\, \mathrm{im}\, d^2\_\mu.$$ *[RU pp. 44–45]*

The tangent quotient removes infinitesimal changes generated by admissible changes of coordinates. The obstruction quotient records whether a first-order direction can be prolonged. These are reduced objects: their meaning depends on the declared subcomplex and cannot be imported from an unrelated deformation problem without a comparison theorem.

11.2. Associator Amplitude

For a fixed norm and a declared test family $\Omega\subset V^3$, an associator amplitude may be defined by $A\_\Omega(\mu)=\sup\_\{(x,y,z)\in\Omega\}\|\mathrm{Ass}\_\mu(x,y,z)\|$. In a concrete one-parameter model μ_α the source corpus uses $A(\alpha)=\sqrt{3}|\alpha|$. This is a proved model computation only after the operation, basis, norm, and test triples are fixed.

COUNTEREXAMPLE. A change of basis or a rescaling of the norm can change a raw amplitude. Therefore $A(\alpha)$ is not an invariant of an abstract algebra unless the admissible transformations and normalization are included in the certificate.

11.3. Typed Deformation Complex

Definition 11.1 [DEF-A]. A reduced deformation datum is a tuple $(V, C^1\_red, C^2\_red, C^3\_red, \mu, d^1\_\mu, d^2\_\mu, Q)$ in which $d^2\_\mu \circ d^1\_\mu = 0$ and $Q(\mu)=0$ is the defining constraint. An infinitesimal variation ν is admissible when $d^2\_\mu\nu=0$. Two variations differing by $d^1\_\mu a$ represent the same reduced tangent class.

Proposition 11.2 [PROP]. The quotient $H^2\_red(\mu)$ is well defined whenever im $d^1\_\mu \subseteq$ ker d^2_μ. The class $[\nu]$ is zero exactly when ν is generated by an admissible infinitesimal change of coordinates.

11.4. Primary Quadratic Obstruction

Suppose $\mu\_t=\mu+t\nu+t^2\eta+O(t^3)$ and $Q(\mu)=0$. Expansion of $Q(\mu\_t)=0$ gives the first-order equation $d^2\_\mu\nu=0$ and a second-order equation $d^2\_\mu\eta=-B\_\mu(\nu,\nu)$, where B_μ is the quadratic term. The class of $B\_\mu(\nu,\nu)$ in $O^3\_red(\mu)$ is the primary obstruction.

Theorem 11.3 [COND]. If the primary obstruction class is nonzero, the infinitesimal direction $[\nu]$ cannot be extended to second order within the declared reduced model. Vanishing of the primary class is necessary, not generally sufficient, for a full deformation.

11.5. Naturalness and Status Boundary

The associator is natural under an isomorphism g when the operation is transported by $(g\cdot\mu)(x,y)=g\mu(g^{-1}x,g^{-1}y)$: $Ass\_\{g\cdot\mu\}(x,y,z)=g\, Ass\_\mu(g^{-1}x,g^{-1}y,g^{-1}z)$. A scalar amplitude is invariant only if g is an isometry of the chosen norm and preserves Ω.

> **CLAIM BOUNDARY.** The source connects NAPG with Hodge and G_2 model realizations. These are model bridges. The reduced deformation statements do not by themselves establish a universal physical geometry, a unique arrow of time, or empirical properties of space.

11.6. NAPG-DEF-CERT

Field group	Mandatory content
Carrier	field, V, split architecture, basis and grading
Operation	μ, bilinearity, symmetry/alternation constraints
Differentials	d^1_μ, d^2_μ and proof $d^2d^1=0$
Tangent	ν, cocycle check, gauge class $[\nu]$
Obstruction	$B\_\mu(\nu,\nu)$, quotient class in O^3_red
Amplitude	norm, test domain Ω, invariance group
Status	DEF-A / PROP / COND / MODEL; physical bridge separate

Chapter 12. PILOT-01, Formula Chains, and the Fano Barrier

Russian source locator: pp. 47–50

PLAIN-LANGUAGE EXPLANATION. PILOT-01 treats a mathematical text as a typed graph. It can identify the first missing domain, assumption, or proof object; build an internal obstruction carrier; and state precisely why seven local Fano-like pictures do not automatically form one global Fano plane.

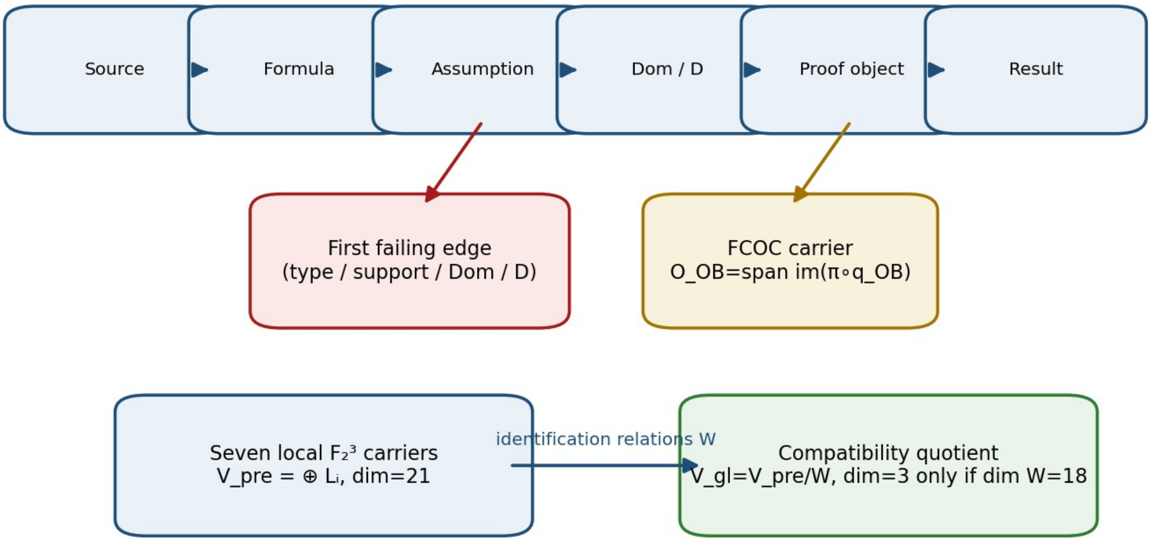

Figure 12.1. Formula-chain audit, FCOC carrier, and the quotient required to cross the Fano barrier.

12.1. Formula-Chain Step and First-Gap Localisation

A formula-chain step is a tuple $s=(F_i,F_j,\tau,A,Dom,D)$, where F_i and F_j are typed nodes, τ is the transition type, A is the support set, Dom is the admissible domain, and D is the sufficient foundation. A step is admissible only when output and input types match, support assumptions are available, Dom contains the actual input, and D points to a verifiable proof object.

Theorem 12.1 (formula-chain gap theorem) [IT]. If a projective truth authorization $cr(U,I;R,D)=-1 \Rightarrow$truth-status is used without an admissible Dom or sufficient foundation D, the RPD audit creates GAP-DOMAIN-MISSING or GAP-ASSUMP-MISSING.

Theorem 12.2 (first-gap localisation) [IT]. In a finite linearly ordered chain, if the final result is not authorized, there is a first edge violating at least one of type, support, Dom, or D.

Proof. The finite nonempty set of failing edge indices has a least element.

12.2. Formula-Chain Obstruction Complex

$$C^0 \xrightarrow{d_0} C^1 \xrightarrow{d_1} C^2, \quad d_1 d_0=0. \qquad \text{[RU p. 49]}$$

$$H\_OB=C^2/\mathrm{im}\, d_1, \quad O\_OB=\mathrm{span}(\mathrm{im}(\pi\circ q\_OB))\subseteq H\_OB. \qquad \text{[RU p. 49]}$$

Theorem 12.3 [IT]. O_OB is a well-defined vector subspace of H_OB. It is independent of representatives of classes in C^2, but depends on the declared maps q_OB and d_1, which are part of the model passport.

12.3. Nontrivial Packet Obstruction

Let $C^1=k^3$, $C^2=k^3$, $d_1=0$, and $q\_OB(a,b,c)=(ab,bc,ca)$. Then $O\_OB=k^3$ because the image contains the three coordinate directions: $q\_OB(1,1,0)=(1,0,0)$, $q\_OB(0,1,1)=(0,1,0)$, and q_OB(1,0,1)=(0,0,1). This is an internal construction theorem, not an identification with every deformation-theoretic obstruction quotient.

12.4. Exact Fano Gluing Barrier

Let $L_1,\dots,L_7$ be local three-dimensional carriers over F_2. Before identifications, the universal independent carrier is $V\_pre=\oplus_i L_i$ of dimension 21. Let $W\subseteq V\_pre$ be the subspace of compatibility relations. The global carrier V_gl=V_pre/W has dimension 3 exactly when dim W=18.

Theorem 12.4 (conditional Fano carrier) [COND]. If W identifies local directions according to the incidence of $P^2(F_2)$, dim W=18, and the seven global nonzero classes are distinct, then $V\_gl\cong F_2^3$ and $P(V\_gl)\cong P^2(F_2)$.

> **COUNTERMODELS.** If W=0, the quotient has dimension 21 rather than 3. If W=V_pre, the quotient is zero. Seven locally similar diagrams therefore do not determine a global Fano plane without explicit identification maps.

12.5. FCOC-CERT and Executable Verdict

Passport field	Content
Graph	graph-id, ordered nodes and edges, node types
Step contract	τ, support A, Dom, D, actual input snapshot
Gap result	first-gap index, violation type, pre-gap state
Complex	d_0,d_1, proof $d_1d_0=0$, q_OB, field
Fano layer	local carriers, relation space W, quotient dimension
Identification	Fano axiom/maps, distinct global classes, countermodel
Verdict	PROVED-INTERNAL / CONDITIONAL / OPEN / ABSTAIN

> **PREDICTION BOUNDARY.** Closing a formula chain is necessary for admitting a predictive claim, but it does not establish empirical accuracy. Matched-null controls, calibration, CGI<1, and independent evidence remain separate gates.

Chapter 13. RBD/RPD and KLT-RBD as a Computational Architecture

Russian source locator: pp. 51–57

PLAIN-LANGUAGE EXPLANATION. RBD is an active evidence graph, not a flat bibliography. Raw items become typed units, Reper nodes, proof dependencies, gaps, blockers, and candidate futures. RPD adds projective and formula-chain audit. Database structure improves traceability but does not prove the stored claims.

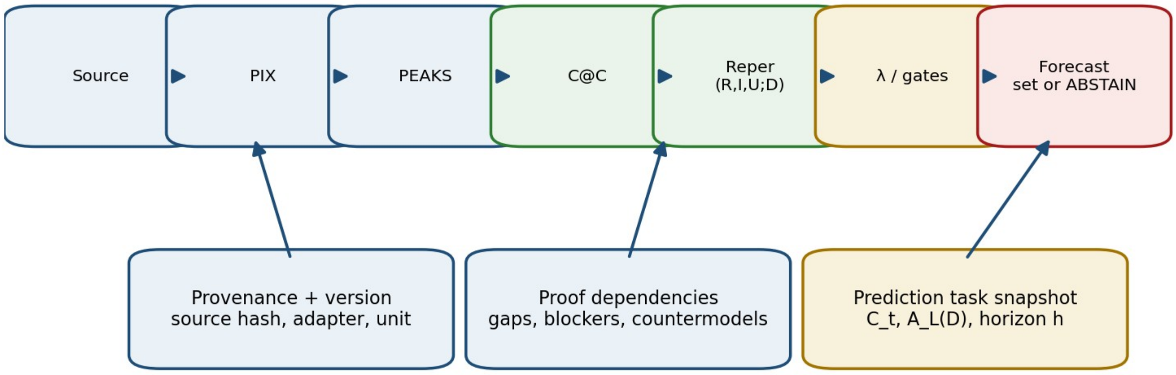

Figure 13.1. KLT-RBD ingest, evidence graph, and set-valued prediction output.

13.1. PIX, PEAKS, and Typed Reper Ingest

PIX are primary extracted items: formulae, values, dates, names, identifiers, and observations. PEAKS are stable semantic states around which related PIX are grouped. A Reper is built from a typed state rather than a raw string.

$$\text{source} \to \text{PIX} \to \text{PEAKS} \to \text{C@C} \to \text{Reper}(R,I,U;D) \to \lambda/\text{gates} \to \text{graph}. \quad \textit{[RU p. 51]}$$

Layer	Function
Source	origin, license, immutable version, content hash
Work	document, dataset, article, program, or experiment
Unit	formula, claim, row, observation, image, or test vector
C@C	event coupled with its state and version
Reper	typed R,I,U,D and admissible Dom
Graph	morphisms, proof dependencies, conflicts, gaps, blockers
Status	mathematical, computational, empirical, reproducibility, legal channels
Forecast	set of admissible future Reper states or ABSTAIN

13.2. Versioned Prediction Task

A prediction task must be frozen as a versioned object $T_t=(C_t,Dom_t,D_t,L_t,h,loss,null,adapter)$, where C_t is the information available at time t, L_t is the active limit system, h is the horizon, and the remaining fields fix evaluation and observation semantics. Later information may be used for scoring, not silently inserted into the original task.

$$A\_L(D)=\{r : \text{all mandatory limit and evidence gates are satisfied}\}.$$ [RU p. 56]

$$Future(C\_t)=\{r\in A\_L(D\_t) : r \text{ extends the frozen snapshot } C\_t\}.$$ [RU p. 56]

The output is generally set-valued. A single selected future requires an additional selection rule with its own proof and loss certificate.

13.3. Matched-Null and Empirical Calibration

A matched-null preserves the object class, data volume, preprocessing, and scoring procedure while breaking the hypothesised relation. It estimates how often the same pipeline would produce an apparently strong pattern when the target relation is absent.

Calibration records the empirical relation between declared scores and realised frequencies. Neither a high λ score nor CGI<1 substitutes for a matched null or an external evaluation.

13.4. ABSTAIN and Multiplicity of the Future

The architecture has four primary outcomes: SINGLE-CANDIDATE, SET-CANDIDATE, ABSTAIN-EMPTY, and ABSTAIN-BLOCKED. The empty result reports that no admissible continuation exists under the current gates. The blocked result reports missing evidence or an unresolved conflict. Neither may be replaced by an arbitrary ranking.

> **NO HIDDEN AVERAGING.** When several Reper continuations remain admissible, an arbitrary prior or unrecorded scalar score may not collapse them to one answer. The selection mechanism must be declared as a new model layer.

13.5. PRED-CERT-13

Field group	Required fields
Task snapshot	task-id, time t, horizon h, frozen input hashes
Adapters	schema, units, missingness, selection, covariance
Carrier	C_t, Dom_t, D_t, limit vector L_t
Candidate generation	morphisms, neighbourhood, constraints, algorithm version
Evaluation	loss, matched-null, blind split, calibration
Output	candidate set, blockers, ABSTAIN reason, provenance
Status	MODEL / NUM / EMP-PLAN / EMP-OBS kept in separate channels

Phenomenological note. A database becomes scientific memory only when it remembers not merely an answer, but the route by which that answer was admitted, the alternatives that remained, and the blockers that prevented stronger speech.

Chapter 14. Examples, Counterexamples, and Evidence Passports

Russian source locator: pp. 58–61

PLAIN-LANGUAGE EXPLANATION. Examples show that a construction can work in a specific case. Counterexamples show why its hypotheses are needed. Evidence passports record enough information to reproduce the case and prevent successful formatting or numerical proximity from being mistaken for a stronger theorem.

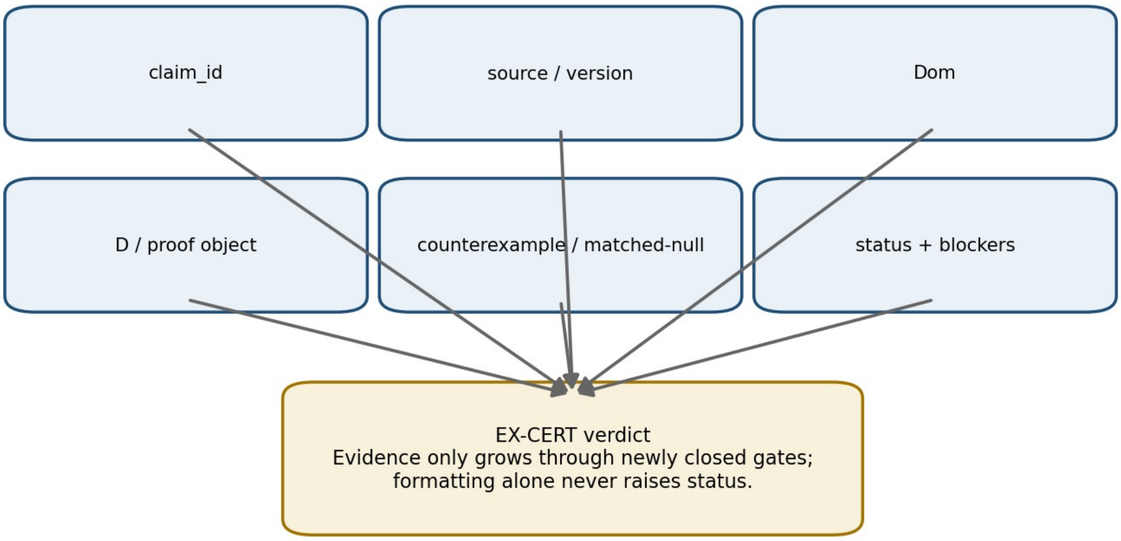

Figure 14.1. EX-CERT evidence passport and the monotonicity rule for status.

14.1. Domain Examples

Domain	Typed object	Mandatory evidence	Forbidden inference
Mathematics	formula or theorem step	hypotheses, Dom, D, proof, countermodel	one example ⇒ universal law
Construction estimate	work item and project state	norm version, period, act, resource source	gap ⇒ intent or fraud
Physical spectrum	line with channel and uncertainty	units, transition, source, covariance, matched-null	proxy ⇒ direct measurement
Chemistry	reaction state	stoichiometry, redox, energy, kinetics, spectroscopy, catalysis	ratio pattern ⇒ natural law
Biology / DNA	mapped biological object	accession, genome build, gene→transcript→protein map, cohort	cross-layer status transfer without morphism

14.2. EX-CERT Definition

Definition 14.1 [DEF-A]. EX-CERT is a record containing source-id, object-id, Dom, D, inputs, formula or procedure, numerical precision, expected result, observed result, a controlled counterexample, and the evidence status.

MANDATORY RULE. An example without a counterexample checks only one successful route; an example without Dom does not state applicability; an example without D does not authorize interpretation.

14.3. Monotonicity of Evidence Status

Theorem 14.2 [PROP]. An editorial improvement of an EX-CERT representation does not raise its status when no new verified evidence has been added.

Proof. Status is determined by the set of closed gates, not by the length or polish of the description. Reformatting preserves that set.

For certificates e_1 and e_2, define $e_1 \preccurlyeq e_2$ when every gate closed in e_1 is also closed in e_2 and all common fields have compatible versions. After quotienting by equality of evidence sets, $\preccurlyeq$ is a partial order.

14.4. Insufficiency of a Finite Noncovering Example Set

Theorem 14.3 [CL/PROP]. Let X contain at least two points and suppose a rule f has been observed only on a proper subset $A \subsetneq X$. Then there exists a rule $g:X \to Y$ agreeing with f on A and differing outside A. Hence a finite noncovering example set does not identify a universal law.

Proof. Choose $x_0 \in X \setminus A$ and two different values $y_1, y_2 \in Y$. Put $g=f$ on A and $g(x_0)=y_2 \neq f(x_0)=y_1$; define remaining values arbitrarily.

Corollary 14.4. Every positive example must be accompanied by a declared generalisation domain, a counterexample, or a preregistered test on new data.

14.5. Frozen Artifact-1 Status

The source preserves the chain RIUD-TETRA-RUN006-029 → PROOF-OBJ-RUN007-0029 → FORMAL-CARD-RUN009-006 → SIGNATURE-REVIEW-RUN013-001.

$$\lambda=-0.992736565468, \quad \delta\_truth=0.007263434532, \quad CGI=0.140948882338.$$

[RU pp. 60–61]

The frozen status is signature-ready-not-truth-layer with truth_layer_promotion=0. Numerical proximity to −1, CGI<1, or improved presentation does not authorize promotion without new independent evidence.

14.6. Paired Counterexample and Matched-Null

A mathematical counterexample violates exactly one essential hypothesis and demonstrates its necessity. An empirical matched-null preserves the class and procedure while destroying the investigated relation. The controls serve different purposes and are not interchangeable.

Chapter 15. Glossary, Notation, Formulae, and Bibliography

Russian source locator: pp. 62–64

PLAIN-LANGUAGE EXPLANATION. This chapter fixes a common language. In a notation-intensive theory, a symbol is part of the type system: changing one star, bracket, or domain marker can change the mathematical object. Bibliography records provenance but does not by itself prove novelty.

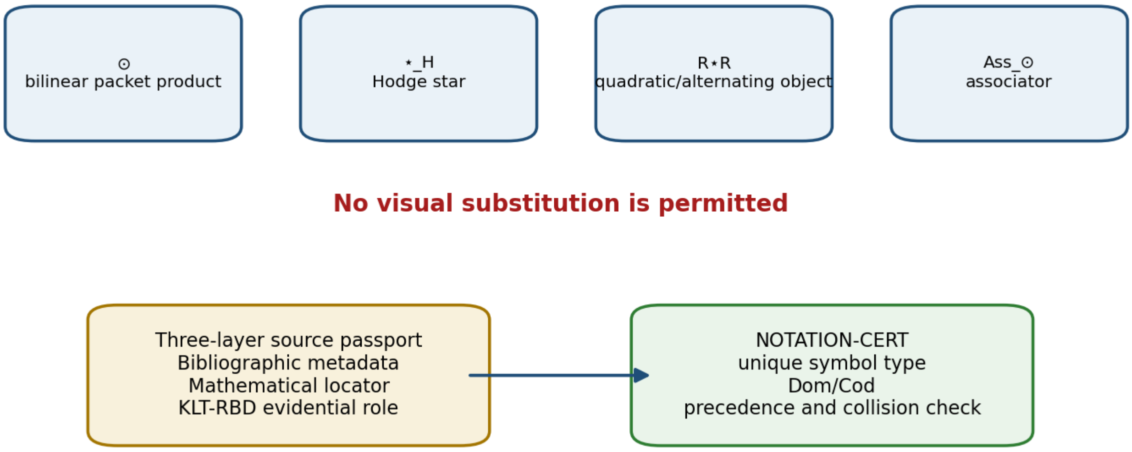

Figure 15.1. Notation firewall and three-layer source passport.

15.1. Normative Glossary

Term	Normative English meaning
Time@Space	stratified temporal primacy; space as an admissible section
C@C	event@state, the minimal typed unit
packet	an object together with a dual, stratified, or evidential layer
Pack	category of admissible packet objects and packet morphisms
Reper	typed quadruple (R,I,U;D)
D	sufficient foundation; not the same object as Dom
Dom	admissible domain of definition or applicability
λ	projective-harmonic coordinate, not a probability
δ_truth	distance from the harmonic normalization −1
FOS	Kurpishev Fundamental Support Connectivity
NAPG	Nonassociative Packet Geometry
PILOT-01	formula-chain audit and Fano-barrier pilot
RBD / RPD	Reper database / Reper-projective audit programme
KLT	computational-mathematical software layer of the Kurpishev method

15.2. Core Formulae and Symbol Types

$$c=C@C=(e,s)$$ *[RU p. 62]*

$$\mathrm{Reper}=(R,I,U;D)$$ *[RU p. 62]*

$$\lambda=\mathrm{cr}(U,I;R,D)$$ *[RU p. 62]*

$$\delta\_\mathrm{truth}=|\lambda+1|$$ *[RU p. 62]*

$$\mathrm{Ass}\_\odot(x,y,z)=(x\odot y)\odot z-x\odot(y\odot z)$$ *[RU p. 62]*

$$H^2\_\mathrm{red}=\ker d^2/\mathrm{im}\, d^1$$ *[RU p. 62]*

$$O^3\_\mathrm{red}=C^3\_\mathrm{red}/\mathrm{im}\, d^2$$ *[RU p. 62]*

$$\mathrm{FOS}=\lim\leftarrow\prod\mathrm{Reper}(c)$$ *[RU p. 62]*

Symbol	Unique type	Not interchangeable with
⊙	bilinear packet product	Hodge star, R⋆R, associator
⋆_H	Hodge operator	bilinear product
R⋆R	authorial quadratic/alternating packet object	Hodge star or ordinary multiplication
Ass_⊙	trilinear associator of ⊙	operation ⊙ itself
λ	projective-harmonic scalar or operator coordinate	truth probability
D	sufficient foundation	Dom

15.3. Three-Layer Source Passport

Layer	Required fields
Bibliographic	author, title, edition, year, DOI/URL/repository revision
Mathematical locator	chapter, theorem, equation, page, figure, data path
KLT-RBD role	claim-id, imported hypothesis, Dom, D, status, blocker, transformation

Rule 15.1. A source reference without an exact mathematical locator cannot support a precise imported formula unless the complete source object is itself the frozen locator. A source card never raises the mathematical status of its claim merely by being complete.

15.4. Selected Bibliography and Prior Art

- Kurpishev, I. B. Monograph 5.0: Kurpishev Logic. Internal project corpus, 2026.
- Kurpishev, I. B. Monograph 5.1: Kurpishev Logic. Internal project corpus, 2026.
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- Mandelkern, M. Constructive Projective Geometry, arXiv:2404.16979.
- Stacks Project, Projective Space, Tag 01ND.

NOVELTY BOUNDARY. The glossary and bibliography support precise attribution. They do not prove absolute worldwide novelty. Statements of priority require a separate bibliographic and patent search with a declared scope.

Chapter 16. Historical-Mathematical Prior Art and the Boundary of Authorial Contribution

Russian source locator: pp. 65–72

PLAIN-LANGUAGE EXPLANATION. The chapter distinguishes inherited mathematics from the new typed synthesis. Cross-ratio, Desargues, polarity, projectivisation, Hodge theory, and hyperbolic/Lorentzian formulae are classical. The authorial contribution lies in how C@C, Reper roles, D/Dom gates, NAPG, FOS, and KLT-RBD are assembled and audited.

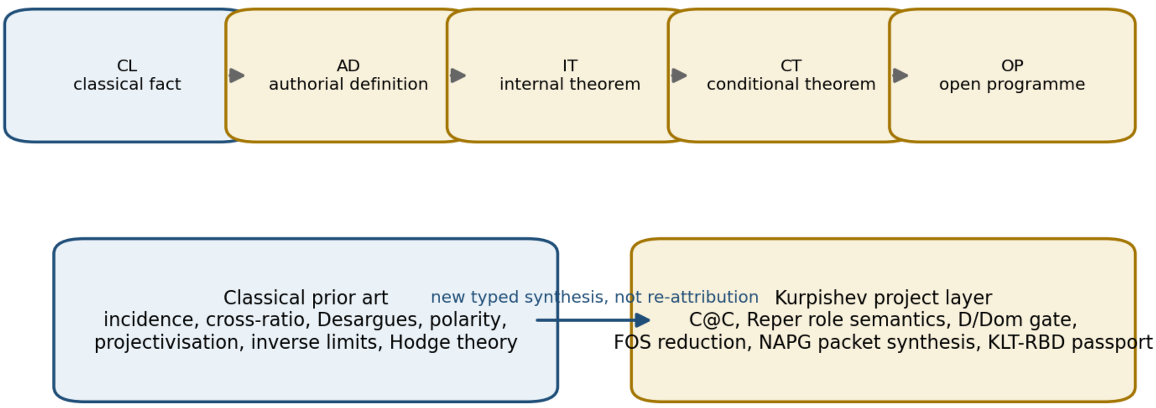


Figure 16.1. Prior-art classes and the authorial synthesis boundary.

16.1. From Perspective to Projective Invariance

Projective geometry arose from the mathematical treatment of perspective. Desargues made central projection a structural relation preserving incidence and perspectivity. Poncelet, Chasles, Steiner, and von Staudt later separated projective geometry from metric intuition. For Volume I the central lesson is that a relation should survive changes of coordinates, scale, and viewpoint.

The cross-ratio and harmonic quadruple belong to the classical core. The project does not claim their invention. The authorial layer consists in choosing the Reper quadruple (R,I,U;D), assigning semantic roles, imposing the D/Dom barrier, and using a projective invariant as one component of an evidential audit.

16.2. Desargues, Coordinatisation, and Applicability

The classical Desargues theorem holds in projective spaces of dimension at least three. In abstract projective planes it is an additional property connected with coordinatisation over a division ring; non-Desarguesian planes exist. Therefore any use of Desargues in an abstract plane must declare a Desargues axiom, an embedding into a three-dimensional projective space, or a coordinate model.

Layer	Classical prior art	Authorial layer in Volume I
Incidence	projective points, lines, planes	C@C as a typed object with state
Quadruple	cross-ratio and harmonic quadruple	Reper(R,I,U;D) and semantic roles
Desargues	perspectivity from a point and from a line	bridge between Desargues axis, polar centres, and D/Dom
Polarity	pole and polar of a nondegenerate conic	central axis as a Reper evidence-closing axis

Layer	Classical prior art	Authorial layer in Volume I
Proof	axiomatic, coordinate, or synthetic deduction	proof status, gap nodes, RBD passport

16.3. Erlangen Programme and Packet Morphisms

Klein's Erlangen Programme views geometry as the study of invariants under transformation groups. Packet Reper logic inherits this principle but adds preservation of state, domain, foundation, and evidence status. A packet morphism must therefore state which parts of the evidence passport are preserved, transformed, weakened, or lost.

16.4. Classical Visual and Dynamical Examples

Source visual	Classical formula	Correct interpretation	Forbidden inference
Angle of parallelism	$\sin \Pi(d)=\operatorname{sech} d$; $\tan(\Pi/2)=e^{(-d)}$	hyperbolic $K=-1$ relation	proof of a Reper model
Poincaré disk circumference	$L(r)=2\pi\sinh r$	hyperbolic growth vs $2\pi r$	boundary is finite distance
Circle / hyperbola	$\cos^2\theta+\sin^2\theta=1$; $\cosh^2\eta-\sinh^2\eta=1$	change of quadratic-form signature	literal sin↔sinh identity
ODE sign	$y''=-y$ gives $\cos t$; $y''=+y$ gives $\cosh t$	oscillatory vs hyperbolic regime	all hyperbolic geometry grows exponentially
Lorentz boost	$t'=t\cosh\eta-x\sinh\eta$; $x'=x\cosh\eta-t\sinh\eta$	hyperbolic rotation preserving t^2-x^2	ordinary Euclidean rotation
Rapidity	$v=c\tanh\eta$	linear addition of rapidities	confirmation of physical PN.2

16.5. Classification of Construction Origin

Code	Meaning	Required wording
CL	classical fact	attribute source and state hypotheses
AD	authorial definition	state exact carrier and semantic role
IT	internal theorem inside AD	prove within declared authorial model
CT	conditional theorem	list bridge hypotheses and blockers
OP	open programme	do not present as completed result
EMP	empirical claim	require data, protocol, uncertainty, and independent test

16.6. Classical Core and Authorial Assembly

Class CL includes projective planes, Desargues in admissible models, polarity of a nondegenerate conic, cross-ratio and PGL_2 invariance, inverse limits, bilinear nonassociative algebras, quotient spaces, Grassmannians, and the Fano plane.

Class AD includes the semantic role distribution Reper=(R,I,U;D), the separation of D and Dom as evidence gates, C@C as the project's minimal object, the KLT-RBD passport architecture, the authorial $R\star R$ object, FOS reduction, and PN.2 in its fixed packet formulation.

Proposition 16.1 (inheritance boundary) [PROP]. If an authorial construction uses a classical theorem T, it inherits the conclusion of T only when every hypothesis of T is verified in the authorial Dom. New semantics assigned to the symbols do not transfer the conclusion automatically.

Proof. A theorem is an implication $H\Rightarrow C$. Without verification of H in the new interpretation, modus ponens is unavailable.

16.7. Criterion for Novelty Statements

Novelty is formulated relative to a specific combination of carrier, morphisms, algorithm, gates, and proved result. A bibliographic search can support a priority statement but is not a mathematical proof and cannot guarantee absolute worldwide novelty.

> **APPROVED WORDING.** “The authorial contribution consists in …” is admissible when followed by the exact typed construction. “For the first time in the world” requires a separate exhaustive patent and bibliographic report and remains outside the mathematical proof of Volume I.

16.8. External Operator Cross-Ratio Boundary

Generalised and noncommutative cross-ratios on polarisations and Grassmannians occur in prior work, including work associated with Zelikin and later cross-ratio mappings. The project therefore does not claim novelty in the mere existence of an operator cross-ratio. Its authorial claim concerns integration into Reper, D/Dom, CGI, and prediction certificates.

16.9. PRIOR-ART-CERT

Field	Content
claim-id	stable identifier and exact wording
class	CL / AD / IT / CT / OP / EMP
internal antecedents	earlier project definitions and proof objects
external references	precise source cards and mathematical locators
comparison	similarities, differences, inherited hypotheses
priority blockers	unresolved searches and prohibited language
approved wording	claim sentence permitted by the current evidence

Phenomenological note. Authorship does not detach a thought from history. It locates a new synthesis within the history of concepts. The more precisely the boundary with predecessors is drawn, the more clearly the project’s own constructive gesture appears.

Projective-Core Checkpoint: Result and Next Route

CHECKPOINT RESULT. Chapters 1–16 now form one controlled English derivative. The projective, harmonic, FOS, NAPG, PILOT-01, RBD/RPD, certificate, notation, and prior-art layers are translated and linked to stable Russian page locators.

Parity item	Result
Translated chapters	16/52
Projective-core chapters	8/8 for Chapters 9–16
Russian address layer	pp. 35–72 preserved
Classical/authorial boundary	explicit in Chapters 9, 12, 15, 16
Negative results	counterexamples and ABSTAIN gates preserved
Status promotion	none; truth_layer_promotion=0
Independent EXT-RUN	not completed
Next checkpoint	T1-EN-OPERATORS-v0.4 · Chapters 17–26

Open Translation Blockers

ID	Blocker	Effect
T1-EN-BLK-013	No independent signed bilingual audit has been performed.	Non-veto for authorial draft; veto for external certification.
T1-EN-BLK-014	The English page map is provisional until full assembly.	Russian source pages remain the only canonical locators.
T1-EN-BLK-015	Some historical source cards lack exact edition/page data in the frozen Russian text.	Keep carried metadata; no fabricated locators.
T1-EN-BLK-016	Physical interpretations of seven Size@Dimensions and early PN.2 remain unvalidated.	Maintain MODEL/PHY-HYP and ABSTAIN for physical confirmation.

NEXT CHECKPOINT. T1-EN-OPERATORS-v0.4 will translate Chapters 17–26: complex, matrix, and operator cross-ratio; proof-cleaned Desargues–Kurpishev material; the canonical mathematical PN.2 construction; the action/change/reversal operators Δ, Ξ, Y; and the nonassociative packet Reper algebra of Size@Dimensions.

T1-EN-OPERATORS-v0.4

CONTROLLED ENGLISH TRANSLATION OF CHAPTERS 17–26

DERIVATIVE BOUNDARY. The following text is a controlled derivative of frozen Russian source pages 73–146. The English layer may normalize layout and terminology, but it may not alter a formula, theorem hypothesis, counterexample, domain, sufficient foundation, or evidence status. Any discovered Russian-source issue becomes a blocker for a future Russian change-set.

Chapter parity map for the v0.4 checkpoint

Chapter	Russian locator	English title	Dominant status
17	73–75	Complex Cross-Ratio and Reper Geometry on CP^1	CL / PROP / THM
18	76–77	Matrix and Operator Cross-Ratio	DEF-A / COND
19	78–81	Proof-Cleaning of the Desargues–Kurpishev Theorem	THM / COND / OPEN
20	82–86	Subject Index, Formula Registry, and Cross-Reference System	DOC / PROP / NUM
21	87–104	Canonical Mathematical Construction of Kurpishev PN.2	THM / COND / MODEL
22	105–109	PN.2 as a Restrictor and Driver of the KLT-RBD Predictive Method	PROP / NUM / EMP-PLAN
23	110–111	PN.2 Examples, Counterexamples, and Computational Tests	PROP / NUM
24	112–115	Export of PN.2 to Physics, Chemistry, Biology, and DNA	EMP-PLAN / PHY-HYP
25	116–124	Operators of Action, Change, and Reversal	DEF-A / THM / COND
26	125–146	Nonassociative Packet Reper Algebra of Size@Dimensions	THM / COND / OPEN

Chapter 17. Complex Cross-Ratio and Reper Geometry on CP^1

Russian source locator: pp. 73–75

> **PLAIN-LANGUAGE EXPLANATION.** A scalar Reper is moved to the complex projective line. Homogeneous coordinates allow one to treat finite points and infinity uniformly, while the stability certificate records how close the configuration is to a forbidden collision.

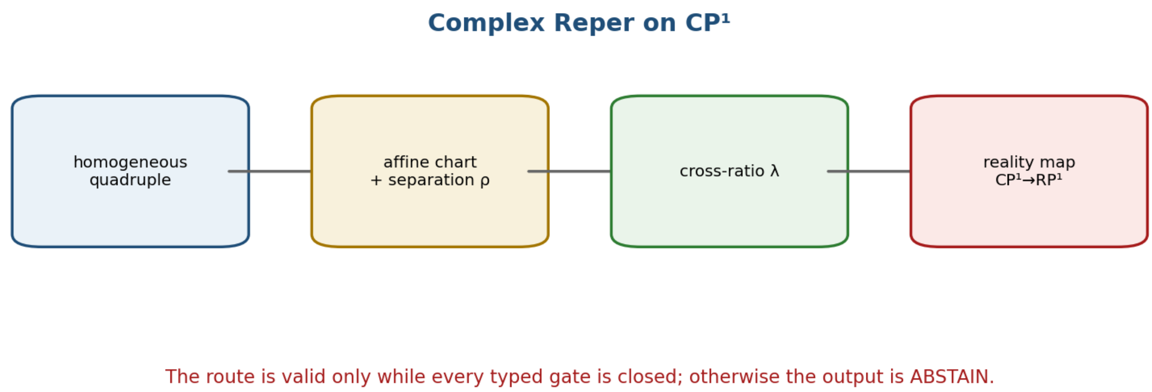


Figure 17.1. The complex Reper requires a chart, separation estimate, and an explicit real-reduction map.

17.1. Homogeneous and Affine Definitions

Let z_1,z_2,z_3,z_4 be pairwise distinct points of CP^1. In an affine chart in which the required differences are nonzero, define

$$\mathrm{cr}(z_1,z_2;z_3,z_4)=((z_3-z_1)(z_4-z_2))/((z_3-z_2)(z_4-z_1)). \quad \text{[RU p. 74]}$$

The value is independent of the affine coordinate and is invariant under Möbius transformations. If one point is infinity, the expression is read through homogeneous determinants or the corresponding limit. Because a Reper is ordered, permutations are not neutral: the six anharmonic values must not be conflated.

17.2. Projective Invariance

Proposition 17.1 [PROP]. For $g(z)=(az+b)/(cz+d)$, $ad-bc\neq 0$, and for any admissible quadruple,

$$\mathrm{cr}(gz_1,gz_2;gz_3,gz_4)=\mathrm{cr}(z_1,z_2;z_3,z_4). \quad \text{[RU p. 74]}$$

Proof. Each transformed difference equals $(ad-bc)(z_i-z_j)/((cz_i+d)(cz_j+d))$; all determinant and denominator factors cancel pairwise.

17.3. Harmonicity, Stability, and Reality

$$\mathrm{Reper\_C}=(R,I,U;D;\ K=C,\ \mathrm{Dom}\subset CP^1), \quad \lambda=\mathrm{cr}(U,I;R,D), \quad \delta\_\mathrm{truth}=|\lambda+1|. \quad \text{[RU p. 75]}$$

The equality $\lambda=-1$ is a projectively invariant structural condition. It does not automatically define a real observable. A map real:Dom_C→Dom_R and a compatibility proof are required for a real or physical reduction.

$$d\lambda/\lambda=(dU-dR)/(U-R)+(dI-dD)/(I-D)-(dU-dD)/(U-D)-(dI-dR)/(I-R). \quad \text{[RU p. 75]}$$

Theorem 17.3 [THM]. If the absolute values of the four denominator differences are bounded below by $\rho>0$, then, to first order,

$$|d\lambda|\le(2|\lambda|/\rho)(|dU|+|dI|+|dR|+|dD|). \quad \text{[RU p. 75]}$$

Hence a small δ_truth does not imply numerical robustness when ρ is small. The CP1-CERT passport records the field, homogeneous representatives, affine chart, pairwise distinctions, λ, δ_truth, ρ, propagated uncertainty, reality test, Dom, D, and status.

The harmonic conjugation $H_{A,C}:B\mapsto D_{harm}$ is a projective involution. If A,C,B lie in RP^1, then D_{harm} also lies in RP^1, including the point at infinity. The converse fails without a declared real structure.

> **STATUS FIREWALL.** Complex projective invariance is mathematics. The interpretation of the third coordinate of a helical visualization as physical time is not a consequence of the theorem.

Chapter 18. Matrix and Operator Cross-Ratio

Russian source locator: pp. 76–77

PLAIN-LANGUAGE EXPLANATION. Noncommuting matrices cannot be inserted into the scalar fraction without choosing the order of factors and the side on which inverses act. The definition therefore begins with an invertibility and ordering contract.

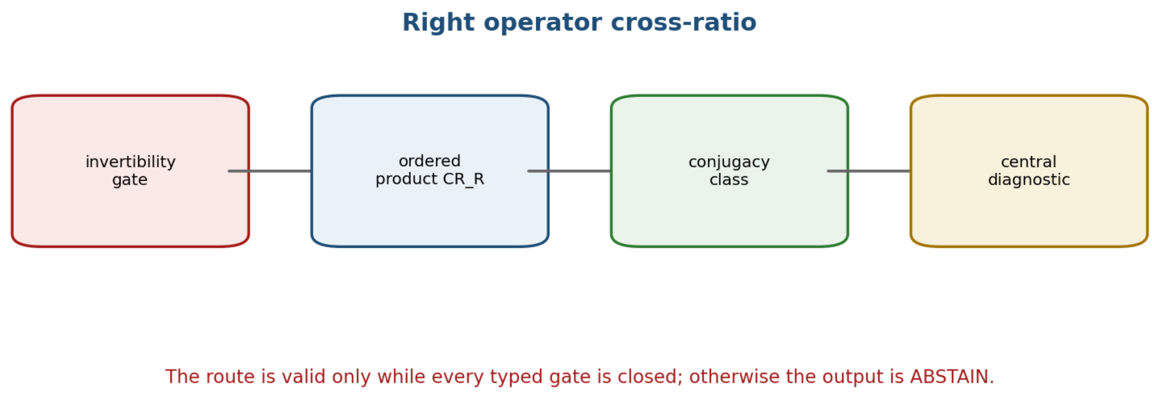


Figure 18.1. The operator construction produces a conjugacy class or central diagnostic only after the domain gates are satisfied.

18.1. Right Operator Cross-Ratio

Let A,B,C,D belong to an associative unital algebra and assume $C-B$ and $D-A$ are invertible. One fixed right convention is

$$CR\_R(A,B;C,D)=(C-A)(C-B)^{-1}(D-B)(D-A)^{-1}.$$ *[RU p. 76]*

Other conventions are possible, but the convention must be frozen before computation. Left and right variants are different typed objects in a noncommutative algebra.

18.2. Conjugacy Covariance

Theorem 18.1 [THM]. For an invertible S and $A'=SAS^{-1}$, $B'=SBS^{-1}$, $C'=SCS^{-1}$, $D'=SDS^{-1}$,

$$CR\_R(A',B';C',D')=S\cdot CR\_R(A,B;C,D)\cdot S^{-1}.$$ *[RU p. 77]*

Consequently, the conjugacy class is natural. In finite-dimensional complex models, spectrum, trace, determinant, or another central function may be used as a diagnostic only when its domain and semantics are stated.

Regime	Condition	Permitted meaning
Strict matrix	$CR\_R=-I$	operator harmonicity
Spectral	$\mathrm{spec}(CR\_R)$ concentrated near -1	review signal; not equality
Trace	$\mathrm{tr}(CR\_R)/n\approx-1$	compressed diagnostic
Norm	$\|CR\_R+I\|\le\varepsilon$	approximate operator gate

Theorem 18.3 [THM]. If A,B,C,D lie in a common commutative subalgebra, the right operator expression reduces to the scalar cross-ratio in the corresponding convention.

Counterexample 18.4. The Jordan matrix $J=[[-1,1],[0,-1]]$ has spectrum $\{-1\}$, but $J\neq-I$. Spectrum alone is therefore insufficient for strict operator harmonicity.

OPCR-CERT. The certificate must record algebra, multiplication order, inverse side, invertibility witnesses, norm, spectrum/trace convention, condition numbers, Dom, D, and status. Missing invertibility yields ABSTAIN-DOM.

Chapter 19. Proof-Cleaning of the Desargues–Kurpishev Theorem

Russian source locator: pp. 78–81

PLAIN-LANGUAGE EXPLANATION. The proof is split into independently checkable obligations: existence of a polar-centre point, identification with a Desargues axis, and harmonicity. A diagram can suggest these coincidences, but it cannot establish them.

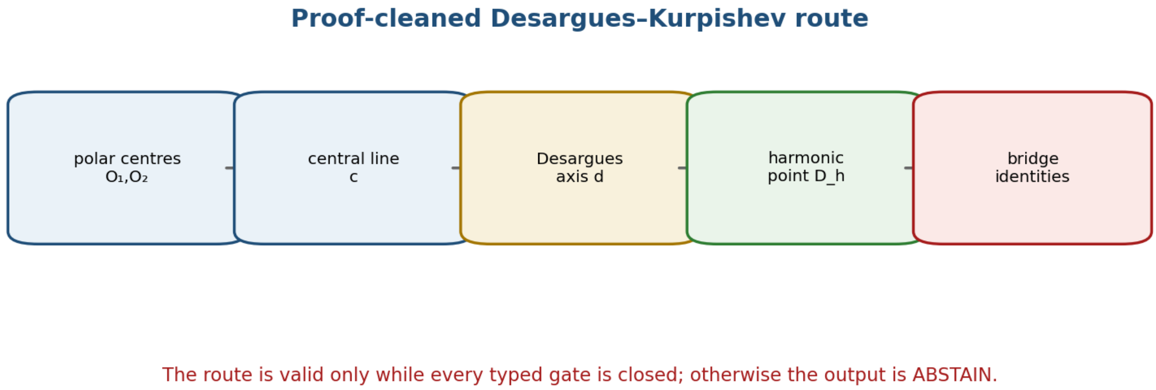


Figure 19.1. Proof-cleaning separates the classical constructions and the authorial bridge identities.

19.1. Existence and Identification Layers

Theorem 19.1 [THM]. Under the declared projective-plane, nondegenerate polarity, and transversality hypotheses, the two pole-centres O_1,O_2 determine a central line c, and c meets the support line p in a well-defined point D_pol.

Theorem 19.2 [COND]. If a pair of triangles satisfies the classical Desargues hypotheses and its axis d_Des is proved to coincide with c, then the Desargues trace on p coincides with D_pol.

19.2. Homogeneous Harmonicity Criterion

For homogeneous representatives a,b,c,d on P^1, harmonicity is equivalent to the coordinate-free determinant identity

$$[b,a][d,c]+[b,c][d,a]=0.$$ *[RU p. 80]*

Theorem 19.3 [COND]. The Desargues–Kurpishev conclusion follows only after the separate bridge D_pol=D_harm has been proved. No incidence-only argument supplies this equality automatically.

19.3. Countermodel and Status Monotonicity

A coordinate countermodel may satisfy the polar and Desargues constructions while failing the harmonic determinant identity. It refutes automatic harmonicity but does not refute the conditional theorem with its explicit bridge hypotheses.

Theorem 19.5 [PROP]. Editorial transformations that close no new mathematical obligation cannot raise the DK status. Reformatting a proof graph is not a proof step.

Proof node	Required evidence	Failure verdict
DK-1	nondegenerate conics/polarities and unique poles	ABSTAIN-DOM
DK-2	central line c and trace D_pol exist	ABSTAIN-INCIDENCE
DK-3	classical Desargues hypotheses	ABSTAIN-DESARGUES
DK-4	bridge c=d_Des	OPEN-BRIDGE

Proof node	Required evidence	Failure verdict
DK-5	bridge D_pol=D_harm / determinant identity	OPEN-HARMONIC

CANONICAL VERDICT. The theorem is a rigorous conditional result. Its unconditional geometric universality remains OPEN until the bridge hypotheses are derived from a stronger common carrier.

Chapter 20. Subject Index, Formula Registry, and Cross-Reference System

Russian source locator: pp. 82–86

PLAIN-LANGUAGE EXPLANATION. Scientific navigation is treated as a typed graph. A citation edge carries a role—definition, proof dependency, example, counterexample, source, or status—and cannot transfer a stronger status than the target itself possesses.

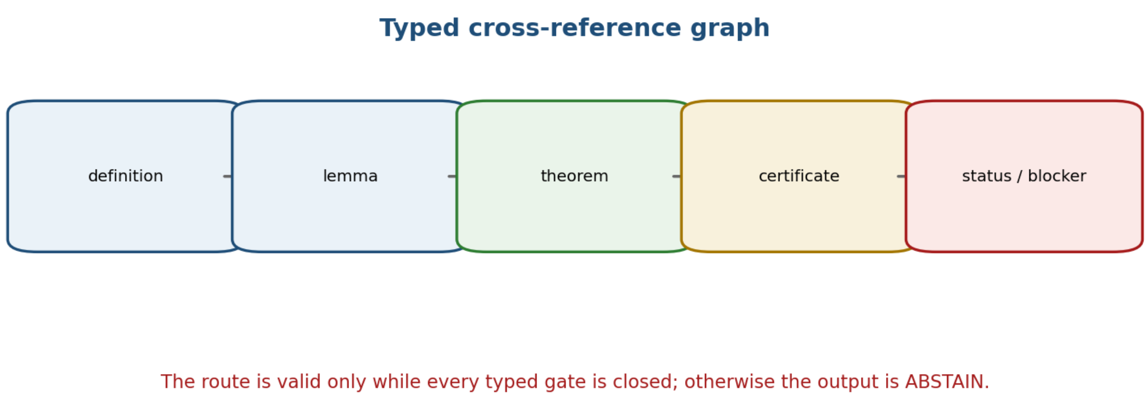


Figure 20.1. Typed reference edges preserve direction, role, and status.

20.1. Reference Graph

Definition 20.1. The cross-reference graph is G_ref=(V,E), where a vertex is a stable scientific object and an edge contains source-id, target-id, edge-type, locator, Dom, and status metadata.

Theorem 20.1 [THM]. If every proof-dependency edge points from a later object to an earlier already-defined object, the verified proof kernel is acyclic. A cycle of bare mutual definitions without a simultaneous fixed-point definition is a defect, not depth.

20.2. No Status Transfer

Proposition 20.2 [PROP]. A reference to a proved statement does not make the referring statement proved. The referring object must independently verify that the theorem hypotheses hold in its own Dom and that its transformation preserves the conclusion.

Theorem 20.3 [PROP]. If an edit changes a vertex a, only its reverse dependency cone must be re-audited, provided all stable identifiers remain unchanged. This locality is the basis of change-set discipline.

Object type	Stable address	Minimum audit
formula	F001–F086 + first RU page	symbol type, Dom, source
formal statement	type + number + RU page	hypotheses, conclusion, status
figure	number or archive locator + RU page	caption and evidential role
table	stable T-ID + RU page	headers, units, source
certificate	certificate ID + hashes	inputs, test, output, limits

INDEX-CERT. A complete index is a reproducibility aid. It does not supply a missing proof or close a scientific blocker.

Chapter 21. Canonical Mathematical Construction of Kurpishev PN.2

Russian source locator: pp. 87–104

PLAIN-LANGUAGE EXPLANATION. PN.2 concerns one estimator facing two hidden structural branches. The estimator must approximate both the resulting state and a coordinate that distinguishes the branches. Two elementary midpoint bounds then force a product lower bound.

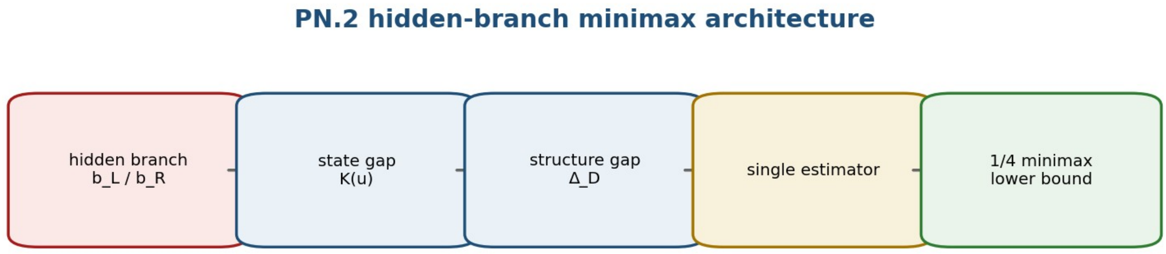


Figure 21.1. Hidden bracketing creates two state targets and two structural targets for one estimator.

21.1. Algebraic Carrier and Hidden Alternative

Let A be a normed real or complex vector space with a bilinear operation ⊙. For $u=(x,y,z)$, define

$$r_L(u)=(x\odot y)\odot z,\quad r_R(u)=x\odot(y\odot z),\quad K(u)=r_L(u)-r_R(u).$$ *[RU p. 87]*

The branch $b\in\{b_L,b_R\}$ is hidden from the estimator. A structural coordinate $\mathfrak{D}$ must genuinely distinguish the two protocols; ordinary vector-space dimension and the maximal depth of a three-leaf tree do not do so automatically.

21.2. Errors and Gaps

$$e_S(u;\hat{s})=\max\{|\hat{s}-S(r_L(u))|,\ |\hat{s}-S(r_R(u))|\}.$$ *[RU p. 89]*

$$e_D(u;\hat{d})=\max\{|\hat{d}-\mathfrak{D}(b_L)|,\ |\hat{d}-\mathfrak{D}(b_R)|\}.$$ *[RU p. 89]*

$$e_R(u;\hat{r})=\max\{\|\hat{r}-r_L(u)\|,\ \|\hat{r}-r_R(u)\|\}.$$ *[RU p. 89]*

$$\Delta_S(u)=|S(r_L(u))-S(r_R(u))|,\quad \Delta_D=|\mathfrak{D}(b_L)-\mathfrak{D}(b_R)|,\quad \Delta_R(u)=\|K(u)\|.$$ *[RU p. 89]*

21.3. Model Axioms

Axiom	Content	Why required
A1	normed carrier; bilinear ⊙; both branches defined on Ω	well-typed state errors
A2	two admissible branches; true branch hidden	information restriction
A3	$\Delta_D>0$ and justified structural meaning	nondegenerate structure gap
A4	one estimator for both branches	prevents branch disclosure
A5-S	scalar observable separates the branch outputs	needed only for scalar form
A6	positive infimum of $\|K(u)\|/m(u)$ on Ω	needed for a uniform constant

21.4. Two-Point Minimax Lemma and PN.2

Lemma 21.1 [CL]. For any a,b,q in a metric space, $\max\{d(q,a),d(q,b)\} \geq d(a,b)/2$. This follows immediately from the triangle inequality.

Theorem 21.2 (local minimax PN.2) [THM]. Under A1–A4, for every $u \in \Omega$ and any estimator that does not use the hidden branch,

$$e_S(u;\hat{s}) \cdot e_D(u;\hat{d}) \geq \tfrac{1}{4} \Delta_S(u) \Delta_D. \quad \text{(PN.2-S)}$$ *[RU p. 90]*

$$e_R(u;\hat{r}) \cdot e_D(u;\hat{d}) \geq \tfrac{1}{4} \|K(u)\| \Delta_D. \quad \text{(PN.2-R)}$$ *[RU p. 90]*

$$\text{if } \Delta_S(u) \geq c\|K(u)\|, \text{ then } e_S\, e_D \geq (c/4)\|K(u)\|\Delta_D. \quad \text{(PN.2-K)}$$ *[RU p. 90]*

Proof. The two-point lemma gives a factor 1/2 for the state or scalar target and a second factor 1/2 for the structural target. Multiplication yields 1/4.

21.5. Uniform Form and Direction of Bounds

$$\varepsilon_- = \inf_{u \in \Omega} \|K(u)\|/m(u) > 0.$$ *[RU p. 91]*

$$e_R\, e_D \geq (\varepsilon_- \Delta_D/4) m(u).$$ *[RU p. 91]*

A supremum $\varepsilon_+ = \sup \|K(u)\|/m(u)$ gives an upper bound on $\|K\|$, not the lower bound required by PN.2. This correction is part of the canonical theorem package.

21.6. Applicability and Non-Equivalences

- No positive bound is obtained on the associative sector $K(u)=0$.
- No positive structural bound is obtained when $\Delta_D=0$.
- The scalar form may vanish when S does not separate r_L and r_R, even if $K(u) \neq 0$.
- The theorem does not apply when the true branch is disclosed to the estimator.
- PN.2 is not the Robertson–Schrödinger relation and is not an Ozawa noise–disturbance relation without an explicit quantum measurement representation.
- Equality of norms $\|r_L\|=\|r_R\|$ does not imply $K(u)=0$; multiplicative-norm algebras provide counterexamples.

21.7. Explicit A_2 Witness

The canonical two-dimensional nonassociative witness uses a basis e_1,e_2 with a frozen multiplication table chosen so that one triple has a nonzero associator. Four cases are retained: an associative zero case, a nonassociative case invisible to the selected scalar observable, a globally c-separating case, and a compact domain with $\varepsilon_- > 0$.

Case	K	Scalar gap	Permitted conclusion
associative zero	0	0	PN.2 lower bound is zero
nonassociative / scalar blind	$\neq 0$	$\Delta_S=0$	use full-state PN.2-R
c-separating observable	$\neq 0$	$\Delta_S \geq c\|K\|$	PN.2-K
compact coercive Ω	$\|K\| \geq \varepsilon_- m$	positive	uniform conditional bound

PHYSICAL BOUNDARY. The theorem is proved inside a hidden-bracketing model. A physical use requires a representation of branches, observables, units, experimental controls, and an independent protocol.

Chapter 22. PN.2 as a Restrictor and Driver of the KLT-RBD Predictive Method

Russian source locator: pp. 105–109

> **PLAIN-LANGUAGE EXPLANATION.** PN.2 is used as a guardrail: it prevents a prediction engine from collapsing genuinely different admissible branches into one overconfident answer. The output may therefore be a single candidate, a set, or ABSTAIN.

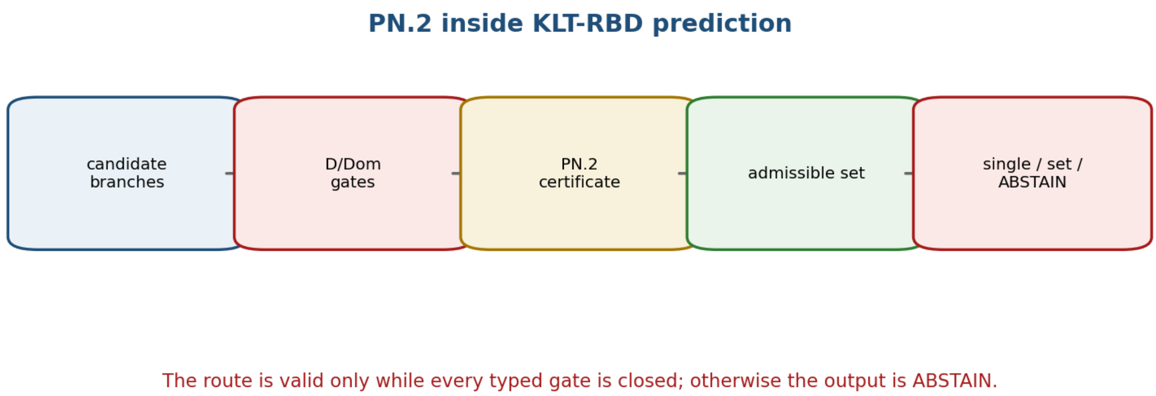


Figure 22.1. Prediction is authorized only after D/Dom, PN.2, calibration, and blocker gates.

22.1. Branch Reper and PN.2 Certificate

Each candidate branch u receives a Reper passport, its state result, structural coordinate, PN.2 gaps, provenance, and blocker vector. The certificate does not choose the branch; it records what cannot be simultaneously reconstructed without branch information.

22.2. Admissible Prediction Set

$$A\_L(D)=\{u : \mathrm{Dom}(u)=\mathrm{PASS},\ D(u)=\mathrm{PASS},\ \mathrm{blockers}(u)=0,\ \mathrm{calibration}(u)=\mathrm{PASS}\}.$$ *[RU p. 106]*

Theorem 22.1 [THM]. A deterministic winner exists only if A_L(D) is nonempty and the predeclared ordering has a unique maximizer. An empty set yields ABSTAIN-EMPTY; a tie yields SET-CANDIDATE unless a separate tie-break rule is frozen.

22.3. Matched-Null and CGI Calibration

KMA flags and harmonic proximity may guide search but do not prove a candidate. A matched-null protocol keeps the same object, preprocessing, and admissible transformations while breaking the claimed structure under a frozen randomization group.

$$\hat{p}=(1+\#\{T\_b\geq T\_obs\})/(B+1).$$ *[RU p. 107]*

The plus-one correction prevents a zero Monte Carlo p-value. Validity requires a null group under which the transformed data are exchangeable or invariant; this is an empirical-plan assumption, not a consequence of λ.

For CGI=N/S with positive calibrated denominator S, increasing a nonnegative defect term in N cannot improve CGI. Perturbation estimates require explicit lower bounds on S.

22.4. Stability and Status Monotonicity

Theorem 22.5 [COND]. If all gate margins are positive and the score/candidate maps are Lipschitz on a neighborhood, sufficiently small perturbations preserve membership in the admissible set. Theorem 22.6 additionally requires a positive winner margin to preserve a unique winner.

Lemma 22.9 [PROP]. Typography, field order, or file renaming cannot promote a certificate.
Proposition 22.10 [PROP]. Closing a positive gate can improve only the corresponding status component; it cannot bypass another open gate.

22.5. Selective Set-Valued Predictor

Condition	Output
one admissible candidate and unique frozen winner	SINGLE-CANDIDATE
several admissible non-dominated candidates	SET-CANDIDATE
no candidate passes mandatory gates	ABSTAIN-EMPTY
data or adapter missing	ABSTAIN-DOM
unresolved proof or causal blocker	ABSTAIN-BLOCKED

RISK DECOMPOSITION. A high ranking score cannot compensate for a failed validity gate. Gate risk and ranking loss are separate quantities.

Chapter 23. PN.2 Examples, Counterexamples, and Computational Tests

Russian source locator: pp. 110–111

PLAIN-LANGUAGE EXPLANATION. Small explicit models show exactly which assumption creates a positive lower bound and which shortcut destroys it. Numerical checks certify arithmetic inside the model; they do not certify a physical interpretation.

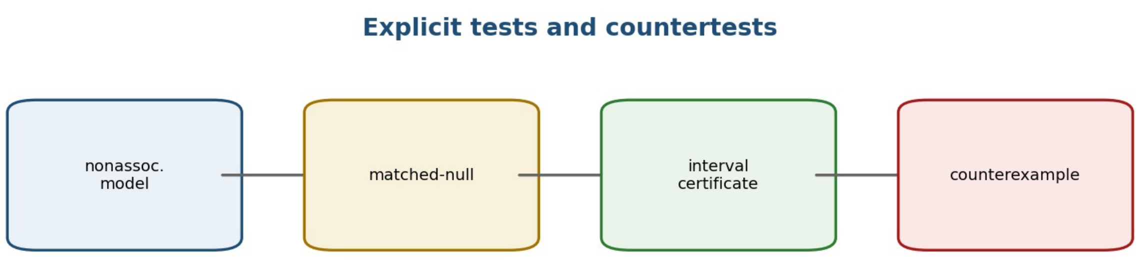


Figure 23.1. A test matrix must contain positive witnesses, matched nulls, and counterexamples.

23.1. Test Matrix

Test	Purpose	Expected verdict
two-dimensional nonassociative witness	verify K≠0 and exact branch outputs	PASS-NUM
associative zero model	confirm the bound collapses to zero	PASS-NULL
equal-norm / nonzero associator	refute norm-only scalar detection	COUNTEREXAMPLE
compact Ω	verify interval lower bound ε_−	PASS-INTERVAL
matched-null with plus-one correction	calibration sanity check	EMP-PLAN / NUM
CGI perturbation	test denominator and monotonicity margins	PASS-NUM

23.2. Optimality of 1/4

Proposition 23.1 [PROP]. In the unrestricted two-point simultaneous-recovery problem, the coefficient 1/4 is sharp: midpoint estimators attain both half-distance bounds simultaneously.

23.3. Infimum, Supremum, and Compactness

A supremum of the normalized associator controls the largest defect and cannot provide a uniform positive lower bound. If Ω is compact and f(u)=‖K(u)‖/m(u) is continuous and strictly positive, then f attains a positive minimum ε_−.

23.4. Interval Certificate

An interval certificate encloses every multiplication, norm, branch gap, and final lower bound with directed rounding. A floating-point point estimate without an error enclosure has status NUM-CHECK, not an exact proof object.

CERTIFICATE BOUNDARY. Zero observed failures in a finite test set does not prove universal correctness. The test domain, seed, tolerance, arithmetic model, and uncovered cases remain part of the certificate.

Chapter 24. Export of PN.2 to Physics, Chemistry, Biology, and DNA: Boundaries and Verification Programme

Russian source locator: pp. 112–115

PLAIN-LANGUAGE EXPLANATION. A theorem about an abstract hidden branch does not inherit a subject-matter meaning by renaming its variables. Every export requires a typed adapter, dimensions and units, a null model, controls, data provenance, and an independent test.

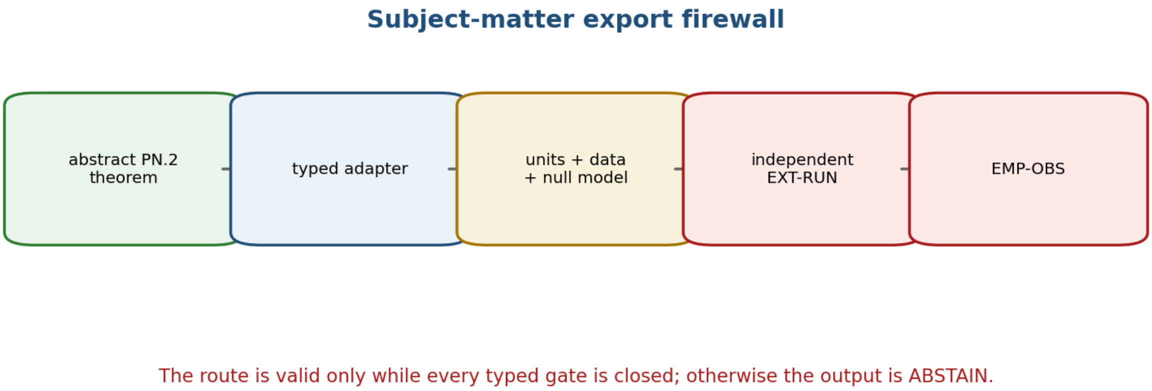


Figure 24.1. The export firewall separates an abstract theorem from an empirical observation.

24.1. Non-Transferability of Proof Status

Theorem 24.1 [THM]. The proved status of an abstract minimax theorem is not transported to a physical, chemical, biological, or genomic claim unless a subject adapter is defined and every adapter obligation is proved or independently validated.

24.2. Typed Export Passport

Field	Required content
carrier	measured or simulated object and sampling unit
branch map	what constitutes b_L and b_R in the subject domain
observable map	S, full-state metric, units, calibration
structural coordinate	$\mathfrak{D}$ and proof that $\Delta_D>0$
domain	inclusion/exclusion rules and validity range
null model	matched object, transformation group, nuisance handling
data	version, provenance, licenses, covariance, missingness
test	primary endpoint, multiplicity correction, falsification rule
independence	blind split, external runner, immutable hashes

24.3. Subject Protocols

Domain	Permitted programme	Current status
Physics	define two operationally indistinguishable structural branches and a calibrated observable	PHY-HYP / EMP-PLAN

Domain	Permitted programme	Current status
Chemistry	compare alternative reaction/structure protocols under matched conditions and exact stoichiometric gates	MODEL / EMP-PLAN
Biology	declare biological unit, hierarchical dependence, batch effects, and intervention limits	EMP-PLAN
DNA	freeze assembly, annotation, alignment, structural coordinate, and multiple-testing plan	EMP-PLAN

24.4. Falsification and Stop Rules

- Failure of the adapter to define both branches in the same empirical carrier blocks the export.
- If the structural coordinate does not separate the branches, the subject PN.2 claim is falsified in that implementation.
- If the full-state or scalar gap is absent in the declared domain, the positive lower-bound claim is rejected.
- Post hoc selection of an observable, subgroup, or null transformation invalidates the preregistered claim unless independently corrected.
- An independent EXT-RUN is required before any EMP-OBS promotion.

> **EXPORT-CERT.** The export certificate stores the abstract theorem ID, adapter version, data and code hashes, preregistration, exclusions, multiplicity rule, result, and an exact statement of what the result does not establish.

Chapter 25. Operators of Action, Change, and Reversal

Russian source locator: pp. 116–124

PLAIN-LANGUAGE EXPLANATION. Action creates an impulse, reversal/insertion turns an admissible impulse into a state, and change evolves the state. Treating all three as one operator produces ill-typed compositions and false inverse symbols.

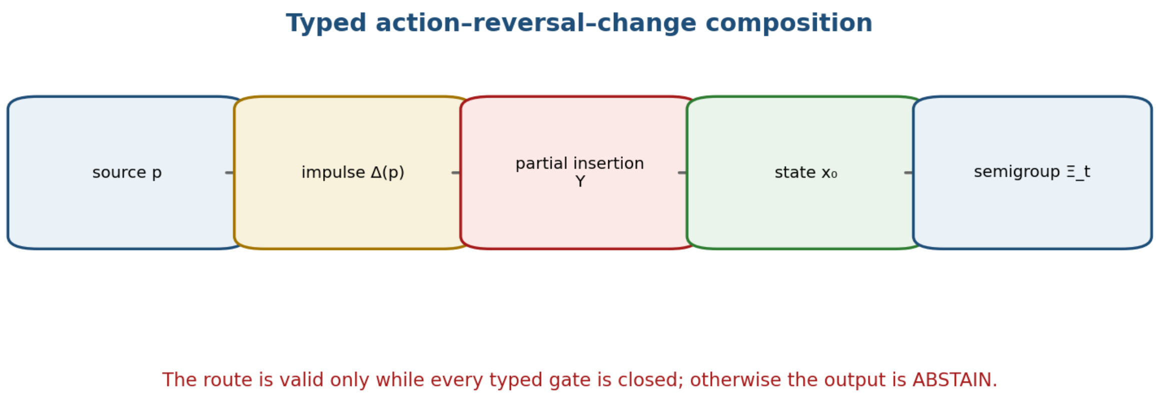


Figure 25.1. The typed route from source through action and insertion to semigroup evolution.

25.1. Typed Data

$$\Delta\_ord:P\_ord\to I,\quad \Delta\_sp:P\_sp\to I,\quad Y:D\_Y\subseteq I\to X,\quad \Xi\_t:X\to X.$$ *[RU pp. 116–118]*

The ordinary and spontaneous action maps share the impulse codomain I but may have different source spaces. Spontaneity is relative to a support relation and an information field; it is not a metaphysical claim of causelessness.

25.2. Relative Spontaneity

$$I\_ord=\{i\in I : \exists s\in S\_- \text{ with } (s,i)\in Supp\}.$$ *[RU p. 117]*

An impulse is spontaneous relative to $(S\_-,Supp)$ when it does not belong to I_ord. Enlarging the information field or support relation may reclassify it. Proposition 25.10 [PROP] formalizes this epistemic monotonicity.

25.3. Partial Insertion and Admissible Sources

$$P\_ad=\Delta\_sp^{-1}(D\_Y)=\{p\in P\_sp : \Delta\_sp(p)\in D\_Y\}.$$ *[RU p. 117]*

If P_ad is empty, a subsequent universal statement is formally true but scientifically vacuous. Nonemptiness is therefore a separate proof obligation.

25.4. Semigroup of Change

$$\Xi_0=id\_X,\quad \Xi\_\{s+t\}=\Xi\_s\circ\Xi\_t,\quad s,t\geq 0.$$ *[RU p. 118]*

These are algebraic semigroup axioms. Continuity, differentiability, linearity, a generator, or well-posedness of a differential equation do not follow without additional hypotheses.

25.5. Three Meanings of Y^{-1}

Case	Meaning of Y^{-1}	Allowed use
Y bijective	global inverse X→D_Y	ordinary composition
Y injective only	inverse defined on im Y	restrict domain explicitly
Y noninjective	set-valued preimage	use a relation or selector; not a function

Theorem 25.1 [THM]. On P_ad, the composition $x_t=\Xi_t(Y(\Delta_{sp}(p)))$ is type-correct. Recovery of p from x_t requires separate injectivity or a declared multivalued inverse; it is not implied by the forward construction.

Theorem 25.9 [THM]. The formula $\Delta_{sp}=\Delta\circ Y^{-1}$ is type-correct only after specifying a domain on which Y^{-1} is an actual function and the codomain of Y^{-1} matches the domain of Δ. Otherwise the formula is undefined or relational.

25.6. Counterexamples and Stability

- A noninjective Y maps two impulses to one state; a single-valued inverse does not exist.
- A partial domain $D_Y=(0,\infty)$ makes negative impulses inadmissible even when Δ_{sp} is total.
- An empty D_Y produces a vacuous theorem and no executable action.
- A Lipschitz inverse on an admissible image yields stable recovery; continuity alone need not.

25.7. Interface with Reper and NAPG

The operator chain may be represented inside a Reper or NAPG carrier only through an explicitly typed morphism preserving Dom, D, state semantics, and status. Chapter 25 does not identify Δ, Ξ, or Y with algebraic multiplication, the Hodge Laplacian, or an associator.

> **CAUSAL MODESTY.** “Spontaneous relative to the recorded support” means “not explained by the current information field.” It does not establish absence of all causes.

Chapter 26. Nonassociative Packet Reper Algebra of Size@Dimensions

Russian source locator: pp. 125–146

PLAIN-LANGUAGE EXPLANATION. A finite based nonassociative algebra can be encoded as a weighted directed incidence geometry. The structure constants become edge weights, and the associator becomes the difference between two length-two paths. The equivalence is proved for based objects; Hodge, G_2, cohomological, and physical layers remain separate bridges.

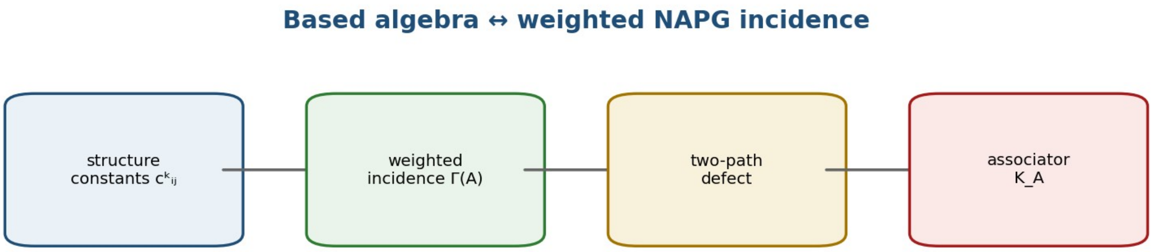


Figure 26.1. Structure constants and weighted two-step paths carry the same based finite-dimensional data.

26.1. Notation and Status Discipline

Symbol	Type
$\odot$	basic bilinear multiplication
$R\star R$	authorial quadratic packet object $Q(R)=R\odot R$
$\star_H$	Hodge star; not multiplication
$\mathrm{Ass}_\odot$	trilinear associator
δ	cochain differential; δ_{Hdg} reserved for Hodge codifferential

26.2. Based Packet Reper Algebra

Definition 26.8. A based packet Reper algebra consists of a finite-dimensional K-vector space A with a fixed homogeneous basis $B=\{e_i\}$, a bilinear multiplication $\odot$, Size@Dimension labels, state/Reper data, and declared domain predicates.

$$e_i\odot e_j=\Sigma_k c^k_{ij}e_k. \quad \textit{[RU p. 128]}$$

$$\mathrm{Ass}_\odot(e_i,e_j,e_\ell)=\Sigma_m K^m_{ij\ell}e_m. \quad \textit{[RU p. 128]}$$

Finite dimensionality makes the product automatically continuous for any chosen norm, but no unit, involution, alternative law, or multiplicative norm is inherited unless separately specified.

26.3. Quadratic Packet Object R⋆R

$$Q(R)=R\star R:=R\odot R. \quad \textit{[RU p. 129]}$$

The quadratic object is not the multiplication itself. Polarization recovers the symmetric cross term when $R,S,R+S$ are admissible: $Q(R+S)-Q(R)-Q(S)=R\odot S+S\odot R$.

26.4. NAPG Operational Frame and Obstruction

An operational NAPG frame fixes the carrier, the admissible operation, a test family, a representation map, and an obstruction target. The quadratic obstruction records failure of two specified packet paths to agree; it is not automatically a cohomology class.

26.5. Weighted NAPG Incidence

Definition 26.20. A weighted NAPG incidence on the finite index set I stores an oriented basis node for each e_i and weights c^k_{ij} for the incidence (i,j)→k. Geometrization Γ sends a based algebra to this weighted incidence object; linearization L reconstructs the product from the weights.

26.6. Algebra–Geometry Reconstruction

Theorem 26.23 (Kurpishev packet Reper algebra–geometry duality) [THM]. On the groupoid of finite-dimensional based packet Reper algebras and the groupoid of weighted NAPG incidences with basis-preserving isomorphisms, Γ and L are mutually inverse up to the canonical based isomorphisms.

$$L(\Gamma(A)) \cong A, \quad \Gamma(L(G)) \cong G.$$ *[RU pp. 134–135]*

The word “duality” here means mutual reconstruction of based data. It is not vector-space duality, Gelfand duality, or an unrestricted contravariant equivalence of all nonassociative algebras.

26.7. Associator as a Two-Path Defect

Definition 26.25. For basis inputs i,j,ℓ and output m, let the left path sum compose (i,j) first and the right path sum compose (j,ℓ) first. Their difference is the geometric path defect.

$$K^m_{ij\ell}=\Sigma_p c^p_{ij}c^m_{p\ell}-\Sigma_q c^q_{j\ell}c^m_{iq}.$$ *[RU p. 136]*

Theorem 26.26 [THM]. Under Γ, the algebraic associator coefficient equals the weighted two-path defect exactly. Hence associativity is equivalent to equality of the two path sums for every basis quadruple.

26.8. Reper Compatibility and λ

A Reper-admissible isomorphism must preserve the role labels R,I,U,D, the projective chart, Dom, and the sufficient foundation. Theorem 26.30 [THM] states that such an isomorphism preserves λ, δ_truth, and the truth-gate status. A bare vector-space isomorphism need not.

26.9. Conditional Cohomological and PN.2 Bridges

A map Π_E from the quadratic obstruction carrier to H^3 is conditional on a declared complex, differential, and compatibility with the quotient projection. The implication Π_E(Ob_B)≠0⇒Ob_B≠0 is one-way unless injectivity is proved; a zero image does not imply a zero obstruction.

The local PN.2 bound is transported through the algebra–geometry reconstruction only when the norm, branch metric, structural coordinate, and hidden-alternative model are preserved. The transport is a theorem about the based equivalence, not a new physical uncertainty relation.

26.10. Operator Interface and Open Layers

An evolution Ξ_t acting on A preserves the associator tensor only when it is an algebra automorphism. Isometry additionally preserves norm-based defects and truth gates. Compatibility of the insertion Υ with the algebra carrier is a separate model hypothesis.

Layer	Status	Reason
finite based algebra ↔ weighted incidence	THM	mutual reconstruction proved
associator = two-path defect	THM	coefficient identity
λ preservation	THM under Reper-admissible isomorphism	typed compatibility required
cohomology map Π_E	COND	complex and injectivity not automatic
Hodge / G_2 realization	MODEL / OPEN	additional geometric data required

Layer	Status	Reason
physical interpretation	PHY-HYP / OPEN	no independent empirical bridge

NOVELTY BOUNDARY. The internal theorem concerns the newly defined based categories and their reconstruction. Classical nonassociative algebras, structure constants, associators, category equivalence, cohomology, Hodge theory, and G_2 geometry remain prior art.

T1-EN-OPERATORS-v0.4 Release Ledger

Item	Verified scope	Result
chapter coverage	T1-CH-01–T1-CH-26	26/26 present
new source range	RU pp. 73–146	translated and locator-preserved
notation firewall	⊙, ⋆_H, R⋆R, Ass_⊙, Δ, Ξ, Υ	distinct types preserved
PN.2 status	hidden-branch minimax theorem	THM inside explicit model
physical status	subject exports and observables	EMP-PLAN / PHY-HYP; no EMP-OBS
next checkpoint	Chapters 27–31	T1-EN-PN2-v0.5

Translation Obligations

ID	Obligation	Status
T1-EN-PO-013	complex cross-ratio and real-reduction parity	CLOSED-DRAFT
T1-EN-PO-014	operator cross-ratio ordering and invertibility parity	CLOSED-DRAFT
T1-EN-PO-015	proof-cleaned DK dependencies and countermodel parity	CLOSED-DRAFT
T1-EN-PO-016	index and cross-reference semantics parity	CLOSED-DRAFT
T1-EN-PO-017	canonical PN.2 theorem and proof parity	CLOSED-DRAFT
T1-EN-PO-018	PN.2 prediction and export firewall parity	CLOSED-DRAFT
T1-EN-PO-019	typed Δ/Ξ/Υ operator parity	CLOSED-DRAFT
T1-EN-PO-020	based algebra–NAPG duality parity	CLOSED-DRAFT
T1-EN-PO-021	independent bilingual formula audit	OPEN NON-VETO

STATUS LOCK. truth_layer_promotion=0. NUM≠EXT-RUN≠EMP-OBS. The English derivative preserves the Russian source status and may not create an empirical result.

T1-EN-PN2-v0.5

CONTROLLED ENGLISH TRANSLATION OF CHAPTERS 27–31

DERIVATIVE BOUNDARY. The following text is a controlled derivative of frozen Russian source pages 140–168. The English layer preserves every theorem hypothesis, counterexample, proof obligation, model limitation, source-certificate limitation, and physical-status firewall. It does not claim a new execution of the PN2-PO12-A2-v1.0 archive.

Chapter parity map for the v0.5 checkpoint

Chapter	Russian locator	English title	Dominant status
27	140–159	Canonical PN.2 with Internal Appendices A–B	THM / COND / NUM-SOURCE
28	160–161	Predictive Limits and the Finite Horizon of a Reper	DEF-A / THM / COND
29	162–163	Adaptive Rebuilding of the Reper Graph	THM-SCHEMA / COND
30	164–165	Predictive Reper Bundle	DEF-A / COND / OPEN
31	166–168	Computational Certification and the Boundary of Evidence Status	THM / NUM-SOURCE / OPEN

Chapter 27. Canonical PN.2 with Internal Appendices A–B and Explanatory Blocks

Russian source locator: pp. 140–159

PLAIN-LANGUAGE EXPLANATION. This chapter stores the complete theorem package rather than a slogan. A single estimator must answer under two hidden bracketing protocols. The elementary geometry of two alternatives yields a minimax error bound; the appendices then show exactly when the bound vanishes, when a scalar observable fails, when the coefficient 1/4 is sharp, and what the source-documented computational certificate does and does not establish.

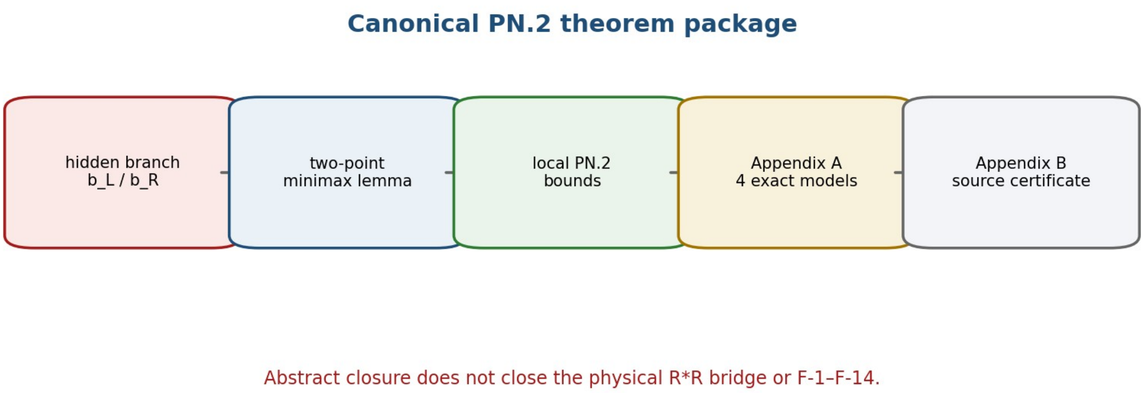


Figure 27.1. The canonical PN.2 route separates theorem, exact models, source certificate, and physical transfer.

27.1. Synchronisation of Evidence Statuses

The canonical Russian source records PO-11 as closed by four explicit constructions and PO-12 as closed for the abstract package by the source-documented certificate PN2-PO12-A2-v1.0. This closure is conservative: it does not propagate to PO-1–PO-10, the physical object R*R, or hypotheses F-1–F-14.

Proposition 27.1 [PROP]. A deterministic certificate for the auxiliary algebra A2 establishes reproducibility of the published computations in that model, but does not establish semantic correctness of a physical map from R*R to A2.

Proof. The certificate checks identities generated by the structural constants of A2. Transfer requires a separate morphism preserving the product, norm, structural coordinate, observable, and domains. The certificate contains no such physical morphism. Therefore computational reproducibility cannot promote the physical bridge.

PHENOMENOLOGICAL READING. Reproducibility answers whether the same computation can be obtained again. The physical bridge must answer what, in experience, that computation represents.

27.2. Objects, Errors, and Model Axioms

Let A be a real or complex normed linear space with a bilinear operation odot. For u=(x,y,z) in the admissible set Omega, define the two bracketed outcomes

$$r_L(u)=(x\ \mathrm{odot}\ y)\ \mathrm{odot}\ z, \qquad r_R(u)=x\ \mathrm{odot}\ (y\ \mathrm{odot}\ z), \qquad K(u)=r_L(u)-r_R(u).$$ *[RU pp. 142–143]*

The hidden branch b belongs to B={b_L,b_R}. A branch-blind estimator must issue the same pair of estimates without using b. This information restriction, not nonassociativity alone, creates the uncertainty problem.

$$e_S(u;\hat{s})=\max\{|\hat{s}-S(r_L(u))|,\ |\hat{s}-S(r_R(u))|\}.$$ *[RU p. 143]*

$$e_D(u;\hat{d})=\max\{|\hat{d}-\mathfrak{D}(b_L)|,\ |\hat{d}-\mathfrak{D}(b_R)|\}.$$ *[RU p. 143]*

e_R(u;r_hat)=max{||r_hat-r_L(u)||, ||r_hat-r_R(u)||}. *[RU p. 143]*

Delta_S(u)=|S(r_L(u))-S(r_R(u))|,   Delta_D=|Dfrak(b_L)-Dfrak(b_R)|,   Delta_R(u)=||K(u)||. *[RU p. 143]*

An observable S is c-separating on Omega when Delta_S(u) >= c||K(u)|| for all u. A uniform PN.2 domain relative to a positive scale m(u) has Delta_D>0 and a constant epsilon_minus>0 such that ||K(u)|| >= epsilon_minus m(u) throughout Omega.

Model axioms of the strict PN.2 package

Axiom	Content	Failure mode
A1	Normed algebra; bilinear operation; both outcomes defined on Omega.	Undefined product or domain.
A2	Exactly two admissible branches; branch hidden from estimator.	No hidden alternative.
A3	Nondegenerate structural coordinate: Delta_D>0.	Structural coordinate does not distinguish protocols.
A4	One branch-blind estimator is used for both alternatives.	Branch label supplied in advance.
A5-S	Scalar observable separates the outcomes, preferably c-separating.	Scalar version may have zero bound.
A6	Uniform coercivity on an explicit normalized domain for a global constant.	Only local or zero lower bound.

SCOPE EXCLUSIONS. The theorem does not apply on K=0 sectors, when Delta_D=0, to a branch-informed estimator, or as an automatic Robertson-Schrödinger or Ozawa relation. Ordinary vector-space dimension and ordinary parse-tree depth do not by themselves supply the required structural coordinate.

27.3. Two-Point Lemma and the Local Minimax Theorem

Lemma 27.2 [LEM]. For any two points a,b in a metric space and any q,

max{d(q,a),d(q,b)} >= d(a,b)/2. *[RU p. 144]*

Proof. The triangle inequality gives d(a,b) <= d(a,q)+d(q,b) <= 2 max{d(q,a),d(q,b)}.

Theorem 27.3 [THM: Local Minimax PN.2]. Under A1–A4, for every u in Omega and every branch-blind pair of estimates,

e_S(u;s_hat) e_D(u;d_hat) >= (1/4) Delta_S(u) Delta_D.   (PN.2-S) *[RU p. 145]*

e_R(u;r_hat) e_D(u;d_hat) >= (1/4) ||K(u)|| Delta_D.   (PN.2-R) *[RU p. 145]*

e_S(u;s_hat) e_D(u;d_hat) >= (c/4) ||K(u)|| Delta_D.   (PN.2-K) *[RU p. 145]*

The last inequality requires a c-separating observable. The proof applies the two-point lemma to the two observable values, the two structural-coordinate values, and, for the full-state form, the two outcomes in the norm metric. Each separate error is at least half the corresponding gap; multiplying yields the factor 1/4.

27.4. Uniform Form and Correction of Earlier Quantitative Arguments

Corollary 27.4 [COND]. If Omega is a uniform PN.2 domain relative to m(u), then

e_R e_D >= (epsilon_minus Delta_D/4) m(u). *[RU p. 145]*

For a c-separating observable, the right side is multiplied by c. A historical expression involving ||R||^3 requires separate identifications of the errors, structural coordinate, scale, and a strictly positive infimum.

epsilon_plus=sup ||K(u)||/m(u)   gives an upper bound;   epsilon_minus=inf_{u in Omega} ||K(u)||/m(u)>0 gives the required lower bound. *[RU p. 146]*

The reverse triangle inequality gives only | ||r_L||-||r_R|| | <= ||K||. Norms of two bracketings may coincide even when K is nonzero, as in normed composition algebras. Hence the default strict formulation uses the full-state distance or a proved separating observable.

> **CATEGORICAL CAUTION.** The absence of a natural transformation between two unspecified functors is not a no-go theorem for joint estimation. A categorical PN.2 requires explicit categories, functors, domains, and a precisely defined absence of a section, lift, or natural estimator.

27.5. Proof Obligations PO-1–PO-12

Conservative proof-obligation ledger

PO	Obligation	Status in this checkpoint
1	Specify the physical algebra R*R: carrier, field, basis, product, constants, unit, involution, norm, domain.	OPEN / source-dependent
2	Verify bilinearity, closure, continuity, zero divisors, and all used operators.	OPEN / source-dependent
3	Compute nonzero associators and classify sectors.	OPEN for physical R*R
4	Define an invariant, distinguishing structural coordinate Dfrak.	OPEN for physical interpretation
5	Choose a c-separating observable or use the full-state metric.	OPEN for physical observable
6	Specify the measurement model and why the branch is hidden.	OPEN
7	Prove a positive epsilon_minus on a normalized Omega.	OPEN for physical domain
8	Fix physical units of S, Dfrak, K, m, and kappa.	OPEN
9	Build the categorical no-go object.	OPEN
10	Construct the Hilbert-space bridge to PN.1 and prove operator-domain conditions.	OPEN
11	Provide four explicit models and countermodels.	CLOSED-ABSTRACT by Appendix A
12	Provide reproducible code, tests, values, and hashes.	CLOSED-ABSTRACT / SOURCE-CERT by Appendix B

27.6. Physical Hypotheses F-1–F-14

No entry in this table inherits theorem status from the abstract minimax result

ID	Hypothesis requiring independent verification	Status
F-1	R*R is a physical algebra of time, not only a mathematical model.	PHY-HYP
F-2	PN.2 is more fundamental than Robertson-Heisenberg or noise-disturbance relations.	PHY-HYP
F-3	Quantum uncertainty follows from the associator through a representation.	PHY-HYP
F-4	A dimensionally correct regime ||K|| approximately hbar exists.	PHY-HYP
F-5	An induced bracket [x,y]_z=K(x,y,z) yields an admissible operator commutator.	PHY-HYP
F-6	Seven R*R objects form an internal multicomponent time structure.	PHY-HYP
F-7	FOS and Time*Space possess an observable physical realization.	PHY-HYP
F-8	The hierarchy and time-course operator describe physical temporal evolution.	PHY-HYP

ID	Hypothesis requiring independent verification	Status
F-9	A physically defined complexity functional is monotone.	PHY-HYP
F-10	The associator-dynamics equation is a valid covariant field equation.	PHY-HYP
F-11	Associator dynamics predicts an observable early-universe regime.	PHY-HYP
F-12	The associator localizes in matter and produces measurable effects.	PHY-HYP
F-13	The observer-accessible structural branch is physically finite.	PHY-HYP
F-14	PN.2 gives testable corrections to GR/quantum theory or explains singularities/dark sectors.	PHY-HYP

MINIMUM EXTERNAL STANDARD. Each physical hypothesis requires operational observables, units, a null model, preregistered discrimination criteria, uncertainty accounting, open data/code, and reproduction by an independent group.

27.7. Internal Appendix A — Four Explicit Models for PO-11

All four cases use the signed protocol coordinate Dfrak(b_L)=-1/2 and Dfrak(b_R)=+1/2, so Delta_D=1 and the midpoint estimate d_hat=0 has e_D=1/2. Cases A.2–A.4 use the auxiliary real algebra A2=R^2 with basis e1,e2 and product

e1 odot e1=e2,   e2 odot e1=e2,   e1 odot e2=-e2,   e2 odot e2=0. *[RU p. 151]*

(alpha,beta) odot (gamma,delta)=(0, alpha gamma + beta gamma - alpha delta), ||(alpha,beta)||=2 sqrt(alpha^2+beta^2). *[RU p. 151]*

Exact witness matrix of Appendix A

Case	Data	Exact result	Role
A.1	A=R; u=(1,2,3); S(t)=|t|.	r_L=r_R=6; K=0; both PN.2 right sides 0.	Counterexample to any unconditional positive lower bound.
A.2	A2; u=(e1,e1,e1); S(v)=||v||.	r_L=e2, r_R=-e2; ||K||=4; Delta_S=0; PN.2-R: 1=1.	Nonassociativity may be invisible to a scalar norm.
A.3	A2; S(alpha e1+beta e2)=2 beta; u=(e1,2e1,3e1).	K=12e2; ||K||=Delta_S=24; c=1; both bounds attain 6.	Global c-separation and sharp factor 1/4.
A.4	A2 on explicit compact box Omega; same S.	inf_Omega ||K|| =epsilon_minus=3; kappa_Omega=3/4, attained at u_star.	Exact positive uniform lower bound on a declared domain.

For x=(a,b), y=(p,q), z=(r,s) in A2, the associator is

K(x,y,z)=(0, 2apr+bpr-aps)=(0, p[(2a+b)r-as]). *[RU p. 154]*

On the compact box a,p,r in [1,2] and b,q,s in [-1/4,1/4], the source proves p[(2a+b)r-as] >= 3/2 and therefore ||K|| >= 3. The point u_star=(e1-(1/4)e2, e1, e1+(1/4)e2) attains equality.

epsilon_minus=3,   c=1,   Delta_D=1,   kappa_Omega=c epsilon_minus Delta_D/4=3/4. *[RU pp. 154–155]*

APPENDIX A SCOPE. The four models close PO-11 only inside the abstract PN.2 theorem package. They do not identify A2 with the physical R*R object and do not supply physical units or an experiment.

27.8. Internal Appendix B — Source-Documented Certificate for PO-12

Identifier: PN2-PO12-A2-v1.0. The Russian source describes a standard-library Python bundle containing the computation, tests, manifest, results, expected/obtained table, deterministic bundle builder, instructions, and SHA-256 list. This English checkpoint translates that record; it does not claim that the archive was independently rerun in the present environment.

$$C[2,1,1]=1, \quad C[2,2,1]=1, \quad C[2,1,2]=-1; \text{ all other structural constants vanish.}$$ *[RU p. 156]*

$$A[m,i,j,k]=\mathrm{sum\_l}\ (C[l,i,j]\ C[m,l,k] - C[l,j,k]\ C[m,i,l]).$$ *[RU p. 156]*

Source-reported certificate matrix

Test item	Expected and source-reported obtained value	Source verdict
A.1	K=0; Delta_S=e_S=e_R=0; e_D=1/2; bounds 0=0.	PASS
A.2	K=(0,2); ||K||=4; Delta_S=e_S=0; e_R=2; PN.2-R: 1=1.	PASS
A.3	K=(0,12); ||K||=Delta_S=24; c=1; e_S=e_R=12; bounds 6=6.	PASS
A.4	K=(0,3/2); ||K|| =Delta_S=epsilon_minus=3; kappa=3/4; bounds 3/4=3/4.	PASS
Grid	729 rational points in Omega satisfy the exact K formula, Delta_S=||K||, and ||K|| >=3.	PASS
Out-of-domain boundary	p=1/2 produces ||K||=3/2<3, confirming domain dependence.	PASS

The source records 11 automated tests and the archive digest

$$\text{SHA-256(pn2\_po12\_cert\_v1.0.zip)=bbcb2715a3e5ab7688dfe1ad317a68f23b163ae10915982216111142ce7da2ad.}$$ *[RU p. 158]*

- The certificate establishes the published A2 operation, associator, four example values, Delta_D=1, e_D=1/2, c=1, epsilon_minus=3, kappa_Omega=3/4, and source-documented deterministic rebuild properties.
- It does not establish that A2 is the physical R*R algebra, the physical meaning of Dfrak or S, PO-1–PO-10 for R*R, a bridge to hbar or PN.1, F-1–F-14, or universal physical validity.
- Chapter 31 further records that the archive itself was not present in that assembly, so an external replay remains open.

STATUS. PO-12 = CLOSED-ABSTRACT / SOURCE-CERTIFICATE. Independent replay in a separate environment remains OPEN. NUM is not EXT-RUN and not EMP-OBS.

Chapter 28. Predictive Limits and the Finite Horizon of a Reper

Russian source locator: pp. 160–161

PLAIN-LANGUAGE EXPLANATION. A Reper is not authorised forever. Its forecast is valid only while every declared political, ecological, spatial, temporal, and ontological gate remains inside its domain and above its boundary. The horizon is therefore a limit of responsibility of current knowledge.

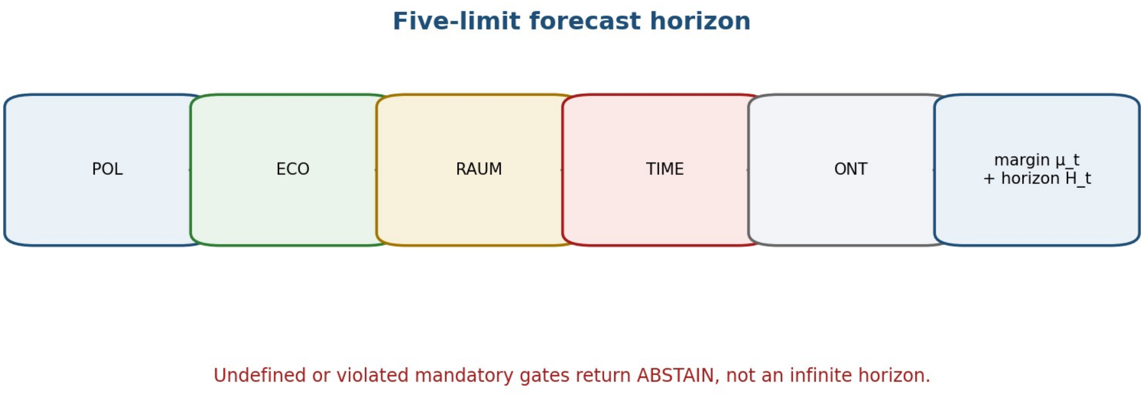


Figure 28.1. The forecast horizon is controlled by the weakest of five typed limit functions.

28.1. Typed Limit Functions

Let Lambda_lim={POL,ECO,RAUM,TIME,ONT}. For each alpha define a partial function

g_alpha : Dom(g_alpha) subset X x Rcal x T -> R. *[RU p. 160]*

Positive values denote an interior admissible state, zero denotes the boundary, negative values denote violation, and an undefined value is bottom and never counts as a passed gate.

Adm_t(r)={x in X : (x,r,t) belongs to every Dom(g_alpha) and g_alpha(x,r,t)>=0 for all alpha}. *[RU p. 160]*

Code	Authorial label	Strict role	Forbidden overclaim
POL	LIM POLITIC	Institutional, infrastructural, or registered-regime boundary.	Universal law of politics.
ECO	LIM ECOLOGICAL	Resource and ecological constraints of the model.	Automatic catastrophe forecast.
RAUM	LIM RAUM	Spatial/geographical admissible domain.	Metaphysical closure of the world.
TIME	LIM TIME	Lifetime of data, Reper, and calibration.	Eternal Reper.
ONT	LIM ONTHOLOGY	Type and semantic dictionary of admissible objects.	Automatic ban on new objects.

The projective boundary marker D_infinity is not the evidence component D. Dom is the mathematical domain, D is the available sufficient foundation, and D_infinity is a projective endpoint marker.

28.2. Margin, Horizon, and Robust Gate

mu_t(x,r)=min_alpha g_alpha(x,r,t). *[RU p. 160]*

H_t(x,r)=sup{h>=0 : inf_{s in [t,t+h]} mu_s(x_s,r)>0}. *[RU p. 160]*

If the trajectory is unknown, the infimum is taken over all trajectories in a registered corridor. An empty trajectory set returns ABSTAIN rather than an infinite horizon.

Theorem 28.1 [THM]. If g_TIME(x,r,s)=tau_r-(s-t0) with finite registered lifetime tau_r, then H_t(x,r)<=tau_r-(t-t0). Thus there is no Reper authorised on the whole half-line under this explicit finite-lifetime model.

For an observed x_hat with the true state in B(x_hat,rho), if every g_alpha is L_alpha-Lipschitz in x, the sufficient robust gate is

g_alpha(x_hat,r,t) > L_alpha rho   for every mandatory alpha. *[RU p. 161]*

Then the whole uncertainty ball lies in Adm_t(r). If any margin fails, the status is boundary-uncertain; a numerical score cannot compensate for that status.

Proposition 28.4 [PROP]. Adding a mandatory limit cannot enlarge the admissible set or the horizon.

FALSIFICATION BOUNDARY. A forecast miss is valid only when Dom, D integrity, and the corridor were fixed in advance. Otherwise the event is protocol failure, not a mathematical refutation.

Chapter 29. Adaptive Rebuilding of the Reper Graph

Russian source locator: pp. 162–163

PLAIN-LANGUAGE EXPLANATION. After a valid miss, the system edits the smallest proof neighbourhood that actually generated the forecast. It creates a new version beside the old one. Learning is a history of reasons, not the silent replacement of yesterday's certificate.

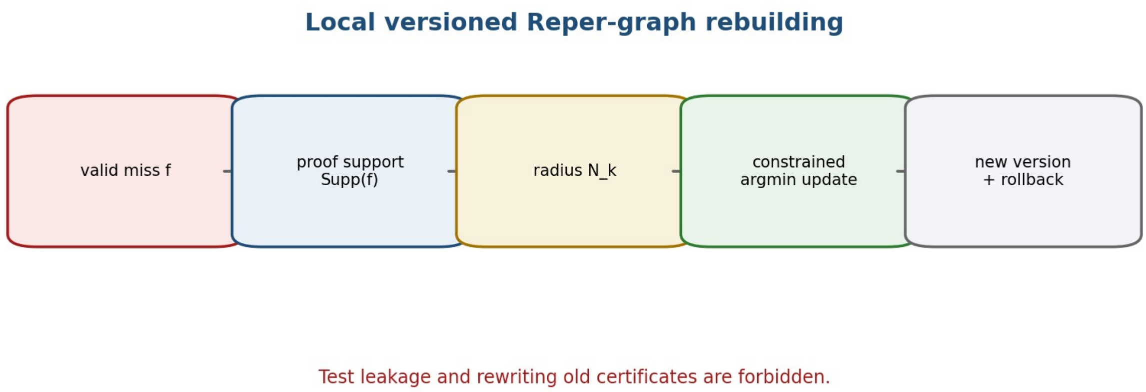


Figure 29.1. A valid miss triggers a local, constrained, versioned update with rollback.

29.1. Versioned Graph and Failure Support

$$G\_t=(V\_t,E\_t,w\_t,s\_t). \quad \text{[RU p. 162]}$$

Vertices are versioned Reper objects; edges are typed formula or domain relations; w_t are numerical parameters; s_t are evidence statuses. Every vertex stores its validity interval and links to D, Dom, code, and certificate. For a failed forecast f, Supp(f) is the smallest set of vertices and edges actually used to form the corridor and select the output.

29.2. Constrained Rebuilding Functional

$$G\_\{t+1\} \text{ in argmin}\_\{G \text{ in } G\_adm\} [L\_\{t+1\}(G)+\text{eta } d\_edit(G,G\_t)+\text{gamma } B\_PN2(G)+\text{kappa } B\_gate(G)]. \quad \text{[RU p. 162]}$$

B_PN2 is infinite when branches are hidden or an unauthorised singleton is produced. B_gate is infinite when D/Dom, matched-null, CGI, or independent-validation requirements are bypassed. The weights are fixed before the independent test is viewed.

Theorem 29.1 [THM-SCHEMA]. If the loss, edit cost, and constraints decompose over vertices and edges and all terms outside N_k(Supp(f)) are unchanged, a minimiser exists that agrees with G_t outside that neighbourhood.

For fixed graph structure and an m-strongly convex parameter objective, if the gradient changes by at most delta at the old minimiser, then

$$||\text{theta}\_\{t+1\}-\text{theta}\_t|| <= \text{delta}/m. \quad \text{[RU p. 162]}$$

This estimate does not apply to discrete structural changes, which retain edit distance, an alternative ledger, and full rollback.

29.3. Sequential Alarm, Test Leakage, and Selective Loss

$$E\_t=\mathrm{product}\_{i<=t}\ e\_i,\quad E\_0=1,\quad E\_0[e\_t \mid F\_{t-1}]<=1.$$ *[RU p. 162]*

Under the registered null, E_t is a nonnegative supermartingale. Ville’s inequality gives P_0(sup_t E_t >= 1/alpha)<=alpha. The conditional null and exchangeability assumptions are proof obligations; choosing e_t after viewing future data invalidates the signal.

The data are separated into T_train, T_cal, T_test, and T_future. Once T_test has been opened, a version tuned on it requires evaluation on a new unopened or external corpus.

$$\mathrm{ell\_sel}=\mathrm{ell\_pred}\ 1\_\{\mathrm{forecast}\}+c\_A\ 1\_\{\mathrm{ABSTAIN}\}+c\_F\ 1\_\{\mathrm{false\ authorisation}\},\quad c\_F>c\_A>=0.$$ *[RU p. 163]*

The inequality formalises evidence safety: when gates fail, abstention is cheaper than an unauthorised point answer. Costs are domain-specific, not universal constants.

> **OPERATOR ALIGNMENT.** Xi evolves an authorised branch, Delta is a new data/action impulse, and Upsilon inserts the result into an updated state space. A noninjective Upsilon preserves the preimage set and yields a set-valued Reper or ABSTAIN.

Chapter 30. Predictive Reper Bundle

Russian source locator: pp. 164–165

> **PLAIN-LANGUAGE EXPLANATION.** Predictions from different sciences live in different fibres over their domains. A domain adapter is a partial morphism. Its curvature measures the discrepancy between two routes of translation; visual similarity of graphs or lambda values is not a proof of law transfer.

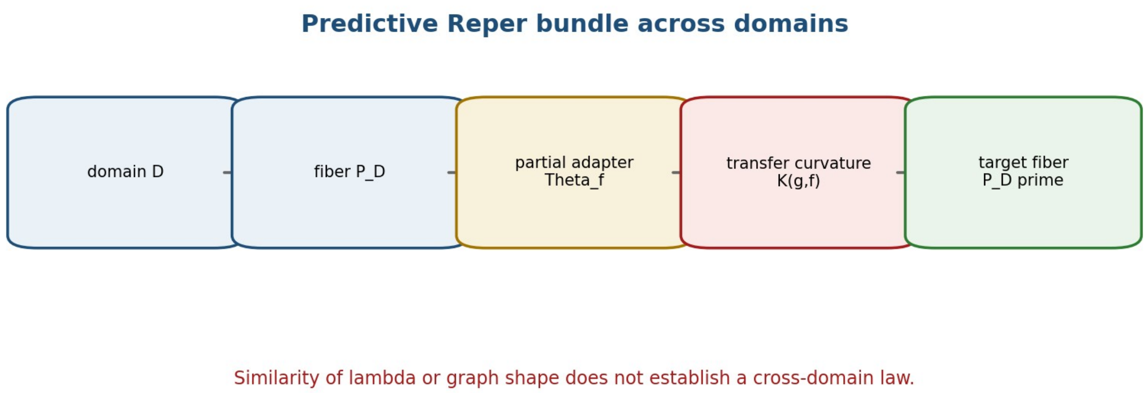


Figure 30.1. Cross-domain transfer is partial and carries an explicit curvature or path discrepancy.

30.1. Base Category, Fibres, and Partial Projection

Let Bcal be a small category of domains and admissible translations. Each domain D carries a fibre P_D of predictive packets and a fibre Obs_D of observables. A packet contains its Reper, data, Dom, branches, gates, corridor, loss, and certificate.

$$\mathrm{pi\_D} : \mathrm{P\_D} \to \mathrm{Obs\_D},\quad p \mapsto (\text{prediction corridor, status, proof object}).$$ *[RU p. 164]*

The projection is partial. A missing mandatory object produces bottom/ABSTAIN, never a numerical zero.

$$\mathrm{Xi\_D}(p)=(\mathrm{delta\_ass},\ \mathrm{delta\_gate},\ \mathrm{delta\_cal},\ \mathrm{delta\_null},\ \mathrm{delta\_transfer}).$$ *[RU p. 164]*

The defect vector is domain-invariant only relative to a declared group of admissible relabellings and representation G_D. Its norm is invariant only when G_D acts isometrically.

30.2. Partial Adapters and Transfer Curvature

Theta_f : Dom(Theta_f) subset P_D -> P_Dprime. *[RU p. 164]*

The adapter must transport types, units, D/Dom, branches, observable, and status. In linear fibres, for composable f and g, define

Kcal(g,f)=Theta_g o Theta_f - Theta_{g o f}. *[RU p. 164]*

In nonlinear fibres the subtraction is replaced by two paths and a target metric. Theorem 30.2 [THM]. If Theta is a functor into the category of partial maps with equal composite domains, then Kcal(g,f)=0. The converse also needs identity maps and coherence on triple compositions.

If the target observable projection is L-Lipschitz and the two transfer routes differ by at most kappa, then the prediction outputs differ by at most L kappa. Without estimates of L and kappa, cross-domain prediction remains exploratory.

30.3. Local Sections, Gluing, and PN.2 Obstruction

For a cover {U_i}, local sections s_i agree exactly when their overlap defects vanish. If P_D is a sheaf and the pairwise and triple-overlap conditions hold, a unique global section exists. This is a conditional theorem: each concrete Reper presheaf must be proved to satisfy the sheaf axioms.

When overlap defects are positive, the output is a corridor or a minimisation problem, not a global point prediction. A positive lower bound is an obstruction to unique gluing.

Proposition 30.5 [PROP]. If Delta_S Delta_D>0, no branch-blind exact section can reproduce both S and Dfrak on the two branches. Otherwise e_S=e_D=0 would contradict the PN.2 lower bound.

> **FANO AND KMA STATUS.** The Fano plane is retained as a finite incidence template and search barrier, not as proof of physical seven-dimensionality. KMA values are seed metadata. Target-domain validation remains mandatory.

Chapter 31. Computational Certification and the Boundary of Evidence Status

Russian source locator: pp. 166–168

> **PLAIN-LANGUAGE EXPLANATION.** A certificate joins formula, code, data, domains, branch structure, and status so that a result can be repeated and contradicted. It is valuable because it remembers its own limits. A digest proves identity of bytes, not correctness of the model.

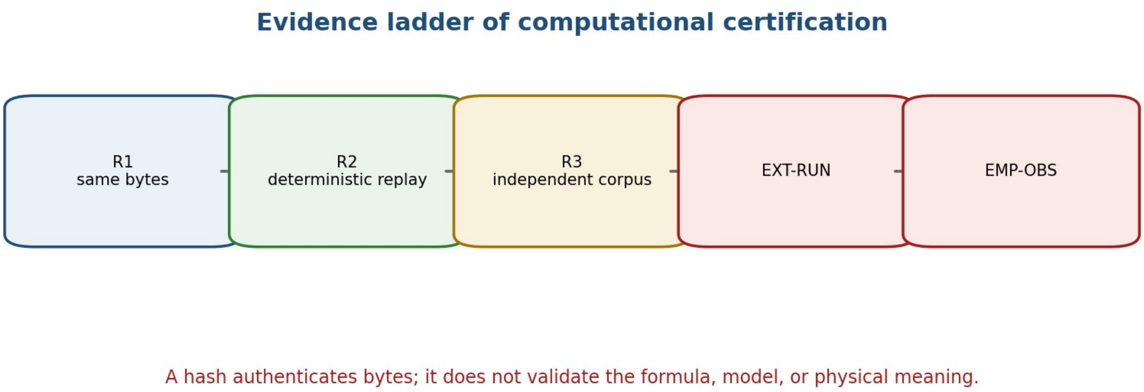


Figure 31.1. Computational replay, independent rerun, and empirical observation are distinct evidence levels.

31.1. Full Certificate Type and Immutability

$$Cert=(id,version,source\_hash,code\_hash,data\_hash,D,Dom,split,B,gates,null,CGI,Xi,H,output,status,PO).$$ [RU p. 166]

D and Dom are mandatory and distinct. B stores branches; gates are three-valued; null records the matched-null assumptions; CGI stores value, calibration, and threshold; Xi is the Chapter 30 defect vector; H is the Chapter 28 horizon. A correction creates a new id/version and a supersedes link; the old object is never rewritten.

Three levels of reproducibility

Level	Requirement	Permitted conclusion
R1	Input and program byte hashes match.	Byte-level identity of the declared inputs.
R2	Fixed environment and exact or fully specified arithmetic reproduce the same output.	Deterministic computational replay.
R3	Independent researcher obtains a compatible result on a new corpus under a preregistered protocol.	Independent subject-matter reproducibility.

Theorem 31.1 [THM]. A pure deterministic program with fixed environment, all input bytes, and exact or fully specified rounding returns the same output on replay. SHA-256 equality is evidence of byte identity with negligible collision probability, but does not verify that the program implements the right formula or that the data are representative.

31.2. PN2-PO12-A2-v1.0 and the Replay Blocker

The canonical source documents the A2 structural constants, eleven tests, exact c=1, epsilon_minus=3, kappa_Omega=3/4, and bundle hashes. The source also states that the archive pn2_po12_cert_v1.0.zip was not present in that assembly. Accordingly, Chapter 31 does not claim a new independent code execution. It records the published source certificate and leaves external replay open.

> **NO STATUS SUBSTITUTION.** A translated certificate record is not a rerun receipt. A local checksum of the monograph is not the checksum of the absent certificate archive.

31.3. Sequential Validity

For a continuously monitored database, a static p-value is insufficient when publication follows repeated inspection. A preregistered e-process or alpha-spending rule is required.

Theorem 31.2 [THM]. If E_t is a nonnegative supermartingale under H0 and E_0<=1, then the test that rejects when sup_t E_t>=1/alpha has false-rejection probability at most alpha.

$$P\_0(sup\_t\ E\_t >= 1/alpha) <= alpha\ E\_0 <= alpha.$$ [RU p. 166]

The supermartingale condition is itself a proof obligation of the concrete null. Without it, continued monitoring introduces undeclared multiplicity and the status is statistical-gate-failed.

31.4. Frozen Artifact Card and Final Status Ledger

The source preserves the following immutable chain without changing any field:

RIUD-TETRA-RUN006-029 -> PROOF-OBJ-RUN007-0029 -> FORMAL-CARD-RUN009-006 -> SIGNATURE-REVIEW-RUN013-001. [RU p. 167]

lambda=-0.992736565468, delta_truth=0.007263434532, CGI=0.140948882338. [RU p. 167]

Its status remains signature-ready-not-truth-layer. CGI<1 is a necessary gate in that pipeline, not a sufficient truth condition.

Final status ledger of the v0.5 translated scope

Object	Preserved status	Established	Still open
PN.2	proved under explicit assumptions	Local minimax lower bound.	Physical bridges.
PO-11	closed abstract	Four explicit models.	Transfer to physical R*R.
PO-12	closed abstract/source certificate	Published exact A2 tests and hashes.	External replay of the archive.
Five limits	formalised conditional	Gates, margin, horizon.	Domain thresholds.
Adaptive Reper	theorem schema	Locality and leakage prohibition.	Empirical evaluation.
Predictive bundle	defined / conditional	Typed transfer and curvature.	Sheaf property of real fibres.
Artifact-1	frozen	signature-ready-not-truth-layer.	Certificate-lock review.

FINAL BOUNDARY. The v0.5 checkpoint ends at Chapter 31. It adds no experimental data, performs no independent EXT-RUN, and does not promote any physical claim. The next stage begins with typed domain adapters and independent predictive validation.

T1-EN-PN2-v0.5 — Checkpoint Register

Register item	Value
Translated scope	Chapters 1–31; new material Chapters 27–31.
Russian locators added	pp. 140–168.
Canonical theorem package	PN.2 local minimax theorem with conditional uniform form.
Internal Appendix A	Four exact constructions; PO-11 closed abstract.
Internal Appendix B	Source-documented certificate; PO-12 closed abstract/source-certificate.
Physical register	F-1–F-14 preserved as PHY-HYP/OPEN.
Predictive architecture	Five limits, finite horizon, local rebuilding, bundle, certification levels.
Evidence firewall	NUM-SOURCE != EXT-RUN != EMP-OBS.
Next checkpoint	T1-EN-DATA-v0.6: Chapters 32–40.

$$\text{Status\_EN}(x) <= \text{Status\_RU}(x), \qquad \text{truth\_layer\_promotion}=0.$$

T1-EN-DATA-v0.6

CONTROLLED ENGLISH TRANSLATION OF CHAPTERS 32-40

This checkpoint extends the frozen Russian Volume I derivative through Chapter 40. It translates the typed domain-adapter layer, data identity and provenance, identifiability and transportability, conformal calibration, blocker-safe execution, covariate-shift correction, anytime-valid monitoring, and branch aggregation. The Russian source remains authoritative for formulas, status labels, hypotheses, and page locators.

Authority(T1-RU v197) > Authority(T1-EN v0.6);   Status_EN(x) <= Status_RU(x)

Status firewall. truth_layer_promotion=0. Type correctness, database integrity, replay, conformal coverage, regret bounds, and e-process evidence do not by themselves imply EXT-RUN or EMP-OBS.

v0.6 Change-Set and Parity Scope

ID	Change	Status
T1-EN-CS-041	Translated Chapters 32-40 with Russian page locators 169-189.	CLOSED-DOC
T1-EN-CS-042	Added a typed-adapter and source-anchor contract.	DEF/PROP
T1-EN-CS-043	Preserved the 46 raw / 45 byte-unique / 45 database-row import audit and its counter blocker.	NUM-AUDIT
T1-EN-CS-044	Translated identifiability, support, matched-null, and split-validation gates.	THM/COND
T1-EN-CS-045	Translated split and weighted conformal corridors with branch-union semantics.	THM/COND
T1-EN-CS-046	Translated blocker absorption, replay passport, e-process, and Hedge regret results.	THM/PROP/NUM
T1-EN-CS-047	Added nine English diagrams and a cumulative status ledger.	DOC-QA

Part VIII. Domain Adapters and Independent Predictive Validation

This part develops concrete domain adapters, identity and provenance rules, transport assumptions, calibration corridors, and a computational contract. The numerical database counts refer to a verified project snapshot, not to a universal volume of knowledge.

Chapter 32. Strict Specification of KLT-RBD Domain Adapters

Russian source locator: pp. 169-171

Central question	What must be defined before one algorithm can operate in several scientific domains?
Plain meaning	Each domain receives its own data types, units, observables, admissibility rules, and null model. The common engine is not permitted to infer these from a column name.
Mathematical core	A domain adapter is a partial typed composition of encoding, Reper construction, observation, loss,

	matched-null, and certification.
Boundary of inference	A type-correct adapter proves interface coherence only. It does not establish the empirical truth of a domain hypothesis.

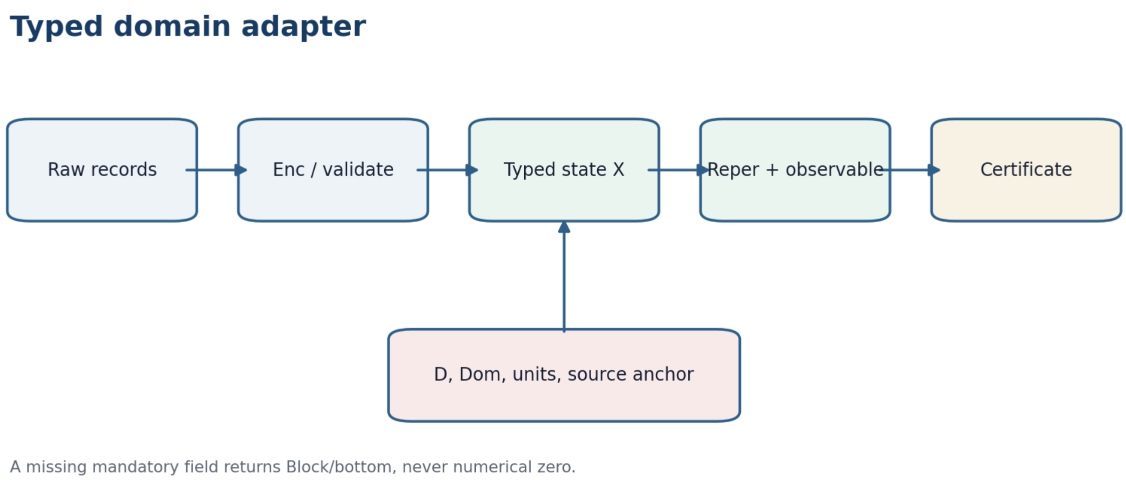


Figure 32.1. A domain adapter preserves types, units, D, Dom, and the source anchor.

32.1. Domain as a Typed Object

Dcal_delta = (Raw_delta, X_delta, Y_delta, Sigma_delta, Unit_delta, Time_delta) *[RU p. 169]*

Raw_delta is the space of raw records, X_delta the space of cleaned states, Y_delta the observable-response space, Sigma_delta the admitted transformations, Unit_delta the unit system, and Time_delta the temporal scale. None of these components is identified with the evidence set D or with the mathematical domain Dom.

A_delta = (Enc_delta, Rep_delta, Obs_delta, Loss_delta, Null_delta, Cert_delta) *[RU p. 169]*

Enc_delta:Raw_delta -> X_delta is partial and encodes a record; Rep_delta:X_delta -> Rcal_delta is partial and constructs a Reper; Obs_delta:X_delta -> Y_delta specifies the observable; Loss_delta evaluates a forecast; Null_delta defines the matched-null; and Cert_delta emits an evidence passport. Dom(A_delta) is the intersection of the domains of all actually invoked operators. The finite evidence set D_delta is a separate object, so the inclusion D_delta subset Dom(A_delta) is a proof obligation.

32.2. Correctness Conditions

Definition 32.1 [DEF]. The adapter A_delta is correct on D_delta when: (i) Enc_delta is defined on every record; (ii) Obs_delta has the declared response type and units; (iii) every Reper stores source_id, U/I/R/D, limits, operators, status, and revision; (iv) Null_delta preserves the registered conditioning covariates; (v) Cert_delta stores hashes, D, Dom, and all blockers; and (vi) loss of a mandatory field returns bottom/Block rather than numerical zero.

Theorem 32.1 - Type soundness of composition [THM]. If Enc_delta, Rep_delta, and Obs_delta are type-compatible and x belongs to Dom(Rep_delta o Enc_delta), then Obs_delta(Enc_delta(x)) and the constructed Reper refer to one state in X_delta. If one domain inclusion fails, the composite is not defined as a function.

> ***Proof.*** *A defined composite requires Enc_delta(x) to belong simultaneously to Dom(Rep_delta) and Dom(Obs_delta). Both operators then receive an object of the same declared type X_delta. If either inclusion fails, at least one value is absent, so writing a total function would be a type error.*

32.3. Canonical Reper Record and Source Anchor

r=(reper_id, source_id, work_id, domain, U, I, R, D, limits, operators, status, revision) *[RU p. 170]*

The full Atlas record may also include subdomain, author, source_title, tags, formula_hint, extraction_level, confidence, copyright_mode, source_basis, r_weight, u_connectivity, and created_at. A database column is not automatically a mathematical hypothesis; each theorem must state which fields enter its assumptions.

Axiom 32.A [DEF-A]. No domain Reper is authorised without a D-source anchor: source_id and source_basis must be nonempty, the sources/works reference must resolve, and copyright_mode must permit the intended operation.

Proposition 32.2 - Orphan-source blocker [PROP]. If source_id does not resolve in the sources table, every claim using that Reper receives blocker=orphan-source regardless of lambda or CGI.

> ***Proof.*** *Both lambda and CGI are computed relative to source data and assumptions. Without a resolvable source, D and the computation conditions cannot be reconstructed, so the certificate is incomplete.*

32.4. Domain-Code Catalogue

Code	Domain	Typical observable	Mandatory qualification
PHYS	Physics	Measurement with units and instrument model	Experimental calibration
CHEM	Chemistry	Composition, channel, rate, spectrum	Stoichiometry, redox, energy, and kinetics separated
BIO	Biology	Phenotype, state, sequence	Accession, build, and pipeline
MECH	Mechanics	Load, displacement, stability	Boundary conditions
NGEOM	Descriptive geometry	Projection, section, visibility	Reper and centre of projection
FIN / BANK / INS	Finance, banking, insurance	Price, liquidity, reserve, risk	Regime and timestamp
CONSTR / ARCH	Construction and architecture	Time, resource, defect, function	Normative version
HIST / LIT	History and literature	Source, motive, period, narrative	Semantic, not physical, observable
GEO / STRAT	Geography and strategy	Territory, flow, scenario, constraint	Limits and source chronology

32.5. Cross-Domain Strategic Slice

SAR_j=(Goal_j; RBD_slice_j, Limits_j, Lambda_j, CGI_j, Evidence_j, Rebuild_j) *[RU p. 171]*

RBD_slice_j subset P_delta1 x_C P_delta2 x_C ... x_C P_deltam *[RU p. 171]*

Proposition 32.3 - Empty compatibility fibre product [PROP]. If two domain packets assign incompatible time intervals or units to the same canonical_id and no registered transformation exists, their fibre product over the compatibility base C is empty.

> ***Proof.*** *A point of the fibre product must have the same image in C. Incompatible intervals or units yield different images and therefore no common point.*

32.6. Minimal Executable Contract

The minimal contract contains parse, validate, canonicalize, build_reper, predict_set, attach_fact, score, rebuild, and emit_certificate. Every function returns Result(value, errors, warnings), so a damaged row cannot silently disappear or become an admissible observation.

> **Philosophical-phenomenological note.** A domain adapter is not a translator that erases differences between languages. It is the discipline of encounter: it must show what survives the passage from phenomenon to record and what remains outside the encoding.

> **ADAPTER-CERT-v196i7.** domain=delta; Raw/X/Y=typed; Enc/Rep/Obs=partial; D/Dom=distinct; units=explicit; source-anchor=mandatory; null=registered; missing-field=bottom; strategy-slice=fibre-product-over-compatibility; empirical-truth=not-inferred-from-type-correctness.

Chapter 33. Identity, Provenance, and Data Integrity

Russian source locator: pp. 172-173

Central question	When do two files represent one object, and how is the derivation history preserved?
Plain meaning	One file may have two names and two files may have one name. A proof chain needs separate path, byte, and semantic identities.
Mathematical core	Raw records are quotiented by a proven equivalence relation, while provenance is stored as a directed acyclic graph.
Boundary of inference	A matching hash establishes byte identity for the checked files; it does not establish semantic equivalence between different documents.

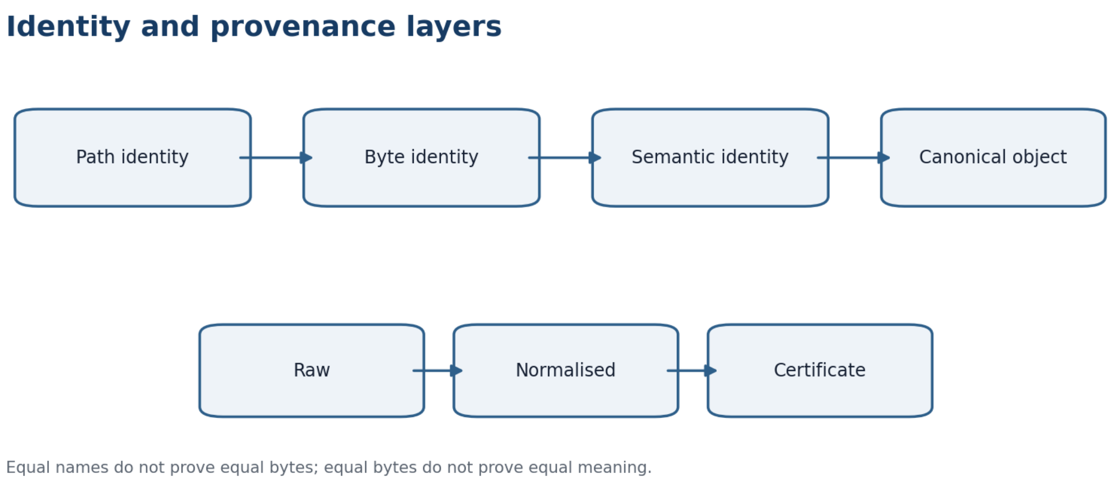


Figure 33.1. Path, byte, and semantic identity are different relations; provenance records the transformation path.

33.1. Three Levels of Identity

$$\mathrm{id\_path}(a)=\mathrm{normalize}(\mathrm{path\_a});\quad \mathrm{id\_byte}(a)=(|a|,\ \mathrm{SHA256}(a))$$ *[RU p. 172]*

The semantic identifier is assigned only after a domain comparison of version, language, object, and role. Definition 33.1 [DEF]. On a finite set of files, a is byte-equivalent to b exactly when their byte sequences are equal. SHA-256 is a fast index; a critical conflict may be settled by direct byte comparison.

Theorem 33.1 - Byte quotient and idempotent canonicalisation [THM]. The quotient A/~_b has one class for each distinct byte sequence. After selecting a representative, the canonicalisation map kappa is idempotent: kappa(kappa(a))=kappa(a).

Proof. *Byte equality is reflexive, symmetric, and transitive, so it partitions A. Re-canonicalising a selected representative stays in the same class.*

33.2. Concrete Import Audit v1.0

The discovered and classified CSV files contain 46 raw rows but 45 distinct SHA-256 values. Index_mirrors_klt510_v4_1.html and index_mirrors_klt510_v4_1.html have the same size (49,981 bytes), the same digest b2efc1635f4ddfca168cb832e17be9a41a05fe2bdbf736eb2457808b3daf4a4b, and direct byte equality. The SQLite import_artifacts table and the entity-map export contain 45 rows, while the run report preserves imported_artifact_count=46. The snapshot is immutable; the mismatch is documented rather than overwritten.

Audit object	Result	Status	Required action
Raw rows	46	verified	Preserve as N_raw
Byte-unique objects	45	verified	Preserve as N_byte
import_artifacts	45	verified read-only	Align a future report
Run imported count	46	counter mismatch	Repair only in a new version
SQLite integrity_check	ok	pass	Preserve database hash
foreign_key_check	0 violations	pass	Keep as mandatory test

Proposition 33.2 - Counter relation [PROP]. For this snapshot N_raw=46, N_byte=N_db=45, and N_duplicate=1; hence N_raw=N_db+N_duplicate.

Proof. *One nontrivial byte-equivalence class contains the two case variants; the remaining 44 classes are singletons. Therefore there are 45 classes and one excess raw row.*

33.3. Provenance as an Evidential DAG

For each result define G_prov=(V,E), with vertex types raw, normalized, reper, forecast, fact, score, and certificate. An edge u->v means that v was computed directly from u. source_hash is attached to raw data, code_hash to a transformation, and result_hash to an output.

Theorem 33.3 - Acyclicity under a strict rank [THM]. If every edge u->v strictly increases a version number or computation timestamp, then G_prov is acyclic.

Proof. *Along a directed cycle the rank would have to increase strictly and return to its initial value, which is impossible.*

33.4. Referential Integrity

Proposition 33.4 - Transactional foreign-key gate [PROP]. If all inserts are transactional, foreign keys are enabled, and COMMIT occurs only after PRAGMA foreign_key_check returns the empty set, the committed state contains no SQLite orphan links detectable by that check.

Proof. *Any foreign-key violation appears in the check output; the COMMIT rule excludes such a transaction from the committed state.*

Foreign-key integrity is necessary but not sufficient for semantic correctness. It proves that the referenced row exists, not that the stated relation is true.

33.5. Privacy as Partial Observability

PUB, MIXED, PRIVATE, and CLOSED classify permission to publish, not evidential quality. The public projection Pub:Artifact -> Artifact_pub is partial and requires a passed public_private_splits decision. In the verified snapshot, 41 imported objects are PUB and four are MIXED; all four MIXED objects remain in needs_review. This is an active publication blocker, not a database error.

Philosophical-phenomenological note. A filename is only one perspective on an object. Provenance returns the object to its history: where it came from, which operation transformed it, and why the current record may participate in an inference.

ID-PROV-CERT-v196i7. identity={path,byte,semantic}; raw_count=46; byte_unique=45; db_rows=45; duplicate_pair={Index,index}; byte_equal=true; counter_mismatch=open; integrity_check=ok; foreign_keys=0; provenance=DAG-under-rank; privacy={PUB:41,MIXED:4-needs-review}; historical-snapshot=immutable.

Chapter 34. Identifiability, Transportability, and Independent Validation

Russian source locator: pp. 174-175

Central question	What can be recovered from observations, and when may a result move from one population or domain to another?
Plain meaning	No program can recover a hidden distinction when two models produce the same observable law. Transport additionally requires target support within source support.
Mathematical core	Identifiability is defined through observational equivalence; target risk is expressed through a Radon-Nikodym weight; matched-null inference uses group invariance.
Boundary of inference	All results are conditional on distributions and registered interfaces. They do not validate a concrete domain hypothesis without data.

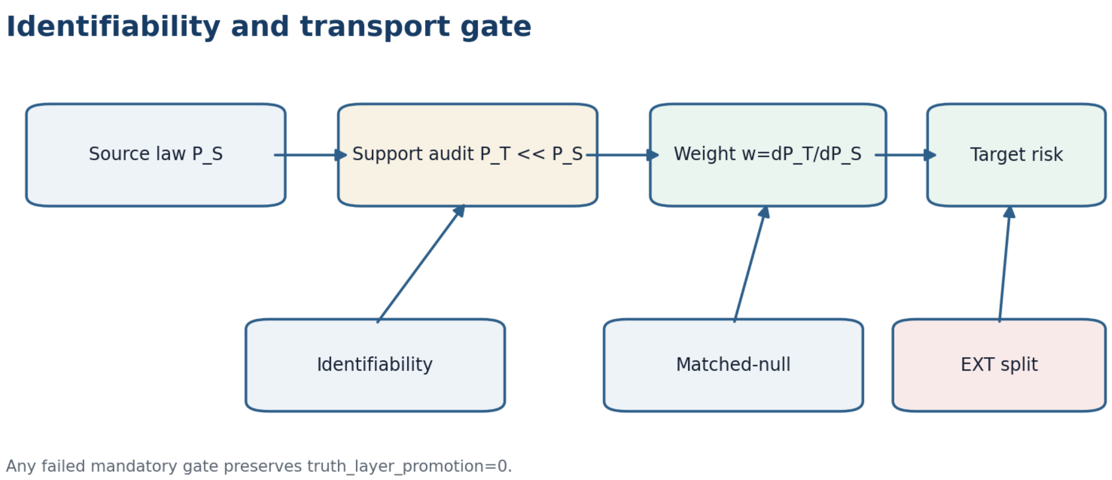


Figure 34.1. Identifiability, support, matched-null, and independent-source gates are conjunctive.

34.1. Observational Equivalence

theta ~_obs theta_prime iff P_theta = P_theta_prime on the observable sigma-algebra *[RU p. 174]*

Definition 34.1 [DEF]. A parameter theta is identifiable when theta~_obs theta_prime implies theta=theta_prime. A functional psi(theta) may be identifiable even when theta is not, provided observational equivalence implies equality of psi.

Theorem 34.1 - Impossibility of exact selection [THM]. If theta is not equal to theta_prime but P_theta=P_theta_prime, no estimator can equal theta almost surely under P_theta and equal theta_prime almost surely under P_theta_prime.

Proof. *The event {theta_hat=theta} would have probability one under P_theta and zero under P_theta_prime. Equal observable laws assign the same probability to every observable event, giving a contradiction.*

Kurpishev PN.2 supplies a specific structural mechanism of such impossibility: hidden branches require one answer while the observable and structural gaps remain positive.

34.2. Support Condition for Transfer

R_T(f)=E_T[loss]=E_S[w(X,Y) loss], w=dP_T/dP_S, P_T << P_S *[RU p. 174]*

Theorem 34.2 - Weighted target-risk identity [THM]. If P_T is absolutely continuous with respect to P_S and w*loss is integrable, then the target risk equals the weighted source risk.

Proof. *This is the defining integral identity of the Radon-Nikodym derivative.*

Counterexample 34.1. If there is a set A with P_T(A)>0 and P_S(A)=0, source data contain no evidence about the loss on A. No finite weighting repairs the gap. The adapter must return support-gap/ABSTAIN.

34.3. Structural Transport of a Reper

A transfer Theta_{S->T} must make the observation diagram commute on Dom(Theta), preserve units and time indices, carry the source anchor, and control the transfer curvature from Chapter 30.

Proposition 34.3 - Internal lambda does not repair a noncommutative observable map [PROP]. If Obs_T o Theta differs from phi_Y o Obs_S, equality of internal lambda coordinates does not imply equality of target predictions.

Proof. *Noncommutativity provides a packet for which the two routes yield different observables. The internal coordinate does not erase that difference.*

34.4. Matched-Null as Group Randomisation

p_G(Z)=|{g in G : T(gZ)>=T(Z)}| / |G| *[RU p. 175]*

Theorem 34.4 - Exact randomisation level [THM]. If a finite group G acts on Z and the null law conditional on the orbit GZ is invariant, then P_0(p_G<=alpha)<=alpha, with ordinary discrete conservatism. For B sampled transformations use p_hat=(1+#)/(B+1).

Proof. *Under the null, the observed position is exchangeable with the positions on its orbit. The upper-tail rank is exact or conservative; the plus-one correction includes the observed configuration in the Monte Carlo rank.*

34.5. Independent Validation Route

T_train independent of T_cal independent of T_test; source(T_ext) != source(T_train union T_cal union T_test) *[RU p. 175]*

Features are selected on train, thresholds and corridors on calibration, one frozen evaluation is performed on test, and transfer is examined on an external corpus. Opening test and then changing the model creates a new version. Distinct source labels do not automatically imply statistical independence; shared instruments, references, or duplicated objects must be audited in provenance.

34.6. CGI and the Noncompensation Rule

Theorem 34.5 - No status promotion through compensation [THM]. If any mandatory identifiability, support, null-invariance, or independent-validation gate equals 0 or bottom, truth_layer_promotion remains 0 regardless of CGI.

> ***Proof.*** *Authorisation is the conjunction of mandatory gates. A zero or undefined conjunct cannot be changed to one by a separate numerical field.*

Philosophical-phenomenological note. Transportability is not visual similarity. It is a right to carry a result across a boundary. That right exists only after showing that the target side does not contain relevant possibilities the source sample never observed.

TRANSPORT-CERT-v196i7. identifiability=explicit; support=P_T<<P_S-or-gap; risk-transfer=Radon-Nikodym-weighted; observation-diagram=commutative; curvature=bounded; matched-null=group-invariant; split=train/cal/test/ext; CGI<1=noncompensating-gate; failed-gate=>truth_layer_promotion=0.

Chapter 35. Forecast Corridors, Conformal Calibration, and Abstention

Russian source locator: pp. 176-177

Central question	How should a predictive method report uncertainty when several PN.2 branches remain admissible?
Plain meaning	The output is a calibrated set of future values, not merely a central number. Hidden branches enlarge the honest answer.
Mathematical core	Split conformal prediction gives finite-sample marginal coverage under exchangeability; branch-aware PN.2 output uses a union of branch corridors.
Boundary of inference	The guarantee is not pointwise conditional coverage and may fail under unmodelled temporal drift or unsupported transfer.

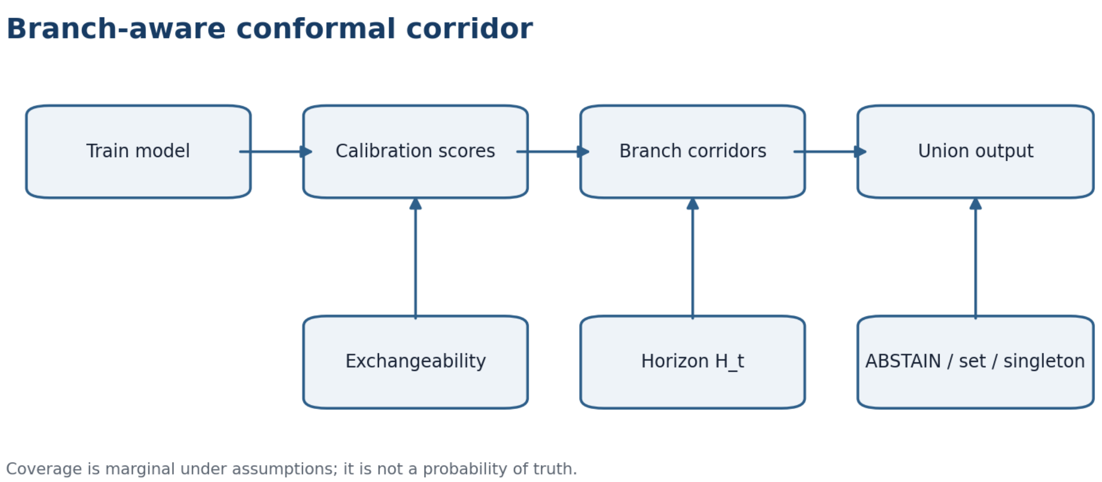


Figure 35.1. Calibration produces branch corridors; the branch-blind output is their gated union.

35.1. Split Conformal Corridor

k=ceil((n+1)(1-alpha)); q=s_(k); C_alpha(x)={y : s(x,y)<=q} *[RU p. 176]*

Theorem 35.1 - Finite-sample marginal coverage [THM]. If the n calibration pairs and the new pair are exchangeable, and the model and score were fixed without using calibration responses after disclosure, then P{Y_(n+1) in C_alpha(X_(n+1))} >= 1-alpha.

Proof. *The rank of the new score among the n+1 exchangeable scores is uniform up to conservative tie handling. The selected order statistic bounds the upper-tail probability by alpha.*

This is a marginal guarantee under the joint law. It is not a promise of 1-alpha coverage at each fixed x. Rare subgroups require preregistered Mondrian or group-conditional calibration and adequate sample size.

35.2. PN.2 Branch Corridors

C_alpha^PN2(x) = union_{b in B(x)} C_{alpha,b}(x) *[RU p. 176]*

Theorem 35.2 - Coverage by branch union [THM]. If the true branch b* belongs to the registered set B(x) and C_{alpha,b*}(x) covers Y with probability at least 1-alpha, the union corridor has coverage at least 1-alpha.

Proof. *The true-branch corridor is a subset of the union, so true-branch coverage implies union coverage.*

Counterexample 35.1. Two disjoint exact branch corridors have an empty intersection. Intersecting them can return an empty answer even when each branch corridor has perfect coverage in its own regime.

35.3. Corridor and Horizon

C_{t,h}(x) is valid only for h<=H_t(x,r) from Chapter 28. Approaching a limit may widen the set monotonically, reduce the horizon, or trigger abstention. The system may not secretly narrow the corridor after observing the fact.

Proposition 35.3 - Safe horizon contraction [PROP]. If C_h is nested monotonically in h and H_prime<=H, replacing H by H_prime does not reduce coverage on the retained horizons h<=H_prime, although it narrows the claim domain.

Proof. *For every retained h the corridor and its distribution remain unchanged; only farther claims are removed.*

35.4. Selective Decision

Out(x) = ABSTAIN, a set-valued corridor, or a singleton with a uniqueness certificate *[RU p. 177]*

If the set is empty because the model is invalid, or every candidate has gate not equal to one, the output is ABSTAIN. If several evidence-admissible components remain, the full labelled set is returned. A singleton requires a proved uniqueness certificate. Noncoverage, false authorisation, and abstention cost are reported separately.

35.5. Drift and Recalibration

A drift alarm removes the exchangeability assumption between calibration and future data. The current corridor receives status=drift-suspected, the horizon is shortened, and recalibration is performed on the next registered block. Old coverage is not carried forward. An e-process may monitor misses, but it requires its own null model and does not replace conformal coverage.

35.6. Calibration after Domain Transfer

Even a flat structural adapter does not automatically transfer the conformal quantile. The target domain requires a target calibration set or a proved weighting scheme under P_T<<P_S. A support gap requires ABSTAIN until target examples are obtained.

Philosophical-phenomenological note. A corridor does not build a wall around the future. It records the width of predictive responsibility: the more hidden branches and the closer the Reper limit, the more honest the set-valued answer becomes.

CORRIDOR-CERT-v196i7. method=split-conformal; guarantee=marginal-under-exchangeability; quantile=ceil((n+1)(1-alpha)); PN2-combination=union; branch-set=registered; horizon=H_t; drift=>status-demotion; target-transfer=recalibrate-or-weight-with-support; outputs={corridor,ABSTAIN,certified-singleton}; conditional-coverage=not-claimed.

Chapter 36. KLT-RBD Computational Contract and Final Audit v196i14

Russian source locator: pp. 178-180

Central question	How are the preceding mathematical conditions turned into an executable database and software route?
Plain meaning	Each theorem-facing claim receives a stage, input, output, invariant, and explicit stop condition.
Mathematical core	The ten Atlas stages form a conditional soundness pipeline from raw C@C input to an immutable publication snapshot.
Boundary of inference	Executability does not mean that any concrete domain adapter has already passed an independent validation.

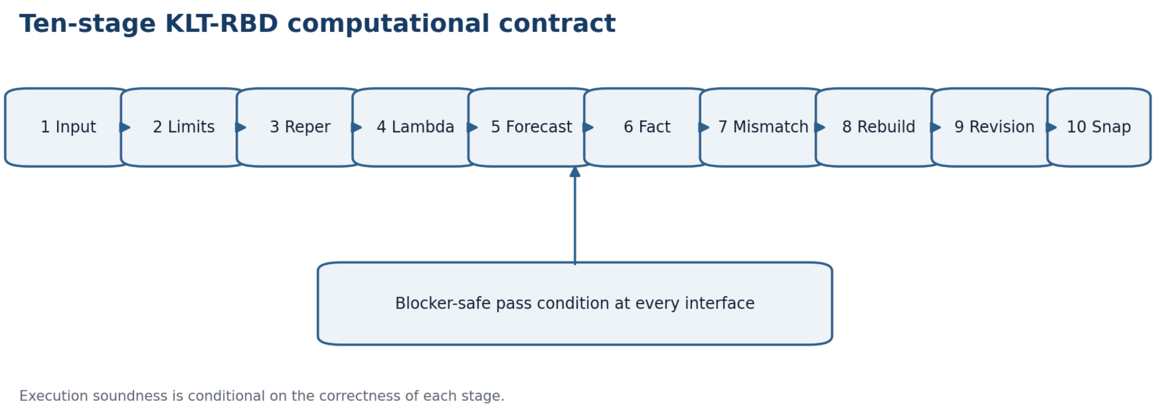


Figure 36.1. Ten-stage KLT-RBD computational contract with a blocker-safe interface at every step.

36.1. Ten-Stage Pipeline

Stage	Input -> output	Mandatory invariant	Block
1 Input C@C	raw -> event_state_limit	source_hash, type	parse error
2 LimitGate	packet -> LimOK/OntOK	five limits, D/Dom	0 or bottom
3 ReperSearch	query -> candidates	source anchor	orphan source
4 LambdaClosure	candidates -> lambda-status	registered formula	KMA-only match

Stage	Input -> output	Mandatory invariant	Block
5 ForecastBuild	status -> corridor	PN.2 branches	hidden branch
6 FactAttach	fact -> pair	canonical_id/time	identity conflict
7 MismatchDetect	pair -> causal gap	frozen tolerance	test leakage
8 NearestRebuild	gap -> N_epsilon queue	locality	global rewrite
9 RevisionChain	queue -> new version	old version immutable	in-place edit
10 Snapshot	revision -> package	privacy/status/hash	MIXED not passed

36.2. State of the Audited Databases

The read-only Atlas v2.1 audit reported sources=236, works=1145, repers=2212, reper_edges=2478, interdisciplinary_domains=14, limit_layers=5, operator_derivatives=8, and predictive_protocol steps=10. PRAGMA integrity_check returned ok and foreign_key_check returned zero violations.

The read-only real-data-import v1.0 audit reported import_artifacts=45, site_pages=33, lambda_audit_items=42 (supported=38, gap=4), public_private_splits=5, and four privacy classes. The 46/45 counter discrepancy remains a documented report-level blocker.

36.3. Minimal Adapter Test Set

Test	Purpose
T-AD1	Schema: mandatory fields and types.
T-AD2	D/Dom: every record in D lies in the domain of every invoked operator.
T-AD3	Round trip: canonicalize(canonicalize(x))=canonicalize(x).
T-AD4	Provenance: complete raw-to-certificate path.
T-AD5	Null: invariance of matched transformations.
T-AD6	Corridor: finite-sample formula on a synthetic exchangeable sample.
T-AD7	Support: target states outside source support trigger ABSTAIN.
T-AD8	Rebuild: only the registered neighbourhood changes.
T-AD9	Privacy: MIXED/PRIVATE objects are not published without passed review.
T-AD10	Replay: identical input and environment reproduce the certificate.

Theorem 36.1 - Conditional end-to-end soundness [THM]. Assume that stages 1-10 are type-correct, preserve source and provenance, pass their gates, and permit transition only when status=pass. Then a published snapshot has a resolvable path to raw data, passed the declared limits, PN.2, null, CGI, and privacy gates, and does not modify historical versions.

> ***Proof.*** *Induct on the stages. Stage 1 creates a typed object with source_hash. At each later step, pass plus invariant preservation provides a valid input to the next stage, while any blocker stops the chain. Stage 10 serialises all retained invariants into the certificate.*

The theorem is a software soundness result relative to the correctness of the stages. It does not prove completeness of ReperSearch, correctness of a domain observable, or truth of the external world.

36.5. Falsification and Rebuilding

The snapshot distinguishes confirmed, local_mismatch, limit_shift, semantic_fog, dark_rejected, and critical. dark_rejected denotes violation of the registered LIM_ONTOLOGY only; it is not a proof of metaphysical impossibility. If CGI_comp>=1 or CGI_pred>=1, the forecast is quarantined. A stable-limit mismatch triggers local Rebuild(N_epsilon); a limit shift creates a new version and preserves the old one as history.

36.6. Immutable Artifact-1 Card

RIUD-TETRA-RUN006-029 -> PROOF-OBJ-RUN007-0029 -> FORMAL-CARD-RUN009-006 -> SIGNATURE-REVIEW-RUN013-001 *[RU p. 179]*

lambda=-0.992736565468; delta_truth=0.007263434532; CGI=0.140948882338 *[RU p. 179]*

truth_layer_promotion=0; status=signature-ready-not-truth-layer; next=certificate-lock/publication-gate review. Neither a conformal corridor, read-only SQLite integrity, nor a small CGI changes this card without an independent signature and publication gate.

36.7. Sources of Mathematical Deepening

Project sources include the frozen Volume I predecessor, the KLT-RBD Interdisciplinary Reper Atlas v2.1, the real-data schema extension, monograph 5.0, PILOT-01, the SIGMA source, NAPG materials, the Desargues-Kurpishev package, FOS journal sources, and KLT6 packages. External prior art includes conformal prediction, transportability, covariate-shift weighting, Ville processes, and prediction with expert advice.

36.8. Final Status Ledger

Object	Status	Proved / checked	Open
Domain adapter	defined + typed	contract and composition	domain implementations
Atlas v2.1	read-only verified	236/1145/2212/2478; integrity ok	corpus updates
Real import	verified with blocker	45 unique/imported; FK=0	align count=46
Identifiability	theorem schema	no exact recovery under equivalence	concrete domain models
Transport	conditional theorem	risk identity under P_T<<P_S	target support and weights
Conformal corridor	proved under exchangeability	marginal finite-sample coverage	drift and conditional coverage
Artifact-1	frozen	signature-ready-not-truth-layer	certificate-lock review

Philosophical-phenomenological note. A predictive method becomes rigorous not when it promises more future, but when it distinguishes what was observed, what was transported, what is covered by a corridor, and where the duty to answer becomes the duty to abstain.

DOMAIN-VALID-CERT-v196i7. source=frozen-T1; preserved_text=yes; chapters=32-36; adapter=typed-partial; identity={path,byte,semantic}; atlas_counts={236,1145,2212,2478}; import_audit={raw:46,unique:45,db:45,counter-blocker:1}; identifiability=required; transport=P_T<<P_S-or-ABSTAIN; matched-null=invariant; conformal=marginal-under-exchangeability; CGI<1=necessary-not-sufficient; KMA=metadata-only; independent_validation=mandatory; truth_layer_promotion=0-unless-all-gates-pass.

The translated checkpoint joins the mathematical PN.2 core to the real RBD/RPD schema. A subsequent independent experiment must implement one end-to-end adapter on an external corpus and publish negative outcomes alongside positive ones.

Part IX. End-to-End Predictive Validation

This part carries the Chapters 32-36 contract into execution semantics for errors, distribution shift, sequential monitoring, and competition between several PN.2 branches. Its subject is not a new truth declaration, but provable system behaviour when a gate fails.

Chapter 37. End-to-End Blocker-Safe Adapter and Reproducibility

Russian source locator: pp. 181-183

Central question	How can an early error be prevented from becoming a plausible late-stage forecast?
Plain meaning	Every operation returns either a valid value or a typed Block. A Block remains visible through all later stages.
Mathematical core	Partial operators are lifted to the sum type Result(X)=Ok(X) disjoint-union Block(B), where Block is absorbing.
Boundary of inference	Perfect replay on the same data remains computational evidence, not an independent empirical observation.

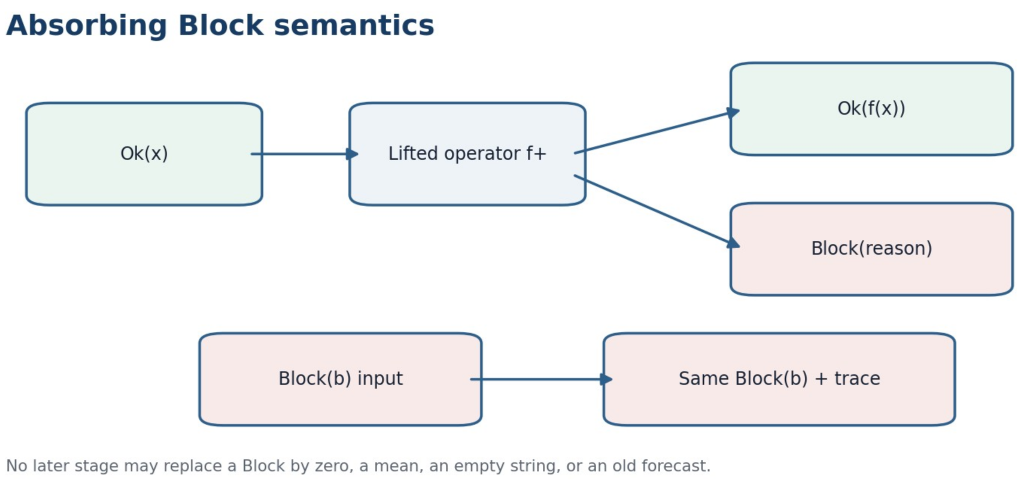


Figure 37.1. Block is an absorbing result with a preserved reason and trace.

37.1. Sum Type of Results

$$\mathrm{Result}(X)=\mathrm{Ok}(X)\ \text{disjoint-union}\ \mathrm{Block}(B) \quad \textit{[RU p. 181]}$$

$$f+(\mathrm{Ok}(x))=\mathrm{Ok}(f(x))\ \text{or Block}; \quad f+(\mathrm{Block}(b))=\mathrm{Block}(b) \quad \textit{[RU p. 181]}$$

B includes parse-error, schema-gap, orphan-source, unit-conflict, support-gap, leakage, invalid-null, privacy-stop, and nonreproducible-state. Definition 37.1 [DEF]. A composition is blocker-safe when no stage replaces Block by a default value, empty string, zero, mean, or previous forecast.

Theorem 37.1 - Absorption of Block [THM]. For blocker-safe lifted operators f_1+,...,f_m+, if the result after stage j is Block(b), the full composite returns Block(b), adding only traversal metadata.

Proof. *By definition, every subsequent lifted operator acts as the identity on a Block. Induction over the remaining stages preserves b; trace metadata does not change the result type.*

Corollary 37.1 [COR]. status=pass is impossible when an unresolved Block occurs earlier in the trace. lambda, delta_truth, and CGI do not cancel this rule.

37.2. Ten End-to-End Stages and Their Blocks

No.	Operation	Verified output	Block
1	Input C@C	type, source_hash	parse/schema
2	LimitGate	five gates, D/Dom	limit 0 or bottom
3	ReperSearch	source-anchored candidates	orphan source
4	LambdaClosure	registered formula	KMA-only
5	ForecastBuild	branch corridor	hidden branch
6	FactAttach	canonical_id and time	identity conflict
7	MismatchDetect	frozen loss	test leakage
8	NearestRebuild	local queue	global rewrite
9	RevisionChain	new immutable version	in-place edit
10	Snapshot	hash/status/privacy	unpassed privacy

37.3. Canonicalisation and Round Trip

$$c(c(x))=c(x); \quad decode(encode(x))=x \text{ on } Dom(\text{round-trip})$$ *[RU p. 182]*

Proposition 37.2 - Idempotence prevents identifier drift [PROP]. Idempotent canonicalisation prevents identifier drift under repeated import, but it does not prove semantic equality of two sources.

Proof. *A second canonicalisation preserves the chosen representative. Semantic equivalence is a separate domain relation not contained in string equality.*

37.4. Real Import Audit

$$N(raw)=46; \quad N(byte)=45; \quad N(db)=45; \quad N(dup)=1$$ *[RU p. 182]*

The count is not retroactively changed to a more convenient value. The certificate stores the raw count, byte-equivalence classes, deduplicated database count, and representative-selection rule.

37.5. Reproducibility Passport

$$RunID=H(data, schema, adapter, config, code, environment, seed)$$ *[RU p. 182]*

The passport contains data_hash, schema_hash, adapter_hash, config_hash, code_hash, environment_hash, seed, locale, timezone, library_versions, and canonicalization_version. Missing any mandatory component returns Block.

Theorem 37.3 - Conditional replay equality [THM]. If the input bytes, all hashed components, deterministic operations, and computation order coincide, the canonical serialised certificate coincides.

Proof. *Every stage is a deterministic function of its input and frozen configuration. Substitution of equal arguments yields equal outputs; canonical serialisation removes field-order variation.*

Equal certificates prove replay of this route only. They do not prove that the model is correct.

37.6. Minimum End-to-End Tests

T-E2E-1 schema; T-E2E-2 D subset Dom; T-E2E-3 idempotence; T-E2E-4 provenance; T-E2E-5 units; T-E2E-6 matched-null; T-E2E-7 support-gap; T-E2E-8 local rebuild; T-E2E-9 privacy; T-E2E-10 replay. Replay compares status, branches, blockers, intermediate hashes, and forecast-set boundaries, not only the final number.

> **Philosophical-phenomenological note.** An error becomes a scientific object when the system does not hide it beneath a number. Block is not an absence of knowledge; it is precise knowledge of the point where continuation is not yet authorised.

> **E2E-ADAPTER-CERT-v196i8.** Result=Ok-or-Block; Block=absorbing; stages=10; D/Dom=distinct; canonicalization=idempotent; round-trip=domain-bounded; import={raw:46,byte:45,db:45,duplicate:1}; provenance=complete; replay=hash-locked; empirical-truth=not-inferred.

Chapter 38. Weighted Calibration under Covariate Shift

Russian source locator: pp. 184-185

Central question	How can calibration be adjusted when the target domain visits states with different frequencies?
Plain meaning	Ordinary ranks cease to be symmetric; density-ratio weights give some observed states a larger target voice.
Mathematical core	Under covariate shift P_S(Y|X)=P_T(Y|X) and P_T(X)<<P_S(X), a weighted conformal quantile includes a special test-point mass at +infinity.
Boundary of inference	Unknown, unstable, or infinite weights create a Block. Weighting does not prove causal transportability.

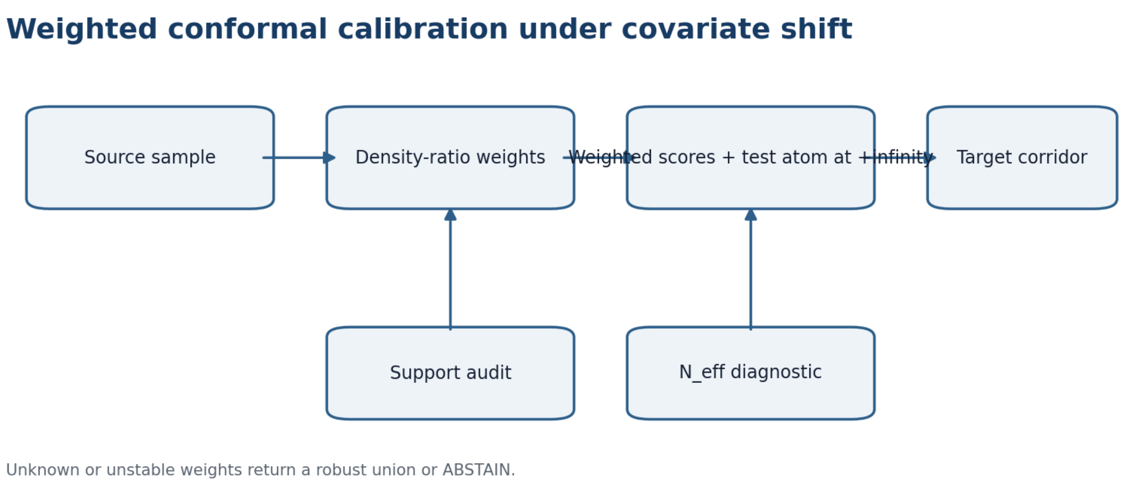


Figure 38.1. Weighted calibration requires support, a registered ratio model, and a finite-sample test atom.

38.1. Covariate-Shift Model

$$P\_S(Y|X)=P\_T(Y|X); \quad w(x)=dP\_T(X)/dP\_S(X); \quad P\_T(X)<<P\_S(X)$$ *[RU p. 184]*

The conditional-law equality is a registered bridge assumption, not a consequence of similar histograms. If P_T(A)>0 but P_S(A)=0, w is undefined on A and the system returns support-gap regardless of the amount of source data outside A.

38.2. Weighted Prediction Set

$$p\_i=w(X\_i)/(w(x)+\sum\_j w(X\_j)); \quad p\_{test}=w(x)/(w(x)+\sum\_j w(X\_j))$$ *[RU p. 184]*

$$C\_\alpha(x)=\{y : s(x,y)\le Q\_{(1-\alpha)}(\sum\_i p\_i \delta\_{(s\_i)} + p\_{test} \delta\_{(+\infty)})\}$$ *[RU p. 184]*

Theorem 38.1 - Conditional weighted coverage [THM]. Under a correct density ratio, invariant P(Y|X), independent calibration, and a registered score, the weighted conformal construction achieves target marginal coverage at least 1-alpha.

> ***Proof.*** *After weighting, the probability of each position in the combined sample is proportional to its target density. The weighted upper-tail rank is at most alpha; the +infinity atom preserves finite-sample conservatism.*

38.3. What the Guarantee Does Not Say

Coverage remains marginal under the target law. It is not pointwise conditional coverage, does not establish causal transport, and does not permit changing the score after target responses are observed. Estimated weights add uncertainty; reusing the same target sample for weight fitting and coverage assessment requires sample splitting or another theorem.

38.4. Effective Size and Weight Instability

$$N\_{eff}=(\sum\_i w\_i)^2 / \sum\_i w\_i^2$$ *[RU p. 184]*

N_eff is a diagnostic of weight concentration, not an exact number of independent observations. A preregistered lower threshold N_eff,min is evaluated before target outcomes. Failure yields status=weight-instability and prevents truth promotion.

38.5. Robustness over a Weight Set

$$C\_\alpha^{rob}(x)=\bigcup\_{w \in W} C\_\alpha^w(x)$$ *[RU p. 185]*

Proposition 38.2 - Robust union [PROP]. If the true weight belongs to the registered set W and its corridor has coverage 1-alpha, the union corridor has no smaller coverage.

> ***Proof.*** *The true-weight corridor is contained in the union, so its coverage event implies union coverage.*

Robustness costs width. If W is so broad that the union is practically uninformative, the strict output is ABSTAIN rather than post-result narrowing of W.

38.6. Transfer Registration Card

The card stores source_population, target_population, inclusion rules, support audit, weight model, weight-training split, clipping rule, W, N_eff,min, alpha, score, horizon, and publication rule. Weight clipping changes the effective target measure; its threshold and bias analysis must be preregistered.

> **Philosophical-phenomenological note.** A weight does not itself transport the phenomenon. It recognises that some observed states must speak more loudly than others. Where the target world reveals what the source never saw, the weight must fall silent.

> **TRANSFER-CAL-CERT-v196i8.** shift=covariate-only; support=P_T<<P_S; conditional-law=invariant; weights=registered; test-atom=plus-infinity; coverage=target-marginal-conditional-on-assumptions; N_eff=diagnostic; unknown-weight=robust-union-or-ABSTAIN; causal-transfer=not-claimed.

Chapter 39. E-Processes, Ville Inequality, and Optional Stopping

Russian source locator: pp. 186-187

Central question	How can evidence be monitored repeatedly without inflating a fixed-sample error claim?
Plain meaning	The rule for looking through time must be written before the result. A nonnegative supermartingale controls its running maximum.
Mathematical core	An e-process starts at one, remains nonnegative, and obeys a conditional supermartingale inequality under the registered null; Ville gives an anytime-valid boundary.
Boundary of inference	The stake must be predictable from the past and the guarantee applies only to the preregistered null and data stream.

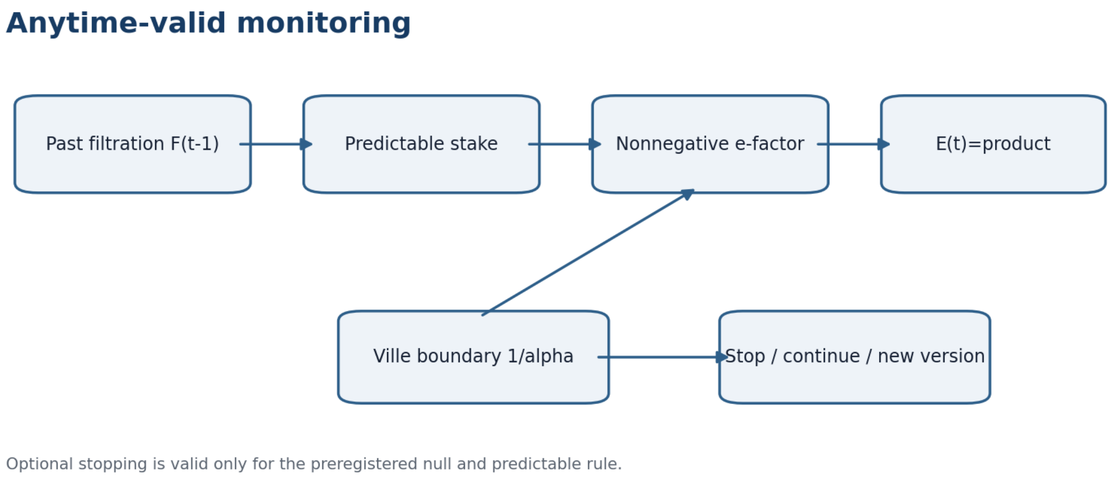


Figure 39.1. Predictable e-factors accumulate into an anytime-valid process with a fixed boundary.

39.1. Filtration and Predictability

$$E(0)=1; \quad E(t)>=0; \quad E[E(t)|F(t-1)]<=E(t-1)$$ *[RU p. 186]*

F(t) is the information available after step t. A stake lambda(t) must be chosen using F(t-1). Using the current outcome to choose lambda(t) violates predictability and creates invalid-sequential-null.

39.2. Ville Inequality

$$P\_0\{sup\_t\ E(t) >= 1/alpha\} <= alpha$$ *[RU p. 186]*

Theorem 39.1 - Ville inequality [THM]. For a nonnegative supermartingale E(t) with E(0)<=1 and alpha in (0,1), P_0(sup_t E(t)>=1/alpha)<=alpha.

> ***Proof.*** *Let tau be the first crossing of 1/alpha, truncated at T. Optional stopping for a nonnegative supermartingale gives E[E(tau wedge T)]<=1. On {tau<=T} the value is at least 1/alpha, so P(tau<=T)<=alpha. Let T tend to infinity.*

Stopping at the first crossing preserves level alpha. It does not permit changing the null, loss, or data stream.

39.3. Bounded-Gain Example

$$e(t)=1+lambda(t)X(t); \quad E(t)=product\_\{s=1\}\hat{}t\ e(s)$$ *[RU p. 186]*

Let X(t) lie in [-1,1] and satisfy E[X(t)|F(t-1)]<=0 under H0. For predictable lambda(t) in [0,1], e(t) is nonnegative and has conditional mean at most one, so the product is a nonnegative supermartingale. X(t) must be defined before the current response as a difference between registered losses of the method and matched-null.

39.4. Mixture of Stakes

$$E\_mix(t)=sum\_k\ pi\_k\ E\_k(t); \quad pi\_k>=0; \quad sum\_k\ pi\_k=1$$ *[RU p. 186]*

Proposition 39.2 - Mixtures preserve e-validity [PROP]. A nonnegative convex combination of e-processes is an e-process.

> ***Proof.*** *Convex combination preserves nonnegativity, initial expectation at most one, and the conditional supermartingale inequality.*

39.5. Versioning after Rebuilding

A local model rebuild changes the law of future gains. Continuation is permitted only when the rebuilding rule and updated stake were part of the null contract. Otherwise the current e-process closes and the new version starts from E(v,0)=1 with its own alpha budget. Old maximum evidence is not transferred as starting capital.

39.6. E-Value, P-Value, and Truth Layer

The truncated reciprocal of the running maximum is an anytime-valid p-process in the stated setting. It is statistical evidence against H0, not the probability that the authorial theory is true. A threshold crossing does not replace provenance, D/Dom, support, CGI<1, an external corpus, or the publication gate.

> **Philosophical-phenomenological note.** Optional stopping tests not the patience of the investigator but the form of expectation. Rigour begins when the rule of looking through time is written before the result.

> **SEQ-E-CERT-v196i8.** filtration=explicit; E0=1; nonnegative=yes; supermartingale-under-null=yes; stake=predictable; boundary=1/alpha; optional-stopping=Ville-valid; rebuild=new-version-unless-predeclared; version-budget=sum-alpha; truth-probability=not-claimed.

Chapter 40. Aggregation of PN.2 Branches and Regret Bounds

Russian source locator: pp. 188-189

Central question	How can several registered PN.2 branches be compared without silently declaring one branch true?
Plain meaning	The system treats branches as experts, learns their predictive weights, and keeps abstention as an explicit expert.
Mathematical core	Exponential weights control cumulative regret relative to the best fixed registered branch under bounded losses.
Boundary of inference	Small regret is neither a coverage guarantee nor evidence that the highest-weight branch is ontologically true.

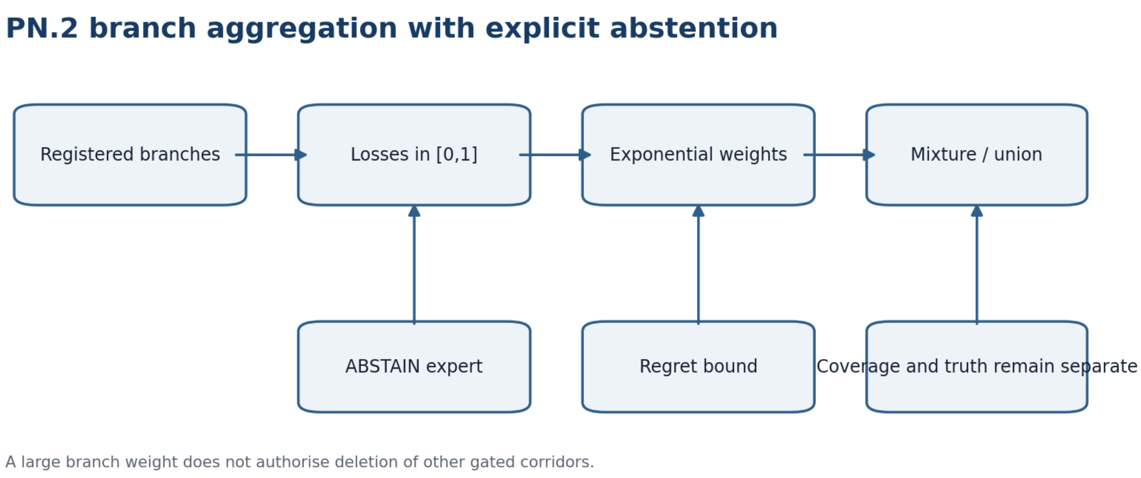


Figure 40.1. PN.2 branches are registered experts; regret, coverage, and truth remain separate channels.

40.1. Registered Experts

Let b=1,...,K be branches fixed before the data stream. Each branch outputs a forecast or ABSTAIN and incurs a bounded loss ell(t,b) in [0,1]. The KMA set {1/2,1/3,3/4,2/3,2,3} remains search metadata only: a match neither creates an expert nor closes a branch.

40.2. Exponential Weights

$$W(1,b)=1; \quad W(t+1,b)=W(t,b)\ \exp(-eta\ ell(t,b)); \quad p(t,b)=W(t,b)/sum\_j\ W(t,j)$$ *[RU p. 188]*

Theorem 40.1 - Hedge regret bound [THM]. For losses in [0,1], the expected cumulative loss L(T) of the mixture satisfies L(T)-min_b L(T,b) <= ln(K)/eta + eta T/8.

> ***Proof.*** *Let Z(t)=sum_b W(t,b). The lower bound ln Z(T+1)>=-eta min_b L(T,b) follows from retaining the best branch term. Hoeffding's lemma gives ln(Z(t+1)/Z(t))<=-eta <p(t),ell(t)>+eta^2/8. Summation and division by eta yield the claim.*

With eta=sqrt(8 ln(K)/T), the bound is of order sqrt(T ln K). Unknown T requires a registered doubling scheme or another anytime analysis.

40.3. Abstention Expert

$$ell(t,ABSTAIN)=c\_A, \quad 0<=c\_A<=1$$ *[RU p. 188]*

The price c_A is fixed before test responses. Too large a price forces false certainty; too small a price makes the system uninformative.

40.4. Prediction Set of the Mixture

$$C\_PN2(x)=union\{C\_b(x) : gate(b)=1\}$$ *[RU p. 188]*

If branches emit corridors, the safe branch-blind output remains the union of gated corridors. A large weight does not authorise deleting a corridor without a separate coverage argument. Regret concerns average mixture loss; coverage concerns future-set inclusion; the truth layer concerns evidence gates. These relations are not interchangeable.

40.5. Changing Branches

If the best branch may change over time, comparison with the best fixed branch is insufficient. A switch budget S and a tracking-regret algorithm must be preregistered. Adding a branch after inspecting errors creates a new registry version; the old Hedge guarantee applies only to the old K.

40.6. Relation to the Reper Architecture

An expert is not a naked lambda value. It is a packet containing source anchor, Reper, operator, Dom, loss, corridor, null, status, and revision. Two branches with the same lambda may remain different experts. A Block within a branch changes its output to ABSTAIN; historical weight cannot make an incomplete branch admissible.

Philosophical-phenomenological note. Multiplicity of branches is not a weakness of reason. It describes a future that has not yet become singular. The aggregator may learn among possibilities, but it must not turn a weight into an ontological verdict.

BRANCH-AGG-CERT-v196i8. branches=pre-registered; loss=[0,1]; weights=exponential; regret=ln(K)/eta+eta*T/8; abstention=explicit-expert; KMA=search-metadata-only; corridor=union-of-gated-branches; regret-not-equal-coverage; coverage-not-equal-truth; new-branch=new-version.

T1-EN-VALIDATION-v0.7

CONTROLLED ENGLISH TRANSLATION OF CHAPTERS 41-46

This checkpoint translates the independent-validation layer of the frozen Russian Volume I: frozen preregistration fields, data splitting, multiplicity control, pre-outcome domain selection, conservative power planning, group-disjoint calibration, the prediction-intervention boundary, and the executable EXT-RUN-000 protocol. The protocol is prepared but not executed.

Authority(T1-RU v197) > Authority(T1-EN v0.7);   Status_EN(x) <= Status_RU(x)

Status firewall. truth_layer_promotion=0. EMP-PLAN is not EMP-OBS. A protocol-ready EXT-RUN is not a completed external run, and PASS in one registered population would not establish a universal physical law.

v0.7 Change-Set and Parity Scope

ID	Change	Status
T1-EN-CS-048	Translated Chapters 41-46 with Russian source locators 190-203.	CLOSED-DOC
T1-EN-CS-049	Preserved Holm familywise control and the union-bound error budget.	THM-PARITY
T1-EN-CS-050	Preserved pre-outcome domain selection and the post-selection counterexample.	THM-PARITY
T1-EN-CS-051	Preserved conservative Hoeffding power planning and cluster caveats.	THM/PLAN
T1-EN-CS-052	Preserved group-level exchangeability, splitting, calibration, and null actions.	THM-PARITY
T1-EN-CS-053	Preserved prediction/intervention nonidentifiability and conditional g-formula.	THM/COND
T1-EN-CS-054	Translated EXT-RUN-000 without inventing source hashes or outcomes.	EMP-PLAN
T1-EN-CS-055	Added six explanatory diagrams and a cumulative validation ledger.	DOC-QA

Part X. Preregistration, Power, and the Causal Boundary

This part turns the requirement of independent verification into a complete study design. It specifies who selects the domain, how many independent units are required, where the cluster lies, what counts as a prediction, and which additional assumptions are required before causal language is permitted.

Chapter 41. Independent Validation and Composition of Error Budgets

Russian source locator: pp. 190-192

Central question	How can a strict forecast be tested without allowing the result to influence the formula or threshold?
Plain meaning	Train, calibration, internal test, and external test are separated; multiplicity and error budgets are

	controlled by declared rules.
Mathematical core	Holm correction controls familywise error, and the union bound composes registered probabilistic error events.
Boundary of inference	A validation protocol is EMP-PLAN. It does not report that independent validation has already occurred.

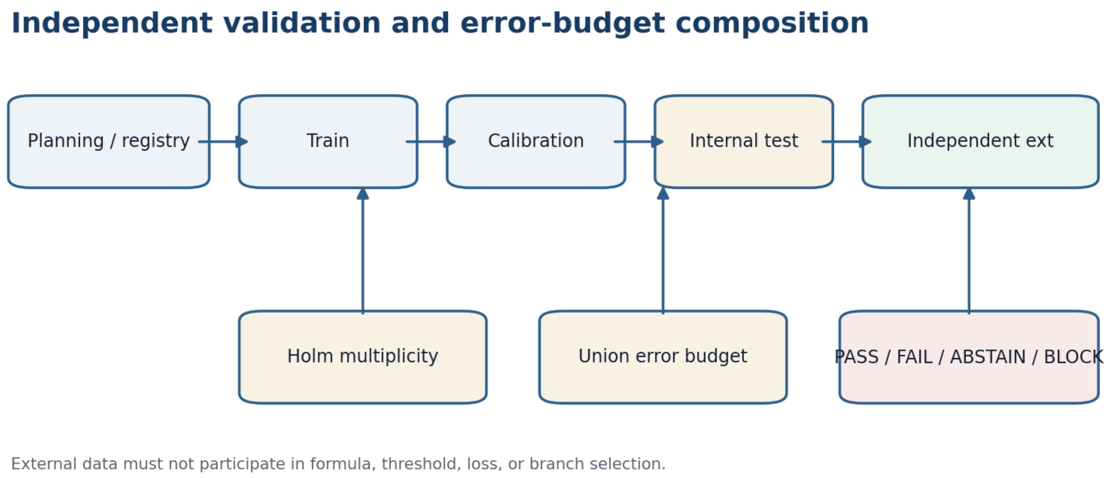


Figure 41.1. Frozen validation design, multiplicity control, and separate decision states.

41.1. Fields Frozen Before Unblinding

Block	Before unblinding	After unblinding
Objective	population, outcome, horizon	do not change
Data	source, unit, split, cluster	audit only
Method	adapter, score, loss, null	execute
Statistics	alpha, multiplicity, stopping	compute
Decision	PASS / FAIL / ABSTAIN / BLOCK	apply literally
Publication	positive and negative outcomes	publish

Freezing is evidenced by a timestamp, protocol owner, and hashes. A blank field is not completed after the result by a silent assumption.

41.2. Sample Splits

train -> model; cal -> corridor; test -> internal audit; ext -> external audit *[RU p. 190]*

An independent ext source does not guarantee statistical independence when objects are duplicated, instruments share calibration, or annotators use one hidden reference. The provenance graph must test these dependencies. Any change to features, loss, null, or threshold after test unblinding creates a new version and requires a fresh untouched test set.

41.3. Multiple Testing

$$p_{(j)} \le \alpha / (m-j+1)$$ *[RU p. 190]*

Theorem 41.1 - Holm familywise control [THM]. For valid individual p-values, the Holm step-down procedure controls the probability of at least one false rejection at level alpha without requiring independence of the p-values.

Proof. *If the first false rejection occurs and m0 null hypotheses are true, the smallest true-null p-value is at most alpha/m0. The Bonferroni inequality bounds this event by alpha.*

41.4. Evidence Levels

Level	Confirmed	Not implied
L0	scheme and formulae	executability
L1	unit/replay on synthetic data	domain validity
L2	internal test	external transportability
L3	independent ext	universality
L4	multi-domain replication	metaphysical truth

Every level inherits unresolved blockers from previous levels. Moving from L2 to L3 requires a new source, not a new interpretation of the same test.

41.5. Decisions and Statuses

PASS means the preregistered criterion was met. FAIL means a valid completed test produced a negative result. ABSTAIN means the method does not authorise a definite object-level forecast. BLOCK means a prerequisite failed or the test was not executable. FAIL is not renamed ABSTAIN, and BLOCK is not included in the denominator of successful tests.

41.6. Error-Budget Composition

P(union_j E_j) <= sum_j alpha_j *[RU p. 191]*

Theorem 41.2 - Registered union budget [THM]. If P(E_j)<=alpha_j for every registered error event and sum_j alpha_j<=alpha_total, then the probability of at least one event in the family is at most alpha_total.

Proof. *Apply subadditivity of probability to the union. Independence is not required.*

CGI, delta_truth, corridor width, and regret do not have the required probability meaning and therefore cannot be inserted into this sum. They remain separate coordinates.

41.7. Immutable Artifact-1 Card

RIUD-TETRA-RUN006-029 -> PROOF-OBJ-RUN007-0029 -> FORMAL-CARD-RUN009-006 -> SIGNATURE-REVIEW-RUN013-001 *[RU p. 191]*

lambda=-0.992736565468; delta_truth=0.007263434532; CGI=0.140948882338 *[RU p. 191]*

The v196i8 layer changes none of these fields. Independent validation must be attached as a new linked object; it does not rewrite the old card.

Philosophical-phenomenological note. Independence begins not with a new table, but with refusing to let a future result rewrite a past rule. A negative outcome then becomes a completed fact rather than a defeat.

SEQ-VALID-CERT-v196i8. splits=train/cal/test/ext; multiplicity=Holm; error-budget=union-bound; blocker-safe=yes; optional-stopping=e-process-only; Artifact-1=frozen; independent-run=required; truth_layer_promotion=0.

Chapter 42. Domain Selection Before Outcome Disclosure and Protection Against Post-Selection

Russian source locator: pp. 193-194

Central question	What happens if many domains are inspected but only the most favourable one is reported?
Plain meaning	The nominal error becomes too optimistic unless the selection was independent of the external responses or explicitly corrected.
Mathematical core	The selection rule S uses planning information I0 only; conditioning then preserves validity of the selected p-value.
Boundary of inference	Selection using test outcomes requires a fresh holdout, multiplicity correction, or a proved selective-inference route.

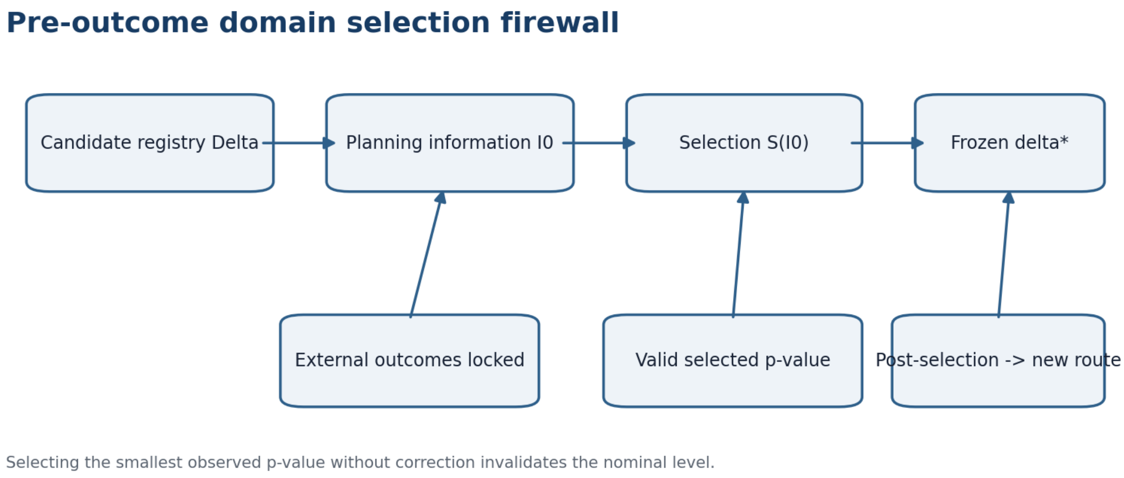


Figure 42.1. Domain selection is frozen before the key to external outcomes is released.

42.1. Candidate Space and Selection Map

$$\mathrm{Delta}=\{\mathrm{delta\_1},\ldots,\mathrm{delta\_M}\};\quad S{:}I0 \to \mathrm{Delta};\quad \mathrm{delta}^*=S(I0)$$ *[RU p. 193]*

I0 may contain source availability, ethics, units, cluster identifiers, cost, and minimum size, but not the external outcomes. D_ext is the finite data set in the selected domain; Dom(S) is the mathematical domain of the selection rule. These symbols remain distinct.

42.2. Validity of a Selected p-Value

Theorem 42.1 - Validity by conditioning [THM]. If for every fixed delta, P(p(delta)<=u | I0)<=u, and delta*=S(I0), then P(p(delta*)<=u)<=u.

> ***Proof.*** *Conditionally on I0, delta* is fixed. Apply the conditional validity inequality and then take expectation over I0.*

A domain may therefore be chosen by logistics, scientific relevance, and previously established feasibility provided those criteria do not use the external responses.

42.3. Post-Selection Counterexample

$$P(\min_{1\le m\le M} p_m \le \alpha) = 1 - (1-\alpha)^M$$ *[RU p. 193]*

For M independent uniform p-values under H0, reporting only their minimum exceeds the nominal level whenever M>1. Agreement with a theoretical expectation does not remove the selection error.

42.4. Admissible Routes After Selection

Route	Requirement
A	Select on planning/train and use a new untouched ext set.
B	Include every inspected domain in a multiplicity procedure.
C	Condition on the selection event and use a proved selective-inference method.

Repeated holdout use is valid only under a mechanism specifically designed to control adaptivity. Repeatedly looking at an ordinary holdout does not become valid merely by calling it a holdout.

42.5. Freeze Register

Field	Frozen value	Block if violated
target	outcome, horizon, population	target-changed
domain	delta* and rule S	post-selection
adapter	code and hash	adapter-drift
score/loss	formula and units	metric-shopping
null	matched transformations	invalid-null
data	source/split/cluster	leakage
decision	alpha, power, PASS/FAIL	moving-threshold

The registry is signed before the external outcome key is released. When temporal order cannot be proved, the independence status is downgraded to unclear.

42.6. Relation to PN.2

PN.2 permits ambiguity among branches within a selected domain, but does not permit choosing the domain by whichever branch happened to look best. Domain and branch registries are frozen separately. A branch discovered after ext becomes a hypothesis of the next version.

Philosophical-phenomenological note. Selection becomes knowledge only when the result cannot secretly become the cause of its own selection. Preregistration breaks this circle and restores the future's right to surprise.

SELECT-CERT-v196i9. candidate-domains=frozen; selection=S(I0); external-outcomes=unseen; selected-p=valid-by-conditioning; post-selection-routes={new-holdout,multiplicity,selective-inference}; PN2-branch-discovery=new-version; truth_layer_promotion=0-before-ext.

Chapter 43. Power, Sample Size, and the Minimum Meaningful Effect

Russian source locator: pp. 195-196

Central question	How large must an external study be to distinguish

	a useful method from its matched null?
Plain meaning	The minimum useful gain Delta_min and tolerated miss probability beta determine a conservative lower bound.
Mathematical core	Hoeffding concentration applies to independent bounded gains; fixed-horizon and sequential rules remain distinct.
Boundary of inference	The formula is conservative and does not replace a cluster-aware design or missingness analysis.

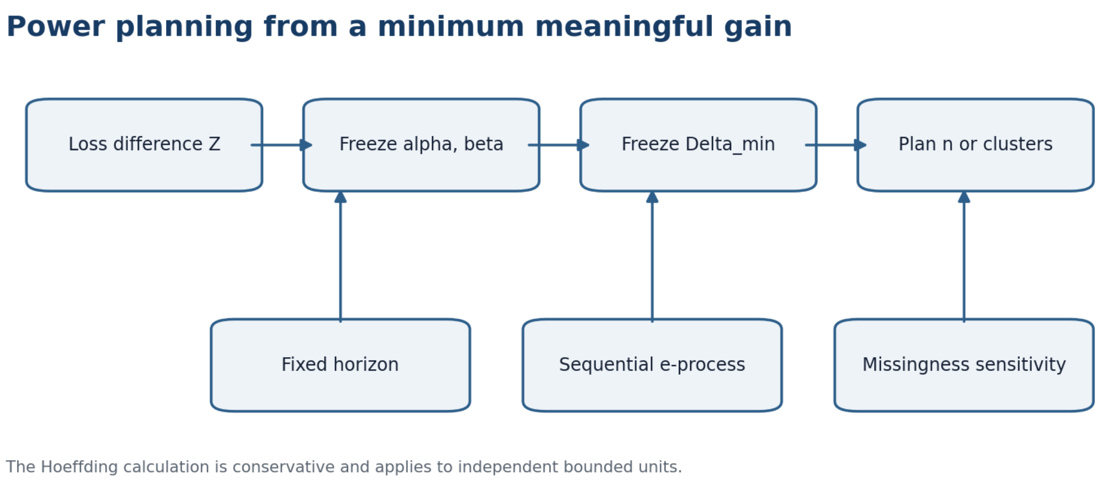


Figure 43.1. Power is planned from a domain-meaningful effect before external outcomes are observed.

43.1. Primary Gain

Z_i=L_null,i-L_KLT,i;   -1<=Z_i<=1;   mu=E[Z_i]   *[RU p. 195]*

A positive mean denotes lower loss for the method. Loss, sign direction, and normalisation are fixed before data. For unbounded loss, another proved concentration result or a preregistered truncation with bias analysis is required.

43.2. Conservative Miss Bound

P(Zbar_n<=0) <= exp(-n Delta^2/2)   *[RU p. 195]*

Theorem 43.1 - Hoeffding miss bound [THM]. For independent Z_i in [-1,1] with E[Z_i]>=Delta>0, the probability that the sample mean is nonpositive is at most exp(-n Delta^2/2).

> ***Proof.*** *Apply Hoeffding to Zbar_n-E[Zbar_n]<=-Delta. Each variable has range length 2, giving exponent -2 n^2 Delta^2/(4n).*

n_plan = ceil(2 ln(1/beta) / Delta_min^2)   *[RU p. 195]*

This is a one-sided demonstration bound for the sign of the effect. A complete test plan also fixes the false-positive level alpha.

43.3. Fixed-Horizon Interval

|Zbar-mu| <= sqrt(2 ln(2/alpha)/n)   *[RU p. 195]*

The interval is for a fixed n. Repeated inspection requires the e-process or confidence-sequence route of Chapter 39.

43.4. Minimum Meaningful Effect

Delta_min is selected for domain usefulness, not expected statistical significance. Choosing Delta_min after ext to equal the observed gain is post hoc description, not power planning.

43.5. Cluster Design Effect

DE=1+(mbar-1)rho;   N_eff approximately n/DE   *[RU p. 196]*

This is a rough planning diagnostic, not a universal theorem for unequal clusters, complex weights, or temporal dependence. In the strict analysis, the independent unit is the cluster as defined in Chapter 44.

43.6. Attrition and Missing Outcomes

The initial size is increased by a registered expected fraction of invalid or lost units. Exclusions after inspecting Z_i are prohibited. A primary missing-outcome rule and sensitivity set are frozen; if plausible mechanisms reverse the sign, the decision is ABSTAIN.

43.7. Planning Table

Parameter	Meaning	Freeze time
alpha	false-positive decision	before ext
beta	miss of Delta_min	before ext
Delta_min	minimum useful effect	before ext
n / M	units / clusters	before ext
rho, mbar	cluster diagnostic	planning
attrition	loss reserve	planning
stopping	fixed or e-process	before first outcome

Philosophical-phenomenological note. Sample size measures how much resistance from the world a design is prepared to accept before deciding. A study that is too small neither confirms nor refutes; it gives the phenomenon insufficient opportunity to distinguish itself.

POWER-CERT-v196i9. gain=bounded[-1,1]; units=independent-or-clustered-explicitly; alpha=frozen; beta=frozen; delta_min=domain-meaningful; n_plan=ceil(2*ln(1/beta)/delta_min^2); fixed-horizon=Hoeffding; sequential=e-process; design-effect=diagnostic-only; missingness=sensitivity-audited.

Chapter 44. Cluster Dependence and Group Predictive Calibration

Russian source locator: pp. 197-198

Central question	Are one hundred rows from one patient, instrument, or document one hundred independent confirmations?
Plain meaning	No. Rows sharing a common origin form one group-level observational unit.
Mathematical core	Exchangeability and splitting are formulated for whole groups; within-group dependence may be arbitrary.
Boundary of inference	A group guarantee does not transfer to a new cluster type or epoch without a new bridge or calibration.

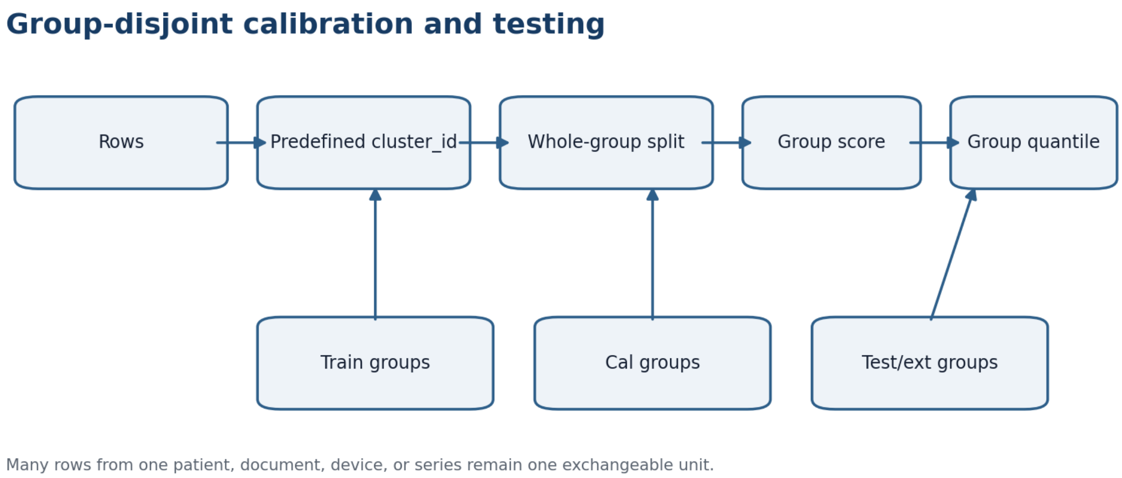


Figure 44.1. Whole groups, not individual rows, are assigned to train, calibration, test, and external sets.

44.1. Groups as Observational Units

D=G_1 disjoint_union ... disjoint_union G_M; exchangeability unit = group *[RU p. 197]*

The cluster identifier is defined by the domain: patient, family, instrument, laboratory, document, author, site, time block, or experimental series. Choosing a convenient cluster identifier after the result is forbidden.

44.2. Group Score

S_g = max{s_i : i in G_g} *[RU p. 197]*

The maximum is a conservative registered functional. It supports simultaneous group coverage but may produce wide corridors for large groups. Other group functionals are allowed only when preregistered.

44.3. Group Calibration Theorem

k=ceil((M+1)(1-alpha)); q=S_(k) *[RU p. 197]*

Theorem 44.1 - Marginal group calibration [THM]. If S_1,...,S_M and the new-group score S_(M+1) are exchangeable, the rule accepting the new group when S_(M+1)<=q has marginal group acceptance probability at least 1-alpha.

> ***Proof.*** *The rank of the new score among M+1 exchangeable scores is uniform with conservative tie handling; the chosen rank threshold leaves at most alpha mass in the upper tail.*

The number of calibration units is M, not the total row count. Reports therefore disclose both counts and the distribution of group sizes.

44.4. Leakage-Free Splitting

Every row of one cluster_id belongs to exactly one of train, cal, test, or ext. Dividing one patient between train and test is leakage even with different time stamps unless the temporal forecasting task was separately registered. Leave-one-group-out and group cross-fitting require that the model for group g is trained without any row from G_g.

44.5. Matched Null at Group Level

g.D=(g.G_1,...,g.G_M); internal structure of each G_g is preserved *[RU p. 198]*

A randomisation null must preserve within-group dependence. Permuting individual rows between groups generally destroys the registered data-generating structure and is not an admissible transformation.

44.6. Unequal Sizes and New Group Types

When group size changes the score distribution, size is included in a preregistered stratum or weighting model. A new laboratory, instrument version, or epoch can break exchangeability and triggers target calibration, a justified weighted bridge, or ABSTAIN.

44.7. Example

Forty documents with one hundred fragments each do not provide n=4000 independent test units. A row split leaks near-duplicates, whereas a document split provides M=40 and tests transfer to a new document. In medicine the analogous unit is a patient; in physics it may be an independent experimental series when repeats share one drifting instrument.

Philosophical-phenomenological note. Repetition within one history deepens its description, but does not create many independent worlds. Group analysis recognises unity of origin before counting rows.

GROUP-CAL-CERT-v196i9. cluster-id=predefined; exchangeability=between-groups; within-group-dependence=arbitrary; score=registered-group-functional; quantile=ceil((M+1)(1-alpha)); split=group-disjoint; matched-null=whole-group; reported-n={rows,groups}; new-cluster-type=recalibrate-or-ABSTAIN.

Chapter 45. Prediction, Intervention, and the Limit of Causal Inference

Russian source locator: pp. 199-200

Central question	Does accurate prediction of Y from X determine what happens when X is forcibly changed?
Plain meaning	No. Observational association and intervention are distinct queries.
Mathematical core	The chapter proves nonidentifiability by observational equivalence and states a conditional g-formula under explicit assumptions.
Boundary of inference	Authorial language of foundation and consequence may guide modelling but does not identify a causal effect without a bridge.

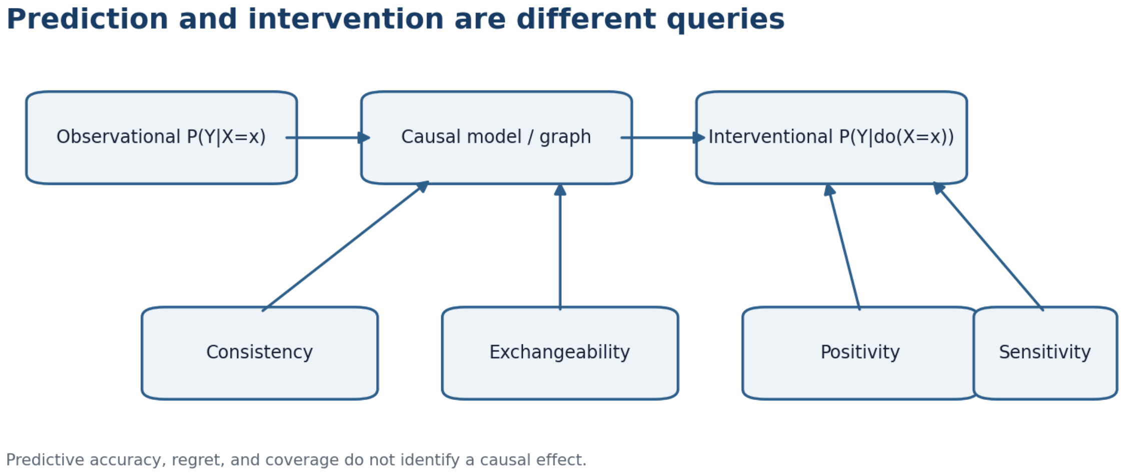


Figure 45.1. A causal answer requires a model and identification assumptions beyond predictive performance.

45.1. Two Different Questions

prediction: P(Y|X=x);   intervention: P(Y|do(X=x))   *[RU p. 199]*

The two distributions coincide only under additional assumptions. High accuracy, low regret, and valid prediction-set coverage do not create those assumptions.

45.2. Nonidentifiability Counterexample

Model A: U~Bernoulli(1/2), X=U, Y=X. Model B: U~Bernoulli(1/2), X=U, Y=U. Both produce P(X=Y)=1 observationally. Under do(X=x), Model A gives Y=x; Model B leaves Y=U, so Y remains Bernoulli(1/2).

Theorem 45.1 - Observational nonidentifiability [THM]. The intervention effect X->Y is not identifiable from the observational distribution alone in any model class containing Models A and B.

Proof. *The models induce the same observational law of (X,Y) but different interventional laws. Any functional of the observational law must have the same value in both and therefore cannot equal both causal answers.*

45.3. Identification Bridge

consistency;   Y(x) independent_of X | L;   P(X=x|L=l)>0   *[RU p. 199]*

P(Y(x)=y)=sum_l P(Y=y|X=x,L=l) P(L=l)   *[RU p. 199]*

Conditional proposition 45.2 - g-formula [COND]. Under consistency, conditional exchangeability, positivity, and a correctly specified target population, the intervention distribution is given by the displayed g-formula.

Proof. *Expand over L by total probability, use exchangeability to replace the potential-outcome distribution by the observed conditional distribution among X=x, and use consistency to identify Y(x) with Y for units receiving x.*

45.4. Positivity as a Dom Gate

If intervention x never occurs for a relevant l, the observed evidence D does not cover that part of the causal functional's Dom. Model extrapolation may be a useful hypothesis, but it is not a nonparametrically identified effect and must carry model-dependent status.

45.5. Foundation-Consequence and Cause-Action

The project notes distinguish reversible cause/action pairs from ambiguous foundation/consequence relations. This remains a philosophical-model heuristic for choosing graphs and branches. A statistical causal certificate is added only after specifying an intervention, potential outcomes or structural equations, covariates L, and identification assumptions.

45.6. Causal Transportability

Even an identified source-population effect does not automatically transport. The analysis must describe mechanism differences, selection nodes, effect modifiers, and target support. Weighted conformal calibration concerns predictive coverage and does not replace a causal transport formula.

45.7. Causal Bridge Card

Field	Mandatory content	Status if absent
estimand	effect and population	undefined
intervention	meaning of do(X=x)	ambiguous
graph/model	nodes and arrows	unidentified
confounders L	inclusion rule	exchangeability-block
positivity	support audit	support-gap
consistency	intervention versions	version-conflict
sensitivity	unmeasured confounding	conditional-only

Philosophical-phenomenological note. Prediction follows a phenomenon along its trace; causal inference asks what changes because of our action. Between trace and action lies not a word, but a bridge of assumptions.

CAUSAL-BRIDGE-CERT-v196i9. prediction-not-equal-intervention; observational-equivalence-counterexample=proved; estimand=required; consistency=required; exchangeability=required; positivity=required; g-formula=conditional; D/Dom=distinct; project-causal-language=model-hypothesis-until-bridged.

Chapter 46. Executable External Validation Protocol for Volume I

Russian source locator: pp. 201-203

Central question	Can the preceding mathematical conditions be executed on a new independent corpus without analytical discretion?
Plain meaning	The protocol card freezes every operational choice and returns one of four distinct decisions.
Mathematical core	Selection, power, clustering, null, coverage, stopping, multiplicity, provenance, and publication are composed in one blocker-safe route.
Boundary of inference	In this edition the card is protocol-ready-not-executed. No external source hash or outcome is invented.

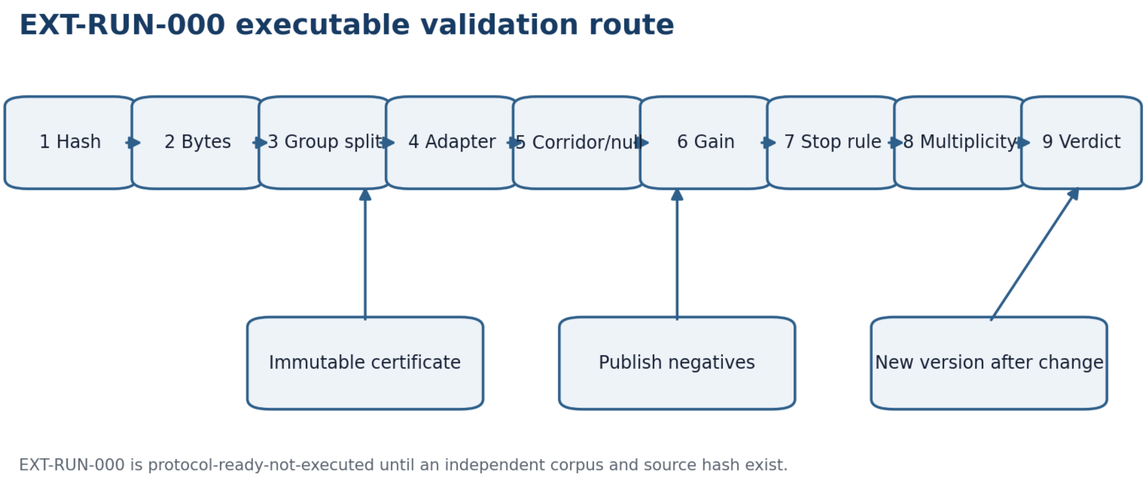


Figure 46.1. Nine-step EXT-RUN-000 route from frozen hashes to an immutable verdict certificate.

46.1. EXT-RUN-000 Object

EXT-RUN-000: protocol-ready-not-executed *[RU p. 201]*

This status is not FAIL because the test has not begun, and it is not PASS because no external unit has been evaluated. truth_layer_promotion remains zero.

46.2. Complete Registration Card

Section	Mandatory fields
Identity	project, run_id, owner, timestamp, version
Objective	domain, population, outcome, horizon, estimand-status
Data	unit, cluster, source, inclusion, hashes, privacy
Split	train, cal, test, ext, provenance-disjointness
Method	adapter, config, schema, code, environment, seed
Forecast	score, corridor, PN.2 branches, abstention
Comparison	loss, matched-null, gain, primary statistic
Errors	alpha, beta, delta_min, multiplicity, stopping
Decision	PASS, FAIL, ABSTAIN, BLOCK, publication rule

No field is left to analytical discretion after unblinding. Uncertainty is represented as a finite list of options with a planning-only selection rule.

46.3. Execution Algorithm

Step	Operation
1	Verify timestamp and frozen hashes.
2	Obtain external bytes and compute source_hash.
3	Apply inclusion and group split without viewing outcomes.
4	Run the adapter in blocker-safe mode.
5	Construct the registered corridor and matched null.
6	Compute group scores and primary gain.

Step	Operation
7	Apply the fixed-horizon or e-process rule.
8	Apply multiplicity control.
9	Issue the decision and immutable certificate.

If any mandatory step returns Block, downstream numerical outputs are not computed or are marked diagnostic-only.

46.4. Decision Rule

Decision in {PASS, FAIL, ABSTAIN, BLOCK} *[RU p. 202]*

PASS requires: no Block; independent domain selection; registered n or e-threshold reached; primary null rejected after multiplicity; gain in the required direction; coverage and support gates passed; and CGI<1. FAIL is a valid completed test whose primary criterion is not met. ABSTAIN is an object-level forecast decision counted in loss. BLOCK is a design violation.

Conclusion boundary. PASS supports the registered operational hypothesis only for the declared population and horizon. It is not a universal physical theorem of PN.2 and does not prove metaphysical truth.

46.5. Negative Results and Versioning

FAIL and BLOCK are published with the same provenance trace as PASS. Excluding a run after observing its result is forbidden. Any modification after FAIL creates EXT-RUN-001 or a later version with a new protocol and a new ext corpus; EXT-RUN-000 remains historical.

46.6. Causal Branch

By default EXT-RUN-000 is predictive. A causal claim additionally requires every CAUSAL-BRIDGE-CERT field: estimand, intervention, graph, L, positivity, consistency, and sensitivity. Missing causal fields do not block an honest predictive test, but they block causal language.

46.7. Artifact-1 Link

external_validation_id -> new linked object; existing lambda, delta_truth, CGI, status, and next-step remain unchanged *[RU p. 202]*

46.8. Final Status Ledger

Object	Status	Established	Next input
Blocker-safe E2E	formalized	absorption of Block	domain run
Weighted calibration	conditional theorem	coverage under bridge	target weights
E-process	conditional theorem	anytime level	null stream
PN.2 aggregation	regret theorem	Hedge bound	registered experts
Domain selection	proved	validity under I0	frozen S
Power	conservative plan	Hoeffding bound	Delta_min, clusters
Group calibration	proved	group-level rank	exchangeable groups
Causal bridge	conditional	g-formula assumptions	graph and L
EXT-RUN-000	protocol-ready-not-executed	complete card	independent corpus
Artifact-1	frozen	signature-ready-not-truth-layer	publication-gate review

Philosophical-phenomenological note. A completed protocol is readiness to meet a result that need not agree with the theory. The possibility of an honest FAIL is what gives a future PASS content.

EXT-VALID-CERT-v196i9. selection=pre-outcome; power=alpha-beta-delta_min-frozen; clusters=group-level; prediction-not-causation; causal-bridge=conditional; EXT-RUN-000=protocol-ready-not-executed; negative-results=publish; Artifact-1=frozen; CGI<1=necessary-not-sufficient; KMA=metadata-only; truth_layer_promotion=0; next=obtain-independent-corpus-and-freeze-source-hash.

46.9. Completion Boundary

The validation layer distinguishes selection before and after outcomes, fixed and sequential horizons, rows and independent groups, prediction and intervention, negative results and protocol violations. The next scientific input is a genuinely independent corpus. Until it exists, the external certificate remains prepared but unexecuted.

T1-EN-CLOSURE-v0.8

CONTROLLED ENGLISH TRANSLATION OF CHAPTERS 47-52

This checkpoint closes the chapter layer of the frozen Russian Volume I. It translates the mathematical deepening from the typed evidence object to the main conditional forecast theorem and the internal Delta-Theta obstruction complex. Appendices A-G remain the subject of v0.9.

Derivative contract. Authority(T1-RU v197) > Authority(T1-EN). Formula IDs, theorem status, domain restrictions, counterexamples, and negative results are preserved. Formula IDs F055-F073 belong to Appendix C and remain reserved until T1-EN-APP-v0.9.

Controlled Change Set

ID	Change	Status
T1-EN-CS-056	Translated typed Obs, Evidence, Reper, PackCert, and blocker-safe composition.	THM-PARITY
T1-EN-CS-057	Translated PGL2-invariant cross-ratio, harmonic conjugate, set-valued forecast, and stability.	THM-PARITY
T1-EN-CS-058	Translated five-limit lattice, time-information gate, and conditional PN.2 minimax bound.	THM/COND
T1-EN-CS-059	Translated extended mismatch metric and stable set-valued rebuilding.	THM/COND
T1-EN-CS-060	Translated typed RBD graph, substochastic kernel, contraction, and interval envelope.	THM-PARITY
T1-EN-CS-061	Translated the main conditional theorem with A1-A14, B1-B8, and no-promotion firewall.	COND-PARITY
T1-EN-CS-062	Translated the minimal obstruction complex and the conditional external E-bridge.	THM/OPEN
T1-EN-CS-063	Added seven explanatory diagrams and cumulative closure registers.	DOC-QA

Part XI. Typed Closure of the Predictive Method

The final six chapters convert the preceding logic, validation, and database layers into a single typed mathematical architecture. The endpoint is not an unconditional prediction oracle. It is a partial, set-valued, proof-carrying method that returns ABSTAIN or BLOCK whenever an obligatory bridge is missing.

Chapter 47. Typed Space of Packets and Repers

Russian source locator: pp. 205-206

Central question	What is the smallest object that may enter a certified forecast?
Plain meaning	An observation becomes evidence only after type, source, units, domain, provenance, hash, adapter, loss, null, and gate are attached.

Mathematical core	PackCert morphisms preserve type, provenance, domain admissibility, and status monotonicity.
Boundary of inference	Internal NAPG products may be nonassociative; the traceable computational composition remains associative.

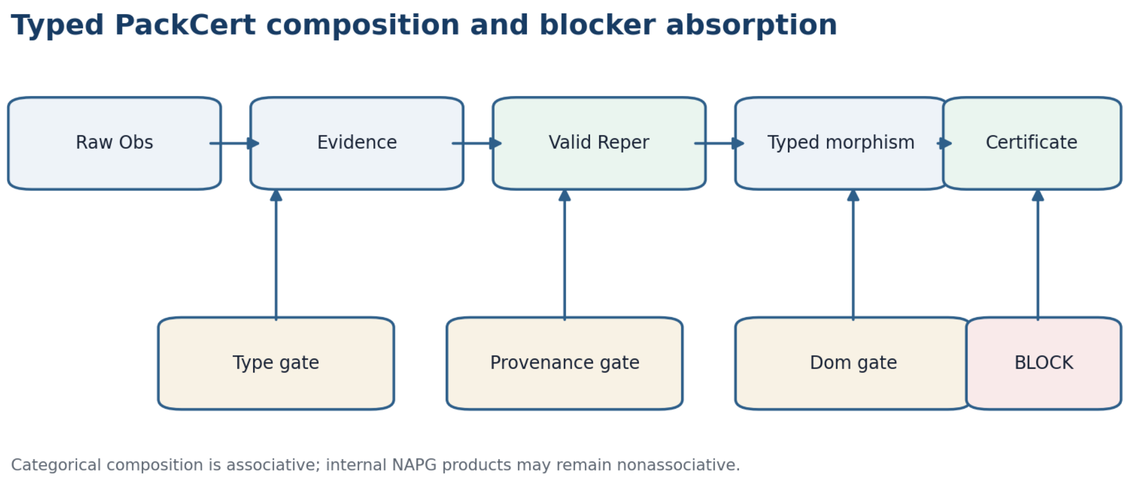


Figure 47.1. Typed composition and the absorbing BLOCK state.

47.1. Event and Evidence Carriers

F001 Obs := (event,state,time,source,unit,cluster,Dom,status) *[RU p. 205]*

F002 Evidence := Obs x {provenance,hash,adapter,loss,null,gate} *[RU p. 205]*

F003 D subset Obs; Dom(T) subset X; D != Dom(T) *[RU p. 205]*

D denotes actually presented data and foundations; Dom denotes the mathematical domain of an operator. Lexical similarity never authorizes their identification.

47.2. Reper as a Typed Quadruple

F004 Rep_i = (R_i,I_i,U_i;D_i) *[RU p. 205]*

F005 ValidRep(Rep) iff typed and distinct-denominators and provenance and Dom-gate *[RU p. 205]*

If U=D0 or I=R in the chosen affine chart, the cross-ratio is not evaluated. The status is Block(denominator-zero), unless a declared projective chart explicitly represents the point at infinity.

47.3. Category PackCert

F006 f:P->Q; type(Q)=f_t(type(P)); prov(Q) contains f_p(prov(P)) *[RU p. 205]*

F007 status(P)=Block => status(f(P))=Block *[RU p. 205]*

Theorem 47.1 - Soundness of typed composition [THM]. If f:P->Q and g:Q->R are admissible PackCert morphisms, then g o f:P->R is admissible and cannot raise status without a new certificate.

> ***Proof.*** *The output type of f matches the input type of g. Provenance is transported through both arrows. BLOCK absorption is transitive. Every nonblocked transition still presents its own gate certificate; therefore composition is closed and status-monotone.*

47.4. Categorical Composition versus NAPG

F008 A(R1,R2,R3) := (R1 star R2) star R3 - R1 star (R2 star R3) *[RU p. 206]*

F009 A != 0 => bracket in metadata and branch-id in certificate *[RU p. 206]*

The internal products R star R, odot, and Hodge-star describe packet geometry and may be nonassociative. They do not replace categorical composition of traceable transformations. Bracketing is data.

Theorem 47.2 - No false completion [THM]. For every finite PackCert chain whose arrows absorb BLOCK, the presence of BLOCK at any intermediate stage excludes a final PASS.

Proof. *Induct on chain length. The one-arrow case is the absorption rule. If the first k arrows end in BLOCK, the next arrow preserves BLOCK; hence PASS is impossible after any finite number of arrows.*

Philosophical-phenomenological note. A type is not clerical decoration. It preserves distinctions without which an object ceases to be that object. BLOCK records the place where the world has not granted permission to continue.

PACK-TYPE-CERT v196i14. D-not-equal-Dom; Rep=(R,I,U,D0); category=PackCert; morphisms=typed-provenance-preserving; Block=absorbing; NAPG products remain separate; bracket=explicit; status-inflation=forbidden.

Chapter 48. Projective-Harmonic Forecast Operator

Russian source locator: pp. 207-208

Central question	How can a forecast be formulated when absolute scale is unreliable but four-point relations are stable?
Plain meaning	The cross-ratio supplies a projective invariant; the harmonic value lambda=-1 is a strict internal consistency gate.
Mathematical core	The forecast is a union of registered admissible branches, with separate ABSTAIN and BLOCK outcomes.
Boundary of inference	Projective invariance does not repair a wrong adapter, missing provenance, or an absent fourth point D0.

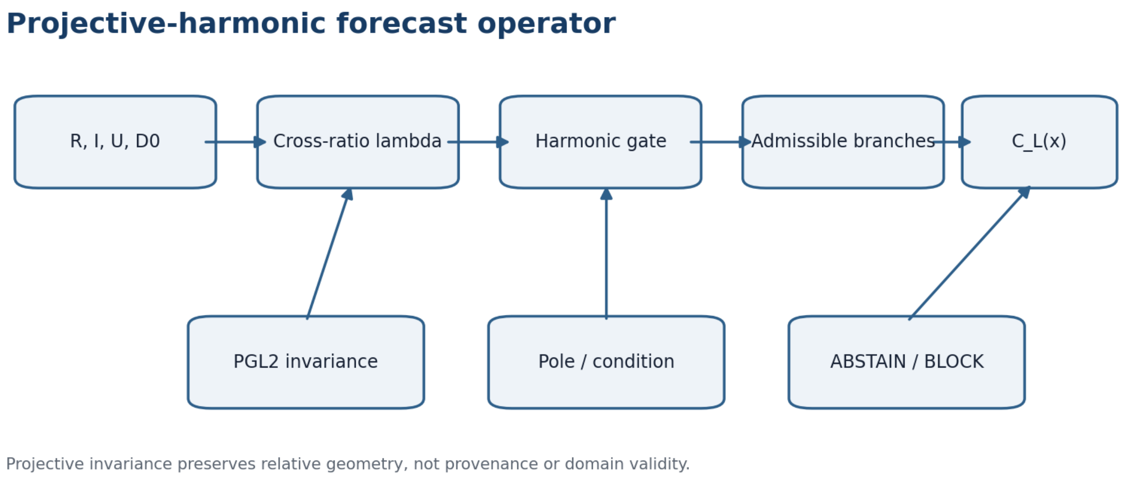


Figure 48.1. Projective invariant, harmonic gate, admissible branches, and conclusion states.

48.1. One-Dimensional Projective Model

F010 lambda(R,I;U,D0)=((U-R)(I-D0))/((U-D0)(I-R)) *[RU p. 207]*

F011 delta_truth(Rep)=|lambda(Rep)+1| *[RU p. 207]*

F012 lambda(R,I;U,D0)=([U,R][I,D0])/([U,D0][I,R]) *[RU p. 207]*

48.2. Projective Invariance

Theorem 48.1 - PGL2(K) invariance [THM]. For every projective transformation g represented by a nonsingular matrix G, lambda(gR,gI;gU,gD0)=lambda(R,I;U,D0) whenever both sides are defined.

> ***Proof.*** *For homogeneous vectors, [Gx,Gy]=det(G)[x,y]. Two determinant factors occur in both numerator and denominator and cancel. Rescaling any point representative also cancels pairwise.*

F013 lambda o g = lambda; g in PGL_2(K) *[RU p. 207]*

48.3. Harmonic Conjugate

F014 D_h = [U(I+R)-2RI]/[2U-R-I] *[RU p. 207]*

The affine formula applies when 2U-R-I is nonzero. A zero denominator means that the harmonic conjugate is the point at infinity of the chosen chart; the correct action is to change charts, not to invent a finite value.

F015 lambda(0,1;3,3/2)=-1 *[RU p. 207]*

48.4. Set-Valued Forecast

F016 C_L(x)=union {Psi_r(x): r in A_L(D), gate(r,x)=1} *[RU p. 207]*

F017 C_L(x)=empty => ABSTAIN; Block nonempty => BLOCK *[RU p. 207]*

ABSTAIN means valid branches produced no admissible answer for the object and is included in predictive loss. BLOCK means an obligatory evidence condition failed and stops the run.

Theorem 48.2 - Equivariance of the forecast set [THM]. If adapter, gate, and Psi are equivariant under one g in PGL2(K), then C_L(gx)=g(C_L(x)).

> ***Proof.*** *Cross-ratio invariance preserves harmonic admissibility, gate equivariance preserves the admitted branch set, and Psi_gr(gx)=g Psi_r(x). The image of a union is the union of images.*

F018 C_L(gx)=g(C_L(x)) *[RU p. 208]*

48.5. Perturbation Stability

F019 |Delta lambda| <= K_epsilon (||Delta R||+||Delta I||+||Delta U||+||Delta D0||) *[RU p. 208]*

On compact sets separated from both poles by epsilon, lambda is smooth and locally Lipschitz. Near a pole K_epsilon increases; a small harmonic defect with enormous sensitivity is not stable evidence.

> **Philosophical-phenomenological note.** A projective invariant preserves relation, not the history by which points received their names. Harmony is a checkable four-position agreement, not a promise of truth.

> **PROJ-HARM-CERT v196i14.** field-characteristic-not-2; cross-ratio=homogeneous; PGL2-invariance=proved; harmonic-conjugate=conditional-on-denominators; forecast=set-valued; empty=ABSTAIN; gate-violation=BLOCK; sensitivity=reported; truth_layer_promotion=0.

Chapter 49. Five Limits as an Admissibility Lattice

Russian source locator: pp. 209-210

Central question	What does a limit mean in the predictive method?
Plain meaning	It is a gate that excludes inadmissible Repers and actions, not a scalar objective that must be maximized.
Mathematical core	Political, ecological, spatial, temporal, and ontological predicates form an ordered vector of restrictions.
Boundary of inference	Tightening a component may only shrink the admissible set; an unregistered post-hoc relaxation is not allowed.

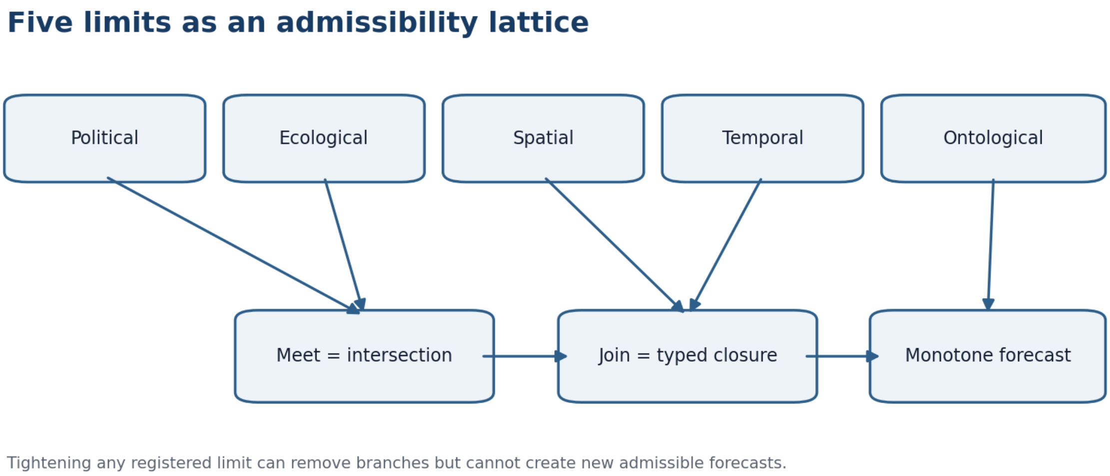


Figure 49.1. Five registered limits, meet, join, and monotone forecast sets.

49.1. Limit Vector and Strictness Order

F020 L=(L_pol,L_eco,L_space,L_time,L_onto) *[RU p. 209]*

F021 gate_L(r)=meet_{j=1}^5 l_j(r); l_j in {0,1,Block} *[RU p. 209]*

F022 L' >= L iff A_L'(D) subset A_L(D) *[RU p. 209]*

Theorem 49.1 - Monotonicity [THM]. If L-prime is no weaker than L, then A_Lprime(D) is a subset of A_L(D), and C_Lprime(x) is a subset of C_L(x).

Proof. *The first inclusion defines the order. The union defining the forecast under L-prime ranges over a subset of the branches available under L and cannot add elements.*

F023 L' >= L => A_L' subset A_L and C_L' subset C_L *[RU p. 209]*

49.2. Meet and Join

F024 A_(L meet M)=A_L intersection A_M *[RU p. 209]*

F025 A_(L join M)=closure(A_L union A_M) *[RU p. 209]*

Proposition 49.2 - Lattice laws [THM]. For a fixed universe of typed Repers and a type-preserving closure operator, meet and join are idempotent and commutative and satisfy absorption.

Proof. *The result follows from intersection and closed union. A join used for publication must be preregistered; otherwise it becomes a post-hoc escape route.*

49.3. Temporal Horizon and Information

F026 Forecast_t(h) is measurable with respect to F_t *[RU p. 209]*

F027 feature-time(x_k)<=t; outcome-time=t+h *[RU p. 209]*

Horizon is stored with its unit and synchronization rule. A conversion between time scales is a separate morphism with uncertainty. Features appearing after t are unavailable even when they occur in the same table.

49.4. PN.2 as a Limit on One Estimator

F028 inf_T sup_(theta in Theta) E_theta[L(T(X),theta)] >= c_PN2 > 0 *[RU p. 210]*

The constant depends on the model class, loss, and degree of observational indistinguishability. It is not a universal physical constant.

Theorem 49.3 - Two-point lower bound [THM]. Let theta0 and theta1 require distinct actions, let TV(P0,P1)<=tau<1, and let every wrong action cost at least c. Then every estimator T satisfies max(R0(T),R1(T)) >= c(1-TV(P0,P1))/2.

Proof. *The sum of the two testing error probabilities is at least 1-TV(P0,P1). One error is at least half that sum; multiplying by the minimum error cost yields the bound.*

F029 max(R0(T),R1(T)) >= c(1-TV(P0,P1))/2 *[RU p. 210]*

49.5. Five-Limit Certificate

Limit	Checked field	Missing-field status
L_pol	authority and publication regime	Block-authority
L_eco	impact budget and units	Block-impact
L_space	population, support, transport	ABSTAIN / Block-support
L_time	timestamp, horizon, leakage	Block-time
L_onto	types, estimand, D/Dom	Block-type

Philosophical-phenomenological note. A limit does not merely prohibit. It outlines the space in which action has a meaning. A forecast without limits appears free precisely because it does not know to which world it belongs.

FIVE-LIMIT-CERT v196i14. limits={political,ecological,spatial,temporal,ontological}; order=strictness; meet=intersection; join=typed-closure; monotonicity=proved; PN2=minimax-conditional; universal-physical-status=not-claimed.

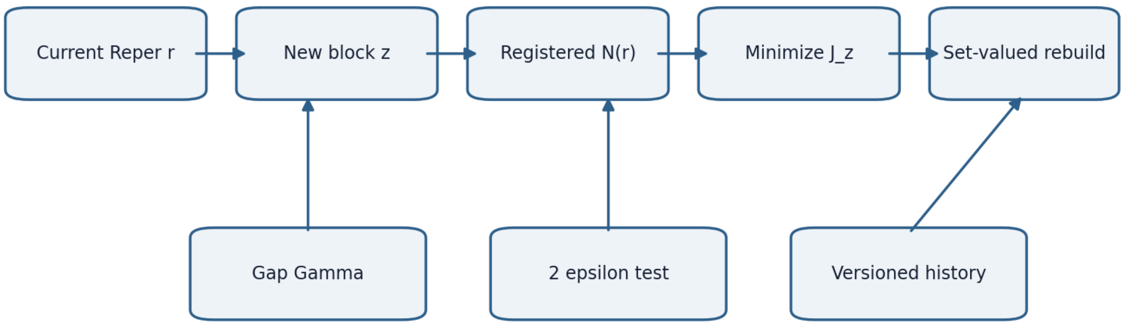
Chapter 50. Mismatch Metric and Stable Rebuilding

Russian source locator: pp. 211-212

Central question	How does the method react when the current Reper no longer fits new data?
Plain meaning	It selects a registered nearest admissible replacement under an extended metric, loss, harmonic defect, and edit-complexity penalty.
Mathematical core	Compactness and lower semicontinuity provide existence; a positive gap provides uniqueness and perturbation stability.
Boundary of inference	A post-hoc convenient structure is not a rebuild.

Candidate sets, penalties, and tie rules are frozen in advance.

Mismatch metric and stable rebuilding



A rebuild is a new proof object; it never erases the parent, bracket, batch boundary, or hash.

Figure 50.1. Registered neighbors, minimization, stability gap, and versioned history.

50.1. Mismatch Types

Code	Meaning	Required action
M-type	incompatible types	BLOCK
M-dom	outside Dom/support	ABSTAIN or BLOCK
M-harm	increased delta_truth	diagnostic / rebuild
M-loss	worse than matched null	FAIL / rebuild-version
M-prov	broken provenance or hash	BLOCK
M-shift	population or epoch change	recalibrate

50.2. Extended Reper Metric

F030 d_R(r,s)=w_phi||phi(r)-phi(s)||+w_lambda|lambda_r-lambda_s|+w_D d_D(D_r,D_s) +P(r,s) *[RU p. 211]*

F031 P(r,s)=infinity if type/provenance/bracket incompatible *[RU p. 211]*

Infinity is implemented by excluding a candidate before optimization, not by inserting an arbitrary large number whose scale could change the answer.

50.3. Nearest Rebuilding Operator

F032 J_z(s|r)=d_R(r,s)+alpha Loss_z(s)+beta delta_truth(s)+gamma Complexity(s<-r) *[RU p. 211]*

F033 R_z(r)=argmin_{s in N(r) intersection A_L(D union z)} J_z(s|r) *[RU p. 211]*

Theorem 50.1 - Existence [THM]. If N(r) intersection A_L is nonempty and compact and J_z is lower semicontinuous, then R_z(r) is nonempty.

Proof. *A lower semicontinuous function attains its minimum on a nonempty compact set. The minimizer set is closed and therefore compact.*

50.4. Uniqueness and Stability Gap

F034 Gamma=J_z(s2|r)-J_z(s*|r) *[RU p. 211]*

F035 Gamma>0 => R_z(r)={s*} *[RU p. 211]*

Theorem 50.2 - Stability of a finite choice [THM]. Suppose |J_zprime(s|r)-J_z(s|r)| <=epsilon for every candidate and Gamma>2epsilon. Then s* remains the unique minimizer after replacing z by z-prime.

> ***Proof.*** *The best value may increase by at most epsilon and every competitor may decrease by at most epsilon. The surviving advantage is at least Gamma-2epsilon>0.*

F036 Gamma>2epsilon => argmin J_z' = argmin J_z *[RU p. 212]*

50.5. Nonassociative Revision History

F037 R_z2(R_z1(r)) != R_(z1 union z2)(r) in general *[RU p. 212]*

Sequential and batch rebuilding are distinct protocols. Every chain stores parent_id, bracket, batch boundary, hash, and deterministic tie rule. Merging chains creates a new proof object and never overwrites history.

50.6. Matched-Null Rebuilding

F038 Gain_rebuild=L(matched-null search)-L(KLT rebuild) *[RU p. 212]*

The matched null receives the same candidate set, search budget, and planning information. Comparing a rich search with a fixed random point exaggerates gain.

Philosophical-phenomenological note. Rebuilding is not erasure of the past. It becomes rational only when it preserves the trace of the failed form and states the rule that produced the new one.

REBUILD-STABILITY-CERT v196i14. mismatch=typed; distance=extended-metric; candidates=registered; argmin=set-valued; existence=compact-lsc; uniqueness=positive-gap; stability=gap-over-2epsilon; revision=versioned; matched-null=equal-search-budget.

Chapter 51. RBD as an Operator of Propagation and Contraction

Russian source locator: pp. 213-214

Central question	When can a Reper database participate in a mathematical forecast rather than remain a catalogue?
Plain meaning	Its nodes, edge types, weights, limits, provenance, damping, and stopping rule are typed explicitly.
Mathematical core	A substochastic kernel with alpha<1 gives a contraction and a unique fixed evidence vector.
Boundary of inference	The fixed vector is not a probability of truth, and the edge count does not imply that every edge has been externally validated.

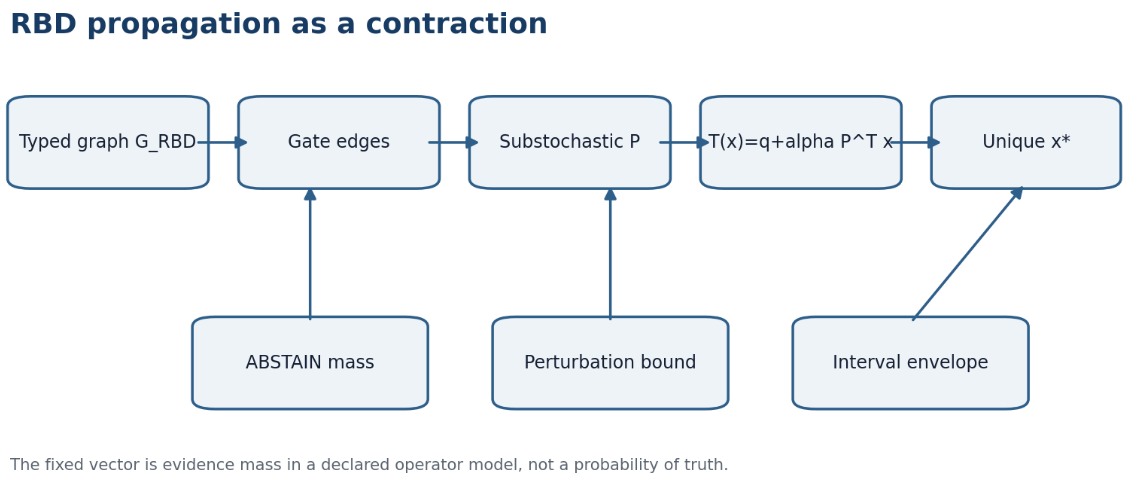


Figure 51.1. Typed graph filtering, abstention mass, contraction, and uncertainty envelope.

51.1. Audited Atlas v2.1 Counts

F039 |S|=236; |W|=1145; |V_R|=2212; |E_R|=2478 *[RU p. 213]*

These are counts of the attached Atlas v2.1 file, not universal sizes of the project. Every usable edge carries edge_type, source_id, work_id, confidence, limit tags, time span, and provenance.

51.2. Typed Graph and Substochastic Kernel

F040 G_RBD=(V,E,tau_V,tau_E,prov,w,L) *[RU p. 213]*

F041 P_ij=w_ij/max(1,sum_k w_ik); sum_j P_ij<=1 *[RU p. 213]*

F042 P_(i,ABSTAIN)=1-sum_j P_ij *[RU p. 213]*

Mass removed by gates is not silently redistributed. It enters an explicit abstention state. Separate adjacency matrices are constructed for each allowed route of node and edge types.

51.3. Propagation Operator

F043 T(x)=q+alpha P^T x; 0<=alpha<1 *[RU p. 213]*

Theorem 51.1 - Contraction [THM]. In the l1 norm, T is a contraction with coefficient at most alpha.

Proof. *For a row-substochastic P, the induced l1 norm of P^T is at most one. Hence ||T(x)-T(y)||_1 = alpha||P^T(x-y)||_1 <= alpha||x-y||_1.*

F044 ||T(x)-T(y)||_1 <= alpha||x-y||_1 *[RU p. 213]*

Corollary 51.1 - Unique fixed vector [THM]. Banach fixed-point theory gives a unique x*, and x^(k+1)=T(x^k) converges geometrically.

Proof. *The affine contraction has a unique fixed point and the standard contraction estimate gives the rate.*

F045 x*=(I-alpha P^T)^(-1)q *[RU p. 213]*

F046 ||x^(k)-x*||_1 <= alpha^k ||x^(0)-x*||_1 *[RU p. 213]*

51.4. Graph Perturbation

F047 ||x*-x'*||_1 <= [||q-q'||_1+alpha||(P-P')^T x'*||_1]/(1-alpha) *[RU p. 213]*

As alpha approaches one, the denominator becomes small and the fixed vector becomes sensitive to edge provenance. Alpha is selected before evaluation, and a sensitivity report is mandatory.

51.5. Interval Evidence Mass

F048 T_minus(x)<=T(x)<=T_plus(x) *[RU p. 214]*

F049 x_minus*<=x*<=x_plus* *[RU p. 214]*

The width x_plus*-x_minus* is epistemic uncertainty of the graph. It is reported separately from the predictive corridor for future Y.

51.6. Executability Boundary

The theorems apply to the declared typed kernel. They do not establish that all 2478 edges passed domain validation or that an external forecast was performed. Execution still requires a frozen adapter, target population, outcome, horizon, and independent ext corpus.

Philosophical-phenomenological note. A memory graph can amplify evidence and can also amplify a provenance error. Contraction makes propagation mathematically stable; validation of edges makes it historically meaningful.

RBD-CONTRACTION-CERT v196i14. atlas-counts={236,1145,2212,2478}; graph=typed; kernel=substochastic; abstention-mass=explicit; alpha<1; contraction=proved; fixed-point=unique; perturbation=bounded; external-run=not-executed.

Chapter 52. Main Conditional Theorem of the Predictive Method

Russian source locator: pp. 215-222

Central question	What exactly does the final theorem promise?
Plain meaning	It combines typed composition, projective invariance, monotone limits, stable rebuilding, RBD contraction, calibration, sequential testing, and multiplicity control.
Mathematical core	Every conclusion is conditional on explicit assumptions A1-A14 and bridge hypotheses B1-B8.
Boundary of inference	It does not promise an error-free future, a universal physical PN.2, or automatic promotion to a truth layer.

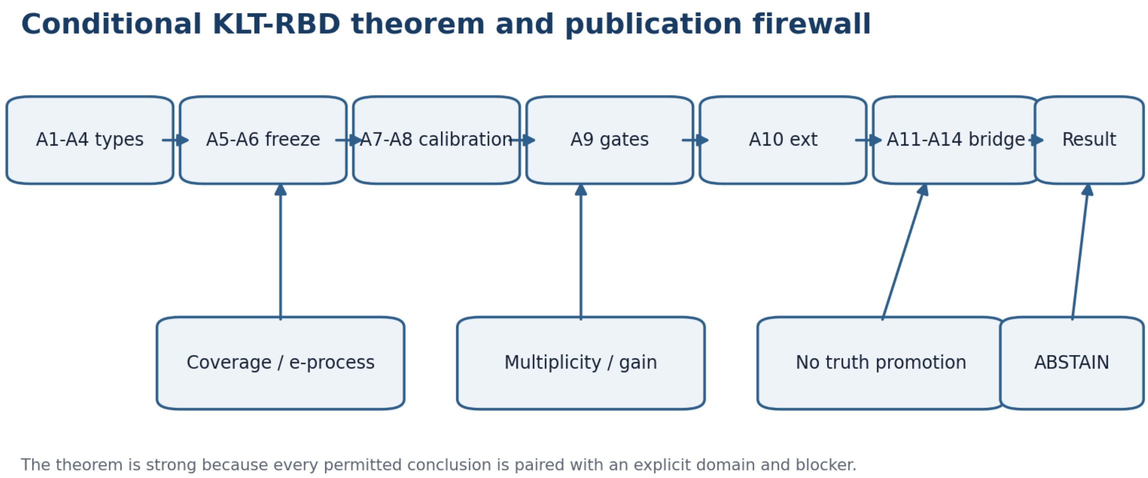


Figure 52.1. Assumptions, statistical guarantees, and the publication firewall of the main theorem.

52.1. Assumptions A1-A10

Code	Assumption	Violation
A1	Obs/Evidence/Reper types agree	Block-type
A2	D and Dom separated; support checked	Block-domain
A3	provenance and hashes complete	Block-provenance
A4	five limits registered	Block-limit
A5	PN.2 branches and brackets fixed before outcome	post-selection
A6	adapter, loss, and matched null frozen	invalid-comparison
A7	calibration assumptions justified	coverage-not-claimed
A8	cluster and time leakage excluded	Block-leakage
A9	CGI<1 and blocker-safe gates passed	no-promotion
A10	ext is independent and full decision is published	protocol-ready-only

Theorem 52.1 - Conditional soundness of KLT-RBD [THM]. Assume A1-A10. Let the projective-harmonic adapter construct C_L(x); let calibration provide marginal coverage at least 1-alpha_cov on the registered target population; let sequential decisions use a valid e-process with budget alpha_seq; let multiplicity have budget alpha_mult; and let the matched null receive the same search budget. Then: every intermediate BLOCK excludes PASS; noncoverage is at most alpha_cov within the calibration theorem domain; false sequential boundary crossing is at most alpha_seq; familywise error is at most alpha_mult; reported gain refers only to the declared loss, population, and horizon; and no truth-layer promotion follows automatically.

Proof. *Compose Theorems 47.2, 48.1-48.2, 49.1, the registered calibration theorem, Ville inequality, and the registered multiplicity procedure. Equal search budgets make the risk difference operationally interpretable. None of these results identifies a frequency guarantee with truth of the theory.*

F050 P{Y_new notin C_L(X_new)} <= alpha_cov   *[RU p. 215]*

F051 P0{sup_t E_t >= 1/alpha_seq} <= alpha_seq   *[RU p. 215]*

F052 FWER <= alpha_mult   *[RU p. 215]*

F053 Risk_KLT <= Risk_matched-null - Delta_min   *[RU p. 215]*

52.2. Composition of Budgets

F054 P(E_cov union E_seq union E_mult) <= alpha_cov+alpha_seq+alpha_mult *[RU p. 216]*

The sum is a safe union bound, not an exact total error. A sharper composition requires a proved dependence structure. All budgets are frozen before ext.

52.3. Status of the Closure Results

Statement	Status	Additional requirement
PGL2 invariance of lambda	proved	valid points and chart
monotonicity of five limits	proved	registered predicates
existence of rebuild	conditional theorem	compact/lsc or finite set
RBD contraction	proved for alpha<1	validated typed kernel
forecast coverage	conditional	exchangeability or weighted bridge
gain over null	not externally executed	independent ext corpus
universal physical PN.2	not claimed	domain-specific bridges
truth-layer promotion	0	certificate lock and publication gate

52.4. Immutable Artifact-1 Card

RIUD-TETRA-RUN006-029 -> PROOF-OBJ-RUN007-0029 -> FORMAL-CARD-RUN009-006 -> SIGNATURE-REVIEW-RUN013-001 *[RU p. 216]*

lambda=-0.992736565468; delta_truth=0.007263434532; CGI=0.140948882338 *[RU p. 216]*

status=signature-ready-not-truth-layer; next=certificate-lock/publication-gate review. The closure theorems do not rewrite any field of this card.

52.5. Typed Category of Quadratic NAPG Frames

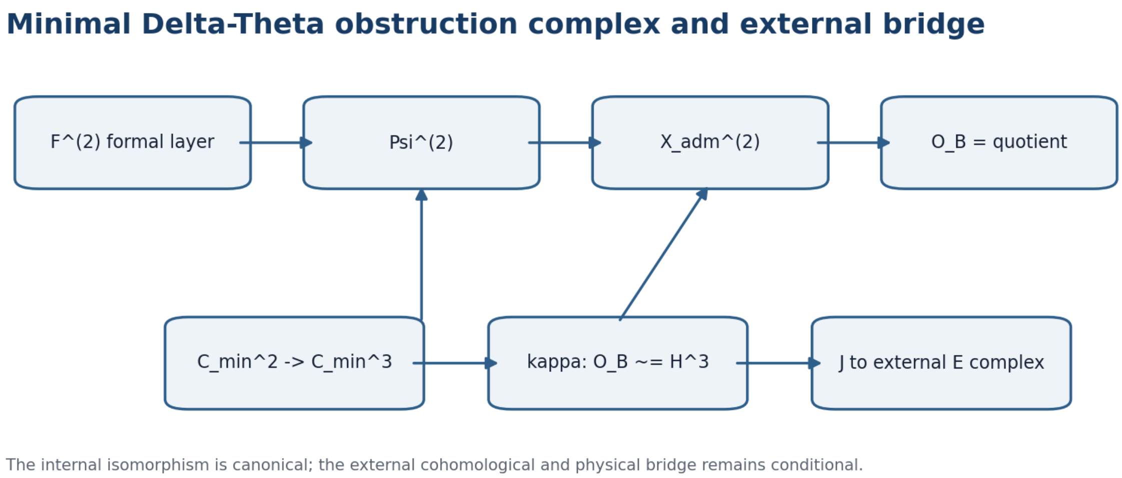


Figure 52.2. Minimal obstruction complex, canonical internal class, and conditional external bridge.

A quadratic NAPG frame is N=(K,A_bullet,odot,G,R;F_N^(2),X_N^(2),Psi_N^(2)). Here F^(2) is the formal admissible degree-at-most-two layer, X^(2) is the tested quadratic layer, and Psi^(2) is the linear evaluation map.

F074 X_N^(2)=Span_K{R odot R, R odot S + S odot R : R,S,R+S in R} *[RU p. 216]*

F075 O_B(N):=X_N^(2)/Im Psi_N^(2); Pi_N:X_N^(2)->O_B(N) *[RU p. 216]*

X^(2) is quadratic. It does not automatically contain the trilinear associator. Connecting the associator requires a separate typed encoding map.

F076 phi_X o Psi_N^(2) = Psi_N'^(2) o phi_F *[RU p. 216]*

52.6. Minimal Universal Cochain Complex

F077 C_min^n(N)=F_N^(2) for n=2; X_N^(2) for n=3; 0 otherwise *[RU p. 216]*

F078 delta_min^2(N):=Psi_N^(2); delta_min^n(N):=0 for n!=2 *[RU p. 216]*

F079 Theta_min,N = id_(X_N^(2)) *[RU p. 217]*

Lemma 52.1 - Existence of the complex [THM]. For every N in NAPG_q, (C_min(N),delta_min(N)) is a cochain complex.

> ***Proof.*** *The only potentially nonzero consecutive composition is delta_min^3 o delta_min^2. Since C_min^4=0 and delta_min^3=0, the composition vanishes. Every other composition contains a zero arrow.*

Theorem 52.2 - Canonical realization of the quadratic obstruction [THM]. For every N in NAPG_q, kappa_N:O_B(N)->H^3(C_min(N)), kappa_N([x])=[x], is a canonical linear isomorphism.

> ***Proof.*** *Because delta_min^3=0, Ker delta_min^3=X_N^(2). Since Im delta_min^2=Im Psi_N^(2), the two quotient spaces are identical by definition.*

F080 H^3(C_min(N))=X_N^(2)/Im Psi_N^(2)=O_B(N) *[RU p. 217]*

> **Scope of Theorem 52.2.** This theorem solves the internal existence problem for C, delta, and Theta. It does not identify this H^3 with Hochschild, Chevalley-Eilenberg, de Rham, Quillen, analytic, topological, or physical cohomology.

52.7. Functoriality and Natural Invariance

Lemma 52.3 - Cochain transport [THM]. Every NAPG_q morphism f:N->N-prime defines a cochain map C_min(f), equal to phi_F in degree 2 and phi_X in degree 3.

> ***Proof.*** *The only nontrivial cochain condition is Psi_Nprime^(2) o phi_F = phi_X o Psi_N^(2), which is exactly F076.*

Theorem 52.4 - Naturality of kappa [THM]. The family kappa_N is a natural isomorphism O_B => H^3 o C_min.

> ***Proof.*** *For [x], both routes through the naturality square yield [phi_X(x)]. If f is an isomorphism, the obstruction class is preserved under canonical transport.*

F081 H^3(C_min(f)) o kappa_N = kappa_Nprime o phi_O *[RU p. 217]*

52.8. External E-Layer and Chain Bridge

An external E-layer is a functor E_bullet:NAPG_q->CoCh_K. A bridge J:C_min=>E is a natural cochain map. Its degree-2 and degree-3 components must satisfy the complete domain and chain conditions below.

F082 d_E^2 o J_N^2 = J_N^3 o Psi_N^(2); d_E^3 o J_N^3 = 0 *[RU p. 218]*

F083 E^3(f)oJ_N^3=J_Nprime^3 o phi_X; E^2(f)oJ_N^2=J_Nprime^2 o phi_F *[RU p. 218]*

Lemma 52.5 - Criterion for an external bridge [THM]. For fixed complexes E(N), maps J_N^2 and J_N^3 extend to a cochain map C_min(N)->E(N) exactly when F082 holds. The family is natural exactly when F083 also holds on the selected subcategory.

> ***Proof.*** *C_min is nonzero only in degrees 2 and 3, so these equalities exhaust the cochain and naturality conditions.*

52.9. Bridge Hypotheses B1-B8

Code	Bridge hypothesis
B1	N belongs to NAPG_q and F^(2), X^(2), Psi^(2) are complete linear data.
B2	E is a genuine cochain complex: d_E^(n+1)d_E^n=0.
B3	J^2 and J^3 are defined on the complete domains.
B4	The chain equalities F082 hold.
B5	Naturality F083 holds for the claimed invariance.
B6	H^3(J_N) is injective for reverse detection.
B7	A separate natural beta_Ass map encodes associator tests.
B8	Topological, analytic, and physical meanings are separately defined and are not consequences of B1-B7.

Theorem 52.6 - Conditional natural external bridge [THM]. Under B1-B5, Pi_E,N:=H^3(J_N)o kappa_N is a well-defined natural linear map O_B(N)->H^3(E(N)). A nonzero external image implies a nonzero internal obstruction. The converse requires B6; complete preservation requires H^3(J_N) to be an isomorphism.

> ***Proof.*** *A cochain map induces a map in cohomology. Naturality follows by composing the naturality of kappa and H^3(J). Every map sends zero to zero, which proves one-way detection; reverse detection is precisely injectivity.*

F084 Pi_E,N([x])=[J_N^3(x)]=[Theta_E,N(x)] *[RU p. 219]*

F085 H^3(E(f)) o Pi_E,N = Pi_E,Nprime o phi_O *[RU p. 219]*

52.10. Separate Associator Channel

Let T_Ass(N) be the linear span of admissible triples and A_N[x,y,z]=Ass_odot(x,y,z). A class in H^3(E) is typed only after a natural map beta_E,N:T_Ass(N)->Z^3(E(N)) has been defined and proved compatible with the actual associator.

F086 [Ass]_E := [beta_E,N(x,y,z)] in H^3(E(N)) *[RU p. 219]*

The formula additionally requires d_E^3 beta_E=0, independence of representation, naturality, and a proof that beta_E encodes the given associator rather than an arbitrary assigned cycle.

52.11. Counterexamples and Firewalls

Counterexample	Failure demonstrated
52.1	Arrows C2->C3->C4 with delta3 delta2 !=0 do not define cohomology.
52.2	A map not sending Im Psi into boundaries does not descend to O_B.
52.3	A zero external bridge may erase a nonzero internal obstruction; reverse detection needs injectivity.
52.4	Pointwise equal-looking maps need not be natural under isomorphism.
52.5	Quadratic obstruction and associator defect are independent before beta_Ass is supplied.
52.6	The tautological minimal complex creates no topology, metric, dynamics, field, curvature, or experiment.

52.12. Additional Assumptions A11-A14

Code	Additional assumption	Without it
A11	state whether the complex is C_min or external E	only internal O_B is allowed
A12	verify F082 and all map domains for E	Pi_E is undefined
A13	verify naturality F083	certificate depends on representation
A14	prove B6 and/or B7 for reverse detection or associator claims	only one-way detection; associator claim prohibited

With A1-A14 and B1-B5, the internal class is invariant under NAPG_q isomorphisms; a nonzero external class certifies a nonzero quadratic obstruction; a zero external class does not exclude obstruction without B6; and neither kappa nor Pi_E promotes a truth layer or creates a physical conclusion.

52.13. Delta-Theta Proof-Obligation Register

ID	Obligation	Status	Boundary
DT-01	type F^(2), X^(2), Psi^(2), O_B	closed for NAPG_q	not untyped models
DT-02	concrete C and delta for every frame	closed internally	minimal two-stage complex
DT-03	concrete Theta on all X^(2)	closed internally	Theta_min is not external realization
DT-04	identify O_B with H^3	closed	tautological by construction
DT-05	functoriality and invariance	closed in NAPG_q	requires F076
DT-06	existence of external E complex	conditional / model-open	not canonical
DT-07	chain bridge J	conditional theorem	requires F082
DT-08	naturality of external certificate	conditional theorem	requires F083
DT-09	reverse detection from H^3(E)	model-open	requires injective H^3(J)
DT-10	associator class in H^3	open	requires beta_Ass or beta_E
DT-11	analytic continuity and closure	open for infinite-dimensional classes	needs Banach/Hilbert bridge
DT-12	physical or empirical interpretation	not claimed	B8 and independent protocol

52.14. Exact Replacement of Status 26.36

NAPG-DTHETA-CERT v196i14. For NAPG_q, C_min, delta_min, and Theta_min are constructed functorially and O_B ~= H^3(C_min) is proved. External E, natural J, injectivity of H^3(J), and beta_Ass remain conditional or open. Analytic, topological, physical, PN.2, and F-1-F-14 statuses are unchanged; truth_layer_promotion=0.

The internal result is not a logical trick: it removes ambiguity in domains, codomains, and functorial transport and exhibits the object that always exists. Its strength is limited because the minimal complex encodes exactly the quotient already selected as O_B. It is a universal comparison object and an interface specification, not a substitute for a richer external theory.

Philosophical-phenomenological note. The predictive theorem is strong not because it promises the future, but because it lists the conditions of its own limitation. Strict typing blocks the recurrent temptation to turn every nonzero H^3 into curvature of the universe.

MASTER-PRED-CERT v196i14. assumptions=A1-A14; bridge=B1-B8 typed; invariance=projective; limits=monotone; rebuild=stable-under-gap; RBD=contraction-alpha<1; coverage=conditional; e-process=conditional; matched-null=equal-budget; CGI<1=necessary-not-sufficient; EXT-RUN=not-executed; truth_layer_promotion=0.

T1-EN-APP-v0.9

CONTROLLED ENGLISH TRANSLATION OF APPENDICES A-G

Russian source locators: Appendix A pp. 151-156; Appendix B pp. 156-159; Appendices C-G pp. 223-235. The appendices are translated as evidence-bearing structures. They do not revise the chapter layer or create new mathematical or physical claims.

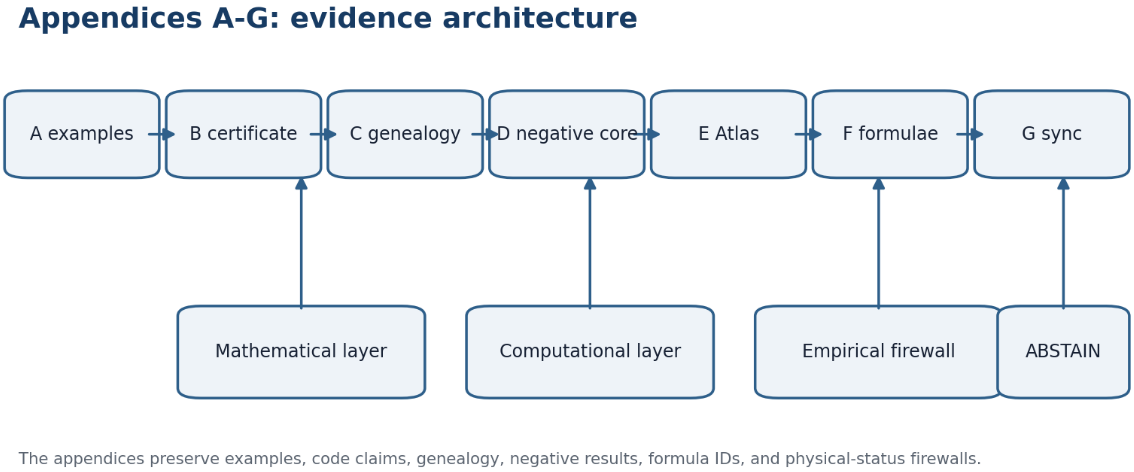


Figure A0.1. Appendices A-G connect exact examples, computational provenance, formula addressing, and empirical status firewalls.

Appendix	Function	Evidence boundary
A	Four exact PN.2 examples and counterexamples	abstract auxiliary algebras only
B	Source-documented computable certificate	NUM-SOURCE, not independent replay
C	Genealogy of the canonical construction	historical formulas do not auto-authorize truth
D	Negative PN.2 statements and repairs	underdefinition is repaired by typed inputs
E	Executable ten-stage Atlas protocol	protocol order and blockers are immutable
F	Stable registry F001-F086	IDs are never renumbered after publication
G	PN.2 / F-1-F-14 synchronization	physical claims remain unvalidated

Appendix A. Explicit Examples and Counterexamples for PO-11

Central question	Why are explicit examples required?
Plain meaning	They test necessity of the assumptions, separate a scalar observable from the full state, and show when the factor 1/4 is sharp.
Mathematical core	All four constructions are exact finite-dimensional calculations with declared products, norms, triples, associators, structural coordinate, observables, and errors.
Boundary of inference	They do not identify the auxiliary algebra with the authorial physical object R-star-R and do not promote any F-hypothesis.

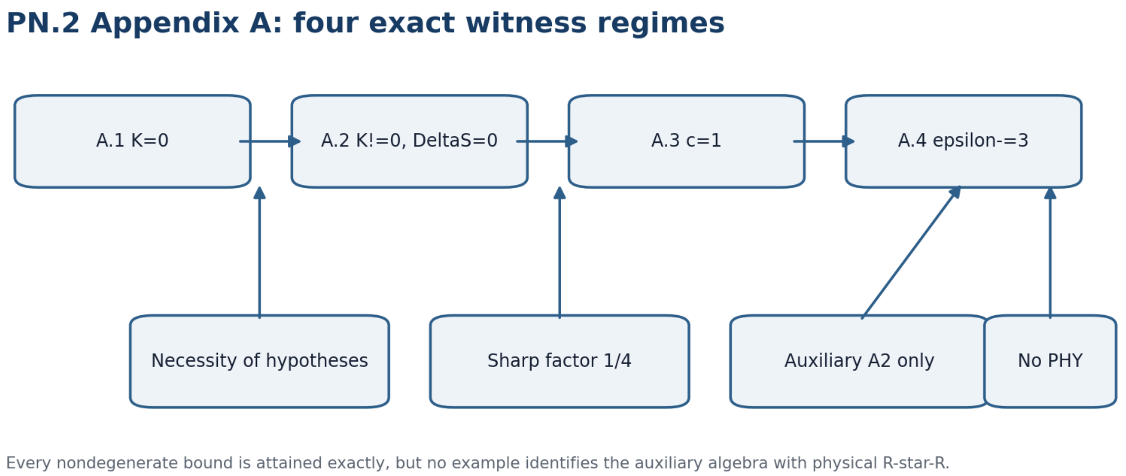


Figure A.1. Four witness regimes close PO-11 at the abstract theorem-package level.

A.0. Common Conventions and Auxiliary Algebra

Let B={b_L,b_R}, where b_L(x,y,z)=(x odot y) odot z and b_R(x,y,z)=x odot (y odot z). The signed protocol coordinate is Dfrak(b_L)=-1/2 and Dfrak(b_R)=+1/2. Hence Delta_D=1, the midpoint estimate is d_hat=0, and e_D=1/2. Relabeling the two bracketings changes the sign of Dfrak but preserves every PN.2 bound.

Dfrak(b_L)=-1/2; Dfrak(b_R)=+1/2; Delta_D=1; e_D(d_hat=0)=1/2 *[RU p. 151]*

Cases A.2-A.4 use the nonunital real algebra A2=R^2 with basis e1=(1,0), e2=(0,1):

e1 odot e1=e2; e2 odot e1=e2; e1 odot e2=-e2; e2 odot e2=0 *[RU p. 151]*

(alpha,beta) odot (gamma,delta)=(0, alpha gamma + beta gamma - alpha delta) *[RU p. 151]*

||(alpha,beta)||=2 sqrt(alpha^2+beta^2) *[RU p. 151]*

The operation is bilinear, closed, continuous, and submultiplicative for the declared norm. Finite dimensionality supplies completeness. A unit is not required for the abstract assumption A1; standard unitalization is possible without changing associator calculations on A2.

A.1. Associative Zero Example

Take A=R with ordinary multiplication, u=(1,2,3), and S(t)=|t|. Then r_L=r_R=6, K=0, Delta_R=0, Delta_S=0. With s_hat=6, d_hat=0, r_hat=6, one has e_S=0, e_D=1/2, e_R=0 and both PN.2 products equal zero.

e_S e_D=0=(1/4) Delta_S Delta_D;   e_R e_D=0=(1/4)||K|| Delta_D *[RU pp. 151-152]*

Status: strict counterexample to every unconditional positive lower bound on a domain containing an associative point. It does not refute the minimax theorem because both right-hand sides vanish.

A.2. Nonassociative Example with Delta_S=0

For u=(e1,e1,e1), r_L=e2, r_R=-e2, K=2e2 and ||K||=4. Choose the natural but nonseparating scalar observable S(v)=||v||. Then S(r_L)=S(r_R)=2 and Delta_S=0 despite K nonzero.

e_S e_D=0=(1/4)Delta_S Delta_D;   e_R e_D=2*(1/2)=1=(1/4)*4*1 *[RU pp. 152-153]*

Status: exact counterexample to replacing the full-state gap ||K|| by the difference of output norms. PN.2-R remains sharp.

A.3. Global c-Separation with c=1

Define S(alpha e1+beta e2)=2 beta. Every bracketed result lies on R e2, so for K=k e2 one has Delta_S=|S(K)|=2|k|=||K||. Thus S is globally c-separating on A2^3 with the exact constant c=1.

For u=(e1,2e1,3e1), r_L=6e2, r_R=-6e2, K=12e2, ||K||=Delta_S=24. Midpoint estimates give e_S=e_R=12 and e_D=1/2.

e_S e_D=6=(c/4)||K||Delta_D;   e_R e_D=6=(1/4)||K||Delta_D   *[RU pp. 153-154]*

Status: proves exact global separation for this observable and auxiliary algebra and shows that the coefficient 1/4 cannot be improved in general.

A.4. Exact Positive epsilon-minus on a Compact Domain

Omega={a,p,r in [1,2]; b,q,s in [-1/4,1/4]} subset A2^3   *[RU p. 154]*

K(x,y,z)=(0, 2apr+bpr-aps)=(0,p[(2a+b)r-as])   *[RU p. 154]*

The parameter q cancels identically. On Omega, g=a(2r-s)+br is minimized at a=1, b=-1/4, r=1, s=1/4, where g=3/2. Since p>=1, inf ||K||=2*(3/2)=3. For m=1 this gives the exact epsilon_minus=3.

epsilon_minus=inf_(u in Omega)||K(u)||/m(u)=3;   c=1;   kappa_Omega=3/4   *[RU pp. 154-155]*

The witness u_star=(e1-(1/4)e2,e1,e1+(1/4)e2) attains equality: r_L=(3/4)e2, r_R=-(3/4)e2, K=(3/2)e2, ||K||=Delta_S=3, and e_S=e_R=3/2.

e_S e_D=e_R e_D=3/4=(epsilon_minus Delta_D/4)m(u_star)   *[RU pp. 155-156]*

A.5. PO-11 Closure and Status Boundary

Case	Associator / observable	Exact result	Status
A.1	K=0; Delta_S=0	both bounds 0=0	associative counterexample
A.2	K!=0; norm observable	Delta_S=0; PN.2-R 1=1	scalar nonseparation
A.3	linear S_sep	c=1; both bounds 6=6	sharp global separation
A.4	compact Omega	epsilon_minus=3; both bounds 3/4=3/4	uniform exact domain

PO-11 STATUS. CLOSED-ABSTRACT for the canonical PN.2 theorem package. The appendix proves necessity and sharpness inside the declared auxiliary models. PO-1-PO-10 for physical R-star-R, physical meanings of Dfrak and S, hbar calibration, PN.1, and F-1-F-14 remain open.

Appendix B. Computable Certificate for PO-12

B.0. Purpose and Status Boundary

The Russian source records the reproducible certificate PN2-PO12-A2-v1.0 for A2 and the four Appendix A cases. This English derivative translates the certificate record. It does not assert a new independent replay of the archive.

B.1. Identifier, Environment, and Files

Field	Recorded value
Identifier	PN2-PO12-A2-v1.0
Archive	pn2_po12_cert_v1.0.zip
Environment	Python 3.10 or newer; standard library only

Field	Recorded value
Core	pn2_cert.py
Tests	test_pn2_cert.py
Machine specification	manifest.json
Results	results.json and values.tsv
Deterministic builder	build_bundle.py
Instructions	README_RU.md
Digests	SHA256SUMS.txt

B.2. Structural Constants and Associator Tensor

C[2,1,1]=1; C[2,2,1]=1; C[2,1,2]=-1; all other C[k,i,j]=0 *[RU p. 156]*

A[m,i,j,k]=sum_l(C[l,i,j]C[m,l,k]-C[l,j,k]C[m,i,l]) *[RU p. 156]*

The only nonzero associator components are A[2,1,1,1]=2, A[2,2,1,1]=1, and A[2,1,1,2]=-1. Therefore the implementation obtains K(x,y,z)=(0,2apr+bpr-aps) exactly.

B.3. Exact Norm Handling, Dfrak, Observables, and Errors

The certificate stores the exact squared norm 4(alpha^2+beta^2). On the multiplication and associator image R e2, it uses ||(0,beta)||=2|beta|, avoiding irrational rounding in all certified equalities. The fixed coordinate gives Delta_D=1 and e_D=1/2. S_norm is used for A.2 and S_sep(alpha,beta)=2 beta for A.3-A.4.

B.4. Expected / Obtained Matrix

Case	Expected and source-recorded obtained values	Verdict
A.1	r_L=r_R=6; K=0; ||K|| =Delta_S=e_S=e_R=0; e_D=1/2; bounds 0=0	PASS
A.2	r_L=(0,1); r_R=(0,-1); K=(0,2); ||K||=4; Delta_S=e_S=0; e_R=2; PN.2-R 1=1	PASS
A.3	r_L=(0,6); r_R=(0,-6); K=(0,12); ||K|| =Delta_S=24; c=1; e_S=e_R=12; bounds 6=6	PASS
A.4	r_L=(0,3/4); r_R=(0,-3/4); K=(0,3/2); ||K||=Delta_S=epsilon-=3; kappa=3/4; bounds 3/4=3/4	PASS

B.5. Certification of c=1 and epsilon-minus=3

Because K always lies in R e2, Delta_S=|S_sep(K)|=||K|| identically. Hence c=1 on A2^3 and is sharp on any domain containing a nonzero K witness. For Omega, the exact interval proof gives ||K||>=3, while u_star attains 3. The certificate also checks 729 rational grid points and includes an outside-domain point with p=1/2 yielding ||K||=3/2, confirming domain dependence.

B.6. Source-Recorded Commands

python3 pn2_cert.py --report *[source command]*

python3 -m unittest -v test_pn2_cert.py *[source command]*

python3 build_bundle.py *[source command]*

sha256sum -c SHA256SUMS.txt *[source command]*

Expected source-reported outcome: PASS; Ran 11 tests; OK; every values.tsv row has PASS.

B.7. SHA-256 Ledger

Object	SHA-256
pn2_po12_cert_v1.0.zip	bbcb2715a3e5ab7688dfe1ad317a68f23b163ae109159822161 11142ce7da2ad
README_RU.md	4e08346221388e5b70ae64a649ca1146653e6b9df8f608d80a4f 4e22a6c0df62
build_bundle.py	e75160342cc59a1207fcb62a356c72b455a1c91d4e553564c5a 3edde2f8c52cb
manifest.json	87c39b11cfb6bbc27659e20e84c914b60851cb4caa481d30566 95dca7dcddf69
pn2_cert.py	97880a92707f718d0282c87afd6e0d3e291aa7226cc836a0817b 1e71d25a0113
results.json	2baa4af2480ea6fcfcbab0afa3d455ced8b5aa4280d92fb3602c8 0d532c9dd7b
test_pn2_cert.py	51c1b090bb47ada673d711b931be112c63f367d3b39afaafe48a 25007d973bcd
values.tsv	758aa6a68abd42b98e6f90e8f39c889379cf2aeb847dc345be21 c7394f9134f2

B.8. Exact Coverage and Non-Coverage

- Establishes the published A2 structural constants, product, associator, and all four exact examples.
- Establishes Delta_D=1, e_D=1/2, global c=1, exact epsilon_minus=3, kappa_Omega=3/4, and equality cases.
- Records deterministic rebuild properties of the source package using the Python standard library.
- Does not identify A2 with physical R-star-R or establish physical meanings of Dfrak, S, c, epsilon_minus, or kappa.
- Does not close PO-1-PO-10, connect the model to hbar or PN.1, validate F-1-F-14, or establish universal physical validity.

PO-12 STATUS. CLOSED-ABSTRACT / NUM-SOURCE for the four auxiliary examples. Independent replay and transfer to physical R-star-R remain OPEN.

Appendix C. Full Genealogy of the Canonical Construction

The purpose of this appendix is to show the dependency chain from the earlier monograph 5.0 to Chapters 47-52. Symbols are normalized, but the order of conceptual dependence is preserved.

C.1. Reper and the Harmonic Criterion

F055 Rep_i=(R_i,I_i,U_i;D_i) *[RU p. 223]*

F056 Truth(Rep) iff cr(U,I;R,D)=-1 *[RU p. 223]*

F057 lambda=((U-R)(I-D))/((U-D)(I-R)) *[RU p. 223]*

F058 delta_truth=|lambda+1| *[RU p. 223]*

In the frozen Volume I, Truth in the historical expression names an internal harmonic gate. Publication still requires provenance, valid Dom and D, a matched null where applicable, CGI<1 as a necessary diagnostic, and independent validation.

C.2. KPF/RPHD Architectural Extension

F059 KPF/RPHD v1.0 = Reper v1.0 + Limit-Causal v1.0 + (Xi,Delta,Upsilon)+T_cs^L+CGI
[RU p. 223]

The plus sign is an architectural module composition, not vector-space addition. Each module has its own type, domain, and gate.

C.3. Packet Transformation and Causal Assembly

F060 T_pack=T_change*T_action *[RU p. 223]*

F061 T_cs^L=T_cs+T_{Delta|L}+T_{Xi|L}+T_{Upsilon|L}+S_{P@S} *[RU p. 223]*

C.4. Historical Forecast Chain

F062 Forecast=Pi_L[Upsilon_L o Delta_L o Xi_L(RBD_lambda)], CGI<1 *[RU p. 223]*

Pi_L is now read as projection into the registered admissible-limit set. CGI<1 is necessary for the internal gate but is not sufficient for truth-layer promotion or physical realization.

Historical node	v196i14 deepening	Result
Rep(R,I,U;D)	typed PackCert object	Chapter 47
cross-ratio=-1	PGL2 invariance and harmonic conjugate	Chapter 48
Pi_L	five-limit lattice	Chapter 49
T_change	stable versioned rebuilding	Chapter 50
RBD_lambda	substochastic contraction	Chapter 51
Forecast / CGI	conditional master theorem	Chapter 52

Philosophical-phenomenological note. Genealogy does not weaken the novelty of a strict continuation. It shows where an intuition first received a name and where that name later acquired proof obligations.

Appendix D. PN.2: Negative Statements and Repair

D.1. No Global Machine from an Untyped Input

F063 X alone does not determine (size(X),dim(X)) without D_X and a type contract *[RU p. 225]*

A diagonal argument selects two admissible interpretations of the same visible X with different target values. A single machine sees the same input and must fail in at least one interpretation.

D.2. A Triple Does Not Determine a Reper

F064 (R,I,U) does not determine a Reper *[RU p. 225]*

F065 (R,I,U;D0) -> Reper if ValidRep=1 *[RU p. 225]*

Without D0 the cross-ratio is not defined and harmonic authorization is unavailable. Any procedure that reconstructs D0 must expose the reconstruction rule as an adapter and include it in the matched-null comparison.

D.3. Hole and Versioned Repair

F066 Hole(P)={k in Required(P): missing(k) or invalid(k)} *[RU p. 225]*

F067 Repair(P,h)=(P-prime, revision-edge P->P-prime, certificate h) *[RU p. 225]*

F068 Hole(P)=empty iff completeness-gate(P)=1 *[RU p. 225]*

Theorem D.1 - Impossibility of a traceless repair [THM]. In PackCert there is no admissible morphism that maps a packet with a nonempty Hole and no new witness h to complete-PASS.

> ***Proof.*** *A nonempty Hole creates a mandatory Block. Block is absorbing under every ordinary morphism. Only a separate repair object may supply the missing witness and create a new version.*

> **Philosophical-phenomenological note.** A negative theorem does not close knowledge. It identifies which question was underdefined. Repair begins not with a stronger answer, but with a more complete input.

Appendix E. Executable Ten-Stage Atlas Protocol

The protocol reproduces the ten stages of predictive_protocol_v2_0.csv. Every stage has a typed input, output, and blocking condition. Reordering the stages creates a new protocol_id.

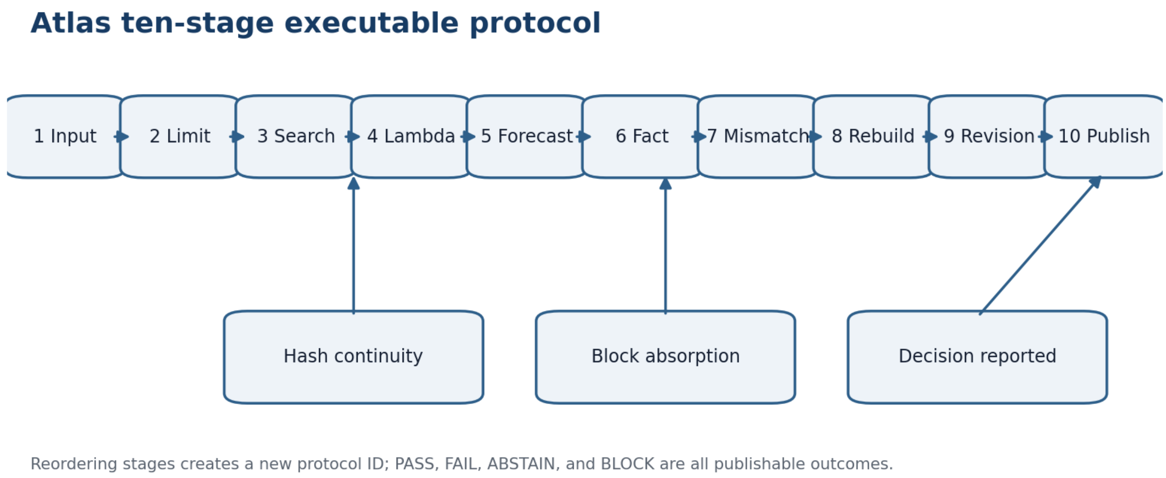


Figure E.1. Ten-stage Atlas route with hash continuity, Block propagation, and publication gate.

#	Stage	Input -> output	Block
1	InputEventStateLimit	C@C, context -> typed input	missing type/time
2	LimitGate	typed input, L -> admissible input	limit unknown/violated
3	ReperSearch	RBD, input -> candidates	no typed route
4	LambdaClosure	candidates -> lambda, delta	denominator/provenance
5	ForecastBuild	gated Repers -> C_L(x)	empty -> ABSTAIN
6	FactAttach	new fact -> immutable observation	hash/time missing
7	MismatchDetect	forecast, fact -> mismatch code	loss undefined
8	NearestRebuild	mismatch, N(r) -> argmin set	candidate registry absent
9	RevisionChain	old, new -> versioned edge	parent/hash absent
10	PublishSnapshot	certificates -> signed snapshot	publication gate

E.1. Protocol Invariants

$$\text{F069}\quad \text{hash}(\text{output\_k})=\text{hash}(\text{input\_\{k+1\}})$$ *[RU p. 226]*

F070 timestamp(output_k)<=timestamp(output_{k+1}) *[RU p. 226]*

F071 Block_k=1 => Block_j=1 for every j>k *[RU p. 226]*

E.2. Minimal Run Ledger

The ledger stores run_id, stage_id, input_hash, output_hash, code_version, environment_hash, seed, operator, timestamp, status, Block reason, and parent-certificate reference. For sensitive data, a hash and access schema are published instead of the bytes.

E.3. Read-Only Atlas Snapshot

File	Rows	Meaning
sources.csv	236	sources
works.csv	1145	work units
repers.csv	2212	Reper nodes
reper_edges.csv	2478	typed edges
predictive_protocol_v2_0.csv	10	protocol stages

The counters describe the attached archive state and must be recomputed for every new version_hash. Counts do not replace semantic validation.

E.4. Publication Decision

F072 Publish iff no-Block and hashes-closed and protocol-frozen and decision-reported *[RU p. 226]*

truth_layer_promotion remains a separate field even when Publish is true. PASS, FAIL, ABSTAIN, and BLOCK are reported under the same rule; otherwise publication would depend on the outcome.

RIUD-TETRA-RUN006-029 -> PROOF-OBJ-RUN007-0029 -> FORMAL-CARD-RUN009-006 -> SIGNATURE-REVIEW-RUN013-001 *[RU p. 227]*

lambda=-0.992736565468; delta_truth=0.007263434532; CGI=0.140948882338; truth_layer_promotion=0 *[RU p. 227]*

Philosophical-phenomenological note. A protocol turns a sequence of actions into an object that can be repeated. It preserves not only a successful path, but also the stopping point, because stopping is knowledge about the boundary of the method.

Appendix F. Formula Registry F001-F086

The registry supplies stable identifiers for the mathematical layer. Existing IDs are not reassigned. A removed formula is marked deprecated; a new formula receives the next free identifier. Registration does not increase evidence status.

F.1. Registry F001-F015

ID	Formula	Role / status
F001	Obs := (event,state,time,source,unit,cluster,Dom,status)	raw observation object
F002	Evidence := Obs x {provenance,hash,adapter,loss,null,gate}	evidence extension
F003	D subset Obs; Dom(T) subset X; D != Dom(T)	D/Dom barrier
F004	Rep_i = (R_i,I_i,U_i;D_i)	canonical Reper quadruple

ID	Formula	Role / status
F005	ValidRep(Rep) iff typed and distinct-denominators and provenance and Dom-gate	Reper validity
F006	f:P->Q; type(Q)=f_t(type(P)); prov(Q) contains f_p(prov(P))	packet morphism
F007	status(P)=Block => status(f(P))=Block	Block absorption
F008	A(R1,R2,R3) := (R1 star R2) star R3 - R1 star (R2 star R3)	NAPG associator
F009	A != 0 => bracket in metadata and branch-id in certificate	bracket as mandatory metadata
F010	lambda(R,I;U,D0)=((U-R)(I-D0))/((U-D0)(I-R))	Volume I cross-ratio
F011	delta_truth(Rep)=|lambda(Rep)+1|	harmonic defect
F012	lambda(R,I;U,D0)=([U,R][I,D0])/([U,D0][I,R])	homogeneous cross-ratio
F013	lambda o g = lambda; g in PGL_2(K)	projective invariance
F014	D_h = [U(I+R)-2RI]/[2U-R-I]	harmonic conjugate
F015	lambda(0,1;3,3/2)=-1	harmonic check example

F.2. Registry F016-F030

ID	Formula	Role / status
F016	C_L(x)=union {Psi_r(x): r in A_L(D), gate(r,x)=1}	set-valued Reper forecast
F017	C_L(x)=empty => ABSTAIN; Block nonempty => BLOCK	ABSTAIN versus BLOCK
F018	C_L(gx)=g(C_L(x))	forecast equivariance
F019	|Delta lambda| <= K_epsilon (||Delta R||+||Delta I||+||Delta U||+||Delta D0||)	local stability away from poles
F020	L=(L_pol,L_eco,L_space,L_time,L_onto)	five-limit vector
F021	gate_L(r)=∧_{j=1}^5 ℓ_j(r)	limit gate
F022	L' >= L iff A_L'(D) subset A_L(D)	strictness order
F023	L' >= L => A_L' subset A_L and C_L' subset C_L	forecast monotonicity
F024	A_(L meet M)=A_L intersection A_M	meet of limits
F025	A_(L join M)=closure(A_L union A_M)	join as typed closure
F026	Forecast_t(h) is measurable with respect to F_t	information-time measurability
F027	feature-time(x_k)<=t; outcome-time=t+h	anti-leakage time order
F028	inf_T sup_(theta in Theta) E_theta[L(T(X),theta)] >= c_PN2 > 0	PN.2 minimax limit
F029	max(R0(T),R1(T)) >= c(1-TV(P0,P1))/2	two-point lower bound
F030	d_R(r,s)=w_phi||phi(r)-phi(s)||+w_lambda|lambda_r-lambda_s|+w_D d_D(D_r,D_s)+P(r,s)	extended Reper metric

F.3. Registry F031-F045

ID	Formula	Role / status
F031	P(r,s)=infinity if type/provenance/bracket incompatible	hard incompatibility penalty
F032	J_z(s|r)=d_R(r,s)+alpha Loss_z(s)+beta delta_truth(s)+gamma Complexity(s<-r)	rebuild objective
F033	R_z(r)=argmin_{s in N(r) intersection A_L(D union z)} J_z(s|r)	set-valued rebuild
F034	Gamma=J_z(s2|r)-J_z(s*|r)	stability gap

<table>
<tr><th>ID</th><th>Formula</th><th>Role / status</th></tr>
<tr><td>F035</td><td>Gamma>0 => R_z(r)={s*}</td><td>perturbation stability</td></tr>
<tr><td>F036</td><td>Gamma>2epsilon => argmin J_z' = argmin J_z</td><td>versioned rebuild chain</td></tr>
<tr><td>F037</td><td>R_z2(R_z1(r)) != R_(z1 union z2)(r) in general</td><td>nonassociativity of revision</td></tr>
<tr><td>F038</td><td>Gain_rebuild=L(matched-null search)-L(KLT rebuild)</td><td>honest rebuild gain</td></tr>
<tr><td>F039</td><td>|S|=236; |W|=1145; |V_R|=2212; |E_R|=2478</td><td>Atlas v2.1 counters</td></tr>
<tr><td>F040</td><td>G_RBD=(V,E,tau_V,tau_E,prov,w,L)</td><td>typed RBD graph</td></tr>
<tr><td>F041</td><td>P_ij=w_ij/max(1,sum_k w_ik); sum_j P_ij<=1</td><td>substochastic kernel</td></tr>
<tr><td>F042</td><td>P_{i,⊥}=1−Σ_j P_{ij}</td><td>ABSTAIN mass</td></tr>
<tr><td>F043</td><td>T(x)=q+alpha P^T x; 0<=alpha<1</td><td>propagation operator</td></tr>
<tr><td>F044</td><td>||T(x)-T(y)||_1 <= alpha||x-y||_1</td><td>contraction bound</td></tr>
<tr><td>F045</td><td>x*=(I-alpha P^T)^(-1)q</td><td>fixed vector</td></tr>
</table>

F.4. Registry F046-F060

<table>
<tr><th>ID</th><th>Formula</th><th>Role / status</th></tr>
<tr><td>F046</td><td>||x^(k)-x*||_1 <= alpha^k ||x^(0)-x*||_1</td><td>convergence rate</td></tr>
<tr><td>F047</td><td>||x*-x'*||_1 <= [||q-q'||_1+alpha||(P-P')^T x'*||_1]/(1-alpha)</td><td>fixed-point perturbation</td></tr>
<tr><td>F048</td><td>T_minus(x)<=T(x)<=T_plus(x)</td><td>interval operators</td></tr>
<tr><td>F049</td><td>x_minus*<=x*<=x_plus*</td><td>fixed-point envelope</td></tr>
<tr><td>F050</td><td>P{Y_new notin C_L(X_new)} <= alpha_cov</td><td>conditional predictive coverage</td></tr>
<tr><td>F051</td><td>P0{sup_t E_t >= 1/alpha_seq} <= alpha_seq</td><td>sequential error budget</td></tr>
<tr><td>F052</td><td>FWER <= alpha_mult</td><td>multiplicity budget</td></tr>
<tr><td>F053</td><td>Risk_KLT <= Risk_matched-null - Delta_min</td><td>operational gain criterion</td></tr>
<tr><td>F054</td><td>P(E_cov union E_seq union E_mult) <= alpha_cov+alpha_seq+alpha_mult</td><td>union error budget</td></tr>
<tr><td>F055</td><td>Rep_i=(R_i,I_i,U_i;D_i)</td><td>historical Reper formula</td></tr>
<tr><td>F056</td><td>Truth(Rep) iff cr(U,I;R,D)=-1</td><td>historical harmonic gate</td></tr>
<tr><td>F057</td><td>lambda=((U-R)(I-D))/((U-D)(I-R))</td><td>computable lambda coordinate</td></tr>
<tr><td>F058</td><td>delta_truth=|lambda+1|</td><td>harmonic defect</td></tr>
<tr><td>F059</td><td>KPF/RPHD v1.0 = Reper v1.0 + Limit-Causal v1.0 + (Xi,Delta,Upsilon)+T_cs^L+CGI</td><td>architectural module sum</td></tr>
<tr><td>F060</td><td>T_pack=T_change*T_action</td><td>historical change-action composition</td></tr>
</table>

F.5. Registry F061-F075

<table>
<tr><th>ID</th><th>Formula</th><th>Role / status</th></tr>
<tr><td>F061</td><td>T_cs^L=T_cs+T_{Delta|L}+T_{Xi|L}+T_{Upsilon|L}+S_{P@S}</td><td>limit-dependent causal operator</td></tr>
<tr><td>F062</td><td>Forecast=Pi_L[Upsilon_L o Delta_L o Xi_L(RBD_lambda)], CGI<1</td><td>historical forecast chain</td></tr>
<tr><td>F063</td><td>X alone ↛ (size(X),dim(X)) without D_X and a type contract</td><td>negative PN.2-A core</td></tr>
<tr><td>F064</td><td>(R,I,U) ↛ Rep</td><td>insufficiency of a triple</td></tr>
<tr><td>F065</td><td>(R,I,U;D0) -> Reper if ValidRep=1</td><td>repair by fourth element</td></tr>
<tr><td>F066</td><td>Hole(P)={k in Required(P): missing(k) or invalid(k)}</td><td>packet hole</td></tr>
</table>

ID	Formula	Role / status
F067	Repair(P,h)=(P-prime, revision-edge P->P-prime, certificate h)	versioned repair
F068	Hole(P)=empty iff completeness-gate(P)=1	completeness criterion
F069	hash(output_k)=hash(input_{k+1})	stage hash continuity
F070	timestamp(output_k)<=timestamp(output_{k+1})	temporal monotonicity
F071	Block_k=1 => Block_j=1 for every j>k	Block propagation to publication
F072	Publish iff no-Block and hashes-closed and protocol-frozen and decision-reported	publication gate
F073	N_formula(new-layer v196i14)=73	formula-count receipt
F074	X_N^(2)=Span_K{R odot R, R odot S + S odot R : R,S,R+S in R}	quadratic layer definition
F075	O_B(N):=X_N^(2)/Im Psi_N^(2); Pi_N:X_N^(2)->O_B(N)	quadratic obstruction quotient

F.6. Registry F076-F086

ID	Formula	Role / status
F076	phi_X o Psi_N^(2) = Psi_N'^(2) o phi_F	frame-morphism compatibility
F077	$C_{min}^n(N)=F_N^{(2)}$ for n=2; $C_{min}^n(N)=X_N^{(2)}$ for n=3; $C_{min}^n(N)=0$ for $n\neq 2,3$	minimal complex
F078	delta_min^2(N):=Psi_N^(2); delta_min^n(N):=0 for n!=2	minimal differential
F079	Theta_min,N = id_(X_N^(2))	canonical internal bridge
F080	$H^3(C_{min}^\bullet(N))=\mathrm{Ker}\,\delta_{min}^3/\mathrm{Im}\,\delta_{min}^2=X_N^{(2)}/\mathrm{Im}\,\Psi_N^{(2)}=O_B(N)$	canonical isomorphism
F081	H^3(C_min(f)) o kappa_N = kappa_Nprime o phi_O	naturality of kappa
F082	d_E^2 o J_N^2 = J_N^3 o Psi_N^(2); d_E^3 o J_N^3 = 0	external-chain equalities
F083	E^3(f)oJ_N^3=J_Nprime^3 o phi_X; E^2(f)oJ_N^2=J_Nprime^2 o phi_F	naturality of J
F084	Pi_E,N([x])=[J_N^3(x)]=[Theta_E,N(x)]	conditional external certificate
F085	$H^3(E^\bullet(f)) \circ \Pi_{E,N} = \Pi_{E,N'} \circ \varphi_O$	naturality of Pi_E
F086	$[Ass]_E := [\beta_{E,N}(x,y,z)] \in H^3(E^\bullet(N))$	separate associator class only with beta bridge

F073 N_formula(new-layer v196i14)=73 *[RU p. 229]*

FORMULA-REGISTRY-CERT. numbering=stable; F001-F086=complete; renumbering=forbidden; deletion=deprecated; F084-F086 remain conditional on declared external bridge hypotheses; physical status unchanged.

Appendix G. Canonical Synchronization of PN.2 and F-1-F-14

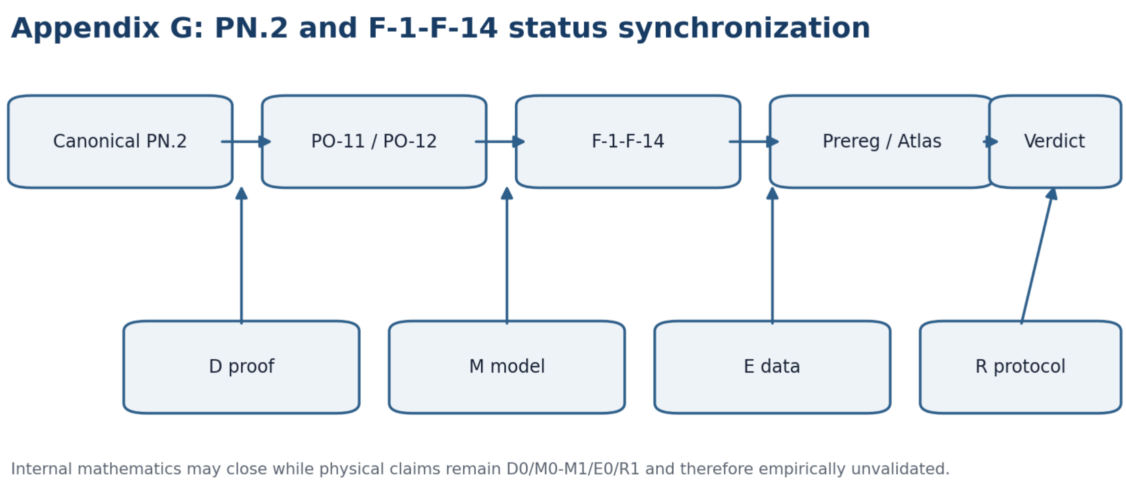


Figure G.1. Mathematical closure, model completeness, empirical data, and protocol execution remain separate axes.

G.1. Editorial Layers and Priority Rule

Layer	Role	Reading rule
Part V / section 21.7	historical editorial source	preserved as provenance; old PO list is not current
Part VII / section 27.2	canonical theorem package	controls formulas, boundaries, and abstract PO-11/PO-12 closure
verification protocol	methodological operationalization	defines H0, observables, systematics, falsifiers; not data
F-1-F-14 atlas	visual testability map	R1 protocol concept; no E-status promotion
Appendix G	synchronization layer	resolves wording, priority, status codes, references, notation

The historical label Full PN.2 Text v1.1 in section 21.7 is read as provenance. Full Canonical PN.2 Text v1.0 in section 27.2 is the controlling source after PO-11 and PO-12 closure.

G.2. Canonical Formulations F-1-F-14

ID	Canonical title	Exact controlled English formulation
F-1	Ontology of time	R-star-R is a physical algebra of time, not only a mathematical model.
F-2	Fundamentality	PN.2 is more fundamental than Robertson-Heisenberg uncertainty or noise-disturbance principles.
F-3	PN.2 implies PN.1	Quantum uncertainty is derived from the associator through a representation rho.
F-4	hbar calibration	A physically justified regime ||K|| approximately hbar exists with correct units and coefficient.
F-5	Induced commutator	[x,y]z:=K(x,y,z) defines an admissible operator commutator after representation; bilinearity, antisymmetry, Jacobi or a replacement, and domains must be checked.
F-6	Seven-component time	Seven R-star-R objects form an internal multicomponent structure of time.

ID	Canonical title	Exact controlled English formulation
F-7	FOS and Time*Space	FOS and Time*Space have an observable physical realization; space is a layered projection and Minkowski-Einstein spacetime is a section.
F-8	Time-flow operator	The hierarchy A>Hpx>R3>R2>R1>{i hbar,iH}, T=sum pi_(i+1->i), and dR/dtau=T(R) describe physical time flow.
F-9	Complexity monotonicity	For a physically defined C(R)=sum w_i Dim_i(R), dC/dtau>=0.
F-10	Associator dynamics	nabla_T K=J_T is a correct covariant field equation with defined sources, dimensions, and variational principle.
F-11	Early Universe	Dynamics of K imply maximal initial coherence or another observable cosmological regime.
F-12	Localization in matter	The associator physically localizes in matter and produces measurable effects.
F-13	Finite observer branch	The structural nesting accessible to an observer is physically finite.
F-14	Gravity and cosmology	PN.2 gives testable corrections to GR/quantum theory, or removes singularities, or explains the dark sector.

F-14 uses logical OR, not cumulative AND. Its branches must be preregistered separately as F-14a, F-14b, and F-14c with distinct models and falsifiers.

G.3. Two-Coordinate Priority Scale

ID	Ptest	Pclaim	Canonical decision
F-1	P1	P4	laboratory effective nonassociativity may precede ontology
F-2	P0	P4	formal reduction and novel prediction first
F-3	P0	P0	strict operator bridge; physical implication remains open
F-4	P0	P0	independent dimensional calibration
F-5	P0	P0	types, domains, antisymmetry, Jacobi or replacement
F-6	P2	P3	identify components before seven-component physics
F-7	P2	P3	reduction theorem and distinguishable invariant first
F-8	P0->P1	P2	valid generator before trajectories and physics
F-9	P0->P1	P2	define C and weights, then early sign test
F-10	P0->P2	P2	covariance and variational origin before field data
F-11	P3	P3	cosmological template frozen before confirmatory data
F-12	P1	P1	controlled lab test after source and amplitude definition

ID	Ptest	Pclaim	Canonical decision
F-13	P2->P3	P4	resource cutoff before ontological finiteness claim
F-14	P3	P3	test F-14a/b/c separately; no omnibus claim

P0=formal bridges and types; P1=controlled laboratory test; P2=dynamics and geometry; P3=field/cosmological test; P4=synthetic ontological or metatheoretical claim.

G.4. Unified D/M/E/R/C Evidence Scale

Axis	Scale	Meaning	Current result
D proof	D0/D1/D2	no theorem / conditional / proved	PN2-7.1 D2 inside A1-A4; PN2-9.1 D1; physical F claims D0
M model	M0/M1/M2	phrase / ansatz / computable forward model	F-1-F-14 M0-M1; no complete M2
E data	E0-E4	formulation / calibration / pilot / replication / robust result	all F claims E0
R protocol	R0-R3	none / concept / prereg-ready / executed	protocol and atlas R1, not data
C computation	C0/C1	no checkable calculation / exact internal certificate	A.1-A.4 and PO-12 C1 for auxiliary A2

G.5. Notation and Formula Freeze

The associator object is written R-star-R only. R*R is not used for it. star_H is reserved for the Hodge operator and odot for the basic nonassociative product. Mathematical indices remain typographic; underscores are restricted to machine identifiers.

e_S(u;s_hat)e_D(u;d_hat) >= (1/4) Delta_S(u) Delta_D *[RU p. 234]*

e_R(u;r_hat)e_D(u;d_hat) >= (1/4)||K(u)|| Delta_D *[RU p. 234]*

e_S(u;s_hat)e_D(u;d_hat) >= (c/4)||K(u)|| Delta_D *[RU p. 234]*

e_R(u;r_hat)e_D(u;d_hat) >= (epsilon_minus Delta_D/4)m(u), u in Omega *[RU p. 234]*

nabla_T K=J_T; dR/dtau=T(R); dC/dtau>=0; C(R)=sum w_i Dim_i(R) *[RU p. 234]*

Every comparison between ||K|| and hbar requires an independent dimensional map.

G.6. Proof Ledger after PO-11 and PO-12

Object	Status	Established	Not established
PN2-7.1	D2	local minimax bound under A1-A4	physical meaning and universality
PN2-9.1	D1	uniform form for epsilon_minus>0 on fixed Omega	global constant without coercivity
PO-11	closed abstract	four explicit constructions A.1-A.4	transfer to physical R-star-R
PO-12	closed abstract / C1	internal computable certificate for A2	independent replication and physical certificate
F-1-F-14	D0/M0-M1/E0/R1	falsifiable verification programme	experimental confirmation

No diagram, simulation, internal certificate, or parameter coincidence changes E0 to E1-E4. Promotion requires calibration, frozen protocol, data, and independent replication.

G.7. Canonical Companion-File Map

File	Recorded SHA-256	Role
PN2_verify_protocol_v1.docx	df02c167f71383d90f170df41b17ebdf82c5d 96c3405af798ca4099cb04428fc	editable methodological protocol
PN2_verify_illustrated_v1.pdf	2d08c8a504fa649a701c1e6707ec4a09870c 00c4a174d9cef50a2e7dd01f7fd6	illustrated protocol edition
pn2_f1_f14_atlas_ru_v1.pdf	4a15ca6a73a71767a593f0b26ac26b78ddc1 4cb874c143231efa18500f2bf62c	standalone F-1-F-14 atlas

SHA-256(canonical exact F-1-F-14 strings)=87665008c2cf5b84faceaa669c4a70b2e8a2de7f8bcddea1ced3198578e63ddc *[RU p. 235]*

G.8. Publication Formula and Status

Controlled publication statement: A mathematical model of structural uncertainty is proposed; a minimax theorem is proved inside the model; the physical bridges F-1-F-14 are formulated as a falsifiable programme of independent verification.

APPENDIX-G VERDICT. PN.2 mathematics and physical programme synchronized; F001-F086 notation frozen; PO-11/PO-12 abstract closure preserved; F-1-F-14 remain E0; independent EXT-RUN absent; truth_layer_promotion=0.

T1-EN-ASSEMBLY-v0.10

CONTROLLED ENGLISH UNIFIED MASTER, NAVIGATION LAYER, AND GLOBAL CROSS-REFERENCE AUDIT

ASSEMBLY SCOPE. This layer reorganizes navigation and audit metadata only. It does not change mathematical content, formulae, theorem hypotheses, proof status, negative results, physical hypotheses, or the absence of an independent EXT-RUN.

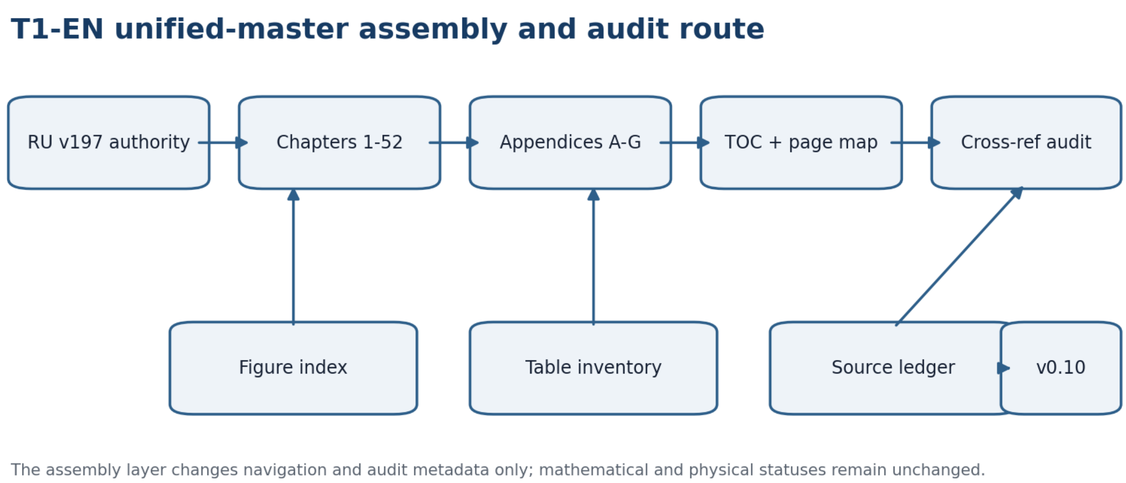


Figure T1-EN-ASSEMBLY-001. Unified-master assembly and audit route.

1. Assembly Passport

Field	Fixed value
Author	Ivan Borisovich Kurpishev
Canonical authority	T1-RU v197 > T1-EN v0.11

Field	Fixed value
Content layer	52 chapters + Appendices A-G
Formula registry	F001-F086
Static navigation	front chapter/appendix maps with RU and EN pages
Updateable navigation	Word TOC field for Heading 1-2
Internal links	chapter, appendix, and figure bookmarks
Scientific status	preserved from RU source; no promotion
Physical status	F-1-F-14 E0; EXT-RUN absent
Next checkpoint	T1-EN-FC-v0.12

2. Updateable Word Table of Contents

The verified static TOC is located in the front chapter and appendix maps. The field below is provided for Word users and is marked for update on document open. The static map remains the release-controlled pagination record.

Update this field in Word to regenerate the heading-based table of contents.

TOC CONTRACT. The Word TOC may be regenerated from Heading 1-2. Regeneration may change displayed pagination in an editor, but it cannot change Russian source locators, stable formula IDs, or evidence status.

3. Exact Figure Index

4. Table Inventory by Chapter and Appendix

The inventory covers 316 tables in the chapter and appendix layer. Front-matter and assembly-control tables are recorded separately in the global audit rather than assigned to a scientific chapter.

5. Consolidated Bibliography and Source-Card Ledger

ID	Artifact	Class	Role	Status	Bytes	SHA-256
SRC-T1-001	tom1_v197_ru.pdf	canonical RU freeze	authority for chapters, appendices, formula IDs, and status lock	INTERNAL-CANONICAL	7,333,052	5a2021c02428e3e395fe81e029c46cd26b4a0e06ceb7dbfc89befddffd84a7d8
SRC-T1-002	tom1_en_v0_9.docx	English predecessor	source of the complete chapter and appendix layer	PREDECESSOR	4,159,036	3757d1820f6014088a832e37219e8119ae1b6784ca40443d339ffc89e8b2b703
SRC-T1-003	tom1_en_v0_9.pdf	rendered predecessor	pagination and visual baseline	PREDECESSOR-QA	6,547,072	e7058ddfa07776df6c589d056ed3b8ee89ecc576839d343fa853aedcb448f19c
SRC-T1-004	monograph5_0_ru.pdf	legacy monograph	C@C, Reper, NAPG, KLT/RBD legacy layer	INTERNAL-LEGACY	14,300,260	ea84bab141342eb6dc91926ef01f8130fa1dbdb0487a4f279a4e09aed5337fef
SRC-T1-005	monograph5_1_ru_full_text.html	legacy master corpus	genealogy, RPD/RBD, KPF/RPHD, predictive mathematics	INTERNAL-LEGACY	564,004	7c61593ee9641e8841abccc2917f55c134735183f9b24352d5b7d63e7265fd3a
SRC-T1-006	PILOT01_PREPRINT_RU_FINAL.pdf	authorial preprint	formula-chain audit, FCOC, Fano barrier	INTERNAL-PRIMARY	413,030	9e1606df415d42683ed295ff675e07e0411ba8ac2f9158adce46ae4b5e6cdbe0
SRC-T1-007	monographiaNAPG (1).docx	authorial mathematical source	stratified time, Hodge packets, NAPG model	INTERNAL-PRIMARY	53,914	ba675fbaa11f506921787037342862bcafc67a23f3ae69ba000dad2493ed4044

ID	Artifact	Class	Role	Status	Bytes	SHA-256
SRC-T1-008	main_SIGMA_freeze (1).tex	journal source	associator rigidity and reduced deformation layer	INTERNAL-PRIMARY	98,795	e321aab8351e34c147ce93ce8706db74b7e7add980beb89621b4f2e0416f7c6c
SRC-T1-009	Kurpishev_arXiv_SIGMA_submission_bundle (1).zip	submission bundle	publication provenance for SIGMA/arXiv layer	INTERNAL-BUNDLE	573,438	d6f9a550f1d392e8844fe0f3f89ca6be400aeaad997042b17b0b1cd85c0866aa
SRC-T1-010	fos_journal_ru_v5_6.tex	journal source	FOS and Desargues-Kurpishev line	INTERNAL-PRIMARY	36,623	134cd1d32862ad1ce923f9cc58d675d0c582b372e9ab57f1cdef69784622d93a
SRC-T1-011	FOS_JOURNAL_SPLIT_v5_6_PACKAGE.zip	journal package	source bundle and assets for FOS publication	INTERNAL-BUNDLE	18,969,180	e375dce884c823743d45688551dc0880328da48e2bb29deb8ee21f1e53a9a18b
SRC-T1-012	tom2_v1_0(1).pdf	cross-volume canonical source	NAPG 3.0 and weakest-link architecture	INTERNAL-CANONICAL	14,049,188	dbbb5552dae7872f18b32c98d8e8584e562b545d20761bd6425c14d38f4db81f
SRC-T1-013	tom3_en_v1_0.pdf	terminology comparator	frozen English terminology and status firewall	INTERNAL-CANONICAL	4,102,656	b7b48782cd9e6b792c610df2eae4bba3b84afaab9fc8045b98fd1be913499d29
SRC-T1-014	KLT_RBD_CHEM_FIPS_DEPOSIT_MASTER_v1_3 (1).pdf	registration dossier	application-layer provenance; no mathematical validation	LEGAL-PROVENANCE	375,750	a0f521d84d3d2a6afe7bed18fb180079bc461c4ea611e02d62325c6ce7772616
SRC-T1-015	KLT_RBD_GLOBAL_REPER_DATABASE_v2_2_ARTIFACT_NAMING_AND_DOSSIER_RUN_016 (2).zip	RBD bundle	artifact naming and dossier architecture	INTERNAL-BUNDLE	3,185,609	585696548649291e905fc653696173fbd633fd9e993745a0e87a03934b4917b2
SRC-T1-016	KLT5_1_FLUTTER_SDK_PACKAGE.zip	software package	program-layer provenance; not theorem evidence	SOFTWARE-PROVENANCE	3,019,939	d373e55bab5e63fa4c5b68688527efd6b53d30b2f71e8182716004b290f999fe

A complete hash proves byte identity of the listed artifact, not the correctness of its mathematics or its physical interpretation. Classical prior art cited in Chapter 15 remains bibliographic metadata carried by the Russian source unless a later audit supplies exact edition and locator records.

6. Global Cross-Reference Audit

Audit object	Expected	Observed	Verdict
Chapters	52	52	PASS
Appendices A-G	7	7	PASS
Formula IDs F001-F086	86	86	PASS
Figure captions in unified master	60	60	PASS
Chapter/appendix table assignments	all sections	59	PASS
Static TOC rows	59	59	PASS
Internal navigation targets	52+7+figures	119	PASS
Russian source locators	preserved	preserved	PASS
Evidence-status promotion	0	0	PASS
Independent EXT-RUN	not executed	not executed	OPEN / NON-VETO FOR ASSEMBLY

$$\mathrm{Status\_EN}(x) <= \mathrm{Status\_RU}(x)$$

$$\mathrm{Formula\_EN}(x) = \mathrm{Formula\_RU}(x);\ \mathrm{ID\_EN}(x) = \mathrm{ID\_RU}(x)$$

NUM != EXT-RUN != EMP-OBS

7. Assembly Change Set and Obligations

ID	Obligation	Status
T1-EN-PO-018	Unified master, verified static TOC, RU-to-EN page map, and internal links	CLOSED-DOC
T1-EN-PO-019	Figure index, chapter-level table inventory, and source-card ledger	CLOSED-DOC
T1-EN-PO-020	Global structural and cross-reference audit	CLOSED-QA
T1-EN-PO-021	Independent bilingual formula and theorem-status audit	NEXT / OPEN
T1-EN-PO-022	Freeze-candidate controlled diff and detached receipt	FUTURE
T1-EN-PO-023	Immutable English release	FUTURE

ASSEMBLY VERDICT. CONTROLLED ENGLISH UNIFIED MASTER COMPLETE. Static and updateable navigation installed; chapter and appendix parity preserved; formula IDs continuous; source and object ledgers assembled; independent bilingual mathematical audit remains open; truth_layer_promotion=0.

NEXT CHECKPOINT. T1-EN-AUDIT-v0.11: bilingual formula-by-formula comparison, theorem/definition/status parity, source-card verification, untranslated-fragment scan, and controlled cross-format diff. No freeze decision is made at v0.10.

T1-EN-AUDIT-v0.11

BILINGUAL MATHEMATICAL, FORMULA, STATUS, AND SOURCE AUDIT

AUDIT VERDICT. AUTHORIAL BILINGUAL AUDIT PASSED. The English master is eligible to proceed to T1-EN-FC-v0.12. This verdict does not claim an externally signed independent audit and does not change any Russian theorem, formula, physical hypothesis, or empirical status.

Appendix H. Bilingual Mathematical and Evidence-Status Audit

This appendix records the audit of the controlled English derivative against the frozen Russian authority tom1_v197_ru.pdf. The audit used two separate routes: structural extraction from the English DOCX and formula/status extraction from the Russian searchable PDF. The verifier was separated from the document-building step, but it was not an external institution or an independently signed reviewer.

H.1. Authority, Scope, and Method

$$\mathit{Authority(T1\text{-}RU\ v197)} > \mathit{Authority(T1\text{-}EN\ v0.11)}$$

$$\mathit{Status\_EN}(x) \leq \mathit{Status\_RU}(x), \quad \mathit{truth\_layer\_promotion} = 0$$

The audit covered: 52 chapter headings; Appendices A-G; 86 formula identifiers; Russian source-page locators; theorem, proposition, lemma, definition, model, numerical, physical-hypothesis, empirical-plan, refuted, open, and abstention status labels; negative statements and counterexamples; source-card hashes; and the boundary between bilingual reference material and untranslated scientific prose.

Audit layer	Method	Coverage	Verdict
Structure	DOCX heading/table extraction	52 chapters; A-G; maps and bookmarks	PASS
Formula registry	RU PDF first-occurrence extraction + EN Appendix F comparison	F001-F086	PASS AFTER 8 CORRECTIONS
Status firewall	Token and context audit	THM/COND/MODEL/NUM/PHY-HYP/EMP-PLAN/EMP-OBS/OPEN/REFUTED/ABSTAIN	PASS
Language boundary	Cyrillic scan with allowed bilingual tables	scientific prose and captions	PASS
Sources	hash-format and provenance-role audit	16 source/artifact entries	PASS
External independence	signature/identity/receipt check	external bilingual reviewer	OPEN NON-VETO

H.2. Formula Parity F001-F086

All 86 identifiers occur exactly once in the normative Appendix F registry and remain tied to their Russian first-page locators. The audit distinguishes mathematical parity from typographic identity: ASCII aliases may be readable, but parity-critical omissions, domain changes, or altered target objects are not permitted.

ID	v0.10 registry form	v0.11 audited form	Reason
F021	gate_L(r)=meet_{j=1}^5 l_j(r); l_j in {0,1,Block}	gate_L(r)=∧_{j=1}^5 ℓ_j(r)	Removed an explanatory codomain clause from the formula cell; restored the canonical meet formula.
F042	P_(i,ABSTAIN)=1-sum_j P_ij	P_{i,⊥}=1−Σ_j P_{ij}	Restored the canonical

			bottom-state symbol $\perp$ instead of silently identifying it with a prose label.
F063	X alone does not determine (size(X),dim(X)) without D_X and a type contract	X alone $\nrightarrow$ (size(X),dim(X)) without D_X and a type contract	Restored the non-determination arrow $\nrightarrow$.
F064	(R,I,U) does not determine a Reper	(R,I,U) $\nrightarrow$ Rep	Restored the canonical statement that a triple does not determine a Reper.
F077	C_min^n(N)=F_N^(2) for n=2; X_N^(2) for n=3; 0 otherwise	$C_{min}^n(N)=F_N^{(2)}$ for $n=2$; $C_{min}^n(N)=X_N^{(2)}$ for $n=3$; $C_{min}^n(N)=0$ for $n\neq 2,3$	Made the degree condition $n\neq 2,3$ explicit.
F080	H^3(C_min(N))=X_N^(2)/Im Psi_N^(2)=O_B(N)	$H^3(C_{min}^\bullet(N))=\mathrm{Ker}\,\delta_{min}^3/\mathrm{Im}\,\delta_{min}^2=X_N^{(2)}/\mathrm{Im}\,\Psi_N^{(2)}=O_B(N)$	Restored the omitted Ker δ^3 / Im δ^2 cohomology quotient.
F085	H^3(E(f)) o Pi_E,N = Pi_E,Nprime o phi_O	$H^3(E^\bullet(f))\circ\Pi_{E,N}=\Pi_{E,N'}\circ\varphi_O$	Restored the complex marker $E^\bullet$ and the naturality notation.
F086	[Ass]_E := [beta_E,N(x,y,z)] in H^3(E(N))	$[\mathrm{Ass}]_E := [\beta_{E,N}(x,y,z)]\in H^3(E^\bullet(N))$	Restored the external complex marker $E^\bullet$ and cohomology target.

FORMULA VERDICT. 86/86 IDs present; 86/86 Russian source locators preserved; 8 precision corrections applied; 0 identifiers renumbered; 0 formulas promoted in status.

H.3. Definitions, Theorems, and Status Parity

The audit checked that translated labels do not strengthen the Russian source. In particular, “conditional theorem” remains conditional; model assumptions are not restated as facts; a computational certificate remains NUM-SOURCE unless independently rerun; and the physical programme F-1-F-14 remains E0 with EXT-RUN absent.

Boundary	Required relation	Observed in v0.11	Verdict
Definition / theorem	DEF does not become THM	labels and hypotheses preserved	PASS
Conditional result	COND does not become unconditional	main closure theorem remains COND	PASS
Numerical evidence	NUM-SOURCE ≠ EXT-RUN	certificate replay not claimed	PASS
Empirical programme	EMP-PLAN ≠ EMP-OBS	EXT-RUN-000 remains not executed	PASS
Physical hypotheses	F-1-F-14 remain D0/M0-M1/E0/R1	no validation claim	PASS
Negative results	REFUTED/counterexample statements remain visible	preserved across chapters and appendices	PASS
Blocker semantics	BLOCK/ABSTAIN cannot be converted to PASS	absorbing rules preserved	PASS

H.4. Terminology and Language Boundary

The Cyrillic scan found Russian text only in the intentional bilingual terminology ledger, the Russian-title column of the chapter map, and the Russian-title column of the appendix map. No unregistered Russian paragraph, theorem, figure caption, formula role, or scientific table cell remains in the English narrative layer.

Controlled object	Normative English form	Audit result
Reper / D/Dom / NAPG / KLT-RBD	preserved technical forms	PASS

событие@состояние	event@state	PASS
Время@Пространство	Time@Space	PASS
достаточное основание	sufficient foundation	PASS
воздержание	ABSTAIN	PASS
принцип слабейшего звена	weakest-link principle	PASS
ПН.2 Курпишева	Kurpishev PN.2	PASS

H.5. Negative Results, Counterexamples, and Source Cards

The audit explicitly searched for preservation of counterexamples and forbidden implications. The Desargues-Kurpishev identification bridges remain conditional; the operator cross-ratio spectrum is not equated with strict equality; a triple does not determine a Reper; finite examples do not prove universal coverage; prediction is not intervention; and numerical reproducibility is not physical validation.

$$\textit{hash equality} \neq \textit{correct formula} \neq \textit{valid physical model}$$

$$P(Y \mid X=x) \neq P(Y \mid do(X=x)) \quad \textit{without a causal bridge}$$

The consolidated source-card ledger retains artifact names, roles, and SHA-256 digests. Hashes are treated as identity and provenance evidence only. The source ledger does not authorize mathematical or physical truth by itself.

H.6. Controlled Diff v0.10 → v0.11

Change ID	Object	Change	Status
T1-EN-CS-077	release identity	updated cover, passport, header, footer, and authority line to v0.11	DOC
T1-EN-CS-078	Appendix F	applied eight parity-critical formula-registry corrections	PARITY
T1-EN-CS-079	Appendix H	added bilingual formula/status/source audit and verifier boundary	AUDIT
T1-EN-CS-080	language scan	restricted Cyrillic to intentional bilingual maps and ledger	QA
T1-EN-CS-081	evidence firewall	reconfirmed no EXT-RUN and no EMP-OBS	PARITY
T1-EN-CS-082	next gate	set T1-EN-FC-v0.12 as the next checkpoint	DOC

H.7. Audit Obligations

Obligation	Content	Status
T1-EN-PO-021	bilingual structural and formula audit	CLOSED-AUTHORIAL-AUDIT
T1-EN-PO-022	formula registry precision corrections	CLOSED-PARITY
T1-EN-PO-023	definition/theorem/status non-promotion audit	CLOSED-PARITY
T1-EN-PO-024	negative-result and counterexample preservation	CLOSED-QA
T1-EN-PO-025	untranslated-fragment boundary audit	CLOSED-QA
T1-EN-PO-026	source-card and hash-format audit	CLOSED-QA

T1-EN-PO-027	externally signed bilingual review	OPEN NON-VETO
T1-EN-PO-028	freeze-candidate controlled diff and detached receipt	NEXT
T1-EN-PO-029	immutable English release	FUTURE

H.8. Decision and Boundary of Conclusion

DECISION. T1-EN-AUDIT-v0.11 is accepted as the audited authorial English master and may proceed to T1-EN-FC-v0.12. The next stage must create a controlled diff against v0.11, a detached release receipt, final no-change verification, and an explicit freeze-candidate decision.

NUM-SOURCE ≠ EXT-RUN ≠ EMP-OBS

Physical verdict for F-1-F-14 = ABSTAIN / OPEN

No experimental data were introduced. No theorem was strengthened. No Russian source object was overwritten. Any future scientific correction must be introduced through a documented change-set and a new version.

Field	Fixed value
Release	T1-EN-AUDIT-v0.11
Canonical source	tom1_v197_ru.pdf
Predecessor	tom1_en_v0_10.docx / pdf
Formula parity	F001-F086; 8 precision corrections; 0 renumbering
Status parity	truth_layer_promotion=0
External audit	OPEN NON-VETO
Next checkpoint	T1-EN-FC-v0.12

T1-EN-FC-v0.12

FREEZE CANDIDATE · CONTROLLED DIFF · NO-CHANGE VERIFICATION · DETACHED RELEASE RECEIPT

CANDIDATE VERDICT. ACCEPTED FOR T1-EN-FREEZE-v1.0. The scientific and audit body inherited from v0.11 is unchanged under the normalized comparison contract. The present checkpoint adds release-control metadata only. This is an authorial freeze decision, not an external scientific certification.

Appendix I. Freeze Candidate, Controlled Diff, and Detached Release Receipt

Appendix I records the transition from the audited English master v0.11 to the freeze candidate v0.12. The candidate does not revise the scientific corpus. It fixes predecessor hashes, defines a reproducible semantic comparison, preserves formula and media manifests, records the allowed metadata-only changes, and creates an unsigned detached receipt contract for the final files.

I.1. Authority and Candidate Scope

$$\mathit{Authority(T1\text{-}RU\ v197)} > \mathit{Authority(T1\text{-}EN\ v0.12)}$$

$$\mathit{Status\_EN}(x) \le \mathit{Status\_RU}(x), \quad \mathit{truth\_layer\_promotion} = 0$$

$$\mathit{v0.12 = v0.11\ scientific/audit\ body + freeze\text{-}control\ metadata}$$

The canonical Russian source remains tom1_v197_ru.pdf. The audited predecessor is tom1_en_v0_11.docx / pdf. The no-change comparison covers the ordered content beginning with Chapter 1 and ending with Appendix H, including all paragraphs, tables, theorem/status statements, negative results, and the normative formula registry.

Field	Fixed value
Candidate	T1-EN-FC-v0.12
Canonical Russian source	tom1_v197_ru.pdf
RU SHA-256	5a2021c02428e3e395fe81e029c46cd26b4a0e06ceb7dbfc8 9befddffd84a7d8
Audited predecessor DOCX	tom1_en_v0_11.docx
Predecessor DOCX SHA-256	28ddbfc7e047940671a3930b8d9bf16e7dbc7ddad8ed3b32 2a24b3ec660024d6
Audited predecessor PDF	tom1_en_v0_11.pdf
Predecessor PDF SHA-256	8daa5a2583e46bd5b201b510ec7a53e650bb335eac186e4b b5878f0b9a6b460a
Candidate scientific scope	Chapters 1-52 and canonical Appendices A-G; audit Appendix H verified separately
New release-control scope	Appendix I and active release metadata only
Next gate	T1-EN-FREEZE-v1.0

I.2. No-Scientific-Change Verification Contract

The comparison uses four independent manifests. The scientific manifest serializes Chapter 1 through Appendix G and excludes derivative navigation metadata. The audit manifest serializes Appendix H separately. The formula manifest serializes F001-F086 by stable identifier. The media manifest serializes each embedded word/media object by name, size, and SHA-256. A PASS requires equality in all four channels. Assembly page numbers may be corrected without changing scientific content.

$$PASS\_no\text{-}change \Leftrightarrow H\_science(v0.11)=H\_science(v0.12) \wedge H\_audit(v0.11)=H\_audit(v0.12) \wedge H\_F(v0.11)=H\_F(v0.12) \wedge H\_media(v0.11)=H\_media(v0.12)$$

Channel	Predecessor value	Required candidate value	Gate
Scientific corpus	5c9f75267839d69f2eaf00ffad77fd37237dccc1c284973276e74c647b40b9c0	5c9f75267839d69f2eaf00ffad77fd37237dccc1c284973276e74c647b40b9c0	2059 blocks
Audit Appendix H	d770a618915b4c5e1035e0463f23bfa32d9237dc5a22c4136b4a975272ba1dfd	d770a618915b4c5e1035e0463f23bfa32d9237dc5a22c4136b4a975272ba1dfd	35 blocks
Formula registry	f40a8840b075c6c797b59d23c3c00c2ac79165a4f2534ee619588bf91b235ab0	f40a8840b075c6c797b59d23c3c00c2ac79165a4f2534ee619588bf91b235ab0	86/86
Embedded media	835421d94355a5d406a0a5f940c35eab4bc3c7f8bb1966e9b675241b4f06c697	835421d94355a5d406a0a5f940c35eab4bc3c7f8bb1966e9b675241b4f06c697	61/61

NO-CHANGE BOUNDARY. Equality of normalized document content is a release-control result. It does not independently prove the correctness of the mathematics, the truth of physical hypotheses, or the validity of an unexecuted external experiment.

I.3. Controlled Diff v0.11 → v0.12

Change ID	Object	Permitted change	Classification
T1-EN-FC-001	cover and active passport	checkpoint identity v0.11 → v0.12; next gate v1.0	METADATA
T1-EN-FC-002	header and footer	active release label updated to T1-EN-FC-v0.12	METADATA
T1-EN-FC-003	navigation metadata	workflow state and displayed EN page locators corrected; v1.0 set as next	NAVIGATION
T1-EN-FC-004	Appendix I	added no-change contract, receipt schema, and freeze decision	RELEASE CONTROL
T1-EN-FC-005	detached receipt	generated after final DOCX/PDF hashes become available	PROVENANCE
T1-EN-FC-006	scientific body	no permitted change	LOCKED
T1-EN-FC-007	formula registry F001-F086	no permitted change	LOCKED
T1-EN-FC-008	statuses and negative results	no permitted change	LOCKED

I.4. Detached Release Receipt Contract

The detached receipt is a JSON sidecar created after the final DOCX and PDF are rendered and accepted. It is unsigned unless a later external signer adds a separate signature. The receipt contains file names, byte sizes, SHA-256 hashes, predecessor hashes, semantic/formula/media manifests, QA verdicts, status locks, and the next release gate. It deliberately contains no self-hash field.

$$Receipt = (source, predecessor, candidate, semantic\ manifests, QA, status\ lock, next\ gate)$$

Receipt field	Requirement	Interpretation boundary
receipt_id	T1-EN-FC-v0.12-RECEIPT	stable identifier, not a signature
candidate hashes	final DOCX and PDF SHA-256	file identity and integrity
predecessor hashes	v0.11 DOCX/PDF SHA-256	controlled lineage
semantic manifests	science, audit H, F001-F086, media digests	no-scientific-change evidence

Receipt field	Requirement	Interpretation boundary
QA evidence	render count, ZIP/PDF checks, placeholder scan	publication hygiene
status lock	truth_layer_promotion=0; EXT-RUN absent	no evidence promotion
signature status	UNSIGNED AUTHORIAL RECEIPT	external signature not implied

I.5. Freeze Gate Matrix

Gate	Acceptance criterion	v0.12 decision	Effect of failure
Authority	RU v197 remains canonical	PASS	BLOCK
Scientific no-change	science and audit-H digests exact match	PASS	BLOCK
Formula parity	F001-F086 exact manifest match	PASS	BLOCK
Media parity	embedded media manifest exact match	PASS	BLOCK
Status firewall	no theorem/model/physical promotion	PASS	BLOCK
Document integrity	DOCX ZIP integrity and searchable PDF	PASS	BLOCK
Visual QA	all pages render without clipping/overlap	PASS	BLOCK
External signed review	not required for authorial freeze	OPEN NON-VETO	NO PROMOTION
EXT-RUN / EMP-OBS	not required for documentary freeze	ABSENT	PHYSICAL ABSTAIN

I.6. Freeze-Candidate Decision

AUTHORIAL DECISION. Final render, integrity, no-change, and visual-QA gates have passed. T1-EN-FC-v0.12 is accepted as the sole source for T1-EN-FREEZE-v1.0. No other predecessor may be promoted directly to v1.0.

$$\textit{T1-EN-FREEZE-v1.0} := \textit{immutable publication copy of accepted T1-EN-FC-v0.12}$$

The freeze operation must create new files rather than rename or overwrite the candidate. After freeze, any scientific, typographic, or metadata correction requires a new change-set and a new post-freeze version. The v1.0 files must preserve the status firewall and the detached receipt lineage.

I.7. Boundary of Conclusion

$$\textit{hash equality} \neq \textit{mathematical proof} \neq \textit{physical validation}$$

$$\textit{NUM-SOURCE} \neq \textit{EXT-RUN} \neq \textit{EMP-OBS}$$

The freeze candidate establishes editorial identity, controlled lineage, and no-scientific-change continuity. It does not create experimental data, execute EXT-RUN-000, validate F-1-F-14, or convert the conditional and model layers into unconditional physical laws. The correct physical verdict remains OPEN / ABSTAIN wherever the Russian source requires it.

I.8. Release Card

Field	Fixed value
Candidate	T1-EN-FC-v0.12
Predecessor	T1-EN-AUDIT-v0.11

Field	Fixed value
Canonical authority	T1-RU v197
Scientific corpus SHA-256	5c9f75267839d69f2eaf00ffad77fd37237dccc1c284973276e74c647b40b9c0
Audit Appendix H SHA-256	d770a618915b4c5e1035e0463f23bfa32d9237dc5a22c4136b4a975272ba1dfd
Formula manifest SHA-256	f40a8840b075c6c797b59d23c3c00c2ac79165a4f2534ee619588bf91b235ab0
Media manifest SHA-256	835421d94355a5d406a0a5f940c35eab4bc3c7f8bb1966e9b675241b4f06c697
Detached receipt ID	T1-EN-FC-v0.12-RECEIPT
Receipt signature status	UNSIGNED AUTHORIAL RECEIPT
Candidate decision	ACCEPTED FOR FREEZE
Next checkpoint	T1-EN-FREEZE-v1.0

I.9. Final QA Evidence

QA object	Observed result	Verdict
DOCX package	ZIP integrity test; no corrupt member	PASS
DOCX render	176 A4 pages rendered to PNG	PASS
PDF render	176/176 pages rendered independently with pdftoppm	PASS
PDF structure	searchable text; tagged; no encryption; A4 portrait	PASS
Visual inspection	all-page contact sheets plus full-size review of release pages	PASS
Page-map anchors	Chapter 1 p.19; Appendix H p.169; Appendix I p.173	PASS
Placeholder scan	reserved placeholder tokens absent	PASS
Status firewall	truth_layer_promotion=0; EXT-RUN and EMP-OBS absent	PASS

FINAL QA VERDICT. PASS. T1-EN-FC-v0.12 is accepted as the freeze candidate. The detached JSON receipt is generated after the final DOCX and PDF hashes are computed; it remains unsigned and does not imply external scientific certification.