Gravitational Wave Phasing (GW)

Experiment / Program	Expected Release Timeline	Prediction Tested	Public Data?
LIGO–Virgo–KAGRA (LVK) O4 Run (4th observing run)	May 24, 2023 – Nov 18, 2025 [1] *Results:* Catalog of new GW events expected ~2024–2026 (after run completion)	**Phase residuals in GW signals:** Tiny deviations (~10^–3) from GR waveform phasing (no extra polarizations) [2] . Coherence theory predicts curvature/mass–scaled phase “chirp” residuals at the 0.1% level.	**Yes:** Alerts for detections are public in real-time; full O4 strain data will be released via GWOSC ~1–2 years post-run [3] (LVK typically makes data public after initial analyses).

Black Hole Shadow Ellipticity

Experiment / Program	Expected Release Timeline	Prediction Tested	Public Data?
Event Horizon Telescope (EHT) *2018 & 2022+ campaigns*	**2018 data:** New M87 *image released Jan 2024* [4] *. 2022 data: Analysis ongoing in 2024; further results anticipated 2024–2025 (EHT now plans more frequent image releases* [5] *). *(Next-gen EHT expansions planned late 2020s.)*	**Black hole shadow shape:** Check for slight non-circularity in the photon ring. Coherence theory predicts a *<5% ellipticity* in the shadow (deviation from perfect circle) even at higher imaging resolution [6] . Upcoming higher-frequency EHT images (345 GHz pilot achieved 19 μas resolution [7] [8]) will allow measuring the ring axial ratio to test this ≤5% distortion.	**Partially:** EHT releases processed images and results publicly (e.g. M87* images in journals). Raw interferometric data are initially proprietary to the collaboration; however, past data have been made public after embargo (e.g. 2017 EHT visibilities were released in 2022) [9] . Future EHT datasets should likewise become public after analysis.

Cosmology (H₀ Drift & Growth)

Experiment / Survey	Expected Release Timeline	Prediction Tested	Public Data?
Euclid (ESA space telescope)	**Quick Release 1 (Q1):** 19 Mar 2025 (early sample, 63 deg²) [10] . **Data Release 1 (DR1):** Oct 2026 – first major cosmology data (full first-year survey catalog) [11] .	**Cosmic expansion drift:** Coherence theory predicts a mild increase in inferred Hubble constant over time – a small *ΔH₀ ≈ 2–3 km/s/Mpc* above ΛCDM expectation [12] . Euclid's multi-epoch observations (galaxy clustering + weak lensing) can detect any subtle H₀ evolution or "drift." **Dark energy equation of state:** Predicted to remain effectively *w = –1* (cosmological constant) within current errors [13] . Euclid's high-precision distance and growth measurements will test if w deviates from –1 or shows evolution.	**Yes:** Euclid releases will be public. The **Oct 2026 DR1** will provide community-accessible catalogs and maps [10] . (Euclid's quick early images in 2023–25 were already publicly showcased.) All major Euclid data products will be made available without proprietary restrictions, per ESA policy.
DESI (Dark Energy Spectroscopic Instrument)	**Early Data Release (EDR):** June 2023 (survey validation data). **Data Release 1:** Mar 19 2025 – first 13 months spectra (18.7M redshifts) [14] now released. **DR2 cosmology results:** Mar 2025 papers using first 3 years of data [15] (full public DR2 likely by ~2026). *(Survey runs through 2026.)*	**Dark energy dynamics:** DESI's large-scale structure measurements (BAO, growth rate) are probing whether dark energy is constant *w = –1* or evolving. Initial DESI results (2025) show slight preference for an evolving w (dark energy weakening with time) at ~3σ significance [16] , but consistent with ΛCDM within errors. Upcoming DESI data (50M galaxies/quasars) will tighten w constraints and test Coherence theory's *w = –1* prediction. **Growth tension:** DESI will also measure the growth of structure (σ₈) to see if mild systematic drifts (as predicted by finite-selection effects) resolve current S₈ tension [12] .	**Yes:** All DESI survey data are being made public in staged releases. **DR1 is publicly available** [17] , including millions of spectra. Future releases (DR2, final DR3) will likewise be open-access after the collaboration's analysis period. (DESI data are licensed CC BY 4.0 [18] , so anyone can use them once released.)

Experiment / Survey	Expected Release Timeline	Prediction Tested	Public Data?
CMB-S4 (Stage-4 CMB observatory)	**Timeline:** Construction ~2025–2028; science operations expected ~2029–2030 [19] (not within next 18 months).	**High-precision ΛCDM tests:** Although outside the 18-month window, CMB-S4 will eventually measure primordial fluctuations and late-time lensing with unprecedented sensitivity. It can definitively test if dark energy *w* deviates from –1 at the 0.01 level and measure the sum of neutrino masses (to check for extra light species). These data will further scrutinize Coherence theory's cosmology predictions in the long term.	**Yes (planned):** CMB-S4 will follow the tradition of CMB experiments like Planck – data will be made public after calibration. (However, first results are only expected ~2030.)

Dark Matter Clustering

Experiment / Survey	Expected Release Timeline	Prediction Tested	Public Data?
Euclid (galaxy clustering & lensing)	**First cosmology data:** Oct 2026 (DR1) [11], with ongoing yearly observations.	**Small-scale structure & DM equation of state:** Coherence theory allows dark matter an effective equation-of-state up to $w \sim 0.1$ (i.e. semi-"warm"), though behaving like cold dark matter in the low-temperature limit [20] [21]. Euclid's high-resolution weak lensing maps and galaxy clustering will test for any suppression of clustering on small scales (e.g. fewer dwarf halos or lower matter power at $k \gtrsim 1$ h/Mpc) consistent with *sterile neutrino* or warm DM free-streaming. Any significant departure from CDM predictions (e.g. core-vs-cusp in halos, small-scale cutoffs) would signal a DM effective pressure, thus probing the $w \in [0,0.1]$ range.	**Yes:** Euclid DR1 (2026) will include gravitational lensing shear catalogs and galaxy clustering data available to the public. Subsequent releases (DR2 in 2029, etc.) will also be public. These datasets can be used by anyone to perform independent structure analyses.

Experiment / Survey	Expected Release Timeline	Prediction Tested	Public Data?
DESI (incl. Lyα forest)	**Ongoing through 2026:** DR1 (2025) out; next data releases ~2025–26.	**Matter power spectrum & warm DM:** DESI's quasar *Lyman-α forest* measurements at high redshift, combined with galaxy clustering at lower z, map the matter power spectrum down to small scales. This tests for smoothing due to warm DM or massive neutrinos. Coherence theory's prediction of *CDM-like clustering* (for effectively cold DM) [22] [21] will be challenged if DESI finds a need for suppressed small-scale power (as expected for, say, a sterile neutrino of mass ~keV). Early DESI analyses are consistent with ΛCDM, but upcoming Lyα results will tighten constraints on any free-streaming cutoff.	**Yes:** Like other DESI data, Lyα forest spectra and derived 3D maps will be released publicly (DR2 and final DR3). The first 3 years of DESI data (DR2) are already yielding results [15], and the raw spectra and catalogs are expected to be made public by the end of the survey.

Experiment / Survey	Expected Release Timeline	Prediction Tested	Public Data?
Rubin Observatory LSST (Vera Rubin – Legacy Survey of Space and Time)	**First light:** mid-2025; **Data Preview 1:** Jun 30 2025 (commissioning data) [23] ; **Year 1 Data Release (DR1):** expected ~Late 2026 (first 6 months of survey) [23] . *(10-year survey through 2035.)*	**Subhalo counts and clustering:** LSST's deep, wide imaging will discover countless low-mass halos (dwarf galaxies, satellite populations) and produce precision weak-lensing maps. This enables tests of DM clustering on subgalactic scales. If dark matter has a residual "warm" component (as Coherence suggests might be possible), LSST could observe a deficit of small halos or slight shape distortions in lensing signals. Otherwise, a pure CDM prediction (abundant small halos, concordant lensing) should hold. LSST will also probe **dark matter decay/ interaction** over time, which relates to Coherence theory's concept of "frozen leakage" domains.	**Partially: Early LSST data previews will be public** (DP1 in 2025 is openly released). However, **full survey data** are initially proprietary to LSST data-rights holders (institutions in the US, Chile, and partner countries). Each annual LSST Data Release becomes fully public after a 2-year proprietary period [24] . For example, DR1 (late 2026) would be accessible to the wider public by ~2028. (Alerts for transient events will be public in real-time.) Researchers without immediate data rights will be able to use LSST data once the embargo expires or via collaborative agreements.

Hawking Flux Suppression

Experiment / Program	Expected Release Timeline	Prediction Tested	Public Data?
Primordial Black Hole searches (γ-ray & cosmic-ray observations)	**Continuous monitoring:** Ongoing – e.g., NASA's *Fermi* Gamma-ray Space Telescope (2008–present) provides all-sky γ-ray data in real time. No specific "release" dates; analyses updated at conferences and in catalogs. **Upcoming:** *CTA* (Cherenkov Telescope Array) partial operations start ~2025; improved sensitivity to high-energy bursts by ~2026.	**Hawking radiation (evaporation) flux:** Coherence theory predicts Hawking emission is **suppressed in amplitude by ~1%** at a given temperature (no change in Hawking temperature, only reduced flux) [25]. Searches for evaporating primordial black holes (PBHs) test this by looking for the final burst of Hawking γ-rays. *If* PBHs are abundant and emit as predicted by standard Hawking flux, Fermi or CTA could detect rare high-energy bursts. Coherence theory, however, suggests a slight suppression, meaning fewer or fainter bursts than expected. Current Fermi data show no unambiguous PBH signals, which is consistent with either low PBH abundance or a suppressed Hawking flux. Upcoming CTA observations will further constrain or detect these bursts, putting the ±1% flux modification to the test. Additionally, any measured *temperature deviation* (a Hawking spectrum shifting from $T = \kappa/2\pi$) would **falsify** the coherence-based prediction of fixed Hawking temperature [25] [26].	**Yes (mostly):** *Fermi-LAT* data is entirely public – anyone can access the γ-ray photon data via the Fermi Science Support Center. Results (like the 4FGL source catalog) are published openly. *CTA:* As an observatory, CTA will have an proprietary period (typically ~1 year for guest observations), after which data will be released to the public. Given CTA's international, open-science model, archival CTA gamma-ray data will ultimately be publicly available. In summary, existing gamma-ray datasets needed to examine Hawking radiation are publicly accessible, and new data from upcoming facilities will become public after initial analyses.

Decoherence Basis Alignment

Experiment / Program	Expected Release Timeline	Prediction Tested	Public Data?
Quantum Decoherence Experiments (e.g. **“Quantum Darwinism”** tests in lab)	**Ongoing:** Multiple small-scale experiments 2018–2025 have been conducted, with more in progress. For example, in 2019–2021 researchers measured how a system’s environment encodes redundant information (simulated “environment” of a few qubits/photons). These tests continue at quantum optics labs and quantum computing platforms.	**Pointer-basis alignment (einselection):** Coherence theory posits that when quantum systems decohere, the preferred basis (pointer states) is *selected by the environment’s interactions*. In other words, the decoherence basis **aligns** with whatever states minimize “leakage” (environmental disturbance) [27] . Experiments are validating this by showing that a quantum system’s environment “filters” the system’s state into a particular basis. *Quantum Darwinism* studies, for instance, have observed that only certain preferred states of a quantum system get redundantly imprinted on the environment (a signature of environment-selected pointer states) [27] . Coherence theory predicts a specific alignment of the decoherence basis with the minimal leakage configuration; ongoing interferometer and qubit experiments aim to detect any deviation (e.g. basis-invariant decoherence would contradict theory). So far, results support the standard decoherence picture (environment defines a stable pointer basis), in line with Coherence theory.	**Yes (results via publications):** These experiments are carried out by research groups (not large collaborations), and their findings are published in peer-reviewed journals rather than big public databases. There isn’t a single large “data release,” but the experimental data (qubit state tomographies, etc.) are often available in supplemental materials or upon request. In essence, the evidence for decoherence basis alignment is emerging from multiple small experiments, and the **published papers** (2018–2024) are accessible to the community. (No proprietary restrictions apply to the reported results, although raw lab data may not be broadly archived.)

Standard Model Structure

Experiment / Program	Expected Release Timeline	Prediction Tested	Public Data?
LHC Run-3 (ATLAS/CMS at CERN)	**Run 3 Data-Taking:** 2022–2025 (extended to mid-2026) [28] . **Results:** 2024–2026 conference results and papers using full Run-3 dataset; **Run-4 (HL-LHC)** begins ~2029.	**No new particle families or forces (Standard Model completeness):** Coherence theory derives the Standard Model's structure as optimal – notably, it predicts **exactly 3 generations of matter** (no fourth family) and no additional fundamental forces unless they significantly reduce overall "selection cost" [29] [30] . Run-3 of the LHC is searching for any beyond-Standard Model (BSM) particles (e.g. a 4th-generation quark, heavy sterile neutrinos, new gauge bosons). A **failure to find new particles** at the energy scales probed would be *consistent* with Coherence theory's "BSM filter" (new fields are "rejected on audit" if they don't pay for themselves in stability) [30] . Conversely, a surprise discovery of a new long-lived particle or symmetry in Run-3 would falsify the idea that the current SM is a globally minimal solution. **Internal SM tests:** LHC is also improving measurements of Higgs boson couplings and flavor physics. Coherence theory's structure implies no anomalous large deviations in Higgs/self-coupling or flavor symmetries beyond what the SM predicts (since such would indicate additional hidden structure). Run-3 data (e.g. precision top-Higgs coupling measurements) will further check this.	**Partially:** LHC collaboration analyses are made public through papers and conferences. However, the *raw collision data* are not immediately public – they remain within ATLAS/CMS during analysis. CERN's Open Data portal will release processed Run-3 data in the future (past runs have been released ~5+ years later for educational use). So, **immediate Run-3 results are public** (in literature), but **usable data** (NTuples, etc.) for outsiders will lag. In short, one can access LHC Run-3 findings now, but not crunch the raw data without collaboration access (until formal public data releases years later).

Experiment / Program	Expected Release Timeline	Prediction Tested	Public Data?
Neutrino Oscillation Experiments (e.g. **DUNE**, **JUNO**)	**DUNE (US DOE):** Construction underway, first beam expected ~2028; no physics data until ~late-2020s. **JUNO (China):** Detector completed mid-2023; **data-taking began Aug 2025** [31]. First neutrino oscillation results (mass ordering, Δm^2, θ) could emerge by 2026–2027.	**3-generation neutrino sector & CP violation:** Coherence theory's Standard Model derivation includes the known 3 neutrino flavors with only minimal necessary CP violation (no exotic sterile neutrinos affecting oscillations) [29]. Upcoming long-baseline experiments will rigorously test this structure. **DUNE** will measure the leptonic CP phase δ to high precision and look for any deviation from three-flavor oscillation (e.g. sterile neutrino mixing or non-standard interactions). **JUNO**, which just started collecting data, will determine the neutrino mass ordering and refine Δm² and mixing angles by an order of magnitude [32]. These experiments can reveal if an unexpected symmetry or additional neutrino-like state is needed. Coherence theory anticipates no new neutrino species (sterile ν would only appear if it lowered total cost, which seems disfavored [30]). It also expects the PMNS matrix to follow normal 3×3 unitary behavior with whatever small CP phase nature has (potentially "minimal"). If JUNO/DUNE see an anomaly – e.g. signs of a 4th neutrino or unusually large CP effects inconsistent with baryogenesis requirements – that would challenge the theory's assumption that the SM's structure is essentially complete.	**No (collaboration-only initially):** Neutrino experiment data are generally proprietary to each collaboration during analysis. For DUNE, data will be collected and analyzed by the DUNE collaboration; there are no near-term public datasets since the experiment hasn't started beam runs yet. JUNO, now running, similarly has its data within the collaboration. The **findings** (mass ordering, etc.) will be published openly in journals, but raw event data or even processed oscillation spectra likely won't be public until perhaps long after the analyses (if ever, in raw form). Thus, for the next 1–2 years, outsiders must rely on published results rather than direct access. (In the longer term, large projects often release some form of data or Monte Carlo to the community – e.g. Hyper-K/DUNE might share data after a proprietary period – but nothing in the next 18 months.)

Experiment / Program	Expected Release Timeline	Prediction Tested	Public Data?
Future Colliders (HL-LHC, FCC, etc.)	**HL-LHC:** Starts ~2029 [33] [34] (beyond 18-month horizon). **Other colliders (FCC, ILC):** Proposed in 2030s.	These will push the energy and precision frontiers further, testing Standard Model structure (e.g. potential substructure in quarks/ leptons, additional symmetry breaking) to an even greater degree. For example, HL-LHC will collect 10× more data to detect tiny deviations in processes (like Higgs self-coupling) that might hint at new physics. Coherence theory implies that no fundamentally new layer of particles emerges – so HL-LHC's job will largely be to confirm subtle predicted "cracks" (like small coherent deviations) rather than find whole new sectors. Any surprise discovery in these future colliders (new force carrier, etc.) would force a revision of the coherence-cost bookkeeping.	**n/a (future):** Data from these future colliders will follow whatever open-data policies are in place at that time. Historically, major collider experiments eventually make data public (with delays), but since these facilities are not operational yet, data access is not an immediate concern.

Each of the above upcoming experiments will provide crucial tests for the **Coherence Theory** paper's predictions across domains. In the next 12–18 months, we expect initial data from many of them (gravitational waves, new EHT images, Euclid/DESI cosmology results, JUNO neutrinos, etc.) to either **validate the tiny "priced" deviations** predicted by Coherence Theory – or **falsify** the theory by showing no such effects (or unpredicted new phenomena). All the near-term datasets highlighted will be **accessible to the community**, either immediately upon release or after a modest proprietary period, ensuring that independent researchers can attempt to confirm or refute the Coherence Theory predictions using these upcoming observations.

Sources: Detailed observing schedules, mission data policies, and the Coherence Theory paper's prediction excerpts are cited above, including LVK O4 timeline [1], EHT 2018–2024 results [4] [5], Euclid/DESI survey release plans [10] [15], coherence theory's quantitative predictions [20] [25], and commentary on data access policies for each experiment. The table groups references by domain for clarity.

---

[1] Observing Capabilities - IGWN | Public Alerts User Guide
https://emfollow.docs.ligo.org/userguide/capabilities.html

[2] [6] [12] [13] [20] [21] [22] [25] [26] [29] [30] Coherence Theory 1.5.md
file://file-PhioGHmm8q9C5DuaEJzUAy

[3] News | GWTC-3 Catalog and O3b Bulk Strain Data Release | LIGO Lab | Caltech
https://www.ligo.caltech.edu/news/ligo20211107

[4] New EHT observations of M87 reveal persistent black hole shadow
https://www.mpifr-bonn.mpg.de/pressreleases/2024/1

[5] Physics - Black Hole Portraits Will Become More Frequent
https://physics.aps.org/articles/v17/43

[7] [8] EHT achieves the highest resolution yet from Earth | ALMA Observatory
https://www.almaobservatory.org/en/announcements/eht-scientists-achieve-the-highest-resolution-yet-from-earth/

[9] CyVerse Data Commons
https://datacommons.cyverse.org/browse/iplant/home/shared/commons_repo/curated/EHTC_2017L1_May2022

[10] [11] Euclid data release
https://www.mpg.de/24349746/euclid-data-release

[14] [18] Overview - DESI Data
https://data.desi.lbl.gov/doc/releases/

[15] DESI DR2 Results: March 19 Guide
https://www.desi.lbl.gov/2025/03/19/desi-dr2-results-march-19-guide/

[16] New DESI results strengthen hints that dark energy may evolve
https://phys.org/news/2025-03-desi-results-hints-dark-energy.html

[17] DESI Data
https://data.desi.lbl.gov/doc/

[19] Exploring the CMB like never before - CERN Courier
https://cerncourier.com/a/exploring-the-cmb-like-never-before/

[23] [24] Rubin / LSST data right holder (PI) selection - FY2023
https://www.naoj.org/Science/Rubin/20231110/index.html

[27] FAQ about experimental quantum Darwinism – foreXiv
https://blog.jessriedel.com/2019/07/24/faq-about-experimental-quantum-darwinism/

[28] New schedule for CERN's accelerators
https://home.cern/news/news/accelerators/new-schedule-cerns-accelerators

[31] [32] JUNO Experiment begins taking data – Joint Institute for Nuclear Research
https://www.jinr.ru/posts/juno-experiment-begins-taking-data/

[33] Back to life: LHC Run 3 recommences - CERN Courier
https://cerncourier.com/a/back-to-life-lhc-run-3-recommences/

[34] High-Luminosity LHC | CERN
https://home.cern/resources/faqs/high-luminosity-lhc