

Closing Note on the UAT/UPC Framework – Final Technical Closure

Points, Limitations and Barriers Encountered:
Why a New Temporal Metric Cannot Be Implemented with Standard Λ CDM Tools
and the Physical and Socioeconomic Constraints of an Independent Programme

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Abstract

This document is the final technical closure of the *Universal Applied Time* (UAT) and *Unified Causal Principle* (UCP) programme Oct 2025 – Sep 2026. The framework is what it effectively is: an effective phenomenological scalar-tensor ansatz $\mathcal{L} = \sqrt{-g}[M_{Pl}^2/2R - 1/2(\partial\phi)^2 - V(\phi) - \xi/2R\phi^2] + \mathcal{L}_m$, $V = \lambda/4(\phi^2 - \eta^2)^2 + V_0$, with parameters $\eta = 4.978$, $\xi = -0.2810$, $\lambda \sim 3.08 \times 10^{-112}$, $\phi_0 \sim 0.456$ postulated by internal consistency, calibrated against observables, not derived from first principles. This note documents why implementing a new temporal metric from another perspective is unviable if we depend merely on evaluative analyses with C source kernels based on Λ CDM (CLASS, CAMB), which limited us to work only with NumPy, SciPy and Matplotlib which do not constitute a priori Λ CDM, and the physical and socioeconomic barriers that prevented full validation. No priority is claimed over recent mathematical results. No empirical validation from LIGO is requested. LIGO strain cannot validate.

1 Status of the Framework

The Lagrangian is an effective ansatz. $k_{\text{early}} = 0.967$ quantum brake, $\kappa_{\text{crit}} = 4.978$ Ivancho limit (metric buffer saturation), $\epsilon = 0.033$ causal overflow 11.76° cycle 348.24° , $\phi/2 = 0.809017$ spectral dimension, $3/4 = 0.75$ half-phase thermodynamic offset heuristic, $R_{\text{geom}} = 0.279182$ non-normalized residual 8-phasor $|\sum|$ at $\Delta\theta = 43.515^\circ = 45^\circ \times k_{\text{early}}$, normalized $0.0348977 = (1/8)|\sum|$, $\phi_*/\eta = 0.07$ thermal margin, $\phi_0 = 0.456$ late frozen, $\phi_* = 0.34846$ early unstable. $G_{\text{eff}} = G/(1 + \xi\phi^2) \sim 1.062G$ confined $z \lesssim 1$ via de-excited branch $\phi(z_{\text{rec}}) \sim 0$ preserving $r_d = 128.15$ Mpc exact equal Λ CDM corrected from empirical 141 Mpc. Parameters not derived from fundamental symmetry.

2 Verifiable Results

Acoustic horizon: $r_d = \int_{z_{\text{rec}}}^{z_{\text{max}}} c_s(z)/H_{\text{UAT}}(z)dz$, $c_s^2 = 1/3(1 + R_b)$ yields 128.15 Mpc identical to Λ CDM same inputs. Consistency check, not differential prediction.

Ω_m coincidence: $\Omega_m^{\text{eff}} = \Omega_b \cdot \kappa_{\text{crit}} \cdot \phi \cdot (1 - 0.07) = 0.3133$ vs Planck 2018 0.315 ± 0.007 within 0.55% requires three postulated parameters, not informative.

Coil array 8+1 and 36+1: 8+1 coils detuning 43.515° residue $R_{\text{geom}} = 0.2792 \pm 0.0005$ consistent standard phasor interference. 36 peripheral coils ring 10° step +1 central, asymmetry 7° , log

torsion $\tau = 0.3697$, central gain 1.9694 INA128 51k Ω , RMS saturation $0.7071 = 1/\sqrt{2}$, simulation ~ 0.7050 . Both arithmetically correct, reproducible lab analog system, consistent with metamaterial physics and non-reciprocal systems, Floquet rotational superradiance synthetic rotation via frequency detuning. Technique recently explored in Nature 655, 8123 (2026) Nasari et al. DOI 10.1038/s41586-026-10725-y. Our 8+1 calibration Zenodo 10.5281/zenodo.19646359 Mar 2026 and 36+1 operational software Zenodo 10.5281/zenodo.19704792 Apr 2026 share methodological principle but purpose differs (detection phasor residue). No priority claimed, methodology predates both in spatiotemporal metamaterials literature.

3 Core Barrier: New Temporal Metric Unviable with C Kernels Based on Λ

Implementing a new temporal metric from another perspective is unviable if we depend merely on evaluative analyses with C source kernels based on Λ CDM.

CLASS and CAMB are built around: FLRW metric $ds^2 = -dt^2 + a^2(t)[dr^2/(1 - Kr^2) + r^2d\Omega^2]$, Friedmann $H^2 = H_0^2[\Omega_r a^{-4} + \Omega_m a^{-3} + \Omega_\Lambda]$, conformal time $d\tau = dt/a$, linear perturbation over FLRW, transfer $\chi = \tau_0 - \tau$. UAT/UCP does not share these.

A faithful implementation would require rewriting:

- **background.c** – background evolution and definition independent time variable, effective expansion $H_{\text{UAT}}(z) = H_0 \sqrt{k_{\text{early}}\Omega_r(1+z)^4 + k_{\text{early}}\Omega_m^{\text{eff}}(1+z)^3 + \Omega_\Lambda^{\text{UAT}}}$
- **perturbations.c** – Einstein-Boltzmann system from UAT/UCP action
- **primordial.c** – initial power spectrum consistent early-time behaviour
- **transfer.c** – line-of-sight projection with UAT comoving distance, angular diameter distance, standard $\chi = \tau_0 - \tau$ no longer valid

Attempts:

- External background table **background from file** not functional in standard distributed CLASS, requires recompilation with flag, segfaults reading UAT table.
- Direct modification **background.c** successful at code level, but Python wrapper **classy** cannot recompile against modified library due to environment management restrictions.
- Parameters k_{early} , κ_{crit} , viscosity β have no counterpart in standard parameter set. Even if background modified, perturbation and thermodynamics modules require corresponding modifications.

Therefore we were limited to work only with NumPy [1], SciPy [2], Matplotlib [3] which do not constitute a priori Λ CDM. They allow model-independent tests: $\text{Om}(z)$ diagnostic with cosmic chronometers $H(z)$, SNe Ia, BAO distances, age, lab phase. They do not allow precise CMB temperature, polarization spectra, matter power at all scales, lensing potential, reliable BAO from first principles. Until dedicated solver exists, predictions remain analytical/semi-analytical approximations.

4 Technical Infrastructure Constraints

LIGO data handling: Repeated corruption downloading HDF5 strain files from GWOSC local environments, several hundred MB for 4096-s at 16384 Hz, network instability, lack checksum verification, numerical values altered at least significant digits, file structure partially damaged leading to segfaults or silent errors. Different environments reported qualitatively similar but

not numerically identical results. Mitigated switching to direct in-memory access via GWOSC API `TimeSeries.fetch_open_data` from `gwpy`, bypassing local filesystem.

Inadequacy LIGO design for UAT metrics: LIGO optimized for transient chirp-like signals. UAT predicts persistent phase coherence 187.37 Hz and 230.17 Hz, phase quantisation multiples 43.515° , stochastic quantum jitter as background phase noise. Standard noise subtraction pipelines may remove stationary spectral lines, calibration models assume standard physics may absorb deviation, simultaneous Hanford-Livingston analysis requires precise time sync, small timing errors or instrumental phase shifts mimic/mask signatures. Predicted perturbations $\sim 10^7$ below LIGO/LISA noise floor. Dedicated table-top experiment required. Prototype already constructed promising preliminary results.

5 Physical Constraints

Nested shielding architecture required to protect Bit 0 (darkness zero topological condition) from decoherence: outer Faraday cage copper solid + isolated ground drains RF, inner optical chamber total absorption carbon felt / ultra-matte nanoparticle paint prevents photon bounce acting as observer collapsing phase, inner Mu-metal high permeability for low-frequency geomagnetic and 50Hz hum, critical for 60s TV yoke ferrite core. Mechanical decoupling anti-vibration supports, thermal inertia insulation stabilizes copper resistance, otherwise thermal fluctuations modify resistance and destabilize rotatory pattern. Galvanic filtering: each line penetrating shield through low-pass capacitive filters and toroidal inductors at cage wall, plus optical link TOSLINK/ADAT between PC and DAC to avoid ground noise riding USB. Buffer fixed 512/1024 frames at 48kHz ~ 10.6 ms, ASIO/WASAPI Exclusive, callback non-blocking, vectorized NumPy generation `pasos_fase=arange(8)*pi/4`, broadcasting (512,8), normalization peak to 1.0 RMS 0.7071 pure sine at max without clipping, phase accumulator modulo 2π to avoid float64 degradation after hours, drift +0.046 Hz/day from epoch 2023-05-27 $F_0 = 84.4$ Hz to Day 971 O4a 232.04 Hz, projected 359.912 Hz. Physical cost: 5x 8-channel audio interfaces Word Clock e.g. Behringer UMC1820, INA128 instrumentation amplifier 51k Ω precision, 36 identical air-core coils 100 turns 10cm +1 central, battery supply $\pm 12V \pm 5V$ low-noise. No clean room, no anechoic chamber available in Puan, Buenos Aires. Temperature fluctuations unavoidable.

6 Socioeconomic Constraints

Programme developed independently without access to academic collaborations in theoretical physics, observational cosmology, quantum field theory. No funding, no HPC, no access to Einstein Telescope, Cosmic Explorer, Euclid, Roman Space Telescope data analysis pipelines. Development of first-principles Lagrangian requires: foundational symmetry fixing functional form, derivation parameters from symmetry structure, analysis stability, renormalizability, consistency with observational bounds, complete Boltzmann solver for CMB, BAO, LSS, cross-validation multiple independent observables. None completed. Acknowledging this is integral part of closure.

7 Methodological Lessons

Inadequacy direct comparisons using standard Boltzmann parameters: Λ CDM at least six free $H_0, \Omega_m, \Omega_b, \sigma_8, n_s, \tau$ vs UAT single free 7% thermal margin. Importing Planck-adjusted Ω_m, σ_8 into UAT comparison asymmetric, measures departure from another model's best fit, not test on own terms. Example S_8 : $S_8^{\Lambda\text{CDM}} \approx 0.831$, $S_8^{\text{UAT}} \approx 0.945$ vs weak lensing 0.76 – 0.78 appears to worsen tension, but calculation used Planck-adjusted Ω_m, σ_8 , Λ CDM

reference background, no UAT power spectrum. σ_8 free parameter Λ CDM not derived quantity UAT, circularity. Result not evidence against UAT, evidence method inadequate.

Parsimony: Cosmic chronometers $N = 31$ H(z) Moresco et al. UAT $H_0 = 73.04$ SH0ES, $\Omega_m^{\text{eff}} = 0.3133$, $\Omega_\Lambda^{\text{UAT}} = 0.6867$, $k_{\text{early}} = 0.967$ vs Λ CDM Planck $H_0 = 67.36$, $\Omega_m = 0.315$. Raw χ^2 20.71 vs 14.90 $\Delta + 5.81$ favours Λ CDM, but $k = 1$ vs 6 params. AIC 22.71 vs 26.90 $\Delta - 4.19$ UAT 89.1%, BIC 24.14 vs 35.50 $\Delta - 11.36$ UAT 99.7%, Bayes factor $B \approx 293$ decisive Jeffreys scale. Even conservative $k = 2$ for H(z) alone BIC still favours UAT $\Delta - 2.38$. Parsimony advantage global property, not artifact dataset.

JWST case study: Direct observables z_{obs} , M_* , angular size, SED, number density, BH mass. Λ CDM requires four auxiliary mechanisms: efficient early star formation, direct-collapse or super-Eddington BH growth, new class Little Red Dots, early quenching. UAT/UCP single causal redshift correction $(1 + z_{\text{obs}}) = (1 + z_{\Lambda\text{CDM}})(1 + z_{\text{causal}})$, $z_{\text{causal}} = (\kappa/k_{\text{early}})R_{\text{geom}} \approx 1.48$, $\kappa/k_{\text{early}} = 5.315$ thermodynamic overdrive, $R_{\text{geom}} = 0.279182$. Galaxy observed $z_{\text{obs}} = 12$ actually $z_{\Lambda\text{CDM}} \approx 4.23$ age 1.3 Gyr instead 0.34 Gyr. Simultaneously addresses overmassive galaxies, rapid SMBH growth, redness compactness Little Red Dots, quiescent galaxies at $z > 4$ without extra tuning. Not validation, methodological proposal, fair baseline same measured redshifts, no adjusted parameter import, penalise additional mechanisms, report failures openly.

Quantum domain null results: Exploration UAT/UPC constants vs quantum constants $\alpha \approx 1/137.036$, $1/\alpha$, $\alpha_s(M_Z) = 0.1180$, $\sin^2 \theta_W = 0.22343$, θ_W rad, mass ratios, G_F , $\hbar$, m_e , m_p . No direct coincidence within 5% for simple pairs. Combinations: $k_{\text{early}}/\alpha \approx 1/\alpha$ $\Delta 3.3\%$, $\epsilon \times \sin^2 \theta_W \approx \alpha$ $\Delta 1.03\%$ at $Q \approx 5.09$ GeV near tau mass factor 2.87. Stress tests: varying $\epsilon \pm 1\%$ shifts Q_{cruce} 100-311%, ratio $(\epsilon \times \sin^2 \theta_W)/\alpha$ varies 51.98% over 0.1 GeV to 10^{19} GeV. Verdict: pointwise coincidence, no structural connection between UAT and Standard Model. Does not invalidate established UAT/UCP results in cosmology or lab, delineates boundary natural domain of applicability. UAT works where designed. Particle physics is not that domain.

8 Conclusion

Framework constitutes phenomenological exploration that produced scalar-tensor Lagrangian with declared parameters, correct calculation acoustic horizon, numerical coincidences postulated constants and cosmological observables, reproducible laboratory experiment correctly classified as analog system. Does NOT constitute first-principles theory, solution Navier-Stokes Millennium Problem, unique falsifiable prediction distinguishing from Λ CDM, empirically validated framework confirmed by independent observations. Correct status numerological construction with formal structure, whose interest lies in coincidences between postulated parameters and certain observables, and whose further development requires resources beyond current reach.

9 Registry and Reproducibility

Source code, numerical calculations, associated documents openly registered Zenodo DOI [10.5281/zenodo.17729221](https://doi.org/10.5281/zenodo.17729221) UAT, [18210808](https://doi.org/10.5281/zenodo.18210808) UCP, [19646359](https://doi.org/10.5281/zenodo.19646359) 8+1 coil calibration, [19704792](https://doi.org/10.5281/zenodo.19704792) Puan Station 36+1 operational software. Main scripts: `uat_main_corrected.py` r_d verification, `8_coils_dephased_R_geom.py` phasor residue, `uat_nonlinear_cosmology.py` effective densities, `puan_36ch_generator.py` 36 signals, `puan_rms_monitor.py` central RMS, `exploracion_uat_quantum.py` and `pruebas_estres.py` quantum domain null results. Reproducible with standard libraries NumPy, SciPy, Matplotlib. No external data required. Supplementary honest assessments: `Limitations_Quantum_Domain`, `Formal_Construction_Field_Tensor`, `Open_Problems_Axiomatic`, `Technical_Limitations_LIGO_Boltzmann`, `Why_Parsimony_Matters`, `Structural_Incompatibility_CLASS_CAMB`, `JWST_Case_Study`, `Inadequacy_Direct` GitHub: Calibration-Code 8+1 and Puan-Station-36-1 operational software.

Final Note

This document closes research programme spanning several months. Author acknowledges framework did not reach initially stated objectives—first-principles theory solving open problems mathematical physics—and numerical coincidences that motivated development do not constitute evidence physical validity. Implementing new temporal metric unviable if depend merely on evaluative analyses with C source kernels based on Λ , limiting to NumPy, SciPy, Matplotlib which do not constitute a priori Λ . Physical and socioeconomic limitations prevented full validation. Honesty about status is principal contribution closure can offer.

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