TRANSFERENCE

Cognitive Signal Physics

Research Domain Charter & Experimental Framework

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A proposed scientific domain for the measurement, characterization, decoding, propagation testing, and controlled interaction of physical signals associated with human cognition.

Scientific posture: open to novel mechanisms, strict about evidence. The domain does not assume that thoughts are broadcast by radio, that the Earth carries semantic mental content, or that remote mind-to-mind communication exists. Those propositions are treated as testable hypotheses whose status depends on reproducible evidence.

Prepared for the Transference research programme

Executive Abstract

Cognitive Signal Physics (CSP) is proposed as an interdisciplinary research domain concerned with the physical signal-space through which cognition becomes observable, measurable, decodable, and potentially interactable.

The starting point is established science: neuronal activity produces electrical and magnetic phenomena that can be measured with technologies such as EEG and MEG, and neural recordings can already be decoded by brain-computer interfaces into useful outputs such as text and synthesized speech. MEG facilities routinely detect brain-generated magnetic fields outside the head at approximately 10^-14 tesla, while recent intracortical systems have decoded attempted speech into expressive synthetic voice. [1-4]

CSP extends from those established facts into progressively stronger questions. Does each person exhibit a stable multidimensional cognitive signal signature? Can meaningful cognitive content be inferred reliably from non-invasive signals? Do any signal components remain detectable at increasing distance from the body? Is there any reproducible coupling between human neurophysiology and environmental electromagnetic phenomena? Could the Earth-ionosphere system, or some other environmental medium, participate in synchronization or propagation? And, only if such effects survive rigorous testing, can information be transmitted back through the same or a related physical channel?

The Earth-mediated proposition is classified here as a high-uncertainty research hypothesis rather than an accepted mechanism. Schumann resonances are real electromagnetic standing-wave phenomena in the Earth-ionosphere cavity, with the lowest modes near 7.8, 14.3, 20.8, 27.3 and 33.8 Hz. Some studies have reported spectral similarities or correlations between these environmental frequencies and human EEG, but such observations do not establish semantic information transfer, causal coupling, or a global human communications network. [5-7]

The purpose of CSP is therefore not to validate a preferred explanation. Its purpose is to create an experimental discipline capable of distinguishing real cognitive signal phenomena from coincidence, common environmental drivers, instrumentation artefacts, electromagnetic contamination, statistical overfitting, and expectation effects. The programme adopts preregistration, blinded analysis, prospective holdouts, calibration provenance, independent replication, falsification criteria and staged escalation of claims.

Within Transference, CSP becomes a long-horizon Sensorium research layer. Files, conversations, decisions, behavioural traces, physiological observations and neural signals can be treated as distinct measurement surfaces of a human cognitive system. CSP adds the physical-signal layer while preserving human sovereignty: neural data, inferred mental states and any future read/write capability must remain subject to explicit consent, revocable authority, provenance and strict security controls. This position is consistent with emerging international neurotechnology governance, including the UNESCO Recommendation on the Ethics of Neurotechnology adopted in November 2025 and the OECD Recommendation on Responsible Innovation in Neurotechnology. [8-9]

Core research proposition

Human cognition produces measurable physical states. CSP asks how much information those states contain, how uniquely they identify an individual, how far they propagate, what media influence them, and under what conditions they can be safely decoded or modulated.

1. Definition of the Research Domain

1.1 Working definition

Cognitive Signal Physics is the study of the physical signals generated by, correlated with, or capable of influencing cognitive processes, with particular emphasis on their information content, individual specificity, spatial propagation, environmental coupling, detectability, decodability, and causal interaction.

1.2 Disciplinary intersection

CSP sits at the intersection of neuroscience, neurophysics, electrophysiology, biophysics, signal processing, information theory, brain-computer interfaces, electromagnetic metrology, geophysics, machine learning, cognitive science and neuroethics. It differs from any one of these fields by making the complete cognition-to-physical-signal pathway the central object of study.

1.3 What CSP is not

- It is not an assumption that a human being possesses a single radio-like carrier frequency.
- It is not a declaration that thoughts are presently readable at a distance.
- It is not evidence that similar EEG and environmental frequencies imply communication.
- It is not a claim that all humans are connected through the Earth in a semantic network.
- It is not a programme for covert surveillance or non-consensual mental-state inference.

Each of those propositions can be converted into narrower scientific questions and tested. CSP exists to make that conversion explicit.

1.4 Foundational distinction: frequency versus signal identity

A central CSP principle is that a cognitive signature should not be reduced prematurely to one frequency. EEG/MEG activity is conventionally described using frequency bands such as delta, theta, alpha, beta and gamma, but modern analysis also considers phase, amplitude, spatial topology, connectivity, transient events, cross-frequency coupling and temporal dynamics. Frequency is therefore one coordinate in a higher-dimensional signal state. [10]

$$C_i(t) = F(f, \text{phase}, \text{amplitude}, \text{spatial topology}, \text{connectivity}, \text{state}, \text{context}, \text{time})$$

The research object is the reproducible structure of $C_i(t)$, not a presumed personal broadcasting frequency.

2. Evidence Ladder and Scientific Status

CSP uses an evidence ladder so that established observations are never blended with speculative extensions.

Evidence level	Meaning	Current status
E0 - Established physical observability	Neural activity produces electrical and magnetic signals measurable with EEG, ECoG, intracortical electrodes and MEG.	Established
E1 - Established functional decoding	Neural signals can be decoded into task-relevant variables; implanted BCIs have decoded attempted speech into text, audio and avatar control.	Established in defined experimental/clinical settings
E2 - Candidate cognitive signature	Multidimensional neural signal patterns may provide stable within-person and between-person signatures across sessions and tasks.	Plausible; must be operationally defined and tested
E3 - Non-contact propagation	Cognition-related fields may remain detectable beyond conventional sensor placement and at increasing distance.	Unverified as a semantic communication mechanism
E4 - Environmental/terrestrial coupling	Environmental electromagnetic or conductive phenomena may measurably synchronize with, modulate, or carry components of human neurophysiology.	Speculative; correlations exist but causal/semantic transfer is unestablished
E5 - Remote semantic channel	A remote receiver may recover specific cognitive content without conventional sensors attached to the subject.	No accepted evidence

Evidence level	Meaning	Current status
E6 - Bidirectional cognitive communication	A physical channel may permit reliable message delivery into cognition and measurable response through the same or related medium.	No accepted evidence for the proposed natural Earth-mediated mechanism

3. Core CSP Hypotheses

CSP-H1: Cognitive Signal Existence

Claim. Specific cognitive states produce repeatable physical signal changes that can be distinguished from baseline and artefact.

Evidence that would support it. Randomized cognitive tasks produce above-chance state classification on held-out trials.

Evidence that would weaken or falsify it. Performance collapses to chance after leakage controls, artefact removal and independent replication.

CSP-H2: Individual Signal Signature

Claim. A portion of the cognitive signal structure is sufficiently stable to identify or authenticate an individual across sessions while separating state-dependent variation.

Evidence that would support it. Cross-session identity classification exceeds preregistered thresholds and generalizes to new days/devices.

Evidence that would weaken or falsify it. Identity performance is explained by sensor placement, anatomy, muscle artefact, device fingerprint or session metadata.

CSP-H3: Semantic Decodability

Claim. Neural signal structure contains recoverable information about constrained semantic content, intention or internally generated representations.

Evidence that would support it. Prospective decoding of unseen trials/items exceeds chance and survives permutation controls.

Evidence that would weaken or falsify it. Models only decode motor preparation, stimulus timing, experiment cues or other non-semantic correlates.

CSP-H4: Extra-cranial/Non-contact Detectability

Claim. Some cognition-linked field components can be detected without electrode contact and characterized as a function of distance.

Evidence that would support it. Signal-to-noise and task information remain measurable under controlled sensor-distance manipulation.

Evidence that would weaken or falsify it. Effects vanish when electromagnetic leakage, motion, acoustic, thermal and equipment channels are blocked.

CSP-H5: Environmental Propagation

Claim. A cognition-linked signal component can propagate through an external physical medium in a way that preserves task information.

Evidence that would support it. A physically separated receiver detects task information with lawful distance/material dependence and no conventional leakage path.

Evidence that would weaken or falsify it. Apparent transfer disappears under shielding, randomized timing, dummy transmitters or independent replication.

CSP-H6: Terrestrial Cognitive Coupling (TCC)

Claim. Human neurophysiology exhibits reproducible coupling with Earth/environment electromagnetic phenomena beyond coincidence and shared confounders.

Evidence that would support it. Time-locked coupling replicates across sites and predicts preregistered neural features after controlling local EM noise, time-of-day and common drivers.

Evidence that would weaken or falsify it. Coupling is indistinguishable from chance, line noise, harmonics, lightning/weather covariates, analysis flexibility or common time structure.

CSP-H7: Bidirectional Physical Interaction

Claim. If a validated carrier/coupling pathway exists, controlled perturbation of that pathway can causally alter a preregistered neural or cognitive response.

Evidence that would support it. Safe, blinded stimulation produces dose-dependent, replicable effects specific to predicted parameters.

Evidence that would weaken or falsify it. No effect, non-specific effect, expectancy effect, or results explainable by sensory stimulation or known confounds.

4. CSP Signal-Chain Model

CSP treats every proposed mechanism as a sequence of independently testable transformations. A failure at one stage prevents stronger downstream claims.

Cognitive / neural state	Biophysical signal generation	Local coupling at the body boundary	Propagation through a candidate medium	Remote or non-contact sensing	Signal separation and decoding	Semantic validation	Optional causal return channel

A candidate Earth-network mechanism would have to satisfy every step from source generation through propagation and remote semantic validation. Shared frequency alone cannot satisfy this chain.

4.1 Candidate carrier classes

Candidate class	Established baseline	CSP treatment
Near-field electric potentials	Established around biological sources at short range	Characterize decay, shielding and artefact sensitivity; do not assume long-range propagation.
Biomagnetic fields	Established; MEG detects weak magnetic fields outside the head	Measure distance scaling and sensor sensitivity; compare SQUID/OPM or equivalent magnetometry.
Radiated electromagnetic fields	Physical possibility in general, but semantic cognition transmission from the brain is unestablished	Search for task-modulated emissions with calibrated antennas/sensors and rigorous RF contamination controls.
Conductive / galvanic pathways	Body and Earth are conductive systems in ordinary physics, with strong dependence on impedance and contact	Test whether grounding state changes measurable signal characteristics; separate direct conductive artefacts from neural effects.
Earth-ionosphere ELF environment	Schumann resonances are established geophysical phenomena	Test synchronization/coupling hypotheses with simultaneous environmental field and EEG measurements; correlation is not communication.
Unknown physical mechanism	Logically possible but scientifically unconstrained	Only introduce after known channels and artefacts have been excluded; require stronger replication and independent instrumentation.

5. Terrestrial Cognitive Coupling (TCC)

TCC is the CSP sub-hypothesis corresponding most closely to the proposed Earth-mediated network: the possibility that a geophysical medium participates in synchronization, propagation or modulation of cognition-linked signals. TCC must be studied in layers so that weaker effects are not misrepresented as stronger ones.

Level	Operational meaning	Interpretive limit
TCC-0: Shared spectral region	Neural and environmental signals occupy overlapping frequency ranges.	This is not evidence of interaction.
TCC-1: Statistical covariance	EEG/MEG features covary with measured environmental fields.	May arise from confounds or common drivers.
TCC-2: Reproducible coupling	Covariance is time-locked, directionally informative and replicates across sites after controls.	Evidence of coupling, not yet semantic communication.
TCC-3: Causal modulation	Controlled changes in the relevant environmental parameter produce specific neural effects.	Requires safe experimental perturbation and blinding.
TCC-4: Information carriage	The environmental channel carries subject-specific task information recoverable remotely.	A major new finding requiring multi-lab replication.
TCC-5: Bidirectional semantic exchange	Messages can be encoded into the channel, received by a person, and elicited responses can be recovered.	Extraordinary claim; requires exceptionally strong, independent evidence.

Scientific caution: Schumann resonances are generated primarily by global lightning activity within the Earth-ionosphere cavity. Their frequency overlap with portions of the EEG spectrum is physically interesting, but frequency overlap alone cannot establish biological synchronization, and synchronization cannot establish semantic information transfer. [5-7]

6. Priority Research Questions

1. What features of brain-generated electric and magnetic signals are reproducible within one person across time?
2. Which features discriminate individuals after controlling anatomy, sensor geometry, task, device and preprocessing pipeline?
3. How much cognitive-state or semantic information can be decoded prospectively from non-invasive signals?
4. What is the spatial decay of cognition-correlated electric and magnetic fields under calibrated conditions?

5. Can any cognition-related component be measured at distances beyond conventional EEG/MEG geometry without an alternative leakage path?
6. Does grounding, electrical isolation, shielding or body orientation alter measurable neural or extra-cranial signal structure?
7. Do simultaneously measured Schumann/ELF or geomagnetic variables predict neural features after removal of line noise, weather, circadian and site effects?
8. If coupling exists, is it causal, or can it be explained by a common external driver?
9. Can a receiver recover intentionally randomized cognitive labels from a physically isolated participant at above-chance levels?
10. What is the information capacity, latency, bandwidth and error structure of any validated channel?
11. Can the effect replicate across laboratories, instruments, populations and geography?
12. What consent, ownership, access-control and revocation structures are necessary before any neural inference system becomes operational?

7. Experimental Programme

Phase 0 - Metrology, Calibration and Artefact Library

Objective: establish what every sensor can and cannot measure before testing cognitive hypotheses. Create calibrated recordings of empty-room noise, phantom sources, mains harmonics, RF emitters, body motion, eye movement, facial muscle activity, respiration, cardiac activity, device clocks and environmental field conditions.

Release gate: no cognitive experiment proceeds until instrumentation noise floors, synchronization accuracy, channel cross-talk and major artefact signatures are documented.

Phase 1 - Cognitive Signature Mapping

Use randomized tasks spanning rest, attention, imagery, internal speech, attempted speech, memory retrieval, arithmetic and decision tasks. Record EEG initially; add other modalities where available. Establish within-person reproducibility and between-person separability using prospective holdout sessions.

Primary metrics: balanced accuracy/AUC, mutual information, cross-session stability, calibration drift, feature reproducibility and confidence intervals.

Phase 2 - Non-contact Field Characterization

Place calibrated electric and magnetic sensors at predefined distances from the head/body while collecting conventional neural recordings as a reference. Randomize sensor distance and use sham sensors or dummy channels. Model signal decay and compare against physical expectations for near-field sources and environmental contamination.

Phase 3 - Isolation, Shielding and Grounding Experiments

Repeat the same randomized cognitive protocol across controlled conditions: electrically grounded versus isolated; ordinary room versus improved electromagnetic shielding; different orientations;

battery-powered versus mains-powered acquisition; and separated transmitter/receiver rooms. The goal is not to produce a positive result but to identify which physical pathways survive each intervention.

Phase 4 - Blind Remote Information Test

Only after a candidate remote signal is found, run a prospectively preregistered test in which the participant receives randomly assigned hidden targets while a physically separated receiver records the candidate channel. The decoding team receives no trial labels until the model and analysis pipeline are frozen.

Minimum acceptance pattern: above-chance decoding on a sealed holdout; successful negative controls; repeat session; independent analyst replication; and no identifiable conventional side channel.

Phase 5 - Multi-site Environmental Coupling

Collect synchronized neural and environmental electromagnetic data at geographically separated sites. Compare local EEG features against local and remote ELF/geomagnetic measurements while explicitly modeling lightning, geomagnetic activity, local electrical infrastructure, time-of-day, sleep/wake state and weather. Test whether the same preregistered coupling statistic replicates across sites.

Phase 6 - Causal Perturbation and Bidirectionality

This phase is conditional. It begins only if earlier phases identify a reproducible physical pathway. Use established safety limits and ethics review to test whether controlled perturbation of the validated carrier predicts a specific neural response. No attempt at semantic message delivery should precede evidence for a safe causal pathway.

7.1 Flagship experiment set

ID	Experiment	Hypothesis	Decisive question
CSP-EXP-001	EEG cognitive fingerprint baseline	H1/H2	Can the system identify state and person on future sessions?
CSP-EXP-002	Internal speech vs matched motor-control task	H3	Does decoding survive removal of overt motor and stimulus cues?
CSP-EXP-003	Sensor-distance field decay	H4	Does task information persist lawfully as distance increases?

ID	Experiment	Hypothesis	Decisive question
CSP-EXP-004	Shielding/grounding crossover	H4/H5/H6	Which candidate pathways are attenuated or preserved?
CSP-EXP-005	Blind separated-room receiver test	H5	Can a remote receiver decode randomized task labels with no conventional channel?
CSP-EXP-006	Dual-site ELF/EEG synchronized study	H6	Is environmental-neural coupling replicable across independent sites?
CSP-EXP-007	Safe causal perturbation pilot	H7	Does controlled carrier manipulation cause the preregistered neural effect?

8. Instrumentation and Data Architecture

8.1 Minimum viable CSP laboratory

- Research-grade multi-channel EEG with hardware event triggers and access to raw data.
- Battery-powered auxiliary biopotential channels for ECG/EOG/EMG to identify physiological artefacts.
- Calibrated magnetometer(s) appropriate to the frequency band under investigation; higher-sensitivity OPM/MEG access where feasible.
- Electric-field and ELF magnetic-field sensors for environmental measurements.
- RF spectrum monitoring covering relevant local interference bands.
- Galvanic/ground potential and contact-impedance instrumentation for grounding experiments.
- Environmental logging: time source, temperature, humidity, power-line state, lightning/space-weather metadata where relevant.
- Hardware-synchronized acquisition computer with immutable raw-data archive and experiment log.
- Shielding and isolation materials introduced progressively rather than assumed adequate from the start.

8.2 Provenance-first data record

Every CSP data object should carry enough provenance to reproduce its scientific meaning. At minimum: participant pseudonym; consent scope; sensor model and serial/calibration record;

montage and physical coordinates; sampling rate; hardware filters; synchronization method; task version; randomization seed or sealed assignment record; timestamp; environment; grounding/shielding condition; preprocessing code version; model version; analyst; and whether labels were visible during analysis.

> Raw signal -> immutable record -> calibrated derivative -> preprocessing provenance -> model provenance -> result -> replication status

8.3 Recommended data separation

Layer	Contents	Access rule
Raw	Unmodified sensor streams and hardware metadata	Restricted; never overwritten
Calibration	Phantom/empty-room/noise-floor and environmental references	Research team; versioned
Derived	Filtered/epoched/features with complete transformation record	Reproducible from raw
Labels	Task assignments and semantic targets	Sealed for blind tests until analysis freeze
Models	Code, weights, training cohort and evaluation manifest	Versioned; train/test separation explicit
Results	Statistics, plots, confidence intervals and negative controls	Released with interpretation limits
Identity mapping	Link between pseudonym and human participant	Separate vault; minimum authorized access

9. Statistical and Falsification Standards

Prospective prediction over retrospective fit

The central CSP result should be performance on data not available when the hypothesis, features and decoder were selected. Exploratory findings generate hypotheses; sealed future data tests them.

Permutation and sham controls

Every classifier or coupling metric should be compared with label permutations, time shifts, sham channels and, where relevant, dummy sensors or inactive transmitters.

Leakage audit

Before accepting remote decoding, audit acoustic, visual, vibration, network, electromagnetic, clock, mains, experimenter and software pathways. A result is not “non-local” merely because the intended channel was absent.

Effect size and uncertainty

Report confidence intervals, calibration and practical information rate, not only p-values. A statistically detectable effect may be physically trivial or unusable.

Multiple-comparison control

Frequency, time, channel and connectivity searches create large analytical spaces. Predefine primary endpoints or use appropriate correction and independent validation.

Independent replication

E4-E7 claims require replication by a team that did not build the original analysis pipeline and, for the strongest claims, different instrumentation and location.

Null results are valuable

A well-controlled null result narrows the physical search space. CSP should publish negative experiments and artefact libraries, not only anomalous signals.

10. Information-Theoretic Formulation

CSP becomes scientifically useful when “mind content” is translated into measurable information. Let X be a randomized cognitive target or state and Y be the measured signal at a receiver. A necessary condition for a communication claim is reproducible information about X in Y on unseen trials.

$$I(X;Y) > 0 \text{ on prospectively held-out data, with appropriate uncertainty and null controls.}$$

For a remote-channel claim, the stronger requirement is that the information remains after every known conventional pathway has been experimentally blocked or accounted for. For an individual-signature claim, performance must generalize across sessions rather than memorize session-specific nuisance features.

A useful CSP channel report should include: detection sensitivity, specificity, mutual information, effective bit rate, latency, spatial attenuation, robustness across sessions, robustness across individuals, error distribution, confound audit, and replication status.

11. Relationship to Transference

CSP should be developed as a research branch of Transference, not as a prerequisite for the broader system. Transference can continue to model cognition from explicit digital evidence while CSP investigates whether additional physical-signal layers can be incorporated into the Sensorium.

11.1 Sensorium expansion

The Transference Sensorium can treat cognitive observations as layers of increasing proximity to neural function:

- Declared layer - what the principal explicitly says, writes, approves or rejects.
- Behavioural layer - choices, workflows, communication patterns and task performance.
- Physiological layer - non-neural bodily signals relevant to state and context.
- Neural layer - EEG/MEG/ECoG/intracortical observations where ethically and practically available.
- Environmental signal layer - measured electromagnetic/geophysical context used for CSP coupling tests.
- Causal interaction layer - any validated and ethically approved read/write interface.

No higher layer should silently override the principal's explicit authority. A neural inference is an observation with uncertainty, not an automatic authorization to act.

11.2 CSP object types for the Nexus

- SignalObservation - timestamped physical measurement with calibration and environment.
- CognitiveTrial - task, target, response, timing and blinding state.
- SignalFeature - derived measurement with exact processing lineage.
- CouplingClaim - relationship between two signal streams with statistical evidence and confound controls.
- DecoderModel - model, training cohort, version, limitations and allowed use.
- ReplicationRecord - independent attempt, protocol fidelity and outcome.
- AuthorityRecord - consent, permitted purpose, duration, revocation and downstream-use restrictions.

12. Ethics, Human Sovereignty and Security

CSP deals with one of the most sensitive possible data classes: measurements and inferences related to mental state. The ethical programme must therefore mature at least as quickly as the sensing programme. UNESCO's 2025 Recommendation on the Ethics of Neurotechnology identifies human-rights, dignity and governance concerns around technologies that measure, infer or modulate nervous-system activity; OECD guidance likewise emphasizes responsible innovation, safety, privacy and accountability. [8-9]

Principle	Operational requirement
Explicit informed consent	Participants must know what is recorded, what may be inferred, who can access it, and how long it is retained.
Mental privacy by default	Raw neural data and inferred mental states are restricted data; secondary uses require explicit authorization.

Principle	Operational requirement
Purpose limitation	A signal collected for research is not automatically authorized for identity, employment, insurance, policing, marketing or behavioural manipulation.
Revocability	Future Transference implementations should make consent and delegated access revocable, with visible authority chains.
No covert experimentation	No attempt should be made to infer or influence an unaware person's cognition.
Safety before bidirectionality	Any stimulation study must use established exposure/safety standards and appropriate ethics review.
Human decision authority	A model's inference about a person is evidence, not proof of desire, intent, consent or authorization.
Security and compartmentalization	Identity mappings, raw neural data, derived features and action permissions should be separately protected.
Scientific transparency	Unexpected effects should be investigated with strong controls before being presented as new mechanisms.

13. Research Governance and Claim Discipline

Each CSP finding should be assigned both an evidence class and a claim ceiling. Researchers may describe only what the experiment establishes, not the strongest interpretation compatible with it.

- Spectral similarity permits the claim "similar frequency structure," not "communication."
- Correlation permits the claim "associated under these conditions," not "caused by."
- Causal modulation permits the claim "this perturbation altered this endpoint," not "message transmission."
- Above-chance decoding permits the claim "information was recoverable," only after leakage controls and on held-out data.
- A single laboratory result is a finding; a proposed new physical mechanism requires independent replication.
- A human-identity claim requires cross-session and cross-device validation to exclude instrumentation fingerprints.

13.1 CSP result labels

Label	Meaning
OBSERVED	Directly measured in the present experiment.
REPLICATED	Repeated independently under materially similar conditions.
INFERRED	Supported by analysis but not directly observed.
HYPOTHESIZED	Proposed explanation awaiting decisive testing.
FALSIFIED / NOT SUPPORTED	Failed a preregistered critical test or is inconsistent with replicated evidence.
UNRESOLVED	Evidence is insufficient or competing explanations remain.

14. Initial Research Roadmap

Stage	Indicative window	Focus	Exit artifact
Stage A - Foundation	0-3 months	Protocol library, terminology, ethics model, data schema, calibration/artefact library, baseline EEG acquisition design.	CSP Charter v1.0; CSP Data Standard; EXP-001 protocol.
Stage B - Signature science	3-9 months	Run repeated cognitive-state and identity studies; freeze first prospective decoder; quantify reproducibility.	CSP Cognitive Signature Dataset 001; decoder benchmark; negative-control report.
Stage C - Field physics	6-15 months	Characterize electric/magnetic signal decay, non-contact sensing, grounding and shielding.	Field attenuation map; sensor validation report; EXP-003/004 results.

Stage	Indicative window	Focus	Exit artifact
Stage D - Remote channel test	12-24 months, conditional	If candidate signal survives Stage C, execute preregistered separated-room blind tests and independent replication.	EXP-005 preregistration; sealed holdout result; replication package.
Stage E - Terrestrial coupling	Parallel / 12-30 months	Multi-site EEG + ELF/environment recordings with strict common-driver controls.	TCC dataset; cross-site analysis; replicated or null TCC finding.
Stage F - Causal/bidirectional	Only after validated pathway	Ethics-reviewed perturbation of a demonstrated channel; no semantic messaging until causal signal interaction is established.	Safety dossier; causal pilot; governance review.

15. Recommended Immediate Work Packages

WP-CSP-01 - Scientific literature map

Build a living evidence graph linking neural field generation, EEG/MEG signal physics, BCI decoding, biometrics, neural oscillations, non-contact sensing, bioelectromagnetics, Schumann/ELF geophysics, electromagnetic compatibility and neuroethics. Every source should be tagged by evidence type and claim ceiling.

WP-CSP-02 - Experimental design standard

Create a reusable protocol template covering preregistration, randomization, blinding, time synchronization, calibration, artefact channels, environmental logging, sample-size rationale, holdout procedure, stopping rules and replication criteria.

WP-CSP-03 - CSP Sensorium schema

Extend Transference’s provenance model to represent signal observations, calibration, transformations, cognitive trials, model outputs, confidence and consent/authority records.

WP-CSP-04 - Baseline EEG pilot

Run a low-risk pilot focused only on H1/H2: can repeated, randomized cognitive states and individual signatures be recovered prospectively from non-invasive EEG? This provides useful science even if every long-range hypothesis is false.

WP-CSP-05 - Environmental instrumentation bench

Establish ELF magnetic/electric and RF monitoring alongside ordinary electrical noise characterization. The first deliverable is an artefact atlas, not an Earth-coupling claim.

WP-CSP-06 - Falsification register

Maintain a living list of observations that would disconfirm each hypothesis. This prevents the research programme from redefining every negative result as support for an unknown mechanism.

16. What Would Constitute a Scientific Breakthrough?

CSP should reserve the word breakthrough for results that materially change what can be measured or explained. Examples, in increasing order of significance, would include:

- A highly stable, cross-session non-invasive cognitive signature that identifies individuals or states with substantially improved reliability.
- Prospective decoding of internally generated semantic variables from non-invasive signals beyond conventional task correlates.
- A calibrated cognition-linked physical signal detected at an unexpected distance with a lawful propagation profile and no conventional leakage path.
- Replicated neural-environmental coupling that survives multi-site confound controls and demonstrates causal sensitivity.
- Recovery of randomized cognitive information at a physically isolated receiver, independently replicated.
- A safe bidirectional channel in which controlled information-bearing perturbations produce specific, decodable cognitive responses.

The strongest results would be scientifically extraordinary precisely because current evidence does not establish them. CSP gains credibility by defining in advance what evidence would be required.

17. Founding Charter

1. Cognitive Signal Physics shall investigate the physical manifestations of cognition without presuming the mechanism it seeks to discover.

2. It shall distinguish measurement from inference, inference from hypothesis, and hypothesis from established mechanism.

3. It shall consider the possibility of individual cognitive signal signatures, non-contact propagation, environmental coupling and bidirectional interaction, while subjecting each to explicit falsification tests.

4. It shall treat terrestrial coupling as an open research hypothesis, not as proof that the Earth forms a human communications network.

5. It shall prioritize prospective prediction, leakage controls, calibrated instrumentation, provenance, independent replication and publication of null results.

6. It shall preserve human sovereignty: cognitive and neural data belong within an explicit consent and authority framework, and no inferred state constitutes permission to act.

7. Its long-term objective is to determine the true physical boundaries of observable and interactable human cognition, and to integrate only validated findings into Transference.

18. Conclusion

Cognitive Signal Physics provides a disciplined way to pursue a radical possibility without weakening the scientific standard required to evaluate it. The human brain unquestionably produces measurable physical signals, and contemporary neurotechnology demonstrates that some of those signals contain decodable information. The unresolved frontier is how far that physical information extends beyond current sensors, whether stable individual and semantic structures can be recovered non-invasively, whether any external medium participates in signal propagation or synchronization, and whether a safe causal return path can ever be established.

The proposed Earth-mediated network therefore enters CSP not as a conclusion but as one of its most ambitious hypotheses. If it is false, rigorous experiments will progressively constrain the search space. If a reproducible component is found, the same framework provides the path from anomaly to measurement, from measurement to mechanism, and from mechanism to independently verified science.

For Transference, the strategic value exists either way: CSP creates a formal scientific programme for extending the Sensorium from digital evidence toward the physical signal-space of cognition while protecting provenance, human authority and the distinction between what is known and what is imagined.

References and Scientific Anchors

1. National Institute of Mental Health (NIMH). Magnetoencephalography (MEG) Core Facility. Notes that SQUID sensors passively detect weak magnetic fields on the order of 10^-14 tesla outside the head produced by brain activity. Link
2. Card NS, et al. An instantaneous voice-synthesis neuroprosthesis. Nature. 2025;644:145-152. Demonstrates real-time voice synthesis from activity recorded by 256 intracortical microelectrodes. Link
3. Willett FR, et al. A high-performance speech neuroprosthesis. Nature. 2023;620:1031-1036. Demonstrates large-vocabulary attempted-speech decoding using intracortical activity. Link
4. Metzger SL, et al. A high-performance neuroprosthesis for speech decoding and avatar control. Nature. 2023;620:1037-1046. Demonstrates decoding to text, speech audio and facial-avatar animation. Link
5. Simoes F, et al. Satellite observations of Schumann resonances in the Earth's ionosphere. Geophysical Research Letters. 2011;38. Reports Earth-ionosphere resonance modes near 7.8, 14.3, 20.8, 27.3 and 33.8 Hz. Link
6. Saroka KS, Vares DE, Persinger MA. Similar Spectral Power Densities Within the Schumann Resonance and a Large Population of Quantitative Electroencephalographic Profiles. PLoS ONE. 2016;11(1):e0146595. Reports spectral similarities/coherence observations; these findings do not by themselves establish semantic transfer or causation. Link
7. Cherry NJ. Human intelligence: the brain, an electromagnetic system synchronised by the Schumann Resonance signal. Medical Hypotheses. 2003;60(6):843-844. Included as an example of an explicitly hypothesized synchronization mechanism, not established evidence. Link
8. UNESCO. Recommendation on the Ethics of Neurotechnology. Adopted by the 43rd General Conference, November 2025; certified copy published 2026. Link
9. OECD. Recommendation of the Council on Responsible Innovation in Neurotechnology (OECD/LEGAL/0457). Adopted 11 December 2019; in force. Link
10. Newson JJ, Thiagarajan TC. EEG Frequency Bands in Psychiatric Disorders: A Review of Resting State Studies. Frontiers in Human Neuroscience. 2019;12:521. Reviews conventional spectral bands and emphasizes substantial methodological variability. Link

Research note: References 6 and 7 concern hypotheses or reported associations around Schumann/brain relationships. They are included to define the research question, not to establish that the Earth carries human thoughts. The CSP programme requires controlled causal and information-theoretic evidence before any such conclusion could be considered.

Appendix A - Proposed CSP Naming System

Prefix	Use
CSP-H#	Hypothesis
CSP-EXP-###	Experiment
CSP-DS-###	Dataset
CSP-SIG-###	Candidate signal signature

CSP-DEC-###	Decoder/model
CSP-ART-###	Artefact or confound signature
TCC-#	Terrestrial Cognitive Coupling claim level
CSP-REP-###	Independent replication record
CSP-ETH-###	Ethics/authority control

Appendix B - Minimal Preregistration Checklist

- Primary hypothesis and claim ceiling
- Primary endpoint and expected direction
- Participant inclusion/exclusion criteria
- Task randomization and blinding method
- Sensors, calibration, sampling and synchronization
- Grounding, shielding and environmental conditions
- Artefact channels and exclusion rules
- Preprocessing pipeline and software version
- Train/validation/test split and sealed holdout method
- Statistical test, effect-size target and uncertainty method
- Permutation/sham/negative controls
- Leakage audit plan
- Stopping rule
- Replication trigger and required independent confirmation
- Consent scope, data retention and access permissions