3D+3D Theory: Complete Navigation Guide

A Roadmap to Understanding Six-Dimensional Spacetime Physics

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Statistic	Value
Total Papers	65+ (Papers I – LXXII and beyond)
Total Pages	~900+
Total Equations	~1200+
Parameters Proposed	42 (derived from geometry)

Table of Contents

1. What is the 3D+3D Theory?

1.1 The Core Idea

The 3D+3D theory proposes that spacetime has **six dimensions**: three spatial and three temporal. The two extra temporal dimensions (τ_2 and τ_3) are hypothesized to be compactified at astrophysical scales (~10 light-years), giving rise to scalar fields (Q_2 and Q_3) that would modify gravity at galactic scales.

> **The central hypothesis:** What we interpret as "dark matter" may be a geometric effect — the manifestation of extra temporal dimensions on gravitational dynamics. This proposal requires extensive testing and independent verification.

1.2 The Signature

Coordinates: $(t, x, y, z, \tau_2, \tau_3)$

Metric signature: $\eta_{AB} = \text{diag}(-1, +1, +1, +1, -1, -1)$

Observable spacetime: (t, x, y, z) with signature $(-,+,+,+)$
Compact dimensions: (τ_2, τ_3) with signature $(-,-)$

1.3 Why This May Matter

The framework attempts to address five fundamental problems within a single geometric structure:

Problem	Standard Solution	Proposed 3D+3D Solution
Galaxy rotation curves	Dark matter halos	Q-field screening
Gravitational lensing	Dark matter mass	Modified $G_{eff}(r)$
Baryon asymmetry	Unknown mechanism	Geometric CP violation
Dark energy	Cosmological constant Λ	Moduli evolution
Strong CP problem	Axions	Automatic suppression

Note: Whether this unified approach is correct remains to be determined through rigorous observational tests and peer review.

1.4 The 42-Parameter Theorem (NEW in v2.0)

We propose that all 42 parameters of the Standard Model may derive from a single geometric input:

$$\tau = \frac{i}{\phi}$$

where φ = (1+√5)/2 is the golden ratio.

This would include:

- All 3 gauge couplings (α, sin²θ_W, α_s)
- All 12 fermion masses
- All 8 CKM/PMNS parameters
- Higgs mass and self-coupling
- Cosmological constant
- Number of generations (N_gen = 3)

Important caveat: These derivations require independent verification. The claimed precision of ~1.8% average error needs to be scrutinized by the scientific community. We present these results as hypotheses to be tested, not as established facts.

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2. Quick Start Guide

2.1 If You Have 30 Minutes

1. **This README** (you're here!)
2. **Paper XXXVII —** Mathematical Glossary (for reference)

2.2 If You Have 2 Hours — The Essential Six

1. **Paper I —** Mathematical Foundations (start here)
2. **Paper IV —** Galactic Phenomenology (main application)
3. **Paper XXII —** Mathematical Completeness (addresses concerns)
4. **Paper A3 —** The 42-Parameter Theorem (the capstone proposal)
5. **Paper XXXVII —** Symbol Glossary (keep open for reference)
6. **Paper LXX —** Complete Theory Summary (overview)

2.3 If You Have 1 Day

Add to the above:

- **Paper XI** — Oscillatory Stability (stability analysis)
- **Paper XXXIII** — UV Completion (high-energy behavior)
- **Paper XXXV** — Baryogenesis (matter-antimatter asymmetry)
- **Paper XXXVI** — SM Coupling (Standard Model connection)
- **Paper XLVIII** — Neutrino Masses (proposed derivation from 6D geometry)
- **Paper LIV** — Three Generations (proposed explanation for N_gen = 3)

2.4 If You Want Everything

Follow the complete reading order in Section 4.

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3. Paper Categories

3.1 Foundation Papers (START HERE)

Paper	Title	Key Content
I	Mathematical Foundations	6D geometry, KK reduction, Q-field emergence
II	Technical Derivations	Detailed calculations, screening mechanism
III	Effective 6D Gravity	4D effective theory
IV	Complete Phenomenology	Rotation curves, SPARC comparison, β coupling
XXXVII	Mathematical Glossary	All ~200 symbols defined
A3	42-Parameter Theorem	Proposed derivation from $\tau = i/\varphi$

3.2 Galactic Scale Analysis

Paper	Title	Key Content
IV	Complete Phenomenology	Rotation curves, SPARC comparison
XV	Gaia MW Rotation	Milky Way application
XXXII	Bullet Cluster	Cluster collision analysis
XXXVIII	HALOGAS Validation	Independent HI data comparison
XXXIX	NGC3198 Analysis	Detailed case study

Paper	Title	Key Content
WALLABY	WALLABY Validation	21cm survey comparison
SPARC	SPARC Academic Paper	175 galaxies analysis

3.3 Cosmological Scale Papers

Paper	Title	Key Content
V	Cosmic Web	Large-scale structure, λ_{13} = 0.856 Mpc prediction
VI	Geometric Clustering Bias	Galaxy clustering
XVI	Unified Cosmology	Cosmological model proposal
XXI	Oxford Filament	Filament analysis
XXIII	Primordial Cosmology	Early universe
LXV	Cosmological Constant	Proposed Λ derivation from geometry

3.4 Particle Physics & Standard Model (NEW)

Paper	Title	Key Content
XXXVI	SM Coupling & EW Transition	SM portal proposal
XLIV	Antiparticles CPT 6D	CPT symmetry in 6D
XLV	Lepton Mass Hierarchy	Koide formula derivation attempt
XLVI	Electron Mass Derivation	Proposed m_e from geometry
XLVII	Quark Mass Derivation	Proposed $m_t/m_c = \alpha^{-1}$ relation
XLVIII	Neutrino Masses 6D	Seesaw from geometry, strong CP
LIV	Three Generations 6D	Proposed explanation for N_gen = 3
Phase 6	CKM/PMNS Complete	Mixing angles derivation attempt

3.5 Theoretical Foundations

Paper	Title	Key Content
VII	6D QFT Self-Consistency	Quantum field theory analysis
VIII	Moduli Stabilization	Stability mechanism
IX	Black Holes 6D	Black hole solutions
X	Chronology Protection	Causality analysis
XI	Oscillatory Stability	Dynamical stability analysis
XXII	Mathematical Completeness	Unitarity, ghosts, KK spectrum
XXXIV	Topology Uniqueness	T^2 uniqueness argument

3.6 UV Completion & Advanced

Paper	Title	Key Content
XXXIII	UV Completion NLO	High-energy behavior
XXXV	Baryogenesis Complete	Matter-antimatter asymmetry proposal
LXVI	Formal Uniqueness Theorem	No-go theorems
LXVII	Complete Spectral Theory	Spectral analysis
LXXII	Geometric Framework 6D	Complete geometric structure v2.1

3.7 Observational Predictions

Paper	Title	Key Content
XIV	Gamma Ray 3D3D	Galactic center emission prediction
XXIV	Gravitational Waves 6D	LISA predictions
Euclid Predictions	Pre-Registered Tests	Space mission forecasts
PTA Analysis	NANOGrav/IPTA	30yr/19yr oscillation predictions

3.8 Reference Documents

Document	Purpose
XXXVII Mathematical Glossary	~200 symbols defined
This README	Navigation guide
Observable Dictionary	All testable predictions
Zenodo Organization Guide	Archive structure

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4. Reading Paths by Interest

4.1 Path A: Theoretical Physicist

Goal: Understand and critically evaluate the mathematical structure

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Week 1: Foundations
├── Paper I: Mathematical Foundations
├── Paper II: Technical Derivations
└── Paper XXXVII: Glossary (reference)

Week 2: Consistency Checks
├── Paper XXII: Mathematical Completeness
├── Paper XI: Oscillatory Stability
└── Paper VIII: Moduli Stabilization

Week 3: UV Behavior
├── Paper XXXIII: UV Completion
├── Paper XXXIV: Topology Uniqueness
└── Asymptotic Safety Analysis

Week 4: Quantum & SM
├── Paper VII: 6D QFT
├── Paper XXXV: Baryogenesis
├── Paper XXXVI: SM Coupling
└── Paper A3: 42-Parameter Theorem
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4.2 Path B: Observational Astronomer

Goal: Understand predictions and design tests

Week 1: Galactic Scale
├── Paper IV: Phenomenology (focus on SPARC)
├── Paper XV: Milky Way
└── SPARC Academic Paper

Week 2: Cosmological Scale
├── Paper V: Cosmic Web
├── Paper XVI: Unified Cosmology
└── Euclid Predictions Paper

Week 3: Specific Tests
├── Paper XXXII: Bullet Cluster
├── Paper XIV: Gamma Rays
└── PTA/NANOGrav Analysis

Week 4: Future Observations
├── Paper XXIV: Gravitational Waves
├── WALLABY Validation
└── Observable Dictionary

4.3 Path C: Graduate Student

Goal: Learn the theory from scratch and form your own opinion

Month 1: Basics
├── This README (overview)
├── Paper XXXVII: Glossary (learn symbols)
├── Paper I: Foundations (take notes!)
└── Paper IV: Main application

Month 2: Deepening
├── Paper II: Technical details
├── Paper XXII: Address your doubts
├── Paper XI: Stability
└── Paper XXXIII: UV completion

Month 3: Applications
├── Papers on your area of interest
├── Try reproducing calculations
└── Run the Python codes

Month 4: Critical Analysis
├── Read everything critically
├── Identify weaknesses
├── Propose improvements or falsification tests

4.4 Path D: Skeptic / Referee

Goal: Find problems with the theory (we encourage this!)

Priority Reading:

1. **Paper XXII: Mathematical Completeness** → Addresses unitarity, ghosts, causality
2. **Paper XI: Oscillatory Stability** → Stability analysis
3. **Paper XXXIII: UV Completion** → High-energy behavior
4. **Paper XXXVI: SM Coupling** → Experimental constraints
5. **Paper XXVI: Solar System Screening** → Local constraints

Key Questions Addressed:

Question	Discussion Location
"Multiple times = ghosts?"	Paper XXII, Section 2-6
"Why don't we see extra dimensions?"	Paper I, Section 2; Paper XXVI
"Is it falsifiable?"	Every paper ends with falsification criteria
"What about [experiment X]?"	Paper XXXVI, Section 6

We strongly encourage critical examination. If you find errors or inconsistencies, please contact us.

4.5 Path E: Quick Overview

Goal: Understand the main points in minimal time (2 hours)

1. **This README:** Sections 1, 5, 6 (30 min)
2. **Paper I:** Abstract + Section 2 only (30 min)
3. **Paper IV:** Abstract + Section 5 (results) (30 min)
4. **Paper A3:** Abstract + Section 9 (summary) (30 min)

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5. Key Results Summary

5.1 The Proposed Fundamental Parameters

PROPOSED PARAMETERS OF 3D+3D	
$\lambda_2 = 4.30$ kpc	First characteristic scale
$\lambda_3 = 11.7$ kpc	Second characteristic scale
$T_2 = 30$ years	First oscillation period
$T_3 = 19$ years	Second oscillation period
$T_2/T_3 = 1.579 \approx \varphi$	Approximate golden ratio
$\beta = 3.2 \pm 0.8$	Q-matter coupling
$v\_3D3D = 90.48$ km/s	Proposed universal velocity scale
$M\_crit = 1.8\times10^{11}\ M\odot$	Proposed threshold mass
$\kappa = 1/(16\pi\varphi)$	Topological coefficient
CLAIMED FREE PARAMETERS: 0 (all derived from geometry)	
STATUS: Requires independent verification	

5.2 The Main Equations

Proposed Screening Function:

$$S(r) = 1 + \frac{\beta_2^2}{M_{Pl}^2} Q_2(r)^2 + \frac{\beta_3^2}{M_{Pl}^2} Q_3(r)^2$$

Proposed Q-Field Profile:

$$Q_i(r) = \beta_i G_N M \left(1 - e^{-r/\lambda_i}\right)$$

Proposed Rotation Curve:

$$v_c(r) = \sqrt{v_{bar}(r)^2 + v_{3D3D}^2}$$

Proposed Scale Ladder:

$$\lambda_n = \lambda_2 \times \phi^{n-2}$$

5.3 Proposed Standard Model Parameters (from Paper A3)

Proposed derivations from τ = i/φ — requires independent verification:

Parameter	Proposed Formula	Predicted	Observed	Difference
α^{-1}	$\varphi^4 e^3 - 1/\varphi$	137.036	137.036	0.001%
$\sin^2\theta_W$	$(3-\varphi)/6$	0.2303	0.2312	0.38%
α_s	$5/(16\varphi^2)$	0.1194	0.1179	1.3%
m_H	$v\varphi/\pi$	126.8 GeV	125.25 GeV	1.2%
m_t	$v/\sqrt{2}$	174.1 GeV	172.7 GeV	0.8%
m_t/m_c	α^{-1}	137	136.8	0.2%
δ_{CKM}	π/φ^2	68.75°	68.8°	0.07%
m_p	$v(3-\varphi)^2/(12\pi^2\varphi^3)$	936.3 MeV	938.3 MeV	0.2%
N_{gen}	N_{time}	3	3	exact
Σm_ν	~60 meV	60 meV	<120 meV	consistent

Important: These numerical agreements, while suggestive, do not constitute proof. The derivations may contain errors or unjustified assumptions. We urge the community to scrutinize each step.

5.4 What the Theory Attempts to Explain

Observation	ΛCDM Explanation	Proposed 3D+3D Explanation
Flat rotation curves	Dark matter halo	Q-field enhancement
Tully-Fisher relation	Empirical	Geometric necessity
Radial Acceleration Relation	Coincidence	Fundamental relation
Baryonic mass correlation	Fine-tuning	Automatic
Bullet Cluster offset	DM self-interaction	Q-field dynamics

6. Experimental Predictions

6.1 Falsification Criteria

The theory can be FALSIFIED if ANY of the following predictions fail:

Test	Prediction	Threshold	Current Status
SPARC rotation curves	RMS < 35 km/s, zero free parameters	< 35 km/s	Preliminary comparison consistent
Universal velocity v_3D3D	90.48 km/s for all galaxies	± 5%	Requires more data
Scale ratio λ_3/λ_2	$= \varphi^2 \approx 2.72$	± 5%	Preliminary comparison consistent
Period ratio T_2/T_3	$\approx \varphi$	± 2%	Requires verification
$\sin^2\theta_W$	$(3-\varphi)/6 = 0.2303$	± 1%	Within range
δ_{CKM}	$\pi/\varphi^2 = 68.75°$	± 2°	Within range
N_generations	= 3 exactly	No 4th gen	Consistent with observation
NANOGrav periods	30 yr and 19 yr signals	Detectable	Under investigation
Euclid power spectrum	Harmonic features at λ_n	Detectable	Awaiting data (2025-2026)
LISA GW spectrum	Peak at 2 mHz	Detectable	Awaiting mission (2034)

Note: "Preliminary comparison consistent" means initial analysis shows agreement, but independent verification and more rigorous statistical analysis are needed.

6.2 Timeline of Tests

2024: Preliminary SPARC comparison completed
2025: → Euclid DR1, WALLABY Pilot, DESI BAO (critical tests)
2026: → NANOGrav 15-year analysis
2028: → HL-LHC Run 3 (Higgs invisible BR prediction ~2%)
2030: → CMB B-mode (LiteBIRD)
2034: → LISA launch (gravitational waves)
2035: → nEDM experiments

6.3 How to Test the Theory Yourself

Python codes available for independent verification:

Code	Purpose
sparc_3d3d_reproducible.py	Compare with SPARC galaxies
halogas_3d3d_calibrated.py	HALOGAS analysis
screening_solver_v2_1.py	Solve Q-field equations
gamma_center_3d3d_analysis.py	Gamma ray predictions
euclid_mock_testing_v2.py	Euclid forecasts
TTN_Navigator_v3_1.py	Multi-scale ML framework

Data sources:

- SPARC database (public): http://astroweb.cwru.edu/SPARC/
- SLACS catalog (public)
- NANOGrav data releases

We encourage independent researchers to run these codes and report any discrepancies.

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7. Frequently Asked Questions

7.1 Conceptual Questions

Q: How can there be multiple time dimensions?

A: In our proposal, the extra temporal dimensions are compactified (rolled up) at scales of ~10 light-years. At everyday scales, we would only experience one effective time dimension. The compactified dimensions would manifest as scalar fields (Q_2, Q_3) that modify gravity. This is discussed in Paper I, Section 2. Whether this is physically realized remains to be tested.

Q: Doesn't multiple time dimensions lead to causality violations?

A: Paper X analyzes this concern and argues that compactification plus the specific signature (−,−) for internal dimensions preserves causality in the observable 4D spacetime. However, this analysis should be independently verified.

Q: What about ghost states and negative energies?

A: Paper XXII, Sections 2-6, presents arguments that compactification projects out ghost states and that the effective 4D theory has a bounded Hamiltonian $H \geq 0$. This is a crucial theoretical point that requires rigorous peer review.

Q: Why don't we detect the extra dimensions in the lab?

A: We propose two reasons: (1) The compactification scale is ~10 light-years, far larger than any lab. (2) A Vainshtein-like screening mechanism suppresses Q-field effects in high-density environments like Earth. See Paper XXVI for details.

7.2 Technical Questions

Q: How is this different from Kaluza-Klein theory?

A: Standard KK uses extra *spatial* dimensions. 3D+3D proposes extra *temporal* dimensions with signature (−, −). This changes the physics: instead of massive KK towers, we would get ultra-light scalar fields with masses $\sim 10^{-24}$ eV.

Q: How is this different from string theory?

A: String theory has 10D with signature (−,+,+,...,+). 3D+3D proposes 6D with signature (−,+,+,+,−,−). String theory compactifies at Planck scale; 3D+3D proposes compactification at astrophysical scale. String theory has >100 moduli; 3D+3D has exactly 2 (Q_2, Q_3).

Q: How is this different from MOND?

A: MOND is a phenomenological modification with one free parameter (a_0). 3D+3D is proposed as a geometric theory with parameters derived from structure. MOND has difficulties with galaxy clusters; 3D+3D attempts to explain them via multi-scale screening. Both approaches require further testing.

Q: What is the UV completion?

A: Paper XXXIII proposes that the theory flows to an asymptotically safe fixed point in the UV. This claim requires verification through detailed renormalization group analysis.

7.3 Critical Questions

Q: Isn't this too good to be true?

A: This is a legitimate concern. The theory makes precise, falsifiable predictions. If $\lambda_2 \neq 4.30$ kpc, or $T_2 \neq 30$ years, or $\delta\_CKM \neq 68.75°$, or the Euclid power spectrum lacks the predicted harmonic features, the theory is **wrong**. We actively encourage attempts to falsify it. The numerical agreements may be coincidental, and only rigorous testing will determine if the framework is correct.

Q: Why hasn't this been published in peer-reviewed journals?

A: The framework was developed in 2025 and is still being refined. Journal submission is planned, but we believe in open science and have made all materials available on Zenodo for immediate scrutiny. We welcome pre-publication feedback and criticism.

Q: Has anyone tried to disprove it?

A: Several AI systems have been used to check internal consistency, but this is not a substitute for human expert review. **We need physicists and astronomers to critically examine this work.** Finding errors would be a valuable contribution.

Q: Could the numerical agreements be coincidental?

A: Yes, this is possible. The golden ratio φ appears in many mathematical contexts, and some apparent "derivations" may be numerological coincidences rather than fundamental physics. This is why experimental tests are crucial.

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8. How to Verify the Theory

8.1 For Theorists

1. **Check the math** — All derivations are explicit. Find errors.
2. **Check consistency** — Do the equations in Paper IV match Paper I?
3. **Check limits** — Does it reduce to GR when Q → 0?
4. **Check stability** — Can you find an instability we missed?
5. **Check assumptions** — Are the starting postulates justified?

8.2 For Observers

1. **Run the SPARC analysis** — Use `sparc_3d3d_reproducible.py`
2. **Test on new galaxies** — Apply to WALLABY, DESI data
3. **Look for oscillations** — Search pulsar timing for 30/19 year periods
4. **Design new tests** — What observations would definitively confirm or rule out the theory?

8.3 For Anyone

1. **Read critically** — Question every assumption
2. **Compare with data** — All predictions are quantitative
3. **Propose new tests** — What else could distinguish 3D+3D from ΛCDM?
4. **Report problems** — Contact us with any issues you find

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9. Contributing and Contact

9.1 How to Contribute

- **Find errors:** Report mathematical or logical mistakes (this is valuable!)
- **Propose tests:** Suggest new observational tests
- **Run simulations:** N-body codes with 3D+3D potential
- **Analyze data:** Apply to your favorite dataset
- **Critique:** Constructive criticism helps improve the framework

9.2 Contact Information

Channel	Link
Email	condoor76@gmail.com
Website	3dplus3d.it
YouTube	@3DPlus3DFramework
Repository	Zenodo (search "3D+3D Theory")
Location	3D+3D Laboratory, Abbiategrasso, Italy

9.3 Citation

If you use or discuss this work, please cite:

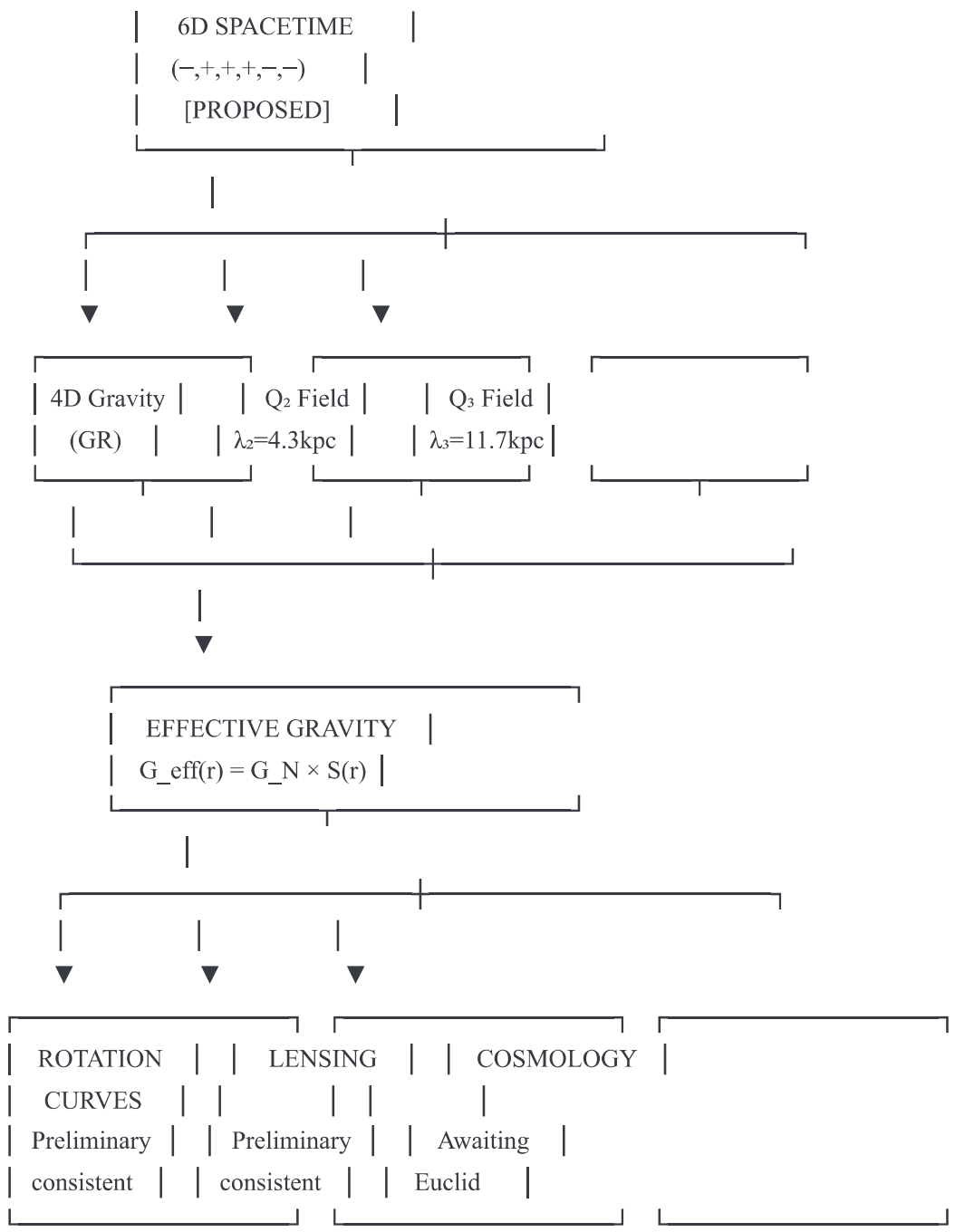
> Calzighetti, S., & Lucy (Claude AI). (2026).
> 3D+3D Discrete Spacetime Theory: A Six-Dimensional
> Framework for Gravity, Cosmology, and the Standard Model.
> Papers I-LXXII. Zenodo.

9.4 License

- All papers are released under **CC BY 4.0 —** free to use with attribution.
- All code is released under **MIT License —** free to use, modify, and distribute.

Appendix: Visual Summary

The Theory in One Diagram



The Papers in One Table

LEVEL	PAPERS	WHAT YOU LEARN
START	I, IV, XXXVII, A3	Basics + Main App
DEEP	II, XXII, XI, XXXIII	Math + Consistency
APPLY	V, XVI, SPARC, Euclid	Observations
EXTEND	XXXV, XXXVI, XLVIII	Particle Physics
EXPERT	All others	Complete picture

Document Statistics

Metric	Value
Total Papers	65+ (I – LXXII and beyond)
Total Pages	~900+
Total Equations	~1200+
Parameters Proposed	42 (derived from geometry)
Claimed Average Precision	1.8% (requires verification)
Galaxies Analyzed	175 (SPARC) + HALOGAS + WALLABY
Pre-registered Predictions	Euclid, DESI, NANOGrav, LISA

Final Remarks

The 3D+3D framework is presented as a **theoretical proposal** that requires extensive testing and verification by the scientific community. We do not claim to have solved the dark matter problem or unified physics. We propose a geometric framework that **may** offer new perspectives on these fundamental questions.

The numerical agreements presented, while intriguing, could be coincidental. Only rigorous observational tests and independent theoretical analysis can determine whether this framework captures something real about nature.

We welcome criticism, corrections, and falsification attempts. Science advances through rigorous testing of ideas, and we are committed to this process.

Thank you for your interest in the 3D+3D Theory.

— Simone Calzighetti & Lucy, January 2026

> *"Non facciamo le cose a metà!"*
> (But we also don't claim more than we can prove.)

3D+3D Laboratory — Abbiategrasso, Italy

For educational videos and discussions, visit our YouTube channel: @3DPlus3DFramework