Wild Card XPRIZE preregistered experiment concepts for detecting SIT-aligned quantum gravity effects using QRNG sensors and complementary instruments

Executive summary

I can frame a “Wild Card” submission as an execution-ready, preregistered experimental program that treats Super Information Theory (SIT) as a falsifiable hypothesis about two measurable “informational” fields (a coherence field and a time-density field) and then asks whether QRNG-derived observables contribute any reproducible, out-of-sample predictive signal about independent physical instruments (clocks, atom interferometers, particle detectors) beyond what standard environmental covariates and rigorous controls can explain. This approach fits the XPRIZE Quantum Applications emphasis on quantitative rigor, benchmarking, and evidence rather than speculative narrative.

The centerpiece is a preregistered analysis plan built around ablations: I train identical forecasting/inference models with and without QRNG-derived features, and I require that any “lift” appear only when QRNG features are real and vanish under at least two negative controls (PRNG replacement and time-shuffled QRNG). This is aligned with the kind of disciplined benchmarking language you already started drafting.

I propose three complementary experimental concepts that span a feasibility spectrum while sharing the same core statistical contract: (1) a lab-scale “coherence clock” protocol that compares frequency/phase stability (Allan deviation and time-error residuals) against QRNG-field features; (2) a higher-risk, high-payoff Bose–Einstein condensate (BEC) versus thermal-cloud differential-acceleration test (atom interferometry) with QRNG “gradiometry” as a candidate auxiliary channel; and (3) a networked atmospheric storm/particle-flux test that pairs QRNGs with muon/neutron/radiation detectors and meteorology, using established atmospheric corrections as explicit covariates and controls.

Because the XPRIZE Quantum Applications Wild Card window referenced on XPRIZE's site closed on March 4, 2026 (today), the cleanest Wild Card posture is to submit an analysis-ready preregistration and a minimally viable data package you can run immediately (even if the full multi-month data collection continues afterward).

Connector and baseline review

Enabled connectors: GitHub. (This is the only enabled connector available to me via the connector toolchain for your account in this chat.)

What I could verify from your publicly visible GitHub footprint is that you have an actively maintained Q-Byte Processing "clock" repository under peaceinc/Qbyte, forked from DoctorOzone/Qbyte, and that it is positioned as a "Hybrid-Quantum Clock" with UTC time display, Q-Byte Processing, and a pipeline that produces raw run files plus comment logs.

From the peaceinc/Qbyte repository page, I can also verify that the repository explicitly includes run instructions (`pip install -r requirements.txt`, then run `python QByte.py mode remarks`) and describes both an "auto" mode (view switching on a timer) and offline re-analysis via `QBread.py`.

I was not able to locate or access a repository named peaceinc/Moonshots via the GitHub connector calls I ran in this session, and general web discovery did not surface a publicly indexed peaceinc/Moonshots repository. In practical terms, the best "start point" I can meaningfully ground in evidence today is the Q-Byte/Qbyte codebase and its described data products, and then design the Wild Card experiments as an extension around that existing clock-plus-RNG architecture.

SIT-aligned measurement targets and hypothesis statements

SIT's public-facing definition (as mirrored on Zenodo) describes two primitive informational fields: a complex coherence field ψ(x) and a real time-density scalar ρ_t(x), and emphasizes testability via predicted "precision-clock shifts" and "BEC gravity analogs."

I translate that into preregisterable hypotheses by tying each to a concrete observable and a falsification criterion that does not depend on mechanism claims.

Hypothesis A (clock pathway). If SIT's "time-density" and "coherence" coupling is physically real and experimentally accessible, then deliberate modulation of a coherence proxy (defined operationally, not metaphysically) will induce repeatable, statistically significant changes in measured clock phase/frequency residuals beyond what is explained by temperature, power, EMI, and other logged covariates. SIT explicitly lists "precision-clock shifts" as an empirical pathway, so this becomes my most direct test family.

Operational hypothesis A1 (QRNG-augmentation test). In out-of-sample forecasting of clock residuals, adding QRNG-derived features (computed strictly from pre-event windows) will improve predictive performance (negative ΔRMSE, negative ΔMAE, negative ΔCRPS) relative to the same model without QRNG features. This improvement must be absent under both negative controls: PRNG replacement and time-shuffled QRNG. If that pattern holds, I treat it as evidence of a "nontrivial shortcut signal" consistent with (but not proving) SIT's claim that coherence/time structure leaves measurable traces.

Hypothesis B (BEC pathway). If SIT's coherence-gradient picture can source gravity-like effects, then a highly coherent matter-wave source (BEC) could show a measurable difference in inferred acceleration or interferometer phase compared with a less coherent thermal cloud, under otherwise identical conditions. SIT's Zenodo summary explicitly lists "BEC gravity analogs" as a testable pathway, so a BEC-versus-thermal differential channel is appropriate.

Operational hypothesis B1 (Eotvos-style differential). Define a preregistered statistic η_BEC,thermal based on differential acceleration extracted from atom interferometry sequences (or equivalent gravimetry readouts). The null is η = 0 within noise and systematic error bounds. Evidence for the hypothesis requires (a) a statistically significant nonzero η in replication blocks, (b) stability under blinded analysis, and (c) disappearance under "coherence-destroying" ablations (e.g., conditions known to reduce condensate fraction or coherence time) while instrument health metrics remain nominal. Atom interferometry is a mature method for precision inertial sensing and has been used in high-precision equivalence testing, which makes it a credible measurement substrate even if SIT is wrong.

Hypothesis C (networked atmospheric/particle pathway). SIT's framing implies that coherence/time-structure may have spatial structure (gradients) that could be probed via

distributed sensing. I can therefore test whether QRNG-derived signals have any reproducible relationship with independently measured particle flux changes (muons/neutrons/radiation), especially during strong atmospheric electric-field disturbances (thunderstorms) where particle detectors are known to respond in measurable ways. The key is to treat known physics (pressure/temperature corrections; thunderstorm ground enhancements) as explicit controls rather than as the thing I am "discovering."

Operational hypothesis C1 (forecast lift under controls). For each site, I build forecast models of particle count rates using only meteorological covariates and time features, then compare to models augmented with QRNG features. The preregistered claim is: QRNG augmentation yields consistent out-of-sample lift across sites and events, and that lift disappears under PRNG replacement and time-shuffled QRNG controls. Pressure correction formulas and temperature terms are included explicitly (not learned implicitly) so that I do not misattribute known atmospheric effects to QRNG.

Important positioning note: even if the operational hypotheses A1/B1/C1 succeed, they do not by themselves "prove SIT" in the strongest sense; they provide evidence that motivates deeper mechanism discrimination. A Wild Card submission can still be strong if it is unambiguous about what would falsify the effect, what controls and ablations are used, and what degree of lift is practically meaningful.

Experimental concept designs

Below I outline three experiment concepts with objectives, instrumentation, replication, controls, ablations, preregistered metrics, and statistics. I keep the design language "XPRIZE-safe": engineered correlations, forecasting lift under controls, and reproducibility as the primary evidence standard.

Lab-scale coherence clock plus QRNG concept

Objective. Build a rigorously characterized "coherence clock" testbed in which a clock signal (or timebase residual relative to a reference) is compared against QRNG-derived features under controlled modulation sequences. The goal is not to claim new physics up front; it is to test whether QRNG features contain any reproducible, nontrivial predictive signal about clock

residual dynamics beyond standard covariates, using preregistered ablations and negative controls.

Core instruments and hardware (minimum viable). I can implement a low/medium-cost timing chain centered on (a) a stable timebase (GPSDO-disciplined oscillator or a chip-scale/miniature atomic oscillator), (b) a time-interval/frequency counter for phase and frequency residual logging, and (c) at least two independent RNG sources plus environmental sensors.

For the clock reference, a pragmatic option is a chip-scale or miniature atomic timing module with published Allan deviation performance and (ideally) 1 PPS disciplining capability. Microchip's timing products explicitly publish Allan deviation metrics and are designed for disciplined operation, which matches your earlier plan to document Allan deviation, GPSDO 1 PPS discipline, and environmental characterization.

For measurement instrumentation, a time-interval/frequency counter that supports Allan variance/Allan deviation plotting and high time resolution is a natural fit. An SR620-class instrument is explicitly positioned for atomic-clock drift measurement and Allan variance reporting and has published list pricing and capabilities in vendor literature.

For RNG sources, I recommend using at least two materially different "quantum/physical entropy" classes so I can discriminate device-specific artifacts. Examples include:

1. A quantum photonic QRNG (ID Quantique Quantis family). ID Quantique describes a QRNG chip using shot-noise photon statistics captured by a CMOS image sensor, and describes monitoring/failure detection and NIST 800-90 A/B/C alignment in its product literature.
2. A high-throughput quantum tunneling QRNG (QuintessenceLabs qStream), positioned as a 1 Gb/s quantum source and NIST 800-90B certified.
3. A lower-cost hardware noise RNG for multi-unit arrays (ubld.it TrueRNGpro). The TrueRNGpro is described as a USB CDC serial HWRNG with multiple modes (whitened/raw/diagnostic) and high output speed, and has installation guidance for Linux/Windows; this can support your multi-node "array" needs at low cost per unit.

Replication and modulation plan. I would preregister a block design with repeated “coherence modulation” epochs and matched sham epochs. The precise modulation method is unspecified in your prompt, so I treat it as unspecified and offer three viable options, from easiest to hardest:

Option A (instrument-only modulation). Treat “coherence state” as an operational condition defined by the QRNG network itself (e.g., cross-QRNG coherence spikes or pre-defined “coherence intervals”) and test whether those intervals are predictive of clock residuals out of sample. This is easiest but is the most vulnerable to hidden confounds and therefore must be paired with strong controls and nuisance covariates.

Option B (electromagnetic and shielding modulation). Alternate the QRNG and clock system between a shielded metrology enclosure (Faraday cage + controlled power + thermal stabilization) and an unshielded condition, while logging EM field proxies and power supply noise. The point is not to “create SIT” but to quantify whether any observed QRNG–clock relationship survives strong EMI/power controls. This is conceptually aligned with ID Quantique’s emphasis on monitoring and environmental perturbation resilience, and with NIST’s focus on entropy source health testing.

Option C (external coherence driver). Couple the timing system to an independently controllable coherence platform (e.g., an optical cavity or cold-atom system), and preregister on/off sequences. This is the most powerful conceptually but may be too high-cost for a near-term Wild Card execution.

Controls and negative controls. For this concept, I preregister at least four control families:

PRNG replacement control: replace QRNG-derived features with PRNG-derived features produced by a deterministic PRNG (seeded and version-pinned). This isolates whether any predictive gain is truly related to quantum/physical entropy or is an artifact of feature engineering.

Time-shuffled QRNG control: shuffle QRNG time indices within blocks (e.g., daily) so marginal distributions match but temporal alignment is destroyed.

Dummy electronics control: run a “dummy sensor” with similar USB/serial interface load and similar power draw (or a loopback) to test whether any correlation is due to bus activity, not entropy.

Geographic and thermal control: use two colocated but separated rigs (or a reference node) so that local disturbances are shared; compare against a remote reference if available (GPSDO discipline).

Ablation procedures. The “what do we remove” question becomes concrete here: I remove QRNG-derived feature channels and subroutines from the modeling pipeline while keeping everything else identical. Specifically, I preregister (a) feature ablations (drop QRNG features, keep time+environment features), (b) sensor ablations (swap QRNG device for PRNG or dummy), and (c) algorithmic ablations (swap quantum model block for classical baseline while keeping data splits fixed).

Preregistered metrics and statistics. I preregister two classes of metrics.

Clock metrology metrics: Allan deviation curves, time-error residual distributions, drift rates, and stability under temperature changes. Allan deviation is a standard stability measure used in frequency/timing metrology and is central to the instrument characterization you plan to publish.

Predictive metrics: ΔRMSE and ΔMAE for point forecasts, and ΔCRPS for probabilistic forecasts, where Δ is defined as metric(model_with_QRNG_features) minus metric(model_control_features_only). Negative Δ indicates improvement (“lift”). I compute 95% confidence intervals via paired bootstrap across preregistered blocks (e.g., days or modulation epochs) and use paired tests across blocks.

Sample size and power. Effect sizes are unspecified. I therefore preregister a power plan in terms of detectable standardized effect size d for paired differences across K blocks: K approximately equals ((1.96 + 0.84) / d)^2 for 80% power at alpha 0.05 (two-sided), assuming near-independence across blocks. Because timing residuals are autocorrelated, I plan to use block bootstrap/permutation with block length preregistered (e.g., 1 hour or 1 day) and treat effective K as “number of blocks,” not number of seconds sampled.

BEC versus thermal-cloud differential acceleration with QRNG gradiometry concept

Objective. Use atom interferometry / cold-atom gravimetry to test whether a coherence-dense matter-wave source (BEC) exhibits any differential acceleration signature versus a thermal cloud, and whether any such signature co-varies with QRNG network features (treated as an auxiliary “informational field probe”) under strict controls.

Why atom interferometry is the right measurement substrate. Atom interferometers are established inertial sensors and a mature precision technology; there is an extensive literature on matter-wave interferometry and its metrological uses.

Equivalence-principle free-fall tests using dual-species atom interferometers provide a template for extracting differential acceleration via gravitationally induced phase shifts, and they highlight the systematic-control culture needed to make a gravity-claim credible.

Feasibility anchor. BEC-based gravimetry and interferometry have published demonstrations (e.g., cold-atom gravimetry with a BEC sample in a Mach–Zehnder configuration).

Instrument stack. In a fully developed version (high budget), I would use:

Atom source: a setup capable of producing both a thermal ensemble and a BEC (same atomic species), with controllable condensate fraction.

Interferometer: Raman or Bragg pulse sequence with well-characterized timing.

Readout: imaging system for fringe visibility and phase estimation.

Auxiliary shields: magnetic shielding and vibration isolation (standard in high precision atom interferometry; I would treat shielding details as part of the “systematics” subsection and document them explicitly).

QRNG gradiometry: multiple QRNG devices placed at fixed geometry around the interferometer chamber (or along a vertical axis), synchronized time-stamping, plus matched dummy electronics. The intent is not to assume a “QRNG measures gravity” claim; it is to define a reproducible feature set and test whether it improves inference of the atom interferometer’s residuals beyond known covariates.

Replication. Because BEC systems are complex and site-specific, I would preregister replication as repeated runs across days with the same apparatus plus at least one external replication partner lab if available (unspecified). The NASA Cold Atom Laboratory science overview emphasizes that microgravity/time-of-flight constraints and applied-field perturbations matter even for BEC work; that reinforces why replication and careful logging are essential.

Controls. The control suite must be exceptionally strict:

Thermal-vs-BEC controls: alternate between high condensate fraction and intentionally reduced condensate fraction (operationally measured), with identical interrogation sequences.

Environmental controls: constant monitoring of B fields, laser phase noise proxies, vibration, and temperature.

QRNG controls: PRNG replacement, time-shuffle, dummy electronics, and (if possible) physical relocation of QRNGs while keeping cabling/power constant to test geometry dependence.

Analysis blinding: preregistered scripts that compute η_BEC,thermal without revealing condition labels until after code freeze.

Metrics and statistics. Primary endpoint: differential acceleration inferred from interferometer phase difference between BEC and thermal states, expressed as an Eotvos-style ratio or in m/s^2 with uncertainty. This is analogous in spirit to published atom-interferometric equivalence testing that reports an Eotvos ratio with uncertainty.

Secondary endpoints: out-of-sample predictive lift for residual phase noise or acceleration residuals using QRNG features vs control features (ΔRMSE, ΔMAE, ΔCRPS). I treat this as a "model-based detection and attribution" layer: the physics measurement is the phase; the ML layer tests whether QRNG features offer any reproducible predictive handle on residuals.

Power and sample size. In a BEC apparatus, practical power is usually limited by number of experimental shots and stability over time. Because effect size is unspecified and systematic uncertainties dominate, I preregister a staged approach: first demonstrate instrument stability and reproduce a known benchmark (e.g., stable gravimetry signal) before interpreting any tiny η_BEC,thermal deviation.

Networked storm and atmospheric particle test with QRNG plus particle detectors concept

Objective. Test whether atmospheric disturbances that measurably affect secondary cosmic-ray particle flux (and therefore particle detectors) also produce any additional, reproducible structure in QRNG-derived features, and whether QRNG features provide additional out-of-sample predictive signal for particle-rate fluctuations once known atmospheric effects (pressure/temperature) are explicitly modeled and removed.

Why storms and particles are useful. There is established literature showing that atmospheric variables modulate particle fluxes. For cosmic-ray neutron sensors, pressure correction is commonly modeled as an exponential function of pressure difference from a reference, and published network papers give explicit formulas and coefficients.

For muons, geophysics literature describes pressure (barometric) and temperature effects and notes that pressure coefficients depend on latitude, altitude, and energy; this gives a clear baseline model for what “should” happen without any new physics.

Thunderstorm-related particle flux changes (including “thunderstorm ground enhancements”) have been observed in high-altitude detector contexts, and muon count changes can be associated with strong electric fields; again, this provides a known-physics event class where high-contrast changes are plausible and therefore good for validating the measurement chain.

Sensor package. For each site node, I would deploy:

QRNG array: at least one “strong” quantum source (e.g., ID Quantique Quantis or similar) plus one lower-cost multi-unit source (e.g., TrueRNGpro) so I can study cross-device agreement and rule out a single vendor artifact.

Particle detector: one or more of (a) a muon detector (e.g., Cosmic Watch style scintillator+SiPM for muons), (b) a radiation counter (Geiger-Muller kit for gamma/beta), and (c) if feasible, a neutron channel or access to a nearby neutron monitor dataset. Cosmic Watch documentation describes coincidence-enabled muon detection and the scintillator/SiPM design, which is a plausible low-cost, scalable instrument class for a hobbyist-to-researcher network.

Meteorology and power: barometric pressure, temperature, humidity, rain gauge, and (ideally) lightning proximity or electric-field proxy; plus power-quality logging for each node.

Elevation and site plan. Your dream protocol suggests comparing stable dry periods to rain/storm days, and testing different elevations and cities. I would preregister a minimum network of N sites (unspecified, but I recommend at least 5–10 for meaningful paired across-site statistics), stratified by elevation classes (e.g., near sea level, mid-elevation, high elevation) and including at least one shielded/underground site as a negative control.

Controls. This experiment needs controls that explicitly address the most likely false-positive drivers:

Pressure/temperature correction control: apply preregistered corrections (or include pressure/temperature terms in the baseline model) so known physics is removed before testing QRNG associations.

EMI control: colocate dummy USB/serial electronics, and optionally use a Faraday enclosure at one node. Compare QRNG anomalies inside/outside shielding.

Underground control: run at least one node underground or heavily shielded, where cosmic-ray muon flux is suppressed, to test whether apparent QRNG–particle linkages persist when the particle channel is reduced.

PRNG/time-shuffle controls: identical to the lab concept.

Preregistered event windows. I would define event windows based on objective meteorological/EM triggers, not on QRNG behavior. For example: precipitation onset, lightning occurrence within radius R, or pressure drop exceeding threshold. The key is “QRNG-blind” event definition.

Metrics and statistics. Primary endpoints are:

Particle channel: corrected particle count residuals (after pressure correction), and event-aligned change statistics.

QRNG channel: autocorrelation changes, inter-arrival times of threshold exceedances, and cross-QRNG coherence (correlation / coherence measures) across devices.

Model-based endpoint: out-of-sample ΔRMSE, ΔMAE, and ΔCRPS for predicting particle residuals with QRNG features added, relative to the baseline model. Evidence standard: (a) negative Δ on held-out events/sites; (b) 95% confidence intervals excluding zero; (c) disappearance of lift under PRNG and time-shuffled controls; (d) robustness to permutation tests that shuffle event labels or shift QRNG timestamps by preregistered offsets.

A note on practical baselines: if you also have access to existing global RNG networks (e.g., GCP network data streams), the HeartMath-hosted GCP 2.0 literature provides context: it describes a global network with devices that each contain 4 independent RNGs and a stated goal of 1000 devices, and it frames hypothesis testing in terms of deviations from randomness and coherence across the network. That background helps justify why a QRNG network plus explicit controls is a coherent experimental framing, even if the underlying interpretation is controversial.

Preregistration, ablations, metrics, and statistical tests

Core preregistration contract

I would preregister the following, in writing, before looking at post-start outcomes:

Data streams and time resolution (unspecified; recommended: 1 Hz to 1 min aggregates for QRNG and particle channels; 1 s to 1 min for timing residual logs).

Feature definitions, including any thresholds (for example, “coherence intervals” could be fixed windows where a bit-frequency Z-score exceeds a preregistered absolute threshold).

Train/validation/test splits and cross-validation scheme (block cross-validation over time; leave-one-site-out for networked designs).

Primary metrics (ΔRMSE, ΔMAE, ΔCRPS) and secondary metrics (autocorrelation, inter-arrival, cross-QRNG coherence).

Stopping/decision rule: what pattern counts as “supporting evidence” versus “no effect,” with explicit reliance on negative controls.

Ablation matrix

The simplest way to answer “what do we remove” is to define the model pipeline as a set of feature families and then preregister removals. The table below spells out ablations in terms of removed functionality, not code aesthetics.

Ablation / control	What I remove or replace	What must stay identical	Why this isolates the effect
No-QRNG ablation	Remove all QRNG-derived features from the feature matrix	Same model class, hyperparameters, splits, seeds, covariates	Tests whether QRNG features add any predictive value
PRNG replacement	Replace QRNG streams with PRNG streams (seeded, version pinned) and recompute the same features	Same feature code, same pipeline, same evaluation	Tests whether “lift” is just feature-engineering or noise exploitation
Time-shuffled QRNG	Shuffle QRNG timestamps within preregistered blocks	Same marginal QRNG distribution and feature code	Preserves distribution but breaks alignment; detects spurious correlation
Dummy electronics	Replace QRNG device with a dummy interface (or record dummy channel alongside QRNG)	Same cabling, host OS, logging	Tests for USB/power/EMI artifacts
Underground / shielded	Relocate node to shielded environment	Same device model and software	Tests whether an effect depends on environmental coupling

This “ablation-first” framing is aligned with the broader NIST stance that statistical testing alone cannot certify suitability and that evaluation must be tied to threat models and controls; in our context, the “threat model” is false correlation from environment, instrumentation, and selection bias.

Statistical tests

For paired comparisons across sites or regions, I would preregister paired tests on per-site summary metrics (e.g., per-site ΔRMSE over held-out windows). Use a paired t-test if approximate normality holds; otherwise use a Wilcoxon signed-rank test. For confidence intervals across sites, use bootstrap resampling of sites (and block bootstrap in time). Permutation tests include (a) shuffling site labels, (b) circularly shifting QRNG features by random offsets per site, and (c) shuffling event window labels, all preregistered.

Because QRNG and particle time series can be autocorrelated, I would avoid naive IID assumptions and preregister block lengths and effective sample sizes. This matters especially for storm windows where conditions persist for hours.

Sample size and power

Parameters are largely unspecified, so I would preregister sensitivity in terms of detectable effect size rather than pretending a precise power number exists.

For paired across-site tests, if I have K sites and define per-site Δ as the difference in error metrics between QRNG-augmented and baseline models, then the approximate K needed for 80% power at alpha 0.05 is K approximately equals ((1.96 + 0.84) / d)^2 where d is the standardized mean difference (meanΔ / sdΔ). Because d is unknown, I would preregister a target of at least K = 8–12 sites for the storm network test if feasible, but explicitly label this as an assumption. For the lab clock, K can be “days” or “modulation blocks,” but only if blocks are long enough to be treated as approximately independent.

For timing sensitivity, the practical detectability threshold is determined by the clock and measurement chain stability, often expressed through Allan deviation; published timing modules and metrology tools give a realistic noise floor. For example, Microchip’s LN-CSAC materials cite an Allan deviation at 1 s on the order of 1e-11 to 1e-10 depending on model class, which anchors what “small” means in fractional frequency terms.

Data pipeline, reproducibility, repo structure, feasibility, and budget

Data pipeline and reproducibility commitments

To be credible in XPRIZE terms, I would treat this as an “open, replayable experiment,” not a one-off demonstration. My reproducibility commitments are:

Open preregistration artifact: a versioned analysis plan (markdown + frozen parameter file) committed before outcome data is analyzed.

Deterministic compute: containerized environment definitions (conda env, pip requirements, and optionally a devcontainer) and fixed random seeds.

Data pointers: raw data stored externally (or via data versioning) with immutable hashes; the repo contains only small samples for tests. (Your existing Qbyte repo already includes environment files and requirements, which can be extended into this style.)

End-to-end scripts: a single command to reproduce paper figures and tables from raw data pointers.

Suggested GitHub repo structure and example filenames

Below is a suggested structure that generalizes your existing Qbyte workflow into the three experiment concepts while keeping everything reproducible.

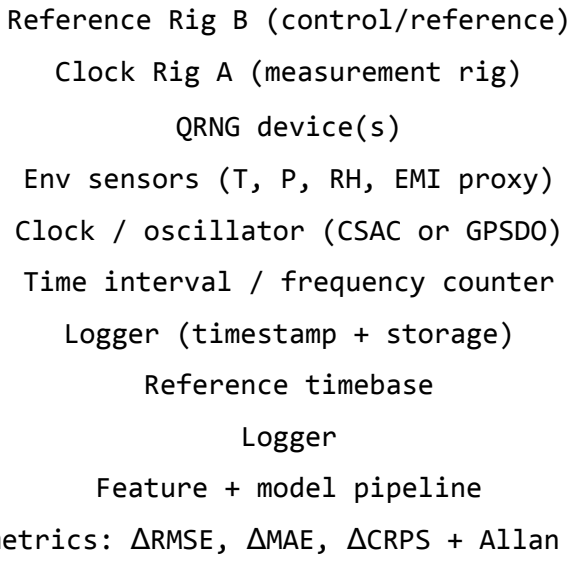
```
text
Copy
sit-qrng-wildcard/
  README.md
  CITATION.cff
  LICENSE
  preregistration/
    prereg_plan_v1.md
    params_v1.yaml
    event_windows_v1.yaml
    ablation_matrix_v1.yaml
  docs/
    wildcard_shareable_summary.md
    phase1_technical_abstract.md
    risk_register.md
    bill_of_materials.md
  hardware/
    clock_rig/
      wiring_diagram.md
      emi_shielding_notes.md
      calibration_protocol.md
    storm_node/
```

```
    enclosure_build.md
    sensor_mounts.md
    site_install_checklist.md
data/
  README_data_pointers.md
  samples/
    clock_rig_sample_2026-02-15.parquet
    storm_node_sample_2026-02-20.parquet
src/
  ingest/
    ingest_clock_logs.py
    ingest_qrng_streams.py
    ingest_particle_counts.py
    ingest_weather.py
  features/
    qrng_features.py
    cross_qrng_coherence.py
    clock_stability_features.py
    particle_corrections.py
  models/
    baseline_models.py
    qrng_augmented_models.py
    probabilistic_forecasts.py
  eval/
    metrics.py
    paired_tests.py
    permutation_tests.py
    make_cis.py
  viz/
    figs_clock.py
    figs_bec.py
    figs_storm.py
notebooks/
  01_data_qc.ipynb
  02_feature_ablation_checks.ipynb
  03_final_figures.ipynb
tests/
  test_features.py
  test_reproducibility.py
Makefile
environment.yml
requirements.txt
```

Mermaid diagrams

Experimental layouts and timeline can be expressed in mermaid to match XPRIZE-style narrative documents.

Coherence-clock plus QRNG layout:



Show code

Timeline sketch:

2026-03-082026-03-152026-03-222026-03-292026-04-052026-04-122026-04-192026-04-262026-05-032026-05-102026-05-172026-05-242026-05-312026-06-072026-06-142026-06-212026-06-282026-07-052026-07-12Freeze analysis plan (v1)Repo scaffolding + CI + env lockClock rig assembly + EMI/thermal testsParticle nodes assembly + dry runBaseline (dry / calm) acquisitionEvent acquisition (storms / campaigns)Locked analysis run + ablationsDraft Phase I narrative figures/tablesPreregistration and toolingInstrument build and calibrationData collectionAnalysis and reportingSIT-QRNG Wild Card experiment program timeline

Show code

Risk and feasibility assessment

The lab coherence-clock concept is the most feasible for a Wild Card because it can be executed with commercially available timing components and QRNG/HWRNG devices, and it produces clean, audit-friendly artifacts (stability plots, Allan deviation curves, calibrated systematics). The main risk is that any observed QRNG–clock association is actually EMI/power/temperature coupling, which is why shielded runs, dummy electronics, and explicit covariate logging are non-negotiable.

The BEC-versus-thermal concept is the highest scientific upside but also highest execution risk. It inherits the complexity of atom interferometry systems and the reality that systematic uncertainties are often the limiting factor, as reflected by the careful bias and strategy discussions in atom-interferometry equivalence testing literature.

The storm/particle network concept is a strong middle ground: it is scalable, can be replicated across many sites, and leverages well-understood atmospheric correction physics as a built-in control layer. Its main risks are (a) confounding by pressure/temperature and (b) local EMI or power anomalies during storms, which is why pressure correction and robust hardware logging matter.

Rough budget ranges

Budgets are inherently approximate and depend on procurement routes, number of sites, and whether you buy new or used metrology equipment. Where I have explicit public pricing or list pricing, I cite it; otherwise I label costs as ranges/assumptions.

Component cluster	Low budget range	Medium budget range	High budget range	Notes / anchors
QRNG/HWRNG per node	$100–$500	$500–$5,000	$5,000+	TrueRNGpro is listed at $99 MSRP; quantum-certified QRNGs vary widely.
Timing measurement	$0–$1,000	$2,000–$6,000	$10,000+	SR620 class has a cited $4,950 list price and used market prices in the low thousands.
Atomic timing reference	$1,000–$5,000	$5,000–$25,000	$50,000+	Stability specs are published, pricing varies by model class and channel; treat as assumption after vendor quotes.

Particle detector per node	$100–$1,000	$1,000–$10,000	$10,000+	Example: Adafruit Geiger kit is $99.95; muon detector costs vary; neutron systems can be expensive.
BEC/atom interferometer platform	N/A	$100,000+	$500,000+	Highly apparatus-dependent; not priced in the cited sources, so these are assumptions.
Network deployment (N sites)	$1,000–$10,000	$10,000–$100,000	$100,000+	Dominated by N, travel, enclosures, maintenance, and data ops; N is unspecified.

XPRIZE-ready writing artifacts

Public-friendly Wild Card summary

I am submitting a preregistered, open-science experiment to test whether quantum-random sensor networks contain any reproducible signal that improves prediction of independent physical measurements linked to gravity and time. Using multiple QRNG devices alongside precision timing references and particle detectors, I will run strict ablations that isolate the contribution of QRNG-derived features versus PRNG and time-shuffled controls. The project publishes code, seeds, and data pointers so anyone can reproduce results end-to-end. Success is defined quantitatively as out-of-sample forecasting lift (ΔRMSE, ΔMAE, ΔCRPS) that appears only with real QRNG features and disappears under both controls, combined with metrology-grade validation of instrument stability and environmental confound logging.

Technical abstract for a Phase narrative document

Super Information Theory (SIT) posits that measurable coherence and time-density fields yield testable consequences including precision-clock shifts and Bose–Einstein condensate (BEC) gravity analogs. We propose a preregistered experimental program using quantum random number generators (QRNGs) as high-rate quantum entropy sensors coupled to complementary instrumentation (precision timing references and particle detectors) to test for reproducible SIT-aligned anomalies under strict controls. The primary claim evaluated is prediction lift:

identical statistical and machine-learning models with and without QRNG-derived features are compared on held-out data, with negative controls using (a) PRNG replacement and (b) time-shuffled QRNG features. We report out-of-sample ΔRMSE (and ΔMAE/ΔCRPS) with 95% confidence intervals using paired tests across sites/regions and permutation tests with preregistered block lengths to address autocorrelation. Three experimental modalities are presented: (i) a lab-scale coherence-clock testbed quantifying Allan deviation and timing residuals versus QRNG features under calibrated EMI/thermal/power controls; (ii) a higher-risk BEC versus thermal-cloud differential acceleration protocol using atom interferometry templates for extracting η-style differential measures; and (iii) a distributed atmospheric particle-flux network integrating QRNGs with muon/neutron/radiation detectors and explicit meteorological correction models (pressure/temperature). All code, parameters, and data pointers are released to enable full replication and independent verification.

Key links used as primary references

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text
Copy
XPRIZE Quantum Applications overview and Wild Card timing:
https://www.xprize.org/competitions/qc-apps
https://www.xprize.org/news/xprize-quantum-applications-wildcard-registration-now-ope
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SIT public record (Zenodo mirror page):
https://zenodo.org/records/16922512

HeartMath / GCP 2.0 paper (PDF):
https://www.heartmath.org/assets/uploads/2024/01/global-consciousness-project-2.pdf

ID Quantique QRNG technical/product pages:
https://www.idquantique.com/random-number-generation/
https://www.idquantique.com/random-number-generation/products/quantis-qrng-chips/

ubld.it TrueRNGpro and install guide:
https://ubld.it/products/truerngpro
https://ubld.it/products/support/truerng-install-guide

NIST RNG guidance (SP 800-90B and SP 800-90C; SP 800-22 test suite context):
https://csrc.nist.gov/pubs/sp/800/90/b/final
https://csrc.nist.gov/pubs/sp/800/90/c/final
https://www.nist.gov/publications/statistical-test-suite-random-and-pseudorandom-numb
er-generators-cryptographic-1
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Atom interferometry / equivalence testing anchors:
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.112.203002
https://journals.aps.org/rmp/abstract/10.1103/RevModPhys.81.1051

Atmospheric particle correction and storm particle effects:
https://essd.copernicus.org/articles/14/1125/2022/essd-14-1125-2022.html
https://www.sciencedirect.com/science/article/pii/S0927650520300773