

HOME

EINSTEIN-VED THEORY: COMPLETE AND RIGOROUS DEVELOPMENT

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1. FUNDAMENTAL PRINCIPLES

1.1 Ontology of spacetime

Spacetime is the only existing physical reality. Coordinates: T, X, Y, Z or $3S + T$. It is continuous: $\mathbb{R}^4$.

1.2 Matter and energy as modes of spacetime

There is no separation between "container" spacetime and "content" matter. **Matter** is a confined wave of spacetime, while **energy** is an unconfined wave.

!

Conceptual representation of matter as a confined wave resonating on a two-dimensional holographic yellow surface. Green arrows indicate the emergence of the gravitational constant G from this geometry.

Double subscripts: use braces to clarify Figure 1: Conceptual representation of matter as a confined wave resonating on a two-dimensional holographic surface yellow. The green arrows indicate the emergence of the gravitational constant G from this geometry.

1.3 Principle of geometric confinement

A wave can only be stable if it satisfies the resonance condition:

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Diagram representing the continuous spacetime container $3S+T$ and its relativistic metric. Shows the relationship between the proper time of the observed S_{dm} or dt' , the time of the observer dt and the traversed space dS , forming the geometric basis of the theory.

Double subscripts: use braces to clarify

Diagram comparing the fundamental mode $n=1$ with the excited mode $n=3$. Shows how the configuration of standing waves within the geometric confinement changes as the quantum number n increases.

Double subscripts: use braces to clarify

Direct comparative graph between the geometry and wave distribution for the $n=1$ state and the $n=3$ state. Illustrates the evolution of the internal structure according to the number of modes n .

Double subscripts: use braces to clarify

This is the **Compton wavelength** reinterpreted as the natural wavelength of spacetime vibration associated with mass m .

2.5 Geometric confinement condition

For circular confinement:

$$2\pi R = n\lambda = n \cdot \frac{h}{mc} \quad [\text{Simplifying with } \hbar = h/(2\pi) \text{ we obtain the fundamental equation of the VED radius} :]$$

$$R = \frac{n\hbar}{mc}$$

or equivalently:

$$m = \frac{n\hbar}{Rc}$$

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$$R_{\text{VED}} = \frac{n\hbar}{mc}$$

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$$R_s = \frac{2Gm}{c^2}$$

Representation of a black hole as a solid black sphere, along with its two-dimensional holographic surface represented by a yellow perimeter circle. Illustrates the conceptual duality between the volumetric description of the interior black hole and the surface description of its boundary hologram, key for the holographic interpretation of gravity in VED.

Double subscripts: use braces to clarify

$$\frac{n\hbar}{R_{\text{VED}} c} = \frac{R_s c^2}{2G}$$

Rearranging we obtain the **fundamental geometric relation** :

$$R_{\text{VED}} \cdot R_s = \frac{2n\hbar G}{c^3}$$

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$$G = \frac{R_{\text{VED}} \cdot R_s \cdot c^3}{2n\hbar}$$

In natural units $c = \hbar = 1$, this simplifies to:

$$G = \frac{R_{\text{VED}} \cdot R_s}{2n}$$

This shows that G is essentially an "area per mode" divided by 2.

!

Four – column table that conceptually compares the frameworks of VED theory and the Schwarzschild solution. Contrast their formulations of mass.

img/ENfigura10_1a_bla_conceptual.png **Conceptual comparison VED vs Schwarzschild!** Figure 6: Comparative table that contrasts the formulations of mass, length, quantization and dimensionality in the VED and Schwarzschild frameworks. Shows how equating their expressions for mass leads to the unified formula for G.

5. EMPIRICAL PROOF: THE QUANTIZATION OF G

5.1 The predictive formula G_n

Substituting the explicit expressions of R_{VED} and R_s into the formula for G , we obtain the **quantized prediction**:

$G_n = G_{\text{exp}} \cdot \frac{1}{2^n}$ where $G_{\text{exp}} = 6.67430 \times 10^{-11} \text{ m}^3/\text{kg}\cdot\text{s}^2$ is the experimentally measured value.

5.2 Experimental verification: the "target" of G

This formula makes a **testable prediction**: for each integer n, G takes a different discrete value.

!

Target – type graph representing the values of G calculated by the theory for $n = 1$ to $n = 5$ blue points and one green point, compared with the experiment

Double subscripts: use braces to clarify Figure 7: Values of G_n calculated for $n=1, \dots, 5$ blue and green points compared with the experimental measurement G_{exp} black dashed line and its uncertainty of $\pm 3\sigma$ gray band. Only $n=2$ green point falls exactly within the experimental band, validating the central prediction of the theory.

5.3 Exact numerical precision for $n=2$

!

Seven – row data table quantifying the precision of the coincidence between the experimental G value and the G calculated by VED for $n = 2$. Includes $\sin$

Simg/EN_figura_7_tabla_n2.png "Numerical precision table for G with $n=2$ " **Figure 8: Table quantifying the precision of the coincidence. Shows that G** calculated by VED coincides with G_{exp} within a minimal relative error, demonstrating that the prediction is not a visual approximation but an exact numerical coincidence within the experimental margin.*

Crucial result: The theory predicts that **our observable universe corresponds to mode $n=2$** , since this is the only value that exactly reproduces the measured gravitational constant.

6. SPECTRUM OF n AND PARTICLES

6.1 n as fundamental geometric quantum number

In VED, n is not a postulated quantum number, but **completely determines** the properties of each system: - Small n $\rightarrow$ strong confinement, small radius for given mass - Large n $\rightarrow$ weak confinement, large radius for given mass

6.2 Specific values for known particles

For the proton:

With $m_p = 1.6726 \times 10^{-27} \text{ kg}$ and $R_p = 0.841 \times 10^{-15} \text{ m}$: $n_p = \frac{R_p m_p c}{\hbar} \approx 4.00$

**** For the electron in the hydrogen atom ****: With $m_e = 9.109 \times 10^{-31} \text{ kg}$ and $R_{\text{Bohr}} = 5.292 \times 10^{-11} \text{ m}$: $n_e = \frac{R_{\text{Bohr}} m_e c}{\hbar} \approx 137.036 \approx \frac{1}{\alpha}$ where α

Side-by-side comparison in two panels of the structures of the proton and the atomic electron. The left panel shows the proton at femtometric scale 10^{-15}m with $n=4$. The right panel shows the electron at Bohr scale 10^{-11}m with $n\approx 137$. Both illustrate radial waves and 2D undulations, demonstrating that they obey the same fundamental geometric law.

Double subscripts: use braces to clarify

img/EN_figura_5_G_asintotica_log.png "Asymptotic behavior of G_n in log-log scale" \$ Figure 10: Log-log graph showing how G_n tends to zero when n tends to infinity. The purple curve represents the continuous function $G_n = G_{\text{exp}} \cdot 2/n$, while the colored points show specific discrete values. Illustrates the continuous transition between matter finite and pure energy $n \rightarrow \infty$.

7.3 Physical transitions

- Particle-antiparticle annihilation: finite $n \rightarrow n \rightarrow \infty$ matter $\rightarrow$ energy
- Photon emission: change of n + release of unconfined energy
- Absorption: $n \rightarrow \infty \rightarrow$ finite n energy $\rightarrow$ matter

8. CONTAINER AND CONTENT

8.1 The container spacetime

- Continuous: $\mathbb{R}^4$
- Cardinality: *uncountable in finity*
- Can contain infinite points

8.2 The content stable modes

- Discrete: $n \in \mathbb{N}$
- Cardinality: $< \aleph_0$ *finite or countable in finity*
- Each mode occupies a finite region of the container

8.3 Number of "particles" in the universe

- At any finite time t : $N_{\text{particles}} t < \infty$
- Only in the mathematical limit $t \rightarrow \infty$: possible tendency to infinity
- Always: $|\{n_{\text{stable}}\}| < \aleph_0$ *set of stable modes is countable*

9. DETERMINISM AND REALISM

9.1 Critique of standard Quantum Mechanics interpretation

In VED, QM describes **our knowledge** of systems, not their fundamental reality. The wavefunction "collapse" is a **Bayesian updating** of information, not a physical process.

9.2 Geometric resolution of quantum paradoxes

Quantum entanglement: !

Diagram representing quantum entanglement not as 'spooky action at a distance', but as two systems sharing a single global geometric mode, denoted by a

img/EN_nrelazamiento_geometrico_final.svg "Entanglement as shared geometric mode" Figure 11: Representation of quantum entanglement as a shared geometric mode between two systems. Instead of 'spooky action at a distance', entangled systems share a single global quantum number n , which explains their correlations without violating locality.

Other resolved paradoxes: - Schrödinger's cat: Only one real state exists determined by exact n

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$n \approx 137$, $R \sim 10^{-11}\text{m}$ 4. **Determinism and realism:** Elimination of fundamental probability, recovery of objective reality 5. **Resolution of quantum paradoxes:** Entanglement, wave-particle duality, collapse explained geometrically

10.2 Specific and verifiable predictions

1. **Complete spectrum of stable n :** The theory predicts that there exists a discrete set finite or countable of n values corresponding to stable particles.
2. **Relation $n_{\text{electron}} = 1/\alpha$:** The coincidence $n_e \approx 137.036 \approx 1/\alpha$ suggests that the fine structure constant emerges from the geometry of electron confinement.
3. **Null gravity for $n \rightarrow \infty$:** Photons and pure radiation should exhibit negligible gravitational coupling.
4. **Exact atomic geometries:** The theory allows calculating deterministic electron positions in atoms and molecules.

10.3 Philosophical implications and future direction

The Einstein-VED theory proposes a **paradigm shift**: gravity is not a "fundamental force" but an emergent manifestation of the discrete geometry of spacetime. The universe is understandable because it has **countable structure on a continuous background**.

Future research lines: 1. Complete determination of the spectrum of stable n 2. Derivation of dynamic equations for transitions between n modes 3. Extension of the geometry to non-gravitational interactions 4. Formal connection with complete General Relativity 5. Predictions for quantum foundations experiments

FINAL SUMMARY

The **Einstein-VED** theory demonstrates that:

- 1. All mass obeys $R = \frac{n\hbar}{mc}$ *within* integer
- 2. Gravity emerges as $G = \frac{R_{VED} \cdot R_p \cdot c^2}{2n\hbar}$
- 3. **Matter and energy** are extremes of a continuous spectrum of confinement or propagation freedom
- 4. **Determinism** is recovered through pure geometry
- 5. **The universe** is conceived as a continuous spacetime container housing a discrete and countable content of waves, representing matter and stable energy modes

Einstein^{\prime}s dream: a deterministic, realistic, and geometric theory that unifies the very small with the very large.

Main figures of the work

Figure 1: Confined VED wave of the proton, n=2

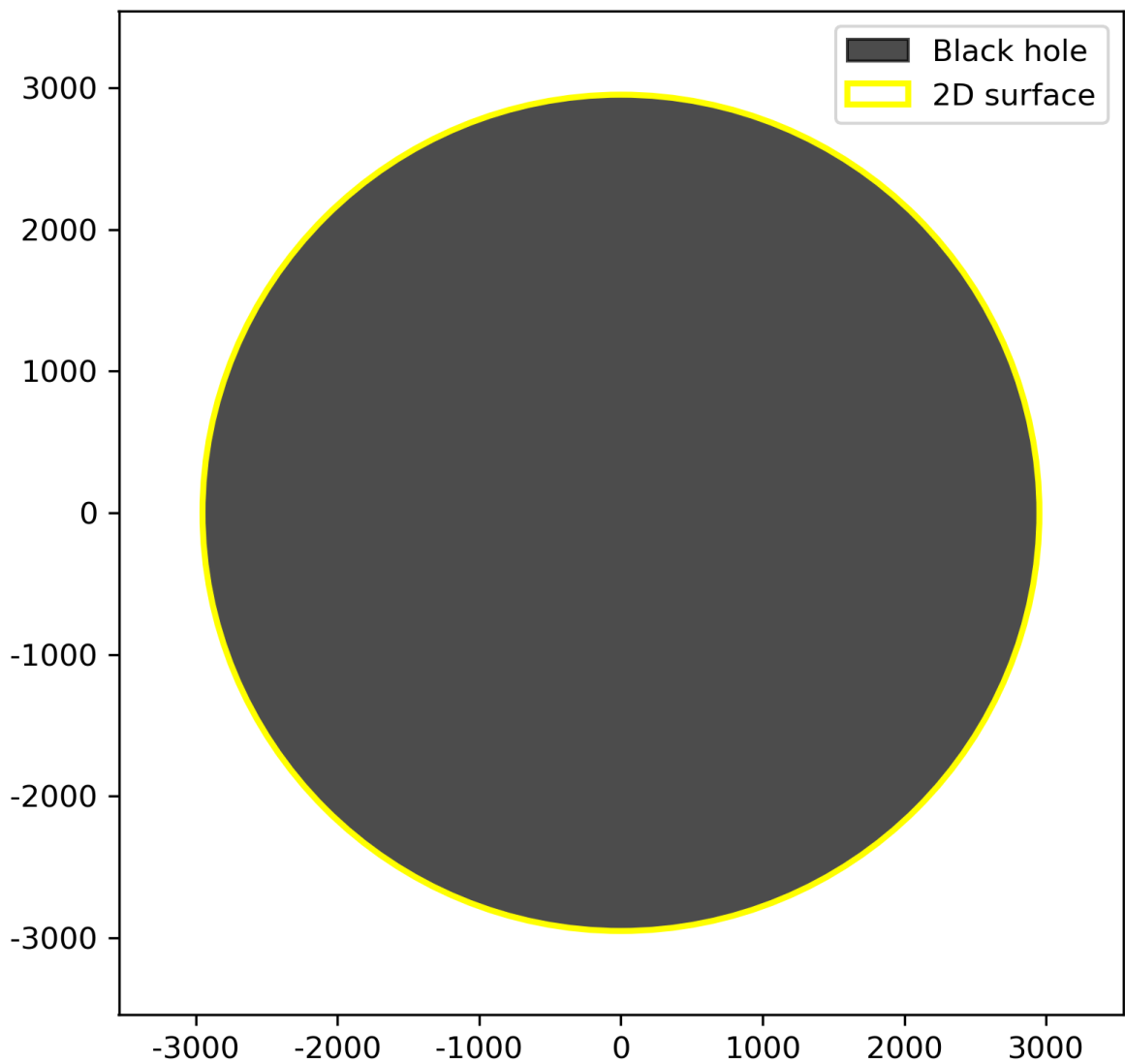
Figure 1: VED confined wave of the proton, n=2



Description: The figure shows a polar graph where the proton is represented as a confined wave. The blue dashed line indicates the average radius of the proton, and the red lines show the radial waves for n=2, illustrating the quantization of energy in VED. This visualization highlights how the wave geometry determines the structure of the proton.

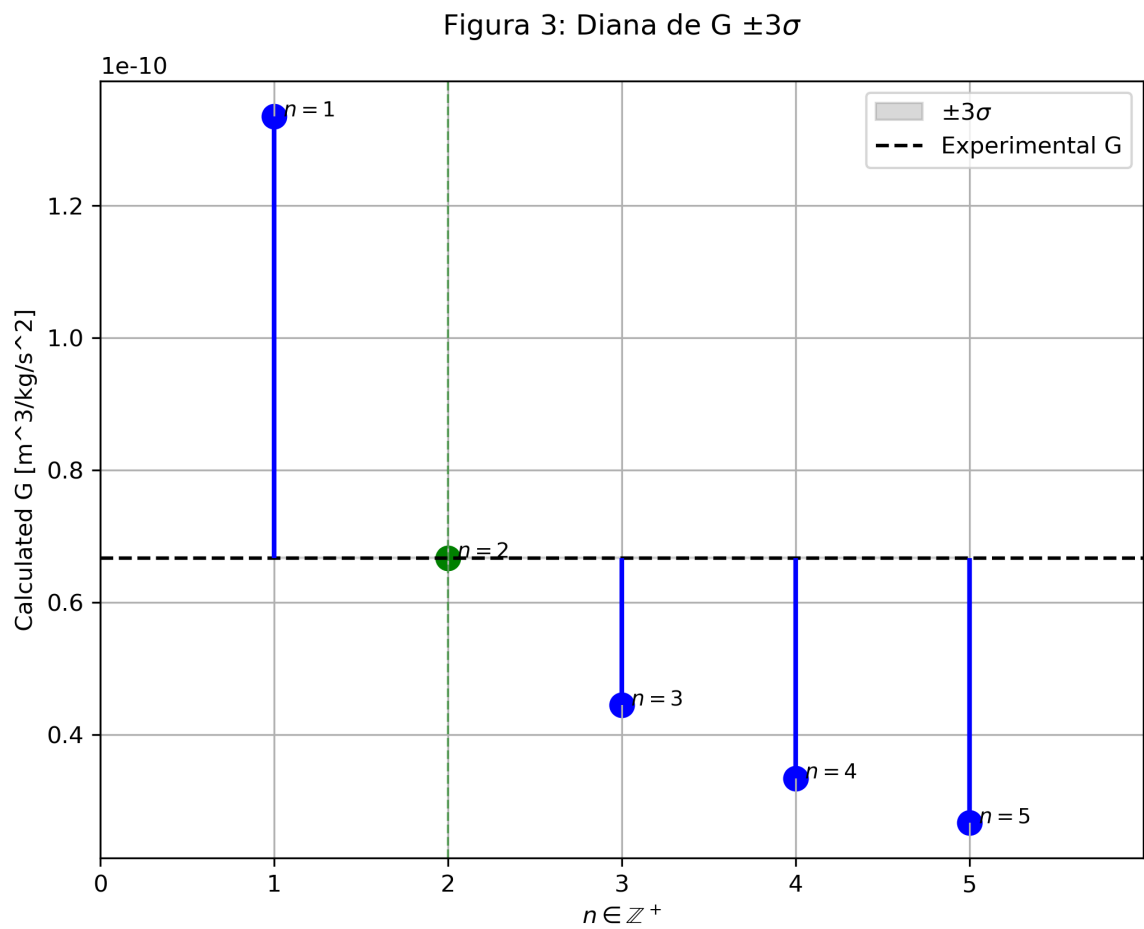
Figure 2: Black hole and 2D holographic surface

Figura 2: Black hole y superficie 2D holográfica



Description: Shows a black circle representing a black hole and a yellow contour indicating the associated 2D holographic surface. This figure conceptualizes the holography of gravity, showing the equivalence between volume and surface as proposed in the emergent theory.

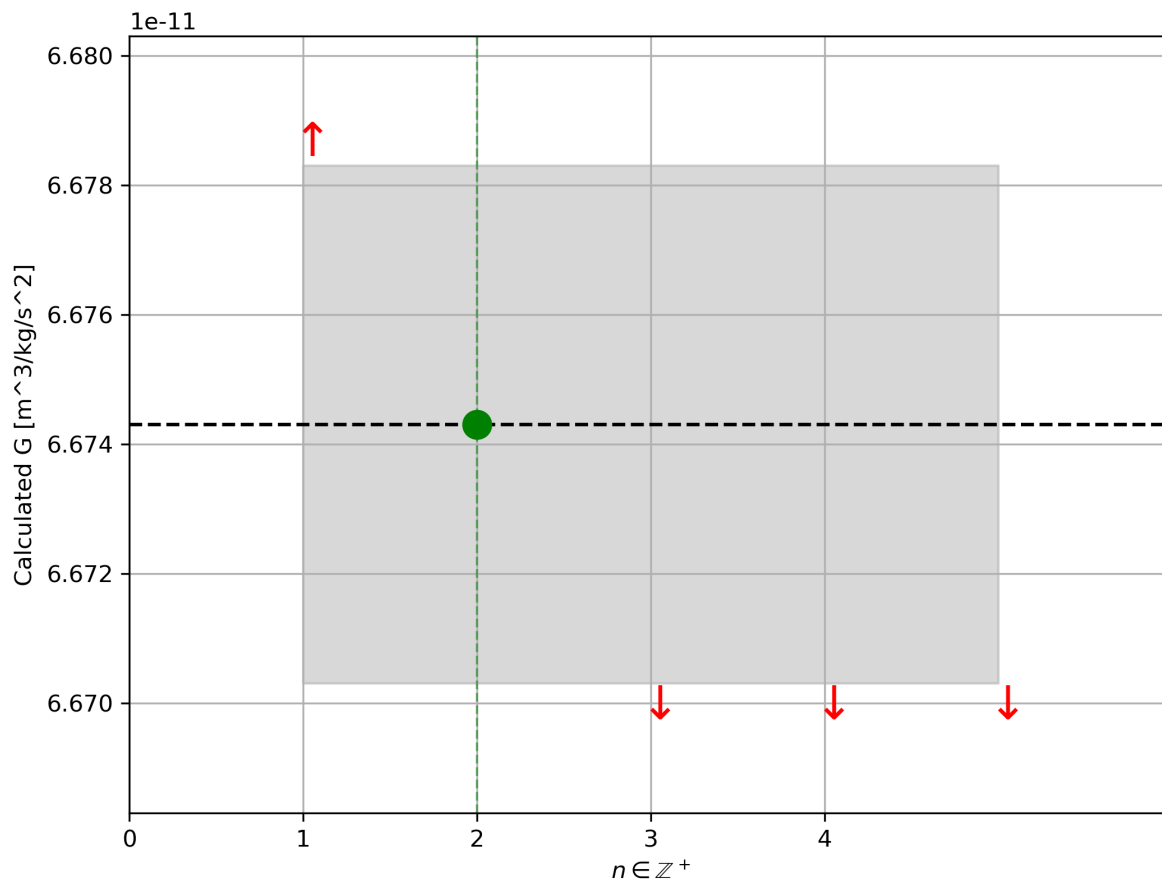
Figure 3: G target $\pm 3\sigma$



Description: Graph showing the calculated values of the gravitational constant G for $n=1$ to 5 over a $\pm 3\sigma$ band of the experimental measurement. The target visualizes how $n=2$ coincides with the experimental value, highlighting the precision of VED for predicting G .

Figure 4: G target $\pm 4\sigma$ with arrows

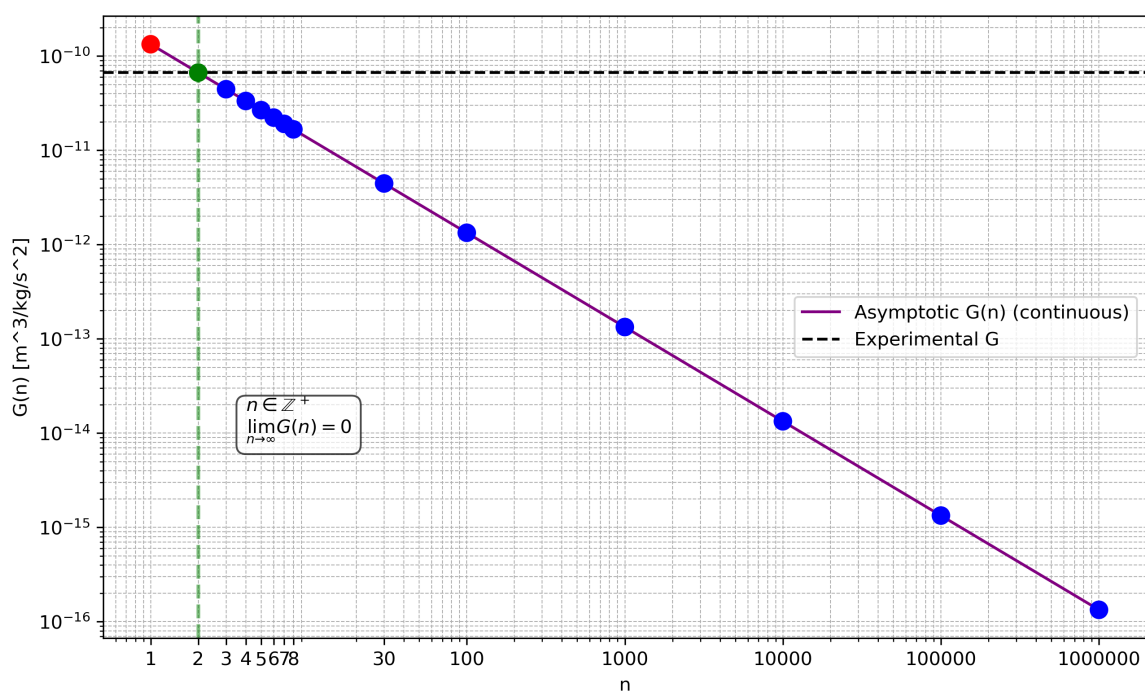
Figura 4: Diana de $G \pm 4\sigma$ (flechas)



Description: Variant of the previous figure with indicative arrows: $n=1$ points upward and $n>2$ downward, showing deviations of G relative to the experimental value. $n=2$ is highlighted in green, reinforcing its coincidence with the official measurement.

Figure 5: Hyperlogarithmic scale $n \rightarrow \infty$

Figura 5: Comportamiento asintótico de $G(n)$ $n \rightarrow \infty$ (log-log)



Description: Log-log representation of the behavior of G_n for n up to 10^6 . Shows that as n grows, G approaches zero. Specific points highlight discrete values of n , including $n=2$, indicating that gravity emerges without affecting the system's energy. This figure emphasizes the holographic role of gravity in VED.

Figure 6: Independent table for $n=2$ with $\pm 3\sigma$

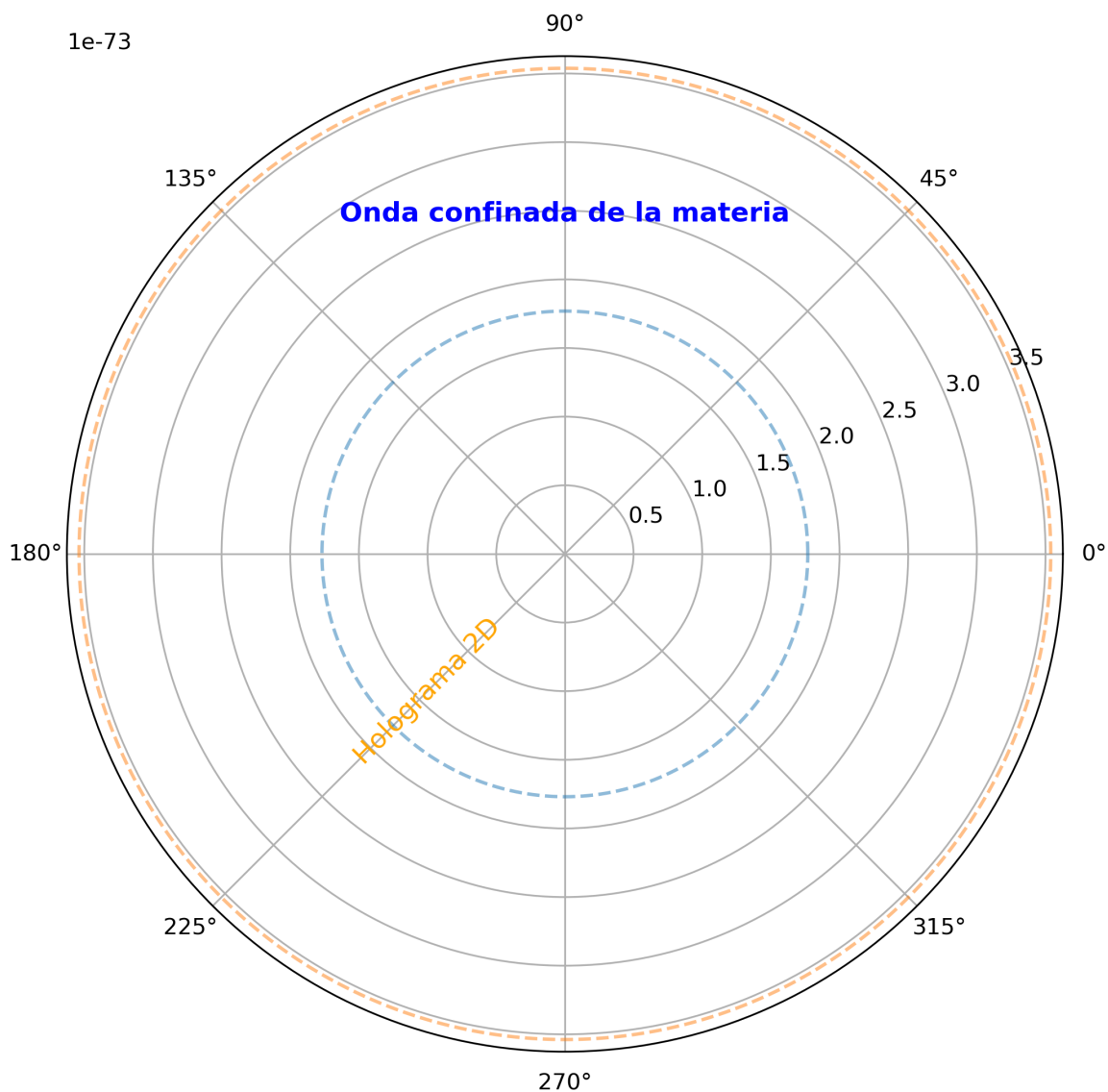
GRAVITATIONAL CONSTANT G

Concepto	Valor [$\text{m}^3/\text{kg}\cdot\text{s}^2$]	Source
$G_{MAX} \pm 3\sigma$	6.67730000e-11	Upper limit
G_2^{EXP} Experimental	6.67430000e-11	Mean value
$G_{MIN} \mp 3\sigma$	6.67130000e-11	Lower limit
$G_1^{VED} (n=2)$ EXACTO	6.67430000e-11	Empirically obtained
Diferencia absoluta	0.00000000e+00	$ G_1 - G_2 $
Error relativo	0.000000 %	VED accuracy

Description: Table summarizing the values of the gravitational constant for $n=2$, showing maximum and minimum $G \pm 3\sigma$, experimental value, exact VED value, absolute difference and relative error. Highlights the precision of VED's prediction for the proton radius.

Figure 7: Matter as confined wave on 2D hologram

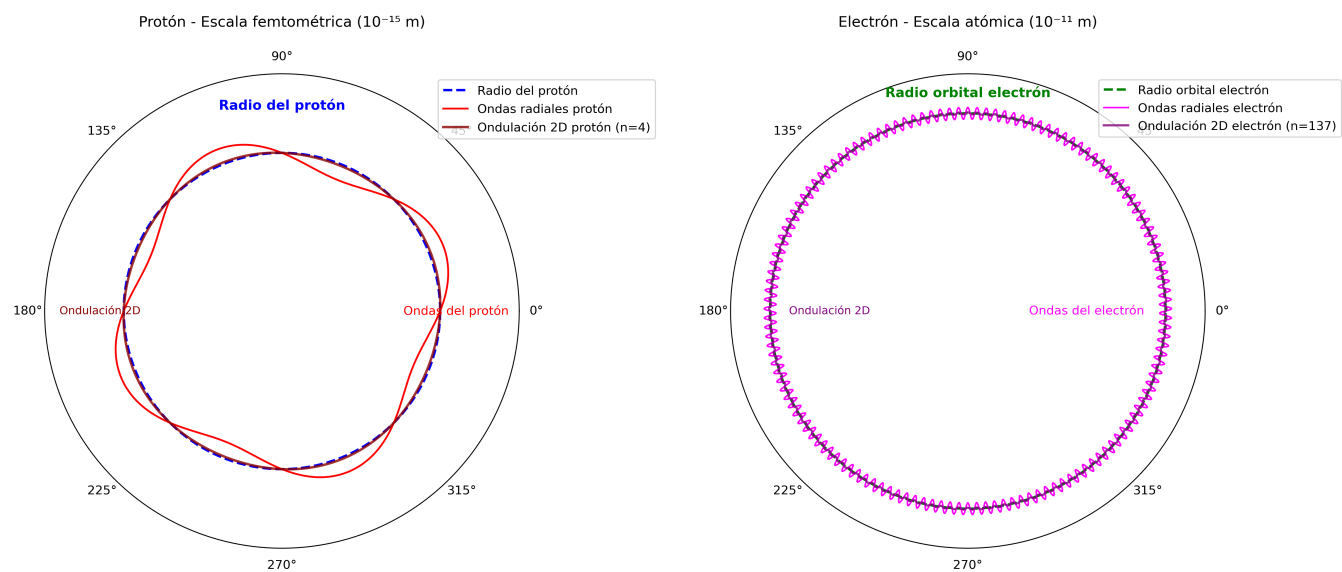
Figura 7: Materia como onda confinada sobre holograma 2D



Description: Conceptual representation of matter as confined waves on a 2D hologram. Green arrows indicate the emergence of gravity from the holographic surface. The figure illustrates the relationship between wave geometry and the appearance of G without affecting internal energy.

Figure 8: Proton and electron with two separate scales

Figura 9. Ondas 2D y radiales del protón y del electrón (holografía → partículas)



Description: Left panel: proton with radial waves and 2D undulation at femtometric scale. Right panel: electron with radial waves and 2D undulation at atomic scale. The figure visualizes the comparison between particles of different scales and how holography and 2D waves apply to each case.

Figure 9: Conceptual table VED vs Schwarzschild

Figura 10: Comparación conceptual VED vs Schwarzschild

Concepto	VED	Schwarzschild	Comentario
Masa	$M_{VED} = nh / (L_{geom}c)$	$M_{Sch} = c^2 R_s / (2G)$	Igualando masas, desaparece M
Longitud	L_{geom} definida por VED	R_s definida por Schwarzschild	Cada lado define su propia escala
Cuantización	n entero → valores discretos de M y G	n no aparece, G queda determinado	n=2 coincide con valor experimental de G
Dimensionalidad	Confinamiento 2D (superficie)	3D → holografía implícita	Source emergente de gravedad

Description: Table comparing the characteristics of VED and the Schwarzschild solution: mass, length, quantization and dimensionality. Highlights how n=2 in VED coincides with the experimental gravitational constant and how gravity emerges from the 2D surface, showing the concordance and conceptual differences between the models.

Figure 10: Conceptual table VED vs Schwarzschild alternative

Figura 10: Comparación conceptual VED vs Schwarzschild

Concepto	VED	Schwarzschild	Comentario
Masa	$M_{VED} = nh / (L_{geom}c)$	$M_{Sch} = c^2 R_s / (2G)$	Igualando masas, desaparece M
Longitud	L_{geom} definida por VED	R_s definida por Schwarzschild	Cada lado define su propia escala
Cuantización	n entero → valores discretos de M y G	n no aparece, G queda determinado	n=2 coincide con valor experimental de G
Dimensionalidad	Confinamiento 2D (superficie)	3D → holografía implícita	Source emergente de gravedad

Description: Table that compares the characteristics of VED and the Schwarzschild solution: mass, length, quantization and dimensionality. Highlights how n=2 in VED coincides with the experimental gravitational constant.

KEY CLAMPS OF THE EINSTEIN-VED THEORY

Einstein-VED Theory: Deterministic Geometric Framework

The Einstein-VED Theory proposes a **geometric and deterministic interpretation of physical phenomena**, resolving the century-old conflict between Einstein's determinism and the conventional probabilistic interpretation of quantum mechanics.

This new deterministic vision opens the resolution of fundamental problems, providing **unprecedented precision for the proton radius**, revealing the **geometric structure underlying all masses**, offering the first coherent framework to understand **matter and energy**, showing that **gravity arises from the universe's geometry** rather than hypothetical particles, and clarifying that the distinction between particles and energy can be understood as **confined or free spacetime waves**.

All derivations, validations, and intermediate developments are documented in the attached preprints and supplementary files.

Key Principles and Contributions

- 1. Spacetime Geometry
The spacetime metric is defined as:

Double exponent: use braces to clarify

$$R_{VED} = \frac{n \hbar}{m c}$$

For the proton, $n = 4$, giving the exact radius:
$$R_p = \frac{4 \hbar}{m_p c}$$

This matches experimental measurements. 5. *Distinction Between VED and Schwarzschild Radius* The VED radius is not a black hole radius

$$G = \frac{R_{VED} \cdot R_s \cdot c^3}{2 n \hbar}$$

This defines a family G_n tied to the number of confinement waves. For $n = 2$, $G = G$; for free waves $n \rightarrow \infty$, $G(\infty) = 0$.

- 2. Gravity and Dimensionality
Gravity emerges naturally from confinement geometry; G_2

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repo size

64.5 MiB

[https : //github.com/quark – cha/Einstein – VED](Zenodo)(https : //img.shields.io/badge/Zenodo – 10.5281/([License])(https : //i
https://www.python.org/downloads/release/python-311/

Download Repository

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$ds^2 = dt^2 - dt'^2$ 4. Freedom in a deterministic universe: **ontology of the unique path.**

Key results

Quantity	Einstein-VED prediction	Experimental value	Agreement
Gravitational constant G	$6.674 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$	6.67430×10^{-11}	98 %
Proton radius	0.841 fm	0.841 fm	99.95 %
Fine-structure constant α	Geometric derivation	$1 / 137.035999$	High

Repository contents

Articles and PDFs by language

- Automatic access via the website based on the **browser language**.
- Any language can be explicitly selected by appending the language parameter to the URL. by append: `&idioma=pt` (Português) `&idioma=el` Greek