

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

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DOI: 10.5281/zenodo.17172925

Framework: Einstein-VED

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Abstract

The confinement radius R_{VED} is inversely proportional to mass: $R_{VED} \propto 1 / m$. 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.

1. Introduction

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

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

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

$$R_{\text{VED}} \propto \frac{1}{m}$$

Mass and confinement radius are inversely proportional.

2. Hierarchy of R_{VED}

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

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

The total mass of the observable universe is approximately:

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

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:

$$R_{\text{VED,univ}} = \frac{\lambda_{\text{univ}}}{2\pi}$$

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

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

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.

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.