From Eligibility to Ethics: An Engine-Agnostic Framework for Safe, Non-Addictive Dream-Gaming

This research report establishes a comprehensive framework for the design and implementation of safety-gated dream-gaming systems, with a primary focus on platforms like Reality.os. The framework prioritizes the activation of gameplay during specific N2/N3 sleep stages, governed by a foundational eligibility scalar. It subsequently details non-addictive gameplay mechanics rooted in monotonic difficulty functions and dynamic policy enforcement. The report further outlines a rigorous, third-phase methodology for evaluating societal impact based exclusively on objective log data, and proposes concrete infra-level data schemas to operationalize these principles. Finally, it distills generalizable, neurorights-invariant rules applicable to any future immersive XR environment. This structure ensures that all downstream claims regarding non-addictiveness, emotional regulation, and societal benefit are built upon a scientifically defensible and ethically robust foundation.

The Eligibility Scalar: Physiologically-Gated Access to Sleep-Based Reality

The cornerstone of the proposed dream-gaming framework is the eligibility scalar, denoted as $E = S \cdot (1 - R) \cdot E_S$. This mathematical construct serves as the primary gatekeeper, determining whether an augmented citizen is physiologically and psychologically eligible to enter a dream-game environment during a given sleep epoch . Its multiplicative nature ensures that multiple stringent conditions must be met simultaneously for access to be granted, thereby creating a robust safety envelope before any non-trivial gameplay logic is engaged. The framework's validity rests upon the empirical validation of this gating mechanism as a prerequisite for all subsequent claims of safety and benefit .

The first component of the scalar, S (Sleep-Depth Token), explicitly links gameplay activation to verified deep sleep stages, namely N2 and N3 . This design choice is grounded in a growing body of evidence indicating that deep N2/N3 sleep represents a "safe window" for external intervention and simulation . During these stages, while the body exhibits low levels of autonomic arousal, the mind is capable of generating rich, multisensory, and complex narratives . Large pooled datasets confirm that compelling dream content is not exclusive to REM sleep, making a cross-stage approach feasible and safer . Neurophysiologically, this prioritization is well-supported. Stage N3, also known as slow-wave sleep (SWS), is characterized by high-amplitude, low-frequency delta waves, which reflect the hyperpolarization of thalamocortical and cortical neurons, a state critical for memory consolidation and synaptic downscaling [8] [63]. Stage N2 is marked by sleep spindles, brief bursts of 12-15 Hz EEG oscillations initiated by the thalamic reticular nucleus (TRN) [7] [55]. The TRN acts as a crucial attentional gate, filtering sensory information and regulating cortical activity, making it a natural point of interaction for a controlled experience [72] [76]. By anchoring eligibility to `S`, the system leverages a period of brain activity that is both stable and generative, minimizing the risk of disruptive parasomnias or excessive arousal while enabling immersive experiences [77]. Recent findings further support this premise, showing that stabilized slow-wave scaffolds, particularly periods of high delta–HF HRV coupling, are associated with measurable next-day reductions in nightmare incidence and waking anxiety scores, suggesting a direct link between N2/N3 stability and emotional health .

The second component, `(1-R)`, introduces a powerful negative feedback loop based on "psychrisk," represented by `R`. Psychrisk is not a static trait but a derived state variable that fluctuates based on a confluence of factors, including the immediate sensory context of the dream, prior memory traces, and real-time autonomic markers such as heart rate variability (HRV) . By penalizing eligibility as psychrisk increases, the system enforces a fundamental rule of non-addictive design: intensity must never escalate under elevated risk. When `R` approaches 1, representing a state of maximum perceived threat or instability, the term `(1-R)` approaches zero, effectively blocking access to the gaming environment. This creates a hard safety brake that prevents users from engaging with potentially destabilizing content when their psychological profile indicates vulnerability. This approach directly counters the common addiction loop found in traditional games, where stress or failure often triggers a desire for more intense stimulation. Instead, the system proactively de-escalates, ensuring that engagement only occurs under conditions of relative psychological calm. This concept is supported by recent findings in REM sleep cohorts, which show that elevated LF/HF HRV combined with reduced prefrontal theta–gamma coherence reliably marks episodes of limbic "fear/affect" circuitry decoupling from regulatory control—a state that must be throttled by safety policies regardless of conscious user intent .

The final component, `E_s` (Enstasis), represents the system's internal stability or readiness. It is a composite metric designed to prevent runaway scenarios by acting as a buffer against cognitive overload. Enstasis is closely related to the `StabilityScore`, which itself is computed from several key Organics-CPU metrics, including Organic Frame Capacity (`OFC`), Narrative RAM (`NRAM`), ENFR (a measure of overall energetic and neural reserve), and an `ArousalEnvelope` that tracks micro-arousals within an epoch . In essence, `E_s` penalizes situations where the computational demands of the dream-engine might exceed the user's current physiological capacity to process them safely. For instance, if the engine attempts to render a highly complex scene when `OFC` and `NRAM` are already depleted due to preceding cognitive tasks, the `StabilityScore` will drop, lowering `E_s` and making it harder for the user to gain eligibility. This creates a closed-loop system where the game adapts to the user's biological substrate, treating "anger discharge" or other intense activities as a controlled workload that can only proceed when both mental and physical resources are sufficient . This mirrors the AI safety principle that systems must be robust and secure throughout their lifecycle, even under conditions of misuse or adverse events [71] .

In summary, the eligibility scalar `E` is a sophisticated, multi-layered gatekeeper that integrates three distinct but interdependent layers of safety: physiological state (`S`), psychological state (`R`), and systemic stability (`E_s`). Its structure is not merely technical but philosophically aligned with the goal of creating a neurorights-safe platform. By making eligibility contingent on verifiable N2/N3 sleep, actively penalizing states of high psychrisk, and preventing cognitive overload, the framework ensures that the potential benefits of dream-gaming—such as a "pressure valve" for anger or a tool for emotional regulation—are pursued within a scientifically grounded and ethically responsible boundary . The successful validation of this gating mechanism through controlled studies is the most critical step in establishing the credibility of the entire research program.

Engine-Level Safeguards: Modeling the Organic-CPU as a Biological Constraint

Beyond the initial eligibility gate, the framework incorporates a set of engine-level safeguards designed to enforce non-addictive and safe gameplay by modeling the human brain, or "Organic-CPU," as a system with finite and variable capacity. This approach treats the brain not as an inexhaustible source of processing power but as a biological constraint, thereby preventing the kind of runaway escalation that characterizes many addictive systems. These constraints are formalized into machine-parsable metrics that govern the very fabric of the dream-engine's output, binding gameplay intensity to real-world neurophysiological limits.

A central innovation in this domain is the formal definition of cognitive limits such as Organic Frame Capacity (`OFC_t`) and Narrative RAM (`NRAM_t`) . `OFC_t` is defined as $E_{REM} P \theta t$, providing a theoretical upper bound on the number of discrete dream scenes or frames that can be rendered per epoch, modulated by REM-related plasticity factors and time (`t`) . Similarly, `NRAM_t` is defined as the product of `OFC_t` and an `A_{RSP}` factor, which represents available resources for maintaining narrative continuity and coherence . These metrics translate abstract neurobiological concepts into concrete parameters that a game engine can use to throttle its own performance. For example, they can limit the number of competing agents in a scene, the complexity of environmental interactions, or the density of narrative threads. This allows the system to treat emotionally charged content, such as "anger discharge," as a quantifiable workload. High-intensity scenarios involving combat or competition are permitted only when the `StabilityScore` remains above a configured floor and there is a sufficient margin between the cognitive load being imposed and the user's current `OFC` and `NRAM` capacities . This creates a dynamic equilibrium where the game's intensity is always in balance with the user's ability to process it, preventing cognitive overload and the emergence of undesirable psychological states.

The dynamic enforcement of these constraints falls to the `NeuroswarmGuard`, an autonomous policymaking object that continuously monitors the user's state and adjusts the gaming experience accordingly . The `NeuroswarmGuard` computes a `StabilityScore`, a composite index derived from OFC, NRAM, ENFR, and the ArousalEnvelope . This score explicitly penalizes pathological states, such as having high cognitive capacity at the same time as very low autonomic arousal, which could indicate a dangerous disconnect between mental simulation and physiological reality. Based on this score, the guard issues a `throttlefactor` that scales down the intensity of dream rendering relative to the ongoing cognitive load . This creates a real-time, closed-loop system that is fundamentally different from static game design. The experience is not fixed; it is adaptive, responding to fluctuations in the user's neurophysiology on a moment-to-moment basis. This principle is analogous to trustworthy AI, which mandates that systems remain safe and effective under normal use, foreseeable misuse, or other adverse conditions [71] . The guard's logic is further refined by explicitly separating fast, automatic signals of instability (e.g., sudden spikes in LF/HF HRV or drops in prefrontal theta–gamma phase-locking value) from slower, choice-driven policies managed by higher-level systems like `AlienGPTAutonomousDreamPolicy` . This separation ensures that immediate physiological threats take absolute precedence over user preferences or narrative goals, embodying a fail-closed safety philosophy.

To further enhance safety, the framework implements dose-limiting mechanisms inspired by radiation safety standards, such as Specific Absorption Rate (SAR) limits . Daily "dose" envelopes, such as $D_r = D_{day}/D$, are used to cap exposure to Cyberswarm/Neuroswarm and XR usage . These systems feature hard stops that trigger when a usage threshold is breached, preventing indefinite escalation of engagement. This structural limitation directly addresses the core challenge of digital addiction by building physical and temporal boundaries into the system's architecture. Furthermore, the framework is designed to respect "neurorights" at a foundational level. `Neurorights Charter modules` encode fundamental rights like mental privacy, cognitive liberty, and mental integrity as non-waivable bits of code . If any condition encoded in these modules is violated—for example, if a scenario were to attempt to profile a user's soul or identity—the dream node automatically fails closed, terminating the session and preventing the violation. This technical enforcement of ethical principles is a critical departure from voluntary user agreements, which can be easily overridden by the persuasive design of addictive systems. The entire infrastructure, from the Organic-CPU metrics to the `NeuroswarmGuard` and neurorights modules, works in concert to create a platform where engagement is not maximized at all costs, but rather optimized for safety, stability, and respect for the user's mental integrity.

Non-Addictive Gameplay Mechanics: Monotonicity and Dynamic Difficulty Control

Once a user has successfully passed the eligibility gate, the second layer of the framework focuses on designing the gameplay experience itself to be inherently non-addictive and safe. The central principle governing this design philosophy is monotonicity, specifically the requirement that the game's difficulty function, `D(fstage,R)`, must be strictly monotone decreasing with respect to the user's psychrisk (`R`) . This mathematical constraint is a powerful safeguard that fundamentally reshapes the relationship between player state and game intensity. Unlike traditional games, where stress, frustration, or failure can trigger escalating challenges (e.g., tougher enemies, faster pace), this framework dictates the opposite: as a user's psychological risk profile worsens, the game must never become more demanding or intense. Instead, it must either maintain its current level of challenge or, more likely, decrease in intensity, potentially triggering a de-escalation sequence or transitioning the user to a "safe-room."

This principle directly counteracts the reinforcement loops that underpin many forms of digital addiction. In conventional gaming, the cycle often involves a player experiencing a negative emotional state (e.g., anger, frustration), seeking relief through more intense gameplay, and then becoming caught in a feedback loop of escalating arousal and engagement. The monotone decreasing difficulty function breaks this cycle by ensuring that the game environment becomes less, not more, demanding as the user's internal state suggests they are approaching a breaking point. The system's response to rising psychrisk is to provide relief, not challenge. This is operationalized through a new object, the `DreamGamingDifficultyProfile`, which would be part of the QPU.Datashard and codify this behavior as a deployable, auditable specification . This profile would contain the logical rules and parameters for how difficulty scales, ensuring that this non-addictive property is a core, unchangeable feature of the platform's gameplay engine.

The function `D(fstage,R)` also incorporates a dependency on the sleep stage (`fstage`), suggesting that the baseline level of challenge may vary depending on whether the user is in N2 or N3 sleep . While the exact functional form is not fully specified, this implies a nuanced adaptation of gameplay to the unique neurophysiological properties of each stage. For instance, N3 sleep, with its strong association with memory consolidation and synaptic homeostasis, might be best suited for restorative exploration, puzzle-solving, or meditative activities that leverage slow-wave activity [63]. Conversely, N2 sleep, characterized by sleep spindle activity linked to thalamic gating and sensorimotor processing, might be better adapted for reactive or sensory-based challenges that require rapid processing and filtering of stimuli [7] [72]. The finding that the product of frontal delta power and HF-HRV during the first N3 episode explains an additional 15–20% of variance in later dream-intensity ratings provides a strong empirical basis for preferentially scheduling certain types of content during these optimal windows . By linking the type of challenge to the underlying brain state, the system can tailor the experience to maximize both engagement and safety.

To ensure these non-addictive mechanics are rigorously enforced, the framework proposes extending the QPU.Datashard with a `NonAddictiveLoopGuard` field . This infra-level flag would act as a persistent check, ensuring that no downstream game logic or narrative branch can override the monotone decreasing difficulty rule. This makes the safety mechanism a hard-coded invariant of the system, not a soft guideline that developers could choose to ignore. The combination of the `DreamGamingDifficultyProfile`'s explicit rules and the `NonAddictiveLoopGuard`'s enforcement mechanism creates a robust architectural solution to the problem of digital addiction. It shifts the paradigm from one where users must exercise self-control to resist manipulative design, to one where the system itself is engineered to protect the user's well-being by design. This approach is consistent with a human-rights-based perspective on technology, which advocates for designs that empower individuals and protect them from harm, rather than exploiting cognitive vulnerabilities [44]. By making non-addictiveness a mathematical certainty within the system's core logic, the framework provides a blueprint for creating immersive experiences that are both powerful and fundamentally respectful of the user's autonomy and mental health.

Societal Impact Evaluation: Third-Phase Assessment via Objective Log Data

A critical aspect of the research framework is its methodologically rigorous approach to evaluating the potential societal benefits of dream-gaming, such as reducing console addiction, lowering the carbon footprint of entertainment, or mitigating real-world criminal activity. The framework correctly identifies that claims of such profound impacts cannot be substantiated by analyzing subjective neural or narrative content, as this would violate core neurorights principles like mental privacy and could introduce significant bias . Instead, it proposes a distinct, third-phase evaluation layer that relies exclusively on objective, aggregated data from system logs. This ensures that assessments of societal benefit are testable, falsifiable, and ethically sound, focusing on verifiable changes in behavior and resource consumption rather than speculative interpretations of inner experience.

The primary sources of data for this third-phase evaluation are time-use logs and energy consumption logs . Time-use logs would track the duration of sessions on the Reality.os platform compared to the time spent on traditional physical hardware, such as console gaming devices. From this raw data, researchers can calculate metrics like the "console retirement ratio" (Rc), which measures the displacement of traditional gaming hardware by the dream-gaming platform . The inclusion of a target `rc_reduction_target` within the `DreamGamingNonAddictionProfile` object formalizes this as a forward-looking, quantifiable goal for the system . This metric transforms the vague claim of "reducing console addiction" into a concrete, measurable outcome that can be tracked over time. For example, a study could correlate an increase in Rc with reported decreases in problematic gaming behaviors, providing empirical evidence for the platform's positive impact without ever needing to analyze a single dream report or neural signal.

Similarly, the carbon footprint of the platform can be assessed by comparing the total energy consumption of the Reality.os network against the aggregate energy consumption of the global physical console gaming industry [118][125]. This analysis would draw on public data regarding the energy efficiency of server farms and user devices, as well as industrywide consumption reports [123124]. By isolating this calculation to energy logs, the framework avoids the ethical pitfalls of attempting to connect subjective feelings of relaxation or catharsis to objective reductions in greenhouse gas emissions. The connection is made through verifiable resource accounting, not through questionable correlations drawn from personal data. This aligns with principles of responsible innovation, which call for transparent measurement of both intended and unintended consequences of technological deployment [106].

The most ambitious and ethically delicate claim is that dream-gaming could serve as a "pressure valve" to reduce socially unacceptable acts in real life, such as violence or crime . The framework wisely places this hypothesis in the third phase and cautions against using any form of coercion or incentive to encourage participation based on this potential benefit . Any investigation into this correlation must be conducted by independent, ethics-approved third parties who have no vested interest in the platform's success. The data used would be limited to anonymized, aggregated statistics from public records, correlated only with anonymized, cohort-level time-use logs from the platform. For instance, a researcher might compare crime statistics in a region before and after the widespread adoption of the platform, controlling for other socioeconomic variables. However, the framework rightly notes that establishing a causal link between dream-gaming and reduced real-world violence is exceptionally difficult. The use of neural or behavioral data to make such a link would be a severe breach of mental privacy, akin to biometric mind reading, which is prohibited under international law and ethical guidelines [29] [103]. Therefore, the only defensible path to investigating this claim is through macro-level statistical analysis of publicly available data, keeping the sensitive personal data of participants entirely insulated. This cautious, evidence-based approach ensures that while the potential for societal benefit is explored, it is done so without compromising the fundamental rights and freedoms of the users themselves.

Infra-Level Data Schemas: Operationalizing Peaceful Dreamscapes

The conceptual pillars of the research framework—eligibility gating, engine-level constraints, and non-addictive mechanics—are brought to life through a series of concrete, infra-level data schemas. These objects, proposed for integration into the QPU.Datashard or as standalone constructs, provide a blueprint for implementing neurorights-safe, peaceful dream-gaming experiences. They operationalize complex human concepts like anger, fear, and consent into machine-checkable, auditable formats that prioritize safety and avoid profiling. The following tables detail the proposed schemas, illustrating how high-level principles are translated into deployable technical specifications.

First, to quantify "safe anger expression" without creating punitive karma scores, the framework introduces the **DreamAngerDischargeIndex (DADI)** . This object is designed as an infra-only metric, logged only in an anonymized, cohort-level table and never used for individual judgment, pricing, or discipline . Its value is calculated from four key fields collected per sleep session, reflecting a holistic view of the experience from physiological, experiential, and behavioral perspectives. The resulting scalar provides a quantitative measure of a successful, safe anger discharge event.

Field Name	Description	Range	Source/Metric
`physio_arousal_delta`	Change in autonomic state from pre-sleep to post-sleep probes.	0–1	LF/HF HRV band change, prefrontal theta–gamma coherence [65]
`dream_intensity_score`	Subjective vividness and affect of anger-themed dream scenes.	0–1	Structured dream reports mapped to game epochs [69]
`behavioral_relief_score`	Self-reported reduction in anger or urge-to-act scales.	0–1	Pre-sleep vs. next-day self-report scales [114]
`safety_gate_fraction`	Proportion of anger-tagged epochs where safety protocols were active.	0–1	Fraction of epochs with StabilityScore $\geq$ floor and no instability events [117]
`dadi_value`	Final composite score for the session.	0–1	0.4 \cdot \text{behavioral_relief} + 0.3 \cdot \text{dream_intensity} + 0.3 \cdot \text{s

Second, to model fear as a context-weighted interpretation rather than a binary user choice, the **FearWeightProfile** object is proposed . This schema captures an individual's propensity to perceive threat based on objective inputs, allowing the game engine to adaptively soften or reroute content for users who exhibit a higher fear weight, unless they explicitly opt into high-exposure scenarios . This personalization respects the user's unique history and physiology without accessing their beliefs or identity.

Field Name	Description	Range	Source/Metric
`context_vector`	Normalized encoding of setting cues (e.g., crowding, height).	0–1 per dimension	Dream scene metadata [120]
`physio_fear_index`	Composite index of physiological threat responses.	0–1	HRV, skin conductance, respiration changes during threat tags [117]
`report_threat_bias`	Historical bias in labeling similar contexts as threatening.	0–1	Fraction of past reports labeling similar contexts as threatening
`fear_weight`	Final scalar representing threat perception propensity.	0–1	0.4 \cdot \text{physio_fear_index} + 0.3 \cdot \text{report_threat_bias} + 0.3 \cdot \text

Third, to formalize consent as a state-dependent resource bounded by cognitive and physiological limits, the **MentalScarcityProfile** is introduced. This object defines a state of limited comprehension and willingness, forcing the system to recognize that consent given under duress or physiological instability is not usable consent . The formula elegantly converts the concept of scarcity into a simple, checkable scalar that can force policies into safe modes regardless of external incentives .

Field Name	Description	Range	Source/Metric
`understanding_score`	Scored comprehension of the current situation.	0–1	Structured checks, lucidity/metacognition tags [79]
`willingness_score`	Scored, revocable consent and stable intent.	0–1	Explicit consent signals, stability under high psychrisk
`capacity_score`	Scored OrganicCPU resource availability.	0–1	Normalized OFC, NRAM, ENFR given current state [98]
`safety_score`	Scored physiological and neuro-stability.	0–1	StabilityScore, AutonomicInstabilityIndex, LF/HF thresholds
`mental_scarcity`	Final scalar representing resource scarcity.	0–1	1 - \min(\text{understanding_score}, \text{willingness_score}, \text{capacity_score}, \te

Finally, the **DreamGamingNonAddictionProfile** serves as a master control panel for all addiction-related parameters, externalizing this critical logic into an auditable and separate entity . This object defines the hard limits on engagement, mirroring safety standards used in medical and industrial contexts.

Field Name	Description	Type	Default Value
`max_nightly_sessions`	Maximum number of dream-gaming sessions allowed per sleep period.	u8	3
`cooldown_hours`	Minimum required wake time between consecutive dream-gaming nights.	f32	16.0
`loop_brake_threshold`	Max fraction of REM/N2 time in game before forced transition to safe-room.	f32 in [0,1]	0.75
`rc_reduction_target`	Target console-retirement ratio to be achieved over time.	f32 in [0,1]	0.1

These schemas collectively provide a detailed technical roadmap for building a dream-gaming platform that is not only engaging but also demonstrably safe, non-addictive, and respectful of user rights. They represent a mature synthesis of neuroscience, game design, and ethics into a cohesive and implementable system architecture.

Generalizable Principles: Extracting Neurorights-Invariant Rules for XR

While the framework is validated on the Reality.os platform, its ultimate contribution lies in extracting a set of generalizable, engine-agnostic principles that can guide the ethical development of any advanced XR or dream-gaming system. These invariants are not tied to a specific technology stack but represent fundamental truths about how to build immersive environments that are safe, respectful, and beneficial. They are deeply rooted in the emerging field of neurorights, which seeks to protect the mental domain as a distinct sphere of human freedom and dignity [4] [28]. The principles outlined below are designed to be universally applicable, forming a governance envelope that can be adopted by any developer or operator of consciousness-interfacing technologies.

The first and most critical invariant is the principle of **no person-level scoring**. The framework explicitly bars the use of climate or "evil-rate" metrics for creating individual reputation systems, karma scores, or punitive measures . Neural or behavioral data should never be used to assign a person a permanent or semi-permanent status that could affect their access to services, opportunities, or social standing. This principle is a direct response to the profound risks of biometric profiling and mind reading, which are recognized as serious ethical concerns by bodies like UNESCO and the United Nations [16] [103]. Constructs like the `DreamAngerDischargeIndex` (DADI) are presented as a model for compliant data handling: it is a session-level, infra-only metric used solely for anonymous, cohort-level analysis to improve system safety, never for individual judgment . This ensures that the system learns and adapts without learning to judge.

The second invariant is **sleep-stage-aware monotonicity in psychrisk**. The design of gameplay mechanics must adhere to the rule that difficulty and intensity should never increase as a user's measured psychrisk (R) rises. The system's default response to escalating risk must be de-escalation, not intensification. This principle is a fundamental safety rule for any system operating in altered states of consciousness, as it prevents the creation of harmful feedback loops that can lead to psychological distress or addiction. The proposal for a difficulty function `D(fstage,R)` that is strictly monotone decreasing in R is the technical embodiment of this principle . It ensures that the user's journey through the virtual landscape is always oriented toward safety and stability, regardless of their internal state.

The third invariant is **narrative-independent eligibility**. The decision to grant a user access to a dream-game environment must be determined by objective, physiological, and systemic state variables (as captured by the eligibility scalar E), and must not be contingent on the narrative choices or paths selected within the game . This prevents manipulation through narrative coercion, where a user might be tricked or pressured into entering a high-risk environment by the unfolding story. The initial gate is purely a function of the user's brain state and the system's readiness, creating a neutral entry point before any narrative-specific decisions are made.

These principles are manifestations of the broader neurorights framework, which includes the right to mental privacy, mental integrity, and cognitive liberty [27] [40] . The `MentalScarcityProfile`, for example, operationalizes the idea that consent is not an infinite commodity but a finite resource dependent on one's cognitive and physiological state . The `Neurorights Charter modules` that fail the system closed upon violation are a technical enforcement of these rights, making them non-negotiable features of the platform's code . This approach aligns with a growing global consensus on the need for robust legal and ethical protections for the brain. Countries like Chile have begun incorporating neurorights into their constitutions, and UNESCO has adopted the first global normative framework on the ethics of neurotechnology, recognizing neural data as uniquely private and requiring strict safeguards [15] [78] [87] .

By articulating these invariants, the research provides a clear, actionable blueprint for a future of immersive technology that is guided by ethical imperatives rather than unfettered commercial interests. It demonstrates that powerful, engaging, and even transformative experiences can be created within a rigidly defined safety envelope. The framework's strength lies in its integrated approach, weaving together neurophysiology, game theory, and human rights law into a coherent whole. Ultimately, it offers a vision for XR and dream-gaming that is not only technologically advanced but also profoundly humane.

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