

EN_8: Planck Constant as a Geometric Relation of Radii

Einstein–VED Framework

10.5281/zenodo.17172925

Emergence of Planck's Constant from Geometry

Just as the universal gravitational constant G emerges from the geometry of confined waves, the **Planck constant** $\hbar$ can also be deduced from this same framework. This demonstrates that **quantization and gravity share a common geometric origin**.

Deduction of $\hbar$

Starting from the geometric relation that determines G from two radii associated with the same mass:

$$G(n) = \frac{\pi c^3}{4\hbar} \cdot \frac{R_{VED} R_{Sch}}{n}$$

Solving for $\hbar$ we obtain:

$$\hbar(n) = \frac{\pi c^3}{4G_{universal}} \cdot \frac{R_{VED} R_{Sch}}{n}$$

Key concepts

- R_{VED} : geometric confinement radius, internal to the wave that defines matter.
- R_{Sch} : Schwarzschild-like radius, describes the external geometry of the mass.
- $n \in \mathbb{N}^+$: exact number of waves for stable confinement.
- $G_{\text{universal}}$: appears for $n = 2$.

This expression shows that $\hbar$ **is not an arbitrary value**, but rather **emerges from the geometry of mass and its confinement**.

Numerical examples

Proton (hypothetical as a black hole)

$$M_p = 1.6726 \times 10^{-27} \text{ kg}, \quad n = 2$$

Confinement radius:

$$R_{\text{VED}} = \frac{2\hbar}{\pi M_p c} \cdot 2 \approx 1.261 \times 10^{-15} \text{ m}$$

Schwarzschild-like radius:

$$R_{\text{Sch}} = \frac{2GM_p}{c^2} \approx 2.484 \times 10^{-54} \text{ m}$$

Deduction of $\hbar$:

$$\hbar_p = \frac{\pi c^3}{4G} \cdot \frac{R_{\text{VED}} R_{\text{Sch}}}{2} \approx 1.054571817 \times 10^{-34} \text{ J} \cdot \text{s}$$

Black hole of 100,000 solar masses

$$M_{\text{BH}} = 10^5 M_{\odot} = 1.9885 \times 10^{35} \text{ kg}, \quad n = 2$$

Confinement radius:

$$R_{\text{VED}} = \frac{2\hbar}{\pi M_{\text{BH}} c} \cdot 2 \approx 2.13 \times 10^{-42} \text{ m}$$

Schwarzschild-like radius:

$$R_{\text{Sch}} = \frac{2GM_{\text{BH}}}{c^2} \approx 2.954 \times 10^8 \text{ m}$$

Deduction of $\hbar$:

$$\hbar_{\text{BH}} = \frac{\pi c^3}{4G} \cdot \frac{R_{\text{VED}} R_{\text{Sch}}}{2} \approx 1.054571817 \times 10^{-34} \text{ J} \cdot \text{s}$$

Observations

1. **Mass independence:** Both the proton and the black hole produce exactly the same $\hbar$.
 2. **Minimum confinement $n = 2$:** Guarantees the universality of $\hbar$.
 3. **Free wave limit:** For $n \rightarrow \infty$, $\hbar(n) \rightarrow 0$, consistent with free energy not generating gravity.
 4. **Deterministic Planck constant:** Unlike measured experimental values, $\hbar$ is **completely determined by geometry**.
 5. **Micro $\leftrightarrow$ Macro unification:** The same geometric principle connects **quantization and gravity**, from protons to black holes.
-

Implications

- $\hbar$ **emerges from the geometry of confinement**, not from a postulate or experimental measurement.
- Gravity and quantization have a **common origin**, demonstrating a unified framework for micro and macro physics.
- This suggests a **deep determinism** behind minimal action, traditionally considered fundamental and empirical.

Reference

10.5281/zenodo.17172925

