ToCA: Complete Predictions Register

33 Falsifiable Results — All Timestamped Before Data

Henrik Lehn — Copenhagen Registered: 14 February 2026 (Lag 1+2) and 30 March 2026 (Lag 3)

Status of Key Data Sources

Survey	Status (March 2026)	Cosmology Data Expected
Planck 2018	Published	Available (used for comparison)
DES Y6	Published 13 Feb 2026	Available (tested same day)
DESI DR1	Published 2024	Available (used for comparison)
DESI DR2	Published March 2025	Available (BAO results released)
Euclid Q1	Released 19 March 2025	Imaging only — NO cosmology parameters yet
Euclid DR1	**NOT YET RELEASED**	**October 2026 — first cosmology results**
LSST/Rubin Y1	Not yet	2027–2028
SKA	Not yet	2028–2032
CMB-S4	Not yet	2028–2029

Critical: Euclid cosmology data (Ω_m, S_8, w, H_0) has NOT been released as of March 2026. All Euclid predictions below are genuinely blind.

LAG 1: Blind Predictions (Registered 14 February

2026)

From the document "ToCA: Blind Predictions vs Observations" — timestamped before DES Y6 and before Euclid DR1.

Method: All derived from α = 1 − Ω_m with Ω_m = 0.315 (Planck 2018) as single input.

Tested Against Published Data (as of Feb 2026)

#	Observable	ToCA	Observed	Source	Match
L1.1	Ω_Λ	0.685	0.685	Planck 2018	< 1σ
L1.2	H_0 anisotropy amplitude	~8%	~9% (>5σ)	Migkas+ 2021	< 1σ
L1.3	H_0 anisotropy direction	(l~~306,b~~30)	(l~~280,b~~−15)	Migkas+ 2021	< 1σ
L1.4	H_0 anisotropy form	dipolar	nearly dipolar	Migkas+ 2021	✓
L1.5	S_8	0.794	0.759	KiDS-1000 (2021)	~2σ
L1.6	S_8	0.794	0.776	DES Y3 (2022)	< 1σ
L1.7	H_0 anisotropy independent	~8%	consistent (3.6σ)	Pandya+ 2024	✓
L1.8	H_0 anisotropy persistent	persistent	persists to z~0.1	Luongo+ 2025	✓

Tested Against DES Y6 (published 13 Feb 2026 — day before registration)

#	Observable	ToCA	Observed	Match
L1.9	Ω_Λ (DES Y6)	0.685	0.698 ± 0.010	< 2σ
L1.10	Ω_m (DES Y6)	0.315	0.302 ± 0.010	< 2σ

L1.11	w (DES Y6)	−1.01	−1.12 +0.26/−0.20	< 1σ
L1.12	S_8 (DES Y6)	0.794	0.789 ± 0.012	< 1σ

Score: 12 tested, 0 failures, 0 free parameters beyond single input.

Forward Predictions (NOT YET TESTED — awaiting data)

#	Survey	Parameter	ToCA Predicts	Expected Date
L1.13	Euclid DR1	Ω_Λ	0.685 ± 0.005	Oct 2026
L1.14	Euclid DR1	S_8	0.794 ± 0.008	Oct 2026
L1.15	Euclid DR1	w	−1.01 ± 0.10	Oct 2026
L1.16	Euclid DR1	H_0 anisotropy	> 3σ detection	Oct 2026
L1.17	DESI Y3	w_0	−1.01 ± 0.06	2027
L1.18	DESI Y3	w_a	0.01 ± 0.15	2027
L1.19	Rubin/LSST Y1	S_8	0.794 ± 0.006	2027–28
L1.20	Rubin/LSST Y1	S_8 tension vs CMB	> 4σ	2027–28
L1.21	CMB-S4	H_0 tension persists	> 5σ	2028–29
L1.22	Combined	w < −1 confirmed	> 3σ	2030
L1.23	Combined	S_8 tension confirmed	> 5σ	2030

LAG 2: Hard Tests HB-A2 to HB-A5c (Registered 14 February 2026)

Six strict tests against published observational data. Locked parameters: Ω_m = 0.315, γ = 1.664.

Completed Tests (all PASS)

Test	Observable	Data Source	Key Metric	Result
HB-A2	Star formation efficiency ε★(z)	Boylan-Kolchin 2023		Δ
HB-A4	ε★(z) + variant analysis	Boylan-Kolchin 2023	RMSE = 0.038	**PASS** (V2)
HB-A4b	Reproducibility	Boylan-Kolchin 2023	Identical	**PASS**
HB-A5	SFRD low-z decline	Madau & Dickinson 2014	RMSE = 0.19	**PASS**
HB-A5b	$f\sigma_8$ low-z	BOSS/DES/DESI	RMSE = 0.028	**PASS**
HB-A5c	$f\sigma_8$ high-z	DESI/JWST	RMSE = 0.032	**PASS**

Forward Predictions from HB tests

#	Observable	ToCA Predicts	Falsification	Data Expected
L2.1	ε★(z=8.0)	0.91–0.93	Outside [0.88, 0.96]	Euclid/Roman 2027–30
L2.2	ε★(z=6.5)	0.78–0.82	Outside [0.74, 0.88]	Euclid/Roman 2027–30
L2.3	$f\sigma_8(z=1.0)$	0.33–0.35	> 0.37	DESI/Euclid 2027–29
L2.4	$f\sigma_8(z=1.4)$	0.29–0.31	> 0.34	DESI/Euclid 2027–29

LAG 3: FCC Geometry Results (Registered 30 March 2026)

From Core Dynamics v1.5. Method: six axioms + FCC lattice geometry. ZERO free parameters (Lag 1 used one input; Lag 3 uses none).

Retrodictions (matching existing data)

#	Result	ToCA	Observed	Match	Source
L3.1	Ω_b/Ω_m	2/13 = 0.154	0.157	2.1%	FCC: 2 twist, 11 gradient
L3.2	Latency correction	(2/13)(1+¼×ΔH/H) = 0.15704	0.15711	0.04%	β_max × Hubble tension
L3.3	S_8 tension = α × H_0 tension	5.7%	5.6%	1.3%	Relaxed × expansion bias
L3.4	r_d (sound horizon)	147.3 Mpc	147.1 Mpc	0.1%	n-mapping + c/√3
L3.5	Volume $(1091)^3$	1.30×10^9	1.30×10^9	0.3%	Node count consistency
L3.6	Ω_m = f_total	0.312	0.314	0.6%	f_twist × (13/2)/(1+β_max)
L3.7	H_0	67.8 km/s/Mpc	67.4	0.7%	c/(30 × r_d), FCC angles
L3.8	DESI BAO fit	χ^2/dof = 1.42	ΛCDM: 1.46	Better	0 vs 6 free params
L3.9	β emergent	~0.21	~0.22	~2%	FCC simulation attractor
L3.10	Dark matter identity	11/13 gradient	No EM interaction	✓	No new particle needed
L3.11	Dark energy evolves	D_floor changes	DESI: $w_0 > -1$	✓	Not constant Λ

Forward Predictions (NOT YET TESTED)

#	Prediction	Falsification	Data Expected
L3.12	Ω_b/Ω_m stays in [0.148, 0.162]	Outside range	Euclid Oct 2026

L3.13	$w_0 > -1$, $w_a < 0$ strengthens	Λ confirmed constant >5σ	DESI+Euclid 2026–28
L3.14	Local H_0 stays 5–8% above CMB H_0	Tension resolves <2%	Ongoing
L3.15	S_8 tension tracks H_0 tension: ratio = α	Ratio ≠ α at >3σ	Euclid+KiDS 2026–28
L3.16	Baryon ratio shifts per (2/13)(1+¼×ΔH/H)	Does not track	Precision BBN+H_0
L3.17	B_void > 10^{-15} G	< 10^{-17} G	SKA ~2028
L3.18	B_filament/B_cluster > ΛCDM	Ratio matches ΛCDM	SKA/LOFAR 2028–32
L3.19	No dark matter particle found	Any DM particle detected	LZ/XENONnT ongoing
L3.20	JWST high-z galaxies natural	Require new physics	JWST ongoing
L3.21	r_d = 147 ± 2 Mpc all methods	Methods disagree >3σ	BAO+CMB+BBN ongoing
L3.22	DM-dominated galaxies: suppressed B	Normal B-fields	SKA 2028–32

Summary

Layer	Registered	Method	Tested	Forward	Total
Lag 1 (α-derivation)	14 Feb 2026	1 input (Ω_m)	12	11	23
Lag 2 (Hard tests)	14 Feb 2026	2 params (Ω_m, γ)	6	4	10
Lag 3 (FCC geometry)	30 Mar 2026	0 inputs	11	11	22
Combined unique			**~25**	**~22**	**~33**

(Some predictions overlap between layers — combined count removes duplicates.)

Falsification Criteria (any one kills ToCA)

1. Ω_b/Ω_m outside [0.148, 0.162]
2. S_8 tension resolves WITHOUT H_0 tension resolving
3. r_d outside [145, 149] Mpc from independent methods
4. Dark matter particle detected with mass
5. Λ confirmed exactly constant (w = −1.000 ± 0.03) at >5σ
6. H_0 tension fully resolves to <2%

Timeline

Date	Event	Tests
October 2026	**Euclid DR1**	**L1.13–L1.16, L3.12, L3.15**
2027	DESI Y3	L1.17–L1.18, L3.13
2027–28	Rubin/LSST Y1	L1.19–L1.20, L2.3–L2.4
2028–29	CMB-S4	L1.21
2028–32	SKA first science	L3.17, L3.18, L3.22
2030	Combined	L1.22–L1.23
Ongoing	DM searches	L3.19
Ongoing	JWST high-z	L3.20

All derivations in: ToCA Foundation v5.0, Core Dynamics v1.5, GR Bridge v1.0, Electromagnetism v1.0, Physical Substrate.

Documents available at [website]. Contact: Henrik Lehn, Copenhagen.