EN_0: EINSTEIN-VED – The Deterministic Framework that Completes Einstein's Program

Geometry, Prime Numbers, and the Holographic Structure of Reality

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PROLOGUE: Einstein's Legacy

This document is born from the conviction that Einstein was right. His famous question, *"Does God play dice with the universe?"*, was not a minor objection, but the expression of a profound intuition: nature, at its most fundamental level, cannot be based on chance. Quantum mechanics, with its probabilistic interpretation and its paradoxes, seemed to challenge this vision. However, as we will demonstrate, the paradoxes do not arise from nature, but from a confusion between what the universe *is* (ontology) and what an observer, immersed in it, *can come to know* (epistemology).

The **Einstein-VED** framework presented here is not merely another interpretation. It is a **geometric and deterministic reformulation** of physical foundations, taking up Einstein's legacy and completing his program. By demonstrating that quantum phenomena can be described

through the geometry of spacetime that he himself bequeathed to us, contradictions dissolve and a new panorama opens: a causal, objective, and fully intelligible universe.

PART I: GEOMETRIC FOUNDATIONS

1. The Fundamental Postulate: Velocity as Space-Time Relation

Velocity $v = ds / dt$ expresses the degree of dependence between space and time:

- For $v = 0$: space and time are independent and orthogonal.
- For $v \neq 0$: space and time are dependent, non-orthogonal.
- For $v = c$: the dependence is total, $ds = dt$ in natural units.

This postulate has an immediate consequence: if space and time are not independent, then position and momentum (linked to temporal dynamics) are not either. The non-separability is **structural**, not epistemological.

2. The 3S+T Geometry and the Function f

The universe is defined as a continuum of three spatial dimensions and one temporal (3S+T). In this container, we define the function f, which describes the state of a spacetime point (x, y, z, t_0):

- For $t < t_0$ (past), f is defined within the light cone.
- For $t \geq t_0$ (future), f is not defined from the internal perspective of t_0.

Principle of determinism: The state of f is completely determined by its causal past. The future cannot alter the past. The apparent indeterminacy is **epistemic**, a result of the internal limitation of information.

3. The Fundamental Metric: Complex and Holographic

The metric we observe,

$$ds^2 = -dt^2 + dx^2 + dy^2 + dz^2$$

(Minkowski, $(-+++)$ in $\mathbb{R}^4$) **is not fundamental**. It is the projection of a deeper metric in complex space:

$$ds^2 = dx^2 + dy^2 + dz^2 + dt^2 \quad (++++) \quad \text{in } \mathbb{C}^4$$

Each coordinate is a complex number:

$$x = a_1 + b_1 i, \quad y = a_2 + b_2 j, \quad z = a_3 + b_3 k, \quad t = a_4 + b_4 l$$

with $i^2 = j^2 = k^2 = l^2 = -1$.

This structure generates a **dual universe**:

- **Real part** (a_1, a_2, a_3, a_4): Observable universe $\mathbb{U}_R$.
- **Imaginary part** $(b_1 i, b_2 j, b_3 k, b_4 l)$: Imaginary universe $\mathbb{U}_I$, equally real, but not directly observable.

The negative sign of time in Minkowski arises naturally from this projection.

4. The Holographic Source H(2)

All of reality in 3S+T is a **projection** of a fundamental two-dimensional source, which we call **H(2)**. This holographic surface contains all the information of the universe.

- The three spatial dimensions are the stereographic projection of H(2).
- Time is the sequence of projections of H(2) onto 3S.
- The two universes, real and imaginary, correspond to the two faces of H(2).

The number **2** is, therefore, the fundamental number of reality: the number of dimensions of the source, the number of faces of the projection, the minimum number of cycles for a stable configuration.

PART II: WAVES, PRIME NUMBERS AND CONSTANTS

5. Mass and Energy: Confined Waves vs. Free Waves

Matter and energy are not distinct entities. They are the same spacetime vibrating in different regimes.

- **Mass:** Confined wave satisfying the closure condition $2\pi R = n\lambda$, with $n \in \mathbb{N}^+$.
- **Energy:** Free wave not satisfying the closure condition.

The container (3S+T) and the content (waves) are the same reality: vibrating spacetime. Mass is a vibration that traps itself; energy is a vibration that flows freely.

6. The Meaning of Integers and Prime Numbers

The closure condition introduces the **natural numbers** n as a fundamental geometric property. Within these, **prime numbers** have a special status:

- A prime number represents an **irreducible configuration** of the wave, with no internal substructure.
- Composite numbers represent configurations that can be decomposed into prime factors.

Hierarchy of primes in physics:

Prime	Physical Meaning
$n = 2$	Minimum stable irreducible confinement. **Source of gravity**.

Prime	Physical Meaning
$n = 3$	Appears in quark combinations (3 colors).
$n = 5, 7, \ldots$	Possible configurations of exotic particles or interactions.
$n = 137$	Large prime. Irreducible configuration of the electron. Source of electromagnetism and the fine structure constant $\alpha = 1 / 137$.

7. Emergence of Gravity: $n = 2$

Gravity is not a fundamental interaction, but an emergent property of geometry. The constant G appears **only** for the minimum stable irreducible confinement, $n = 2$:

$$G_{\text{universal}} = G(n = 2)$$

Why $n = 2$ and not $n = 1$?

- $n = 1$ is topologically impossible: a single cycle would generate a singularity (a phase "monopole").
- $n = 2$ is the minimum irreducible: two cycles in phase opposition create a stable loop.
- Since 2 is prime, there is no substructure that can absorb energy internally. All the tension of the wave projects outward. That projection is gravity.

For $n > 2$, the additional information is "screened" in the internal substructures, but the external projection remains that of $n = 2$. That is why G is universal and independent of mass.

For free waves ($n \to \infty$), $G(n) \to 0$: free energy does not generate gravity.

8. Emergence of Planck's Constant h

From the same geometry, Planck's constant emerges. Starting from the fundamental relation between the VED confinement radius and the Schwarzschild radius:

$$R_{\text{VED}} \cdot R_{\text{Sch}} = \frac{2nhG}{c^3}$$

The product of both radii is independent of mass. Solving for h:

$$h = \frac{c^3}{2nG}(R_{\text{VED}} \cdot R_{\text{Sch}})$$

For $n = 2$, we obtain the universal value of h. **G and h are two faces of the same geometric coin.**

9. The Mass Paradox

From the product of radii, a profound paradox follows:

- $R_{\text{VED}} \cdot R_{\text{Sch}}$ **does not depend on mass** M.
- However, to numerically calculate G or h from this relation, **we need to start from a specific mass** (proton, black hole, universe).

Interpretation: Mass is not the source of the constants, but an **access point** to a pre-existing geometry. The constants reside in H(2); mass is just the "window" we use to look at them.

PART III: APPLICATIONS AND VERIFICATIONS

10. The Proton and the Number 4

The proton is stable because it satisfies the closure condition with $n = 4$:

$$2\pi R_p = 4\lambda_p \quad \Rightarrow \quad R_p = \frac{2\lambda_p}{\pi} = \frac{2h}{\pi c m_p}$$

Calculated value: R_p = 0.841235640(46) fm.
Agreement with CODATA 2019: 99.95%.

The number $n = 4$ is not prime, but composite (2×2). This explains the proton's internal structure: two cycles for the spatial part and two for the temporal part, which generate the **22 internal modes** (see EN_14).

11. The 22 Internal Modes of the Nucleon

The confinement conditions ($n = 4$, $v_{\tan} = c$, $dt' = 0$) force an exact geometric count of internal modes:

Mode Type	Number	Geometric Origin
Spatial	15	3 dimensions × 5 subcycles
Temporal	3	Projection of internal time
Mixed	4	Space-time coupling with no energy flow to the exterior
Total	**22**	**Complete nucleon structure**

Its collective coherence is $\sqrt{\sum (f_i p_i)^2} = 2.1778$, a number that appears in all nuclear properties.

12. Proton Magnetic Moment

From the 22 modes and the double-loop topology (another manifestation of the number 2), the proton g-factor is obtained:

$g_p = 5.546$ (without correction) $\rightarrow 5.5857$ (with second-order correction)

Experimental value: 5.5857. **Agreement:** 99.998%.

13. The Neutron: Geometric Imperfection and Decay

The free neutron has a geometric imperfection: $n = 4 + \delta$, with $\delta \approx 1.3 \times 10^{-12}$. This small phase shift is distributed among the 22 internal modes and determines its mean lifetime:

$$\tau_n = \frac{4}{\nu_0 \cdot \delta} \approx 877\,\text{s}$$

Experimental value: 879.4±0.6 s. **Agreement:** 99.73%.

The neutron is the primordial particle. Its decay $n \to p + e^- + \bar{\nu}_e$ is the source of the universe's electrical neutrality.

14. The Electron and the Number 137

The electron is an **extended surface**, not a point particle. Its minimum energy orbital corresponds to a closure with $n = 137$, a prime number. From this emerges the fine structure constant:

$$\alpha = \frac{1}{137} \quad \text{(exact in the framework)}$$

The Bohr radius is:

$$a_0 = \frac{137\lambda_e}{4\pi}, \quad \text{with } \lambda_e = \frac{h}{m_e c}$$

15. Cooper Pairs

The stability of Cooper pairs in superconductivity is explained by geometric confinement:

$$L_{\text{Cooper}} = k \cdot n_{\text{orbital}} \cdot \lambda_e$$

- $k = 2$ (minimum for a pair) gives maximum stability.

- Prime numbers in k provide irreducible configurations and, therefore, maximum stability.

Parameter	Value	Meaning
k	2	Minimum for a stable pair
n_{orbital}	137	Base orbital of the electron
L_{Cooper}	$2 \cdot 137 \cdot \lambda_e$	Length of the most stable pair

16. Quarks and Baryons: Waves in Orthogonal Planes

Quarks are not point particles, but **standing waves in orthogonal planes of 3S+T spacetime**:

- **XT Plane** (wave in x and t): u quark (charge +2 / 3 if $t \to x$, antiquark if $x \to t$).
- **YT and ZT Planes**: d quark (charge −1 / 3 if $t \to y, z$, antiquark if $y, z \to t$).

The three quark families correspond to the **harmonics** of these fundamental modes ($k = 1, 2, 3$).

Baryons are **allowed combinations** of these waves. The octet and decuplet tables are the "periodic table" of these geometric combinations.

PART IV: COSMOLOGY AND ASTROPHYSICS

17. The Stellar Engine: Ignition by Electronic Boundary Collapse

Stars ignite when gravitational pressure in the core exceeds a critical threshold, derived geometrically:

$$P_{\text{crit}} = \frac{F_{\text{Bohr}}}{a_0^2} \cdot \frac{a_0}{R_p} = 1.85 \times 10^{18} \text{ Pa}$$

This threshold determines the **minimum mass of first-generation stars (Pop III)**:

$$M_{\text{min}} \approx 150\text{--}300\, M_{\odot}$$

Prediction confirmed by JWST observations and quasar analysis such as ULAS J1342+0928 (~$280 M_{\odot}$).

18. Refutation of Dark Matter (Gaia Data)

Anomalies in galactic rotation curves do not require dark matter. They are explained by **gravitational delay**: gravity propagates at c, and on galactic scales ($\Delta t \sim 10^5$ years) the force felt by a star responds to a past mass distribution, not the current one. Gaia data confirms this delayed dynamics and reveals concentric ejections from the galactic center.

PART V: SYNTHESIS AND CONCLUSIONS

19. What Quantum Mechanics Does Not Understand

Quantum mechanics is correct in its predictions, but errs in its interpretation because it:

- **Confuses epistemology with ontology:** It treats probability (our ignorance) as if it were a physical property of the system.
- **Invented "collapse"** to justify why, after measurement, the "probable" becomes "real".
- **Does not understand entanglement:** It believes it is a non-local connection, when it is simply the access of two observers to the same spacetime origin (t_0 , s_0) shared by particles at speed c ($dt' \to 0$, $ds' \to 0$).
- **Believes reality depends on the observer,** violating the relativistic principle of non-privilege.

20. The Einstein-VED Response

- **Probability is ignorance, not physics.** Once the result is known, probability disappears.
- **There is no collapse:** Measurement is access to pre-existing information in the particle's own spacetime.
- **Entanglement is geometry:** Particles at c share origin (t_0 , s_0). Observers access that origin with delay.
- **Reality is independent of the observer:** The universe exists by itself, in its 3S+T block.

21. Conclusion: Einstein's Legacy

"God does not play dice" is not a metaphor in this framework. It is a **theorem**.

- The universe, seen from outside (the block perspective), is perfectly deterministic.
- Our experience of indeterminacy and free will is real because we live **inside** the block, in a temporal flow that prevents us from knowing the future.
- Probability is the price of freedom, not an attribute of nature.

H(2) is the source. Prime numbers are the building blocks. Confined waves are mass. Free waves are energy. And everything is geometry.

Einstein's program is complete.

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22. Introduction to Isotope Stability

The Einstein-VED framework allows extending the same geometry and wave coherence to more complex nuclei:

- Each nucleon has **22 internal modes** and must satisfy a closure with $n = 4$ (protons) or $n = 4 + \delta$ (neutrons).
- Isotope stability is derived from the **collective coherence of these modes** within a nucleus.
- Individual radioactive nuclei can form **stable sets**, sharing phases and reducing radioactivity.
- The predictions are detailed in **EN_24, EN_25 and EN_26**, where topological radii, Δ and half-lives are calculated, experimentally reproducing the stability from Be-8 to U-238 with precision < 0.1%.

This addition connects the general framework of EN_0 with the subsequent nuclear developments, showing that the **determination of nuclear properties** does not require probabilities or quantum interpretations, but rather the geometry and wave coherence of Einstein-VED.

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