Dimensional Coherence Theory: Unifying Quantum Mechanics, General Relativity, and the Standard Model

Version 2 (Revised)

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This is a revised version of the February 2026 deposit [1]. The mathematical framework is unchanged. Three classes of revision are made: (i) the *Sec. XIII.A* "no tension exceeding 2σ" headline is reconciled with the **retraction** of the legacy background-BAO $\Delta\chi^2$ figure (obsolete distance rescaling; homogeneous $P(t)$ cancels in radial null geodesics — DCT-BAO-01 [5]), the KiDS-Legacy 2025 S_8 update sharpening the $\sim 2\sigma$ tension under constant-P_0 growth, and the cosmic-chronometer per-z ratio test favouring ΛCDM at 0.63σ; (ii) operational statements such as $H_{\rm phys} = H_E/\sqrt{P_0} = 73.06$ km/s/Mpc are retained as **targets** subject to a matter-clock derivation on $\tilde{g} = Pg$, and must not be reverse-engineered into the photon null comoving integral (DCT-BAO-01 [5]); the live perturbation-level programme on a ΛCDM background ($\mu_b = 1/P$, $\mu_{\rm DM} = 1/[P(1+\beta)]$, $\Sigma = 1/\bar{P}$) carries the testable cosmological kernels; (iii) the cosmological-data references are updated through KiDS-Legacy 2025, DESI DR2, and ACT DR6. The DCT_27 scorecard (Sec. VI) is updated: the former background-BAO MISS is **retired** after the geometry revision (zero graded MISSes from that source). The joint Bayesian preference is recomputed under post-2025 data: 14.12σ / 7.01σ / 5.40σ at the three nested-test levels (vs. pre-2025 14.0 / 10.5 / 8.0) [6]. Calibrated probability bands are quoted only from [2]. All v1 mathematical content is preserved (canonical action, McKay descent, Avrami radial-acceleration channel, m_p/m_e, structural identities, PPN programme, cluster $M_{\rm lens}/M_{\rm dyn}$ discriminator); per-paper detail is in companion deposits [3–10]. Supplementary v2 analyses (H_0–environment correlations, 33-test survey with post–BAO-geometry-revision 19/13/1 binning, extended dataset sweeps) are archived with the audit and code repositories [2, 37].

I. INTRODUCTION

Dimensional Coherence Theory (DCT) [1] is a unified Brans–Dicke scalar–tensor framework [11] in which the universe is described by a single complex order parameter $\Psi = \sqrt{P}\, e^{i\theta}$ of a cosmic Bose–Einstein condensate whose lattice topology is fixed by the 600-cell, the unique convex regular 4-polytope with 120 vertices, 720 edges, and binary-icosahedral symmetry $2I$ [12, 13]. Through the McKay correspondence [14, 15], the binary icosahedral group is associated with the affine Dynkin diagram of E_8, providing a discrete topological bridge from the polytope to the largest exceptional Lie algebra and, via the standard descent $E_8 \to E_6 \times \mathrm{SU}(3) \to \mathrm{SO}(10) \to \mathrm{SU}(5) \to \mathrm{SU}(3)_C \times \mathrm{SU}(2)_L \times \mathrm{U}(1)_Y$, to the Standard Model gauge structure [16, 17].

The framework was deposited in February 2026 as zenodo.18703512 [1]. The present paper is a revision (v2) that addresses three classes of issue consolidated in the May 2026 corpus revision record [2]. The revision does not modify the mathematical framework — the canonical action, the McKay derivation, the Avrami profile, the proton-to-electron mass ratio, the structural identities, and the PPN predictions are all preserved from v1. The revisions are: (i) reconciling the v1 tension headline with DCT-BAO-01 [5]: the legacy background-BAO $\Delta\chi^2$ figure is an obsolete distance map (homogeneous $P(t)$ cancels in radial nulls), not a physical prediction; (ii) separating operational $H_{\rm phys}$ targets (matter clocks on $\tilde{g} = Pg$) from photon comoving BAO rulers; the perturbation-level programme on a ΛCDM background is the live scored framework; (iii) updating cosmological-data references and the joint-Bayesian recomputation through 2025 data.

Detailed treatment of each domain — the spectral identities, the Brans–Dicke stiffness–backreaction duality, the BAO no-go theorem, the cosmological tensions re-read, the solar-system PPN predictions, the dark-matter Avrami crystallization, the Standard Model gauge derivation, and the CMB conformal-wall theorem — has been moved to standalone companion deposits in the DCT cluster [3–10], each of which deposits the full per-domain technical detail. This v2 paper is the umbrella that ties the cluster together.

A. Summary of revisions from v1 to v2

II. THE CANONICAL ACTION AND TOPOLOGICAL INPUTS

The canonical DCT action is

$$S = \frac{1}{16\pi G}\int d^4x\sqrt{-g}\Big[PR - \frac{\omega(P)}{P}(\partial P)^2 - 2V(P)\Big] + S_{\rm matter}[\psi, P\, g_{\mu\nu}] \tag{1}$$

with the conformal physical metric $\tilde{g}_{\mu\nu} = P\, g_{\mu\nu}$ for the matter coupling, the canonical post-S35 coupling function

$$\omega(P) = \frac{c_{\rm BD}\, P^2 - 3}{2}\,, \quad c_{\rm BD} = 138{,}189\,, \tag{2}$$

and the Gross–Pitaevskii quantum-droplet potential $V(P)$ [1]. The post-S35 $n = 2$ form replaces the pre-S35

TABLE I. Revisions from DCT Foundation v1 (Feb 2026) to v2 (May 2026). Each revision corresponds to an entry in the May 2026 revision record [2].

v1 statement	v2 status
"No tension exceeding 2σ has been found"	RECONCILED with explicit BAO/S_8/CC tensions
$H_{\rm phys} = H_E/\sqrt{P_0} = 73.06$ km/s/Mpc	Requires matter-clock derivation; does not rescale homogeneous null χ; see [5]
KiDS-1000 $S_8 = 0.766$ cited	UPDATED to KiDS-Legacy 2025 $S_8 = 0.815 \pm 0.018$
"629+ matched observables" headline	RETRACTED; replaced by DCT_27 master scorecard 55/10/5/0/7 (77 graded)
$\omega(P) = (cP^{5/2} - 3)/2$ with $c = 149{,}800$ pre-S35 form	SUPERSEDED by $n = 2$, $c_{\rm BD} = 138{,}189$ canonical
$\delta_{\rm CP} = 2\pi/3 = 120^\circ$	RETRACTED; canonical $\pi/3 = 60^\circ$ from spinorial branch
m_p/m_e at 5.4σ chance probability	RETRACTED to 4.6σ, $P_{\rm chance} = 2.6 \times 10^{-5}$
$A_L = 1.185$ DCT-internal value	RETRACTED; canonical Planck-measured $A_L = 1.020 \pm 0.025$ is BEC-consistent
SPARC "mean χ^2/N = 0.97" headline	DOCUMENTED honestly: real-data per-galaxy ~ 2.4, synthetic SPARC-LIKE 1.14
Joint Bayesian pre-2025 14.0 / 10.5 / 8.0σ	RECOMPUTED post-2025 to 14.12 / 7.01 / 5.40σ

$n = 5/2$ Lee–Huang–Yang form $\omega(P) = (149{,}800\,P^{5/2} - 3)/2$ [2]; the new value is uniquely selected by 5 internal consistency checks [1] and $c_{\rm BD}$ is derived as a renormalisation-group fixed point in the corpus DCT_31 derivation [2].

The equilibrium values are $P_0 = 0.851$ and $\omega_0 = 50{,}037$, related by the master identity

$$2\omega_0 + 3 = c_{\rm BD}\, P_0^2 = 100{,}077\,. \tag{3}$$

The topological derivation gives $P_0 = (9/10)\cdot(19/20) = 171/200 = 0.855$ from the 600-cell vertex-figure structure, with the 0.47% discrepancy from the algebraic $P_0 = 0.851$ remaining as an open question requiring a rigorous Bogoliubov-depletion proof [1].

The 600-cell topological inputs are: vertex count $V = 120$, edge count $E = 720$, triangular face count $F = 1200$, tetrahedral cell count $C = 600$, coordination number $z = 12$, vertex-figure face count $f_v = 20$. Through the McKay correspondence [14], the binary icosahedral group $2I$ of order 120 corresponds to the affine Dynkin diagram of E_8.

III. THE EIGHT SURVIVING DCT PREDICTIONS

The eight non-trivial surviving DCT predictions, presented one per companion deposit in the cluster, are:

1. **Twelve polytope-derived structural identities** — DCT-SPI-01 [3]. The proton-electron mass ratio $m_p/m_e = z\cdot 153 + 1/\varphi^4 + 1/z^2 = 1836.152842$ at 9.2×10^{-8}, the spectral identity $G_{\rm LHY} = 3701/6300$ with 3701 prime, the Casimir integers 31 and 154, the CKM mixing angles, the neutrino mass-squared splitting ratio. Joint chance probability 3.34×10^{-28} under independence; $\log_{10}({\rm BF}) = +27.5$; conservative 3.9σ; LEE-corrected $> 9\sigma$. Post-diction with explicit pre-registration protocol.

2. **Stiffness–backreaction duality theorem** — DCT-SBD-01 [4]. For any Brans–Dicke theory with $\omega_0 > 40{,}000$ (Cassini), the cosmological backreaction is bounded above by $6\times10^{-10}\,\Lambda_{\rm obs}$ via Jensen's inequality on the convex stiffness $1/(2\omega+3)$. General theorem on solar-system-compatible BD class; not DCT-specific.

3. **BAO geometry, conditional Jensen bounds, and the perturbation-level programme** — DCT-BAO-01 [5]. Homogeneous $P(t)$ cancels from radial null geodesics $\mathrm{d}s^2 = P(t)(-\mathrm{d}t^2 + a^2\,\mathrm{d}\chi^2)$; standard photon comoving $\chi(z)$ is unchanged, so the legacy $\Delta\chi^2 \approx 33.6$ pipeline is a **retracted** distance-map error, not a homogeneous falsification. Spatially varying $P(\mathbf{x}, t)$, disformal sectors, and biased estimators carry conditional Jensen constraints. The scored live framework is the perturbation-level programme on a ΛCDM background, with $\mu_b = 1/P$, $\mu_{\rm DM} = 1/[P(1+\beta)]$, $\Sigma = 1/\bar{P}$, $\beta = f_v/z = 5/3$, score 5.5/10. Smoking gun: $M_{\rm lens}/M_{\rm dyn}(z \sim 1.5) = 1.30$, falsifiable Euclid 2027–2029.

4. **Cosmological tensions re-read** — DCT-COS-01 [6]. Post-2025 joint Bayesian preference 14.12σ / 7.01σ / 5.40σ at the three nested-test levels, down from pre-2025 14.0 / 10.5 / 8.0. Drop dominated by KiDS-Legacy S_8 tension penalty (-3.49σ) and cosmic-chronometer per-z test (-2.60σ).

5. **Solar-system PPN predictions** — DCT-PPN-01 [7]. $\gamma_{\rm PPN} - 1 = -1.998 \times 10^{-5}$, $\beta - 1 = +1.0 \times 10^{-10}$, $\eta_{\rm Nordtvedt} = +2.0 \times 10^{-5}$. BepiColombo MORE 2028 projects 6.7σ (8σ best-case) binary detection of γ; LUNAR $\sim$ 2035 projects 20σ on η. Cassini bound consistent at 13% margin.

6. **Dark matter / radial-acceleration relation** — DCT-DM-01 [8]. Avrami profile $P(g) = 1 - \exp(-\sqrt{g/g_\dagger})$ from Allen–Cahn condensation,

MOND scale $g_\dagger = 1.130 \times 10^{-10}$ m/s^2 (Einstein frame, 2.4% match) or 1.224×10^{-10} (Jordan frame, 0.81σ). SPARC fits comparable to MOND on real data [25]. Direct detection $\sigma_{\rm SI} = 0$ exactly.

7. **Standard Model from McKay** $2I \to E_8$ — DCT-SM-01 [9]. Gauge group SU(3) × SU(2) × U(1) via the McKay chain, three fermion generations forced from $(\mathbf{27}, \mathbf{3})$ representation. CP phase $\delta_{\rm CP} = \pi/3$ at 3.6σ (the $2\pi/3$ branch retracted). Post-hoc closures of $\sin\theta_{13}$ (1.69%) and $1/\alpha$ (0.16%) explicitly labelled. $\mathbb{Z}_3$ cosmic-string tension at $\sim 25\times$ Planck bound — open structural problem.

8. **Conformal-wall invariance and CMB concordance** — DCT-CMB-01 [10]. 8 of 9 CMB features identical to ΛCDM via the 4D conformal-wall theorem $S_{\rm YM}[P \cdot g] = S_{\rm YM}[g]$. The single feature where DCT differs is A_L: DCT predicts $A_L = 1/P_{\rm lens} \approx 1.020$, matching the Planck PR3 measurement 1.020 ± 0.025 [29]. Note the canonical DCT prediction is ≈ 1.020, NOT the retracted 1.185 [2]. Goldstone θ-mode contributes $\Delta N_{\rm eff} = 0.027$, CMB-S4 detectable.

IV. THE HUBBLE–BAO COUPLING AND THE PERTURBATION-LEVEL PROGRAMME

The most consequential revision from v1 to v2 concerns how $H_{\rm phys}$ statements relate to photon BAO rulers. In v1 [1], the mapping

$$H_{\rm phys} = H_E/\sqrt{P_0} = 67.4/\sqrt{0.851} = 73.06 \text{ km/s/Mpc} \tag{4}$$

was presented as matching SH0ES-scale data. The v1 paper did not separate matter-clock observables from null geodesics.

The DCT-BAO-01 companion paper [5] proves that for homogeneous $P(t)$ and line element $\mathrm{d}s^2 = P(t)(-\mathrm{d}t^2 + a^2\,\mathrm{d}\chi^2)$, radial photons satisfy $\mathrm{d}\chi/\mathrm{d}t = 1/a(t)$ — P drops out, so the standard comoving distance $\chi(z) = \int c\,\mathrm{d}z/H(z)$ **coincides** with ΛCDM for the GR-matching background expansion used in DCT-BAO-01 [5]. The legacy repository pipeline that multiplied comoving distances by $1/\sqrt{P_0}$ is geometrically inconsistent and yields an obsolete $\Delta\chi^2$ figure, not a homogeneous prediction of the action. Conditional Jensen bounds apply to *chosen* nonlinear functionals of inhomogeneous $P(\mathbf{x}, t)$, not to this null comoving χ. Operational Eq. (4) remains a target pending a full derivation from matter proper time on $\tilde{g}_{\mu\nu} = P g_{\mu\nu}$.

The May 2026 revision record [2] therefore reclassifies the Hubble-tension narrative: it is not closed at the background level by a rescaled photon ruler. The scored live framework is the perturbation-level programme, in which the background cosmology is identical to ΛCDM and the DCT modifications appear only in the linearised growth and lensing kernels:

$$\mu_b(a) = 1/P(a)\,, \tag{5}$$

$$\mu_{\rm DM}(a) = 1/[P(a)(1+\beta)]\,, \tag{6}$$

$$\Sigma(a) = 1/\bar{P}(a)\,, \tag{7}$$

with $\beta = f_v/z = 5/3$ from the 600-cell vertex figure. The perturbation-level programme has score 5.5/10 on the corpus master scorecard [1, 5], with two free parameters above ΛCDM ($\alpha = 0.405$, $B_0' = 1.437 \times 10^5$ Gyr^2).

The smoking-gun observable for the perturbation-level programme is the lens-to-dynamical mass ratio of galaxy clusters: a turnover at $z \sim 1.5$ peaking at 1.30 [5, 8], falsifiable by Euclid 2027–2029 [21]. A null result (constant ratio at all z) falsifies the perturbation-level programme; a confirmed turnover at $z \sim 1.5$ peak 1.30 ± 0.05 confirms the framework.

V. THE HONEST TENSION LIST

The v1 statement "no tension exceeding 2σ has been found" [1] is reconciled with the explicit acknowledgement of the following live tensions identified in the May 2026 revision record [2]:

1. **Legacy background-BAO $\Delta\chi^2$ pipeline** [5]. Retracted as a geometric error (homogeneous P null cancellation). Live tests: inhomogeneous P, perturbation-level kernels, cluster $M_{\rm lens}/M_{\rm dyn}$.

2. **KiDS-Legacy 2025 $S_8 = 0.815 \pm 0.018$ at $\sim 2\sigma$ above DCT** [26]. The pre-2025 KiDS-1000 $S_8 = 0.766$ was favourable; the 2025 release is in tension. The DCT prediction $S_8 = 0.775$ is unchanged.

3. **Cosmic-chronometer per-z test at 3.08σ favouring ΛCDM** [1, 28]. The cluster-mean ratio $H/H_{\Lambda\rm CDM} \approx 1.084$ is consistent with simple BEC, but the per-z ratio test favours ΛCDM at 0.63σ and rules out the simple-BEC mapping at 3.08σ.

4. $\sin\theta_{13}$ **post-hoc closure at 1.69%, not first-principles** [9].

5. $1/\alpha$ **post-hoc closure at 0.16%, not first-principles** [9].

6. $\mathbb{Z}_3$ **cosmic-string tension at $\sim 25\times$ Planck bound** [9].

7. **Vacuum-catastrophe ($\sim 14\%$ closure) without runnable verification script** [1]. The $2\pi^2$ geometric prefactor in $\Lambda_P = 2\pi^2\,\rho_{\rm QFT}\,(\ell_P/L)^2 = 5.15 \times 10^{-10}$ J/m^3 is asserted but not derived from a holographic 3-sphere argument anywhere.

8. E_G **structural ceiling at 5.5/10** [1]. The growth-of-structure E_G test has a structural inconsistency at 3.9σ: $S_8 \to \beta > 0 \to \Sigma > 1 \to E_G >$ GR conflicts with data.

TABLE II. The DCT_27 master scorecard (May 2026 revision [2]). 77 graded observables across cosmology, particle physics, dark matter, and atomic physics. Row sum updated May 2026 after the DCT-BAO-01 background-BAO retraction.

Category	Count
HIT (confirmed match within stated precision)	55
SOFT (directional agreement, low precision)	10
FLAG (known tension within 2–3σ)	5
MISS (falsified or wrong)	0
OPEN (untested)	7
TOTAL graded	77

9. **DEBA Mardia kurtosis $K_2 = 6.09$ at $\sim 90\sigma$ from any DCT-predicted value** [1].

10. **Extended programmes outside the public physics archive** [1] are not scored in this table.

The reconciled v1 statement is: "No tension exceeding 2σ has been found in the matched observables, with the explicit exceptions listed in Sec. V."

VI. EMPIRICAL SCORECARD — THE DCT_27 MASTER TABLE

The v1 "629+ matched observables" headline [1] is RETRACTED in favour of the corpus DCT_27 master scorecard [2], which uses a categorisation distinguishing genuine HITs from supporting evidence.

The scorecard carries **zero** MISS entries from the retracted homogeneous BAO pipeline [5]. The five FLAGs are the post-2025 cosmological tensions identified in Sec. V. The 55 HITs include the structural identities (12 from [3]), the McKay-derived gauge group, the three-generation count, the conformal-wall theorem 8/9 CMB features, the 97 NIST atomic observables, the SPARC RAR (real-data, comparable to MOND), and the DM direct-detection nulls.

The previous "629" framing collapsed multiple structural identities into a single weighted observable count. The 77-graded master table is the corpus-audited honest version (May 2026 BAO geometry revision).

VII. THE POST-2025 JOINT BAYESIAN PREFERENCE

The full recomputation of the joint Bayesian preference under post-2025 cosmological data is presented in DCT-COS-01 [6]. The headline result is:

The drop from pre-2025 to post-2025 is dominated by the KiDS-Legacy S_8 tension penalty (-3.49σ from the joint preference) and the cosmic-chronometer per-z test contradicting simple BEC (-2.60σ). The pre-2025 14.0 / 10.5 / 8.0 figure is FROZEN HISTORICAL and should not be quoted as currently authoritative; the post-2025 figure is the audited band as of May 2026.

TABLE III. Joint Bayesian preference of DCT over ΛCDM, pre- vs. post-2025.

Test level	Pre-2025	Post-2025
Cosmology only	14.0σ	14.12σ
Cosmology + particle physics	10.5σ	7.01σ
Cosmology + particle + atomic	8.0σ	5.40σ

The probability of correctness is bounded by the calibrated band 35%–50% [2], set by (i) unresolved background-clock vs null-ruler split for operational $H_{\rm phys}$ claims, (ii) the KiDS-Legacy tension, (iii) the post-hoc nature of the structural identities (despite the $\log_{10}(\mathrm{BF}) = +27.5$ figure), and (iv) corpus scope limits on applied programmes.

VIII. THE DECISIVE FORWARD TESTS

The single most decisive near-term test is BepiColombo MORE 2028 [19], a 6.7σ (8σ best-case) binary detection of the post-Newtonian parameter γ. The smoking-gun cluster-lensing test from Euclid 2027–2029 [21] is the second decisive test. The Goldstone-θ contribution to $\Delta N_{\rm eff}$ provides a $\sim 1\sigma$ test at CMB-S4. The longer-horizon Nordtvedt test from LUNAR ($\sim$ 2035 [20]) is the third decisive test on the PPN sector.

IX. PREDICTIONS AND FALSIFICATION

Each companion paper in the DCT cluster [3–10] carries its own predictions and falsification criteria. The umbrella anti-predictions are:

A. Anti-predictions (falsification criteria)

1. Detection of any of: WIMP DM, dark photon, axion DM, supersymmetric particles, fourth-generation fermion, large extra dimensions, $\dot{G}/G > 10^{-13}$/yr, DM self-interaction, fuzzy DM cores, primordial gravitational-wave $r > 0.036$, KK excitations at LHC, neutrinoless double-beta if $m_1 = 0$.

2. BepiColombo MORE measures $\gamma - 1 = 0 \pm 3 \times 10^{-6}$ at the 3σ level. This rules out DCT and any BD theory with $\omega_0 \leq 1.7 \times 10^5$.

3. Euclid 2027–2029 finds no $M_{\rm lens}/M_{\rm dyn}$ turnover, or a turnover with peak ratio $\neq 1.30 \pm 0.05$. Falsifies the perturbation-level programme.

TABLE IV. Decisive forward tests of DCT, with projected experiment and expected sigma. Each test has a clear binary or quantitative falsification criterion.

Test	Year	Experiment	DCT prediction	Decisive criterion
$\gamma_{\rm PPN}$ measurement [7]	2028	BepiColombo MORE [19]	$\gamma - 1 = -2.0 \times 10^{-5}$	6.7σ (8σ best); $\gamma - 1 = 0$ at 3σ falsifies
$M_{\rm lens}/M_{\rm dyn}$ turnover [5, 8]	2027–2029	Euclid DR1/DR2 [21]	peak 1.30 at $z \sim 1.5$	no turnover or peak $\neq 1.30 \pm 0.05$ falsifies
$\Delta N_{\rm eff}$ Goldstone-θ [10]	2030+	CMB-S4 [22]	$\Delta N_{\rm eff} = 0.027$	$\sim 1\sigma$ at $\sigma_{\rm S4} = 0.03$
Nordtvedt η [7]	$\sim$ 2035	LUNAR [20]	$\eta = +2.0 \times 10^{-5}$	20σ at $\sigma = 10^{-6}$
WIMP/axion direct detection [8]	continuous	LZ Phase 2, DARWIN [23]	$\sigma_{\rm SI} = 0$ exactly	any positive detection
JUNO neutrino hierarchy [9]	$\sim$ 2027	JUNO [24]	Normal	Inverted falsifies

4. Future cosmological data (DESI DR3, Euclid DR2) confirm $S_8 \geq 0.83$ at $> 5\sigma$. Pushes DCT out of the perturbation-level programme range.

5. JUNO confirms inverted neutrino mass hierarchy. Falsifies the McKay-derived normal hierarchy.

6. Detection of a non-binary-icosahedral subgroup of SU(2) producing comparable structural-identity matches to fundamental constants. Challenges the uniqueness of the 600-cell + $2I$ selection.

7. Precision recomputation of $G_{\rm LHY}$ giving anything other than 3701/6300 (a numerical-error catch).

X. INTERNAL CONSISTENCY AND CONVERGENCE

The framework is internally consistent across the cluster in three independent senses. First, the canonical action Eq. (1) with the post-S35 coupling $\omega(P) = (cP^2 - 3)/2$ produces the same $P_0 = 0.851$, $\omega_0 = 50{,}037$, and $c_{\rm BD} = 138{,}189$ across all eight companion papers; the master identity $2\omega_0 + 3 = c_{\rm BD}\, P_0^2$ holds exactly. Second, the McKay correspondence [14, 15] from $2I$ to E_8 used in DCT-SM-01 [9] is the same structural identity that gives the spectral content of DCT-SPI-01 [3], providing cross-paper convergence on the same finite-group framework. Third, the Cassini bound $\omega_0 > 40{,}000$ [18] drives the stiffness–backreaction duality of DCT-SBD-01 [4], the PPN predictions of DCT-PPN-01 [7], and the Brans–Dicke-class membership of DCT-COS-01 [6]; all three companion papers operate in the same Cassini-allowed region of parameter space.

XI. DISCUSSION

A. Summary of the framework

DCT v2 is a Brans–Dicke scalar–tensor framework with topological inputs from the 600-cell + $2I$ + McKay $\to E_8$ chain. The framework derives the Standard Model gauge group, the three-generation fermion structure, the proton-to-electron mass ratio at 9.2×10^{-8}, and the CKM mixing angles. It predicts the radial-acceleration relation through Allen–Cahn condensation with the MOND scale $g_\dagger$ derived from the Yukawa mass. It operates at the perturbation level on a ΛCDM cosmological background; background BAO comoving nulls match ΛCDM when $P(t)$ is homogeneous (DCT-BAO-01 [5]), while operational $H_{\rm phys}$ claims await a matter-clock derivation. The post-2025 joint Bayesian preference is 14.12σ / 7.01σ / 5.40σ. Probability of correctness: 35–50% calibrated band.

B. Relationship to existing frameworks

The framework belongs to the Brans–Dicke class [11, 31], with $\omega_0 = 50{,}037$ at present epoch consistent with the Cassini bound. The disformal coupling at large scales [32, 33] provides the perturbation-level deviations from ΛCDM. The Damour–Nordtvedt cosmological-attractor mechanism [34] is consistent with $\omega(P)$ having positive curvature at P_0. The McKay-derived gauge structure is in the spirit of grand-unified extensions to E_8, but uses the McKay correspondence rather than a direct embedding (avoiding the Distler–Garibaldi obstruction [30]).

C. Status of derived quantities

1. Topological inputs from the 600-cell: VERIFIED. Coordination $z = 12$, vertex-figure $f_v = 20$, vertex count $V = 120$ are mathematical theorems on the 600-cell [12].

2. Master identity $2\omega_0 + 3 = c_{\rm BD}\, P_0^2$: EXACT for $n = 2$ [2].

3. Twelve structural identities at log Bayes factor +27.5: POST-DICTION; pre-registered extension protocol described in DCT-SPI-01 [3].

4. Hubble tension / $H_{\rm phys}$: homogeneous photon BAO comoving rulers coincide with ΛCDM for $P(t)$ only (DCT-BAO-01 [5]); operational clock derivation and late-universe tracers remain open. Perturbation-level programme is live.

5. PPN predictions: derived; BepiColombo MORE 2028 binary test [7].

6. RAR: derived from Allen–Cahn; comparable to MOND on real data [8].

7. Standard Model gauge group: derived from McKay [9]; post-hoc closures explicitly labelled.

8. CMB concordance: structural via conformal-wall theorem [10]; A_L Planck-consistent at 0σ.

D. Remaining open questions

1. First-principles derivation of $\sin\theta_{13}$ and $1/\alpha$ at $< 1\%$ — DCT_28 Programs A, B [1].

2. Resolution of the $\mathbb{Z}_3$ cosmic-string tension at $\sim 25\times$ Planck bound [9].

3. Rigorous Bogoliubov-depletion proof of $D = 1/f_v = 0.05$ for $P_0 = 9/10 \cdot 19/20$ [1].

4. Vacuum-catastrophe verification script for $\Lambda_P = 2\pi^2\,\rho_{\rm QFT}\,(\ell_P/L)^2$ [2].

5. Heavy-particle masses (W, Z, Higgs, t) — no clean 600-cell formulae [9].

6. Extended applied research programmes outside the public physics archive remain outside the graded scorecard [1].

E. Computational implementation

A reproducible Python implementation of the umbrella framework, with switches for each companion paper's specific predictions and a parametric exposure of ω_0, P_0, $c_{\rm BD}$, f_v, z, is available at the master code repository [37]. The script orchestrates the cluster computations and outputs the joint Bayesian preference, the master scorecard, and the per-companion predictions.

XII. CONCLUSION

This is a revised version of zenodo.18703512 [1]. The mathematical framework is unchanged: a Brans–Dicke scalar–tensor theory on the 600-cell with topological inputs $z = 12$, $f_v = 20$, $V = 120$, McKay correspondence to E_8, and the canonical post-S35 coupling $\omega(P) = (cP^2 - 3)/2$ with $c = 138{,}189$.

The revisions are: (i) reconciliation of the v1 tension headline with DCT-BAO-01 [5] (homogeneous P null cancellation; legacy $\Delta\chi^2$ map retracted), the KiDS-Legacy $S_8 \sim 2\sigma$ tension under constant-P_0, and the cosmic-chronometer per-z negative; (ii) separation of $H_{\rm phys}$ targets from photon BAO nulls, and the perturbation-level programme on a ΛCDM background as the live framework; (iii) post-2025 cosmological-data references (KiDS-Legacy 2025, DESI DR2, ACT DR6) and joint Bayesian recalculation to $14.12\sigma\,/\,7.01\sigma\,/\,5.40\sigma$; (iv) the "629+ matched observables" headline is retracted in favour of the DCT_27 master scorecard 55/10/5/0/7 across 77 graded; (v) the $\delta_{\rm CP} = 2\pi/3$, $A_L = 1.185$, $\omega(P)$ pre-S35 form, and SPARC synthetic-vs-real headline numbers are explicitly retracted to their canonical post-audit values.

The eight companion papers in the DCT cluster [3–10] carry the per-domain technical detail. The decisive forward tests are BepiColombo MORE 2028 (PPN γ at 6.7σ [19]), Euclid 2027–2029 (cluster $M_{\rm lens}/M_{\rm dyn}$ turnover [21]), and LUNAR $\sim$ 2035 (Nordtvedt η at 20σ [20]). Calibrated probability of correctness: 35–50%.

[1] N. G. Parrott, "Dimensional Coherence Theory: unifying quantum mechanics, general relativity, and the Standard Model," Zenodo 10.5281/zenodo.18703512 (2026).

[2] N. G. Parrott, "May 2026 corpus revision record (scores, retractions, master table)," consolidated values underlying this cluster deposit.

[3] N. G. Parrott, "Spectral and structural identities on the 600-cell: a Bayes-factor test of polytope-derived constants of nature," Zenodo 10.5281/zenodo.20032750 (2026).

[4] N. G. Parrott, "Stiffness–backreaction duality: a general bound on cosmological backreaction in solar-system-compatible Brans–Dicke theories," Zenodo 10.5281/zenodo.20032799 (2026).

[5] N. G. Parrott, "A background-BAO no-go theorem and the perturbation-level program in Dimensional Coherence Theory," Zenodo 10.5281/zenodo.20032803 (2026).

[6] N. G. Parrott, "Cosmological tensions re-read: Dimensional Coherence Theory vs. ΛCDM after KiDS-Legacy 2025 and DESI DR2," Zenodo 10.5281/zenodo.20032811 (2026).

[7] N. G. Parrott, "Solar-system PPN predictions for BepiColombo MORE 2028 from Dimensional Coherence Theory," Zenodo 10.5281/zenodo.20032819 (2026).

[8] N. G. Parrott, "Dark-matter Avrami crystallization and the radial-acceleration relation in Dimensional Coherence Theory," Zenodo 10.5281/zenodo.20032821 (2026).

[9] N. G. Parrott, "Standard-model gauge structure from McKay $2I \to E_8$ in Dimensional Coherence Theory," Zenodo 10.5281/zenodo.20032825 (2026).

[10] N. G. Parrott, "Conformal-wall invariance and CMB concordance in Dimensional Coherence Theory," Zenodo 10.5281/zenodo.20032834 (2026).

[11] C. Brans and R. H. Dicke, "Mach's principle and a relativistic theory of gravitation," Phys. Rev. **124**, 925 (1961).

[12] H. S. M. Coxeter, *Regular Polytopes*, 3rd ed. (Dover Publications, 1973).

[13] P. du Val, *Homographies, Quaternions and Rotations* (Oxford University Press, 1964).

[14] J. McKay, "Graphs, singularities, and finite groups," in *The Santa Cruz Conference on Finite Groups*, Proc. Symp. Pure Math. **37** (American Mathematical Society, 1980), pp. 183–186.

[15] P. Slodowy, *Simple Singularities and Simple Algebraic Groups*, Lecture Notes in Mathematics **815** (Springer, 1980).

[16] H. Georgi and S. L. Glashow, "Unity of all elementary-particle forces," Phys. Rev. Lett. **32**, 438 (1974).

[17] R. Slansky, "Group theory for unified model building," Phys. Rep. **79**, 1 (1981).

[18] B. Bertotti, L. Iess, and P. Tortora, "A test of general relativity using radio links with the Cassini spacecraft," Nature **425**, 374 (2003).

[19] L. Iess, S. W. Asmar, and P. Tortora, "MORE: an advanced tracking experiment for the exploration of Mercury with the mission BepiColombo," Space Sci. Rev. **217**, 21 (2021).

[20] S. Dell'Agnello *et al.*, "Lunar Laser Ranging in the next decade with LUNAR," Adv. Space Res. **55**, 521 (2015).

[21] Euclid Collaboration, R. Scaramella *et al.*, "Euclid preparation: cosmological constraints from the cosmic shear power spectra," Astron. Astrophys. **684**, A82 (2024).

[22] K. Abazajian *et al.* (CMB-S4 Collaboration), "CMB-S4: forecasting constraints on primordial gravitational waves," Astrophys. J. **926**, 54 (2022).

[23] J. Aalbers *et al.* (LZ Collaboration), "First dark matter search results from the LUX-ZEPLIN (LZ) experiment," Phys. Rev. Lett. **131**, 041002 (2023).

[24] A. Abusleme *et al.* (JUNO Collaboration), "JUNO physics and detector," Prog. Part. Nucl. Phys. **123**, 103927 (2022).

[25] F. Lelli, S. S. McGaugh, and J. M. Schombert, "SPARC: mass models for 175 disk galaxies with Spitzer photometry and accurate rotation curves," Astron. J. **152**, 157 (2016).

[26] A. H. Wright *et al.*, "KiDS-Legacy: cosmological constraints from cosmic shear with the complete Kilo-Degree Survey," arXiv:2503.19441 [astro-ph.CO] (2025).

[27] DESI Collaboration, A. G. Adame *et al.*, "DESI 2024 VI: cosmological constraints from the measurements of baryon acoustic oscillations," arXiv:2404.03002 [astro-ph.CO] (2024).

[28] M. Moresco *et al.*, "Unveiling the universe with emerging cosmological probes," Living Rev. Relativ. **25**, 6 (2022).

[29] Planck Collaboration, N. Aghanim *et al.*, "Planck 2018 results. VI. Cosmological parameters," Astron. Astrophys. **641**, A6 (2020).

[30] J. Distler and S. Garibaldi, "There is no 'theory of everything' inside E_8," Commun. Math. Phys. **298**, 419 (2010).

[31] Y. Fujii and K.-i. Maeda, *The Scalar–Tensor Theory of Gravitation* (Cambridge University Press, 2003).

[32] J. D. Bekenstein, "Relation between physical and gravitational geometry," Phys. Rev. D **48**, 3641 (1993).

[33] T. S. Koivisto, D. F. Mota, and M. Zumalacárregui, "Screening modifications of gravity through disformally coupled fields," Phys. Rev. Lett. **109**, 241102 (2012).

[34] T. Damour and K. Nordtvedt, "General relativity as a cosmological attractor of tensor–scalar theories," Phys. Rev. Lett. **70**, 2217 (1993).

[35] C. M. Will, "The confrontation between general relativity and experiment," Living Rev. Relativ. **17**, 4 (2014).

[36] R. E. Kass and A. E. Raftery, "Bayes factors," J. Am. Stat. Assoc. **90**, 773 (1995).

[37] N. G. Parrott, "DCT-FND-V2: orchestration code for the cluster-level computations," GitHub repository (2026), companion code to this paper.