Radius and constant notation. The author defines $R_{\mathrm{VED}} = nh / (Mc) = n\lambda$, without π, and ñ = $R_{\mathrm{VED}} R_{\mathrm{Sch}} = 2nhG(n) / c^3$. The circular calculations in this article retain their values by using $r_{\mathrm{VED}} = R_{\mathrm{VED}} / (2\pi)$ for the circular radius. Its product with the Schwarzschild radius is the derived quantity ñ / (2π), not another constant named ñ. Code example identifiers are retained for compatibility and refer to that circular radius and derived product. For the author's constant: $G(n) = ñc^3 / (2nh)$.

EN_38: The confinement radius of matter r_{VED} and its relationship with the scale of the universe

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Framework: Einstein-VED
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Abstract

The confinement radius r_{VED} is inversely proportional to mass: $r_{\mathrm{VED}} \propto 1 / m$. Therefore, the lowest-mass system possible (the universe as a whole) has the largest possible r_{VED}. This maximum radius coincides with the Hubble radius, establishing a natural limit for the observable universe. This result reinforces the deduction that the cosmological constant is $\Lambda = 0$ and that the expansion of the universe is not spatial, but temporal.

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1. Introduction

In the Einstein-VED framework, all matter is a wave confined within a closed boundary. The confinement radius is defined as:

$$r_{\mathrm{VED}} = \frac{n\lambda}{2\pi}$$

Since $\lambda = h / (mc)$, we have:

$$r_{\mathrm{VED}} \propto \frac{1}{m}$$

Mass and confinement radius are inversely proportional.

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2. Hierarchy of r_{VED}

System	Mass	r_{VED}
Proton	1.67×10^{-27} kg	0.841×10^{-15} m
Muon	1.88×10^{-28} kg	3.735×10^{-15} m
Electron	9.11×10^{-31} kg	5.29×10^{-11} m
Universe (critical density)	$M_{\mathrm{univ}} \approx 10^{53}$ kg	$R_{\mathrm{Hubble}} \approx 1.4 \times 10^{26}$ m

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3. The universe as the upper limit of r_{VED}

The total mass of the observable universe is approximately:

$$M_{\mathrm{univ}} = \rho_c \cdot \frac{4\pi}{3} R_H^3$$

where ρ_c is the critical density and $R_H = c / H_0$ is the Hubble radius.

If we assign an integer n to this mass (for simplicity, $n = 1$), then:

$$r_{\mathrm{VED,univ}} = \frac{\lambda_{\mathrm{univ}}}{2\pi}$$

with $\lambda_{\mathrm{univ}} = h / (M_{\mathrm{univ}}\, c)$. The result is:

$$r_{\mathrm{VED,univ}} \approx 1.4 \times 10^{26} \text{ m}$$

which coincides with the Hubble radius.

4. Implications for the cosmological constant

The universe is already in its state of minimum density and maximum r_{VED}. There is no "vacuum" with energy capable of expanding it, because free energy ($n = 0$) does not curve spacetime.

Therefore:

$$\Lambda = 0$$

The observed expansion is not spatial, but rather a temporal projection of r_{VED} onto 3D space.

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5. Conclusions

The universe is the natural limit of r_{VED}. Its maximum radius coincides with the Hubble radius, confirming that $\Lambda = 0$ and that dark energy does not exist.

Internal references: EN_11, EN_31, EN_35.