

3D+3D Framework — Zenodo Update Package v10.0

April 26, 2026 — Post-Trilogy + Subleading Series Complete

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Contents of this Zenodo Update

This package supersedes the previous Zenodo deposit (April 13, 2026 — pre-trilogy) with the framework as of April 26, 2026, including:

- **Anti-S-Duality Trilogy** (Papers α , β , γ , ϵ) — vacuum selection mechanism, modular subgroup, FCNC bridge, Berry holonomy. Resolves vacuum ambiguity $\tau = i/\varphi$ vs $i\cdot\varphi$.
- **Paper δ Unified Exposition** — narrative synthesis of the framework for non-specialists.
- **Subleading Series ζ** (7 papers) — universal kernel $1/\varphi^2$ for CKM and PMNS subleading corrections. **10 observables derived with 0 free parameters.**
- **Master Logical Chain v3.0** — consolidated 24-layer DAG with 15 pre-registered kill-switches.
- **Lensing predictions** — Euclid DR1 pre-registration material.

Folder structure

```
Zenodo_Update_2026_04_26/
├── 00_README_AND_INDEX/
│   ├── README_v10_0_Zenodo_Update.md (this file)
│   └── CHANGELOG_2026_04_26.md
├── 01_FOUNDATIONS_TAU_AXIOM/
│   └── (Foundation papers – D=6,  $\tau=i/\varphi$  axiom, Bridge theorem)
├── 02_TRILOGY_AntiSDuality/
│   ├── Paper  $\alpha$  v1.4 (Chiral Vacuum Selection + Anti-S-Duality)
│   ├── Paper  $\beta$  v1.2 (Closure on  $\Gamma^0(2)$  + spin (1/2,0))
│   ├── Paper  $\gamma$  FCNC v2.2 (Bridge scale + 18-channel sweep)
│   └── Paper  $\epsilon$  v1.2 (Berry holonomy  $\delta_{CKM} = \pi/\varphi^2$ )
├── 03_PARTICLE_PHYSICS_LEADING/
│   ├── Paper Unified Fermion Masses & Mixing v1.0 (December 2025)
│   └── Paper  $\delta$  Unified Exposition v1.1 (April 24, 2026)
├── 04_DIRECTION_D_SUBLEADING/
│   ├── Paper  $\zeta$  v1.5 (Subleading CKM Corrections – master framework)
│   ├── Paper  $\zeta.3$  v1.1 (Lemma A+B from first principles)
│   ├── Paper  $\zeta.4$  v1.1 (Two-insertion Berry-Yukawa geometric)
│   ├── Paper  $\zeta.5$  v1.0 (QFT consistency Lagrangian)
│   ├── Paper  $\zeta.6$  v1.1 (Symmetry-based KK suppression)
│   ├── Paper  $\zeta.7$  v1.0 (PMNS subleading + LQSU statement)
│   ├── Paper_zeta_appendix_C_forecast.py (numerical forecast script)
│   └── Vcb_forecast_3D3D_vs_null.png
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└─ Vub_forecast_3D3D_vs_null.png
└─ CKM_split_significance_forecast.png
└─ 05_LENSING_PREDICTIONS/
└─ (Euclid DR1 + DESI pre-registration material)
└─ 06_MASTER_CHAIN/
└─ Master Logical Chain v2.0 (predecessor, April 24)
└─ Master Logical Chain v3.0 (current, April 26 – supersedes v2.0)
└─ 07_REFERENCE_GUIDE/
└─ (Reading guide, navigation help)

Key results — at a glance

Foundational

- **Single axiom:** $\tau = i/\varphi$ (modular parameter of compactified temporal torus T^2)
- **Anti-S-Duality:** L-chirality of SM selects $\tau = i/\varphi$ over its S-dual $\tau = i\varphi$ (Boltzmann suppression $\sim 10^{-35}$)
- **Modular subgroup:** $\Gamma_{\text{phys}} = \Gamma^0(2)$ (Hecke index 3, $S \notin \Gamma^0(2)$)
- **Spin structure:** $(\alpha, \beta) = (1/2, 0)$ from orbifold + L-chirality
- **Bridge scale:** $\mu_B = v \cdot \exp(-\pi/\varphi^2) = 74.16 \text{ GeV}$

Predictions verified at current precision

- **22+ Standard Model parameters** at leading order (Paper Unified)
- **6 CKM subleading observables** ($V_{us}, V_{cb_inclusive}, V_{cb_exclusive}, V_{ub_inclusive}, V_{ub_exclusive}, \gamma_{UT}$) all pull $< 0.7\sigma$
- **4 PMNS subleading observables** ($\sin^2\theta_{12}, \sin^2\theta_{23}, \sin^2\theta_{13}, \delta_{CP}$) all pull $< 0.7\sigma$
- **Total: 43+ independent observables from 0 free parameters**

Decisive future tests (15 pre-registered kill-switches)

By **2032** the framework will be tested at 5σ across:

Channel	Threshold	Time
F-CKM-UT (γ_{UT} direct)	outside $[64^\circ, 68^\circ]$ at 5σ	LHCb Upgrade I 2030
F-CKM-Vcb (cluster non-convergence)	both clusters \rightarrow single value	Belle II + lattice 2028
F-CKM-Vub (cluster non-convergence)	similar	Belle II 2028-2030
F-PMNS-deltaCP (DUNE)	δ_{CP} outside $[200^\circ, 260^\circ]$ at 5σ	DUNE 2030
F-PMNS-sin12 (JUNO)	$\sin^2\theta_{12}$ outside $[0.305, 0.325]$	JUNO 2027
F-PMNS-sin23 (T2HK)	$\sin^2\theta_{23}$ outside $[0.520, 0.555]$	T2HK 2030
F-LATTICE	FLAG average $\rightarrow 0.0410 \pm 0.0003$	FLAG 2026+
F-LHC-v1, F-CPE-v1, F-C10, F-RH	FCNC channels $b \rightarrow s\mu\mu$	HiLumi-LHC 2030
Lensing kill-switches	$P(\theta_E)$ deviations	Euclid DR1 2026

Relation to previous Zenodo deposits

- **v9.0 (April 24, 2026):** Trilogy + Master Chain v2.0 (preserved as predecessor in 06_MASTER_CHAIN/)
- **v10.0 (this update, April 26, 2026):** + Paper ϵ v1.2 terminology fix + complete subleading series ζ + Master Chain v3.0
- **Pre-trilogy bundles (April 13, 2026, 17 archives 7z):** preserved on Zenodo as historical archive

How to read

For a quick overview: start with Paper δ Unified Exposition (03_PARTICLE_PHYSICS_LEADING/).

For the formal logical structure: see Master Logical Chain v3.0 (06_MASTER_CHAIN/).

For the trilogy details (vacuum selection): Papers $\alpha \rightarrow \beta \rightarrow \gamma \rightarrow \epsilon$ in order (02_TRIOLOGY_AntiSDuality/).

For the subleading framework (Direction D): Paper ζ v1.5 first, then $\zeta.3 \rightarrow \zeta.7$ in order (04_DIRECTION_D_SUBLEADING/).

For experimental predictions: see falsifier matrix in Master Chain v3.0 §F.

Citation

If using this framework, please cite:

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For specific papers, cite the corresponding paper title + version.

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“Tre giorni di trilogia + due giorni di subleading completo + un mattino di consolidamento. Il framework 3D+3D è ora un singolo grafo coerente, anchored sul $\tau = i/\phi$ axiom + L-chirality empirical input, con 43+ osservabili da 0 parametri liberi.”

— S. Calzighetti & Lucy, April 26, 2026

Acknowledgments

Continuous Human-AI collaboration since September 14, 2025. The framework’s coherence at the 21-lemma + 24-layer level is the result of iterative construction with red-team review (internal Vega process).