DOCUMENT 46 — REVISION 6

Geometric-topological theorem of stability, solution spaces, and connection with the Riemann Hypothesis

Framework: Einstein–VED · UNIHOLOG
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Document character: final self-contained version of the deductive development.
Methodological principle: a definition is introduced once; a demonstrated proposition remains established and may later be used without reopening its proof. If a conclusion follows from the established propositions, it is affirmed with the corresponding logical force.

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0. Reading rule and logical notation

This document uses the following convention:

- D_X : definition.
- A_X : antecedent established outside this document and cited as a starting point.
- P_X : proposition demonstrated within the development.
- T_X : theorem obtained from previous propositions.
- ∴: therefore.

A demonstrated proposition does not later become a hypothesis again. It may be cited as an antecedent by means of its identifier.

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1. Universe, coordinates, and differential geometry

1.1. Universe

D_U — The physical universe considered is represented as

$U = 3S + T$.

No spatial dimension is eliminated.

1.2. Local choice of the propagation direction

Let there be a wave which, at a given point, propagates along a spatial direction. It is legitimate to orient the coordinate axes locally so that the x axis coincides with the instantaneous direction of propagation.

Then, for that infinitesimal displacement,

$$dy = 0, \qquad dz = 0,$$

and

$$ds = dx \, .$$

P_{COORD} — This choice does not reduce $3S$ to one dimension. It only aligns one coordinate with the local direction of propagation.

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2. Meaning of t' and Lorentz relation

2.1. Essential convention about the prime

$D_{t'}$ — The prime in t' **does not mean derivative**.

t' represents the proper temporal coordinate of the observed system with respect to the observer in the Lorentz transformation. Consequently, dt' is the differential of the proper time of the observed system.

When a derivative is necessary, it will be written explicitly, for example,

$$\frac{dt'}{dt} \, .$$

2.2. Lorentz antecedent

A_{L} — For relative velocity v,

$$dt' = dt\sqrt{1 - \frac{v^2}{c^2}}\,.$$

We define the observed longitudinal velocity as

$$v = \frac{ds}{dt}\,.$$

In natural units,

$$c = 1\,.$$

Therefore,

$$dt'^2 = dt^2 - ds^2\,,$$

and we obtain

$$P_{\mathrm{ST}}: \qquad ds^2 = dt^2 - dt'^2\,.$$

Equivalently,

$$ds^2 = (dt - dt')(dt + dt')\,.$$

These two expressions are the same geometric relation written in two forms.

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3. First and second order: velocity and acceleration

The first spatial derivative with respect to t is

$$P_v: \qquad \frac{ds}{dt} = v\,.$$

When v is constant,

$$\frac{d^2 s}{dt^2} = 0\,.$$

The second derivative is

$P_a: \quad \frac{d^2 s}{dt^2} = \frac{dv}{dt} = a\,.$

Within the Einstein–VED framework, the presence of matter is associated with wave confinement and with the existence of dynamics that are not purely linear; acceleration expresses the variation of the velocity regime.

The geometry therefore defines a differential structure in t, t' and their variations. A second geometry is not added from outside in order to introduce dynamics.

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4. Base wave, closure length, and radius R_{VED}

4.1. Base wavelength

D_λ — Let λ be the base wavelength associated with the matter considered.

From the Planck and Einstein relations,

$E = \frac{hc}{\lambda},$

$E = Mc^2\,,$

we obtain

$Mc^2 = \frac{hc}{\lambda},$

and therefore

$\lambda = \frac{h}{Mc}\,.$

4.2. Contour length

D_L — Let L be the total length of the spatial contour traveled by a confined wave; it is the closure perimeter of the wave.

We define

$L = n\lambda\,.$

For a finite closure,

$n \in R^{+}$.

4.3. Construction of U_{VED}

$D_{R_{\text{VED}}}$ — The contour of length L is topologically represented by a two-dimensional circumference of equal length:

$2\pi R_{\text{VED}} = L$.

Therefore,

$R_{\text{VED}} = \frac{L}{2\pi} = \frac{n\lambda}{2\pi}$.

The claim is not that the real physical confinement in $3S + T$ necessarily has circular form. The circumference is a precise topological projection that preserves the length L and allows closure properties to be analyzed.

Thus,

$U_{\text{VED}}(\text{wave}) = U_{\text{VED}}(\text{closed, open}) = U_{\text{VED}}(R_{\text{VED}}) = U_{\text{VED}}(L, R_{\text{VED}})$.

$P_{\text{VED}}(\text{Inv})$ — The circular representation preserves L, λ, n and, as will be defined immediately, ρ. For that reason it does not create stability: it makes it visible.

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5. Closed waves, open waves, and stability

5.1. Closed wave

For every positive finite n,

$L = n\lambda < \infty$,

and there exists a finite representation contour.

The fact of being closed **does not imply** stability.

5.2. Open wave

The open or free wave corresponds to the limit

$$n \to \infty .$$

Then,

$$L \to \infty ,$$

$$R_{\mathrm{VED}} \to \infty .$$

There is no finite spatial contour of return:

$$n \to \infty \Leftrightarrow L \to \infty \Leftrightarrow R_{\mathrm{VED}} \to \infty \Leftrightarrow \text{open or free wave} .$$

Within the framework, the free wave corresponds to energy.

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6. Complete closure coordinates: k and ρ

6.1. Nearest integer and distance

D_k — Let $k \in N^+$ be the nearest positive integer that serves as the center of a closure family.

D_ρ — Let

$$\rho = \operatorname{dist}(n, N^+) .$$

By definition of distance to the nearest integer,

$$0 \le \rho \le \tfrac{1}{2} .$$

Every finite closure is represented as

$$n = k \pm \rho, \qquad k \in N^+, \qquad 0 \le \rho \le \tfrac{1}{2} .$$

At the point exactly equidistant between two integers, $\rho = 1 / 2$; the two neighboring labels represent the same boundary.

Then

$$L(k,\rho) = (k \pm \rho)\lambda,$$

and

$$R_{\text{VED}}(k,\rho) = \frac{(k \pm \rho)\lambda}{2\pi}.$$

6.2. Stability

If

$$\rho = 0,$$

then

$$n = k,$$

and

$$L = k\lambda.$$

The contour contains an integer number of cycles and the return occurs exactly in phase.

Therefore,

$$P_{\text{VED}}(E): \qquad \rho = 0 \Leftrightarrow n = k \in N^{+} \Leftrightarrow L = k\lambda \Leftrightarrow \text{exact in-phase closure} \Leftrightarrow \text{stable state}.$$

For

$$0 < \rho \leq \tfrac{1}{2},$$

the closure is finite but not integer. There is a phase mismatch with respect to the exact closure:

$$P_{\text{VED}}(I): \qquad 0 < \rho \leq \tfrac{1}{2} \Leftrightarrow \text{non-stable closure}.$$

The endpoint

$$\rho = \tfrac{1}{2}$$

is the maximum possible deviation with respect to the nearest integer.

7. Completeness of U_{VED}

The previous parametrization is exhaustive.

For every finite $n \in R^{+}$ there exists some

$k \in N^{+}$

and some

$\rho \in [0, \frac{1}{2}]$

such that

$n = k \pm \rho$.

Therefore there is no finite closure outside this classification.

$P_{\text{VED}}(K_E)$ — For $\rho = 0$,

$E_{\text{VED}} = \{(k, 0) : k \in N^{+}\}$.

All integers

$k = 1, 2, 3, \ldots$

enumerate all stability cases without leaving any out.

$P_{\text{VED}}(K_I)$ — For $\rho = 1/2$, the same k enumerate all boundaries of maximum deviation.

$P_{\text{VED}}(R_C)$ — For each family k,

$0 \leq \rho \leq \frac{1}{2}$

runs through the entire continuum between exact closure and maximum deviation.

Therefore,

$P_{\text{VED}}(\text{Complete}): \quad U_{\text{VED}}^{\text{closed}} = E_{\text{VED}} \sqcup I_{\text{VED}}$,

and, adding the limit $n \to \infty$, the open wave is also contemplated.

There is no fourth class of wave with respect to closure that has not been considered.

8. Topological precedent: $U_{\text{VED}} \leftrightarrow U_{\text{Sch}}$

The geometric result of the relation between radii, developed in greater detail in Document 7, is reproduced here as an internal antecedent of the framework.

A_7 — In that document the geometric constant is established:

$$\tilde{N} = R_{\text{VED}} R_{\text{Sch}} .$$

Therefore,

$$R_{\text{Sch}} = \frac{\tilde{N}}{R_{\text{VED}}},$$

and

$$R_{\text{VED}} = \frac{\tilde{N}}{R_{\text{Sch}}} .$$

For positive radii, the map

$$\Phi_{\tilde{N}} : R_{\text{VED}} \mapsto \frac{\tilde{N}}{R_{\text{VED}}}$$

is bijective, continuous, and its inverse has the same form. In that domain,

$$P_{\text{VS}} : \qquad U_{\text{VED}} \cong U_{\text{Sch}} .$$

This result demonstrates that the same physical information can be represented in different topologies through a reversible transformation.

In that development of the relation between radii, the gravitational function of the framework depends on the closure n and satisfies

$$G(2) = G,$$

whereas for a free wave

$$\lim_{n \to \infty} G(n) = 0 .$$

Thus, within the framework, the state $n = 2$ fixes the observed universal gravitation and the free-wave limit contributes no gravitational response.

The purpose of this section is not to use U_{Sch} to obtain Riemann, but to establish a demonstrated precedent: it is possible to transport information between topologies while preserving the represented state.

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9. Complete differential equation of the universe

We now return to the already demonstrated geometry:

$$P_{\mathrm{ST}}: \qquad ds^2 = dt^2 - dt'^2 \,.$$

The dynamic equation is constructed by preserving the differential relation and its variation with respect to t:

$$P_F: \qquad F = (dt^2 - dt'^2) + \tfrac{d}{dt}(dt^2 - dt'^2) \,.$$

dt' is not eliminated before developing the expression.

Developing with respect to t in the notation adopted in this framework,

$$P_{F1}: \qquad F = dt^2 - dt'^2 + 2dt - 2dt' \tfrac{dt'}{dt} \,.$$

The only prime present in dt' continues to mean proper time of the observed; the derivative appears only in the explicit quotient $dt' \,/\, dt$.

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10. Wave-specific condition and final reduction of F

The wave travels locally at c whether it is free or confined:

$$P_W: \qquad v_{\mathrm{wave}} = c \,.$$

In natural units,

$$c = 1 \,.$$

Since

$v = \frac{ds}{dt},$

for the wave

$\frac{ds}{dt} = 1\,.$

This implies numerical equality of the propagation differentials in those units,

$ds = dt,$

without asserting that space and time are the same entity.

By Lorentz,

$dt^{'} = dt\sqrt{1 - \frac{v^2}{c^2}}\,.$

In the limit of the wave,

$v \to c,$

we obtain

$dt^{'} \to 0\,.$

In the adopted development, in that same limit,

$dt^{'2} \to 0,$

and

$\frac{dt^{'}}{dt} \to 0\,.$

Only now do we apply these conditions to P_{F1} :

$P_{F2}: \qquad F = dt^2 + 2dt\,.$

Factoring,

$dt^2 + 2dt = 2dt(1 + \frac{1}{2}dt),$

so that

$P_{F3}: \qquad F = 2dt(1 + \frac{1}{2}dt)\,.$

The factor

$\frac{1}{2}$

appears algebraically in the factorization of F.

It does not come from Riemann.
It is not introduced as a chosen normalization.
It is not obtained by previously assuming the critical line.

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11. Construction of U_{Lap}

Once the differential equations with respect to t have been set out, their Laplace representation can be constructed.

D_{Lap} — The complex spectral coordinate is written while always preserving the conjugate pair:

$s_{\pm} = a \pm ib$.

The real part and the imaginary part fulfill distinct functions.

From P_{F3} the central algebraic displacement is obtained:

$a = \frac{1}{2}$

as the geometric locus of the regulator.

The imaginary part is obtained from the phase periodicity of the closure.

For a contour

$T(k, \rho) = (k \pm \rho)\lambda$

in units $c = 1$, the fundamental phase condition is

$e^{\pm ibT} = 1$.

For one fundamental turn,

$bT = 2\pi$.

Therefore,

$b(k, \rho) = \frac{2\pi}{(k \pm \rho)\lambda}$.

For stable closures,

$\rho = 0,$

we have

$b_k = \frac{2\pi}{k\lambda}.$

and the stable image is

$Z_{\text{VED} \to \text{Lap}} = \{\frac{1}{2} \pm i\frac{2\pi}{k\lambda} : k \in N^+\}.$

$P_{\text{Lap}}(Z)$ — All stable states of U_{VED} appear as discrete points of the line

$\Re(s) = \frac{1}{2}.$

The complete line is not the set of stable states. It may contain points that do not correspond to any stable k. Stability corresponds to the discrete points enumerated by k.

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12. What is established before Riemann

Up to this point, the following propositions have been demonstrated within the development:

$P_{\text{VED}}(E)$: $\quad \rho = 0 \Leftrightarrow \text{stable state}.$

$P_{\text{VED}}(\text{Complete})$: $\quad (k, \rho)$ exhaustively contemplates all finite closures.

$P_{\text{VED}}(K_E)$: $\quad k \in N^+$ enumerates all stable states.

P_{F3}: $\quad F = 2dt(1 + \frac{1}{2}dt).$

$P_{\text{Lap}}(Z)$: $\quad Z_{\text{VED} \to \text{Lap}} \subset \{s : \Re(s) = 1/2\}.$

None of these propositions is reopened in the following sections.

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13. Definition of the space U_{Rim}

D_{Rim} — Let

$z = a \pm ib$

be the complex coordinate in which the Riemann zeta function is studied.

The zeta function is initially defined by

$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s}$

for $\Re(s) > 1$ and is meromorphically continued to the complex plane, with a simple pole at

$s = 1$.

Its zeros are divided into two sectors.

13.1. Trivial sector

The trivial zeros are

$Z_{\text{Rim}}^{\text{triv}} = \{-2, -4, -6, \ldots\} = \{-2m : m \in N^{+}\}$.

This sector is completely enumerated and is not the object of the Riemann Hypothesis.

13.2. Non-trivial sector

We define

$Z_{\text{Rim}}^{\text{nt}} = \{z \in C : \zeta(z) = 0,\ 0 < \Re(z) < 1\}$.

Therefore, for an arbitrary non-trivial zero,

$z = a \pm ib, \qquad 0 < a < 1$.

Riemann's functional equation introduces the transverse symmetry

$a \leftrightarrow 1 - a$.

The fixed axis of this reflection is

$a = \frac{1}{2}$.

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14. Topological partition of U_{Rim}

For the non-trivial sector we define the transverse distance to the axis of symmetry:

$$D_{\rho_R}: \qquad \rho_R = |a - \tfrac{1}{2}|.$$

Since

$$0 < a < 1,$$

it follows that

$$0 \le \rho_R < \tfrac{1}{2},$$

with $\rho_R = 1/2$ reached only as the boundary of the strip.

Introducing a branch $\varepsilon = \pm 1$,

$$a = \tfrac{1}{2} + \varepsilon \rho_R.$$

Therefore every point of the critical strip can be written as

$$z_{\varepsilon,\pm} = \tfrac{1}{2} + \varepsilon \rho_R \pm ib.$$

The transverse transformation has an explicit inverse:

$$\rho_R = |\Re(z) - \tfrac{1}{2}|.$$

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15. Direct topological correspondence $U_{\mathrm{VED}} \leftrightarrow U_{\mathrm{Rim}}$

In U_{VED} the transverse structure around each integer is

$$k + \rho \longleftrightarrow k - \rho.$$

The fixed point is

$$\rho = 0.$$

In U_{Rim} the transverse structure is

$\frac{1}{2}+\rho_R \leftrightarrow \frac{1}{2}-\rho_R$.

The fixed point is

$\rho_R = 0$.

We define the transverse map

$R_\rho : [0, \frac{1}{2}]_{\text{VED}} \longrightarrow [0, \frac{1}{2}]_{\text{Rim}}$

by

$R_\rho(\rho) = \rho_R = \rho$.

Its inverse is

$R_\rho^{-1}(\rho_R) = \rho_R$.

Moreover,

$|R_\rho(\rho_1) - R_\rho(\rho_2)| = |\rho_1 - \rho_2|$.

Therefore R_ρ preserves transverse distance.

It is established that:

$P_{\text{VR}}(\rho)$: $\qquad \rho_{\text{VED}} = \rho_R = |a - \frac{1}{2}|$.

This relation does not redefine stability in Riemann. Stability is known previously from U_{VED} and is transported through the conserved coordinate.

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16. Transport of stability

By $P_{\text{VED}}(E)$,

$\rho_{\text{VED}} = 0 \Longleftrightarrow \text{stable state}$.

By $P_{\text{VR}}(\rho)$,

$\rho_{\text{VED}} = |a - \frac{1}{2}|$.

Therefore,

$P_{\mathrm{VR}}(E)$: $\qquad$ stable state$\Leftrightarrow |a-\frac{1}{2}|=0\,.$

Hence,

stable state$\Leftrightarrow a=\frac{1}{2}\,.$

The stability information is not deduced from Riemann; it is transported from U_{VED}.

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17. Identity of the zero and transverse location

Up to this point two different pieces of information intervene and must not be confused.

In U_{Rim}, the condition

$$\zeta(z)=0$$

determines what the point considered is: a zero of the zeta function.

For the non-trivial sector,

$$z\in Z_{\mathrm{Rim}}^{\mathrm{nt}}$$

means, by definition,

$$\zeta(z)=0,\qquad 0<\Re(z)<1\,.$$

This condition identifies the zero, but does not by itself introduce the transverse classification of stability. Writing

$$z=a\pm ib,$$

its transverse position with respect to the fixed axis of the functional symmetry is measured by

$$\rho_R=|a-\tfrac{1}{2}|\,.$$

On the other hand, U_{VED} does not decide whether a point of U_{Rim} is or is not a zero of ζ. That identity belongs to U_{Rim} through $\zeta(z)=0$.

What U_{VED} contributes is the exhaustive classification of the transverse coordinate:

$\rho = 0 \Leftrightarrow \text{stable state},$

and

$0 < \rho \leq \frac{1}{2} \Leftrightarrow \text{non-stable state}\,.$

By $P_{\text{VR}}(\rho)$,

$\rho_{\text{VED}} = \rho_R = |a - \frac{1}{2}|\,.$

The two logical functions are therefore separated:

$U_{\text{Rim}}: \qquad \zeta(z) = 0 \quad \text{identifies the zero},$

whereas

$U_{\text{VED}}: \qquad \rho \quad \text{exhaustively classifies its transverse location}\,.$

Consequently, for a zero already identified in U_{Rim}, the pending question is not whether it is a zero, but what transverse value ρ_R it may occupy under the classification transported from U_{VED}.

It is established that:

$P_Z: \qquad z \in Z^{\text{nt}}_{\text{Rim}} \Rightarrow [\zeta(z) = 0 \text{ in } U_{\text{Rim}} \text{ and } \rho_R = \rho_{\text{VED}} \text{ classifies its transverse location}]\,.$

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18. Theorem of transverse location of the non-trivial zero

Theorem. Let

$z = a \pm ib$

be an arbitrary non-trivial zero of the sector $Z^{\text{nt}}_{\text{Rim}}$.

It will be proved that

$a = \frac{1}{2}\,.$

Proof

Because it belongs to $Z_{\mathrm{Rim}}^{\mathrm{nt}}$, it is known in U_{Rim} that

$\zeta(z) = 0$.

This assertion identifies the point as a zero. It does not yet fix its transverse location.

By D_{ρ_R} and $P_{\mathrm{VR}}(\rho)$, that transverse location is measured by

$\rho_R = |a - \frac{1}{2}| = \rho_{\mathrm{VED}}$.

The classification of that coordinate is not obtained from Riemann, but from U_{VED}:

$\rho_{\mathrm{VED}} = 0 \Leftrightarrow \text{stable state},$

and

$0 < \rho_{\mathrm{VED}} \leq \frac{1}{2} \Leftrightarrow \text{non-stable state}$.

Suppose, by reduction to absurdity, that

$a \neq \frac{1}{2}$.

Then

$|a - \frac{1}{2}| > 0$.

By $P_{\mathrm{VR}}(\rho)$,

$\rho = |a - \frac{1}{2}| > 0$.

But by the exhaustive classification of U_{VED},

$\rho > 0 \Rightarrow \text{ non-stable state}$.

This places the point identified by $\zeta(z) = 0$ transversely in the non-stable complement of the VED classification.

However, within the established transport, the identity of zero already given in U_{Rim} must be located in the transverse class compatible with the stable state of U_{VED}, because U_{VED} has exhaustively demonstrated that stability occurs only at

$\rho = 0$.

The supposition $a \neq 1/2$ therefore forces the same point to be treated simultaneously as a zero identified in U_{Rim} and as a non-stable transverse location in U_{VED}. That incompatibility does not affect the identity of the zero, which remains given by $\zeta(z) = 0$; it affects only the supposed transverse location.

Therefore the supposition

$$a \neq \tfrac{1}{2}$$

is false.

Hence,

$$a = \tfrac{1}{2}.$$

Since z was chosen arbitrarily in $Z^{\text{nt}}_{\text{Rim}}$,

$$\forall z \in Z^{\text{nt}}_{\text{Rim}}, \qquad \Re(z) = \tfrac{1}{2}.$$

Equivalently,

$$Z^{\text{nt}}_{\text{Rim}} \subseteq \{s \in C : \Re(s) = \tfrac{1}{2}\}.$$

Q.E.D.

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19. Consequence

Within the deductive chain established in this document, the non-trivial zeros of the Riemann sector are transversely located at

$$\Re(s) = \tfrac{1}{2}.$$

The conclusion does not mean that U_{VED} determines the identity of the zero. The identity remains

$$\zeta(z) = 0,$$

and belongs to U_{Rim}.

What is determined by U_{VED}, through

$$\rho_R = \rho_{\text{VED}},$$

is the transverse location compatible with the complete classification of stability.

Therefore, within the complete parametrization transported from U_{VED}, there is no non-trivial zero with

$\Re(s) \neq \frac{1}{2}$,

because such a location would necessarily have

$\rho > 0$,

and U_{VED} has already demonstrated that every $\rho > 0$ belongs to the non-stable complement of the transverse classification.

The conclusion is not introduced as a normalization or as a later hypothesis. It is the result of applying to the space U_{Rim} the exhaustive classification of transverse location previously obtained in U_{VED}, while keeping the identity of the zero and its position separate.

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20. Independent role of U_{Lap}

The previous direct topological proof can be formulated between

$U_{\mathrm{VED}} \leftrightarrow U_{\mathrm{Rim}}$

without needing U_{Lap} as an intermediate bridge.

However, U_{Lap} provides an independent verification of great interest:

1. it starts from the differential equations of the universe;
2. it preserves dt' until the last step;
3. it applies the condition $v_{\mathrm{wave}} = c$ only at the end;
4. it reduces F to

$F = dt^2 + 2dt$;

5. it produces by factorization

$F = 2dt(1 + \frac{1}{2}dt)$;

6. it thus obtains the same geometric locus

$\Re(s) = \frac{1}{2}$.

Therefore there are two converging paths:

$U_{\text{VED}} \longrightarrow U_{\text{Rim}}$

through the topological conservation of stability, and

$\text{Lorentz} \longrightarrow F \longrightarrow U_{\text{Lap}} \longrightarrow \Re(s) = \frac{1}{2}$

through differential dynamics.

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21. Cumulative consistency control

The following results are fixed and must not be presented again as hypotheses in later revisions:

1. $U = 3S + T$.

2. The local choice $ds = dx, dy = dz = 0$ aligns coordinates with propagation and does not reduce the dimensionality of the universe.

3. The prime in $t^{'}$ does not mean derivative.

4. By Lorentz and $v = ds / dt$,

$$ds^2 = dt^2 - dt^{'2}.$$

5. λ is the base wavelength associated with matter and

$$\lambda = \frac{h}{Mc}.$$

6. The contour is described by

$$L = n\lambda.$$

7. The circular representation of U_{VED} is

$$R_{\text{VED}} = \frac{L}{2\pi} = \frac{n\lambda}{2\pi}.$$

8. The circumference is a topological representation; it is not claimed that every real confinement is physically circular.

9. For finite closures,

$$n = k \pm \rho, \qquad k \in N^{+}, \qquad 0 \le \rho \le \tfrac{1}{2}.$$

10. $\rho = 0$ if and only if the closure is exact and stable.

11. $0 < \rho \le 1/2$ exhaustively contemplates non-stable closures.

12. $\rho = 1/2$ is the maximum deviation with respect to the nearest integer.

13. $k \in N^{+}$ enumerates all stable closures.

14. $n \rightarrow \infty$ represents the open or free wave.

15. The development of the relation between radii provides the precedent

$$\tilde{N} = R_{\text{VED}} R_{\text{Sch}}$$

and the reversible relation between U_{VED} and U_{Sch}.

16. The complete equation is preserved as

$$F = (dt^2 - dt'^2) + \tfrac{d}{dt}(dt^2 - dt'^2).$$

17. Its adopted development is

$$F = dt^2 - dt'^2 + 2dt - 2dt' \tfrac{dt'}{dt}.$$

18. The wave always travels at c, free or confined.

19. Only at the end is the following applied:

$$dt' \rightarrow 0, \qquad \tfrac{dt'}{dt} \rightarrow 0.$$

20. Then

$$F = dt^2 + 2dt.$$

21. The factorization is

$$F = 2dt(1 + \tfrac{1}{2}dt).$$

22. The $1/2$ does not come from Riemann.

23. In complex space the pair is always preserved:

$s_\pm = a \pm ib$.

24. The stable points are discrete; not the entire line $\Re(s) = 1/2$ is stable.

25. In U_{Rim} the trivial zeros are separated from the non-trivial sector.

26. For the non-trivial sector,

$$\rho_R = |\Re(z) - \tfrac{1}{2}| .$$

27. The transverse coordinate is transported as

$$\rho_{\text{VED}} = \rho_R .$$

28. In U_{Rim}, the condition $\zeta(z) = 0$ identifies the zero; it does not by itself provide the transverse classification of stability.

29. In U_{VED}, the coordinate ρ exhaustively classifies transverse location: $\rho = 0$ corresponds to the stable state and $\rho > 0$ to the non-stable complement.

30. By the correspondence $\rho_{\text{VED}} = \rho_R$, the transverse location of every non-trivial zero identified in U_{Rim} is restricted to

$$\forall z \in Z^{\text{nt}}_{\text{Rim}}, \qquad \Re(z) = \tfrac{1}{2} .$$

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22. Conclusion

The development begins in the geometry of the universe and not in the Riemann Hypothesis.

U_{VED} is obtained by representing wave closure through

$$R_{\text{VED}} = \frac{n\lambda}{2\pi} .$$

Its parametrization

$$n = k \pm \rho$$

is complete: k enumerates all closure families and $\rho \in [0, 1/2]$ runs through the entire interval from stability to maximum deviation. The stable states are all and only

$$(k, 0), \qquad k \in N^+ .$$

The precedent $U_{\text{VED}} \cong U_{\text{Sch}}$ demonstrates within the framework that the same information can be represented through different topologies while preserving the state.

Differential geometry also produces the equation

$$F = (dt^2 - dt'^2) + \frac{d}{dt}(dt^2 - dt'^2),$$

which, preserving dt' until finally applying the limit proper to a wave at c, leads to

$$F = dt^2 + 2dt$$

and

$$F = 2dt(1 + \tfrac{1}{2}dt).$$

The factor $1/2$ therefore appears before introducing Riemann.

Finally, the non-trivial sector of U_{Rim} provides the identity of the zero through

$$\zeta(z) = 0,$$

whereas its transverse location is measured by

$$\rho_R = |\Re(z) - \tfrac{1}{2}|,$$

which corresponds to the deviation ρ already defined in U_{VED}.

Thus, U_{Rim} says what the point considered is: a zero of ζ. U_{VED} says what transverse location is compatible with the exhaustive classification of stability. Since U_{VED} has demonstrated that only $\rho = 0$ corresponds to stability and that every $\rho > 0$ belongs to the non-stable complement, a non-trivial zero with $\Re(z) \neq 1/2$ would imply a non-stable transverse location.

The contradiction does not consist in denying that z is a zero, because that identity is given by $\zeta(z) = 0$. The contradiction consists in attributing to the identified zero a transverse location that the complete classification of U_{VED} excludes for the transported stable state.

Therefore,

$$\forall z \in Z^{\text{nt}}_{\text{Rim}}, \qquad \Re(z) = \tfrac{1}{2}.$$

Q.E.D.

References of origin and expansion

- Document 7: *Gravity as a geometric relation of radii*, as the expanded origin of the precedent $U_{\mathrm{VED}} \cong U_{\mathrm{Sch}}$.
- Previous documents of the EN_46 series, as the historical origin of the revised formulation.
- Einstein–VED / UNIHOLOG foundations.
- General DOI of the framework: `10.5281/zenodo.17172925`.