WAM Hypothesis: Gravitational Capacitor Model

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Abstract

We propose the **WAM (Universe-Antimatter-Matter)** model where antimatter (A) is bound to an exotically curved hyperspace (**SNP**), forming a *gravitational capacitor*. SNP generates dark energy (ρ_{DE}) through gradual discharge of curvature energy, while the **G-2 force** accounts for matter-antimatter separation in the early Universe. The model predicts observable anomalies in antimatter distribution and $\rho_{DE}(t)$ evolution.

1 Introduction

1.1 Theoretical context

- The missing antimatter problem in the observable Universe
- Unsolved issues of dark energy and dark matter
- Limitations of the standard ΛCDM cosmological model

1.2 Basic assumptions of the WAM model

- Existence of Special Hyperspace (SNP) as an antimatter-bound region
- Gravitational capacitor mechanism as a source of dark energy
- Higher-dimensional (5D) geometric effects in SNP

2 Mathematical model

2.1 Mechanics of the gravitational capacitor

SNP and the observable Universe act as a *gravitational capacitor*:

- **Gravitational capacitance** (in *gravifarads*, GF):

$$C_{GF} = \frac{R \cdot r}{G(R - r)} \quad \text{[GF]}, \tag{1}$$

  where:

  - R = SNP radius (antimatter boundary) $[m]$,
  - r = observable Universe radius $[m]$,
  - G = gravitational constant $[m^3 kg^{-1} s^{-2}]$,
  - GF dimensions:

$$[C_{GF}] = \frac{[R][r]}{[G][R-r]} = \frac{m \cdot m}{(m^3 kg^{-1} s^{-2}) \cdot m} = \frac{kg \cdot s^2}{m^2}$$

  - 1 GF = 1 $\frac{\mathrm{kg \cdot s^2}}{\mathrm{m^2}}$.

- **Stored energy**:

$$U = \frac{1}{2} C_{GF}\, \phi^2, \tag{2}$$

  where ϕ is the gravitational potential difference between SNP and the Universe (e.g., $\phi \sim \frac{GM}{r} - \frac{G''M}{R}$) with dimensions $[m^2/s^2]$.

  Dimensional consistency:

$$[U] = [C_{GF}][\phi^2] = \left(\frac{kg \cdot s^2}{m^2}\right) \cdot \left(\frac{m^4}{s^4}\right) = kg \cdot m^2/s^2 = J$$

- **Repulsive G-2 force** (antimatter-matter):

$$F_{\text{rep}} = \frac{(G'' - G) m_A m_M}{r^2}, \quad G'' > G, \tag{3}$$

  where G'' is the effective gravity constant for antimatter $[m^3 kg^{-1} s^{-2}]$.

2.2 Geometry and dynamics of the model

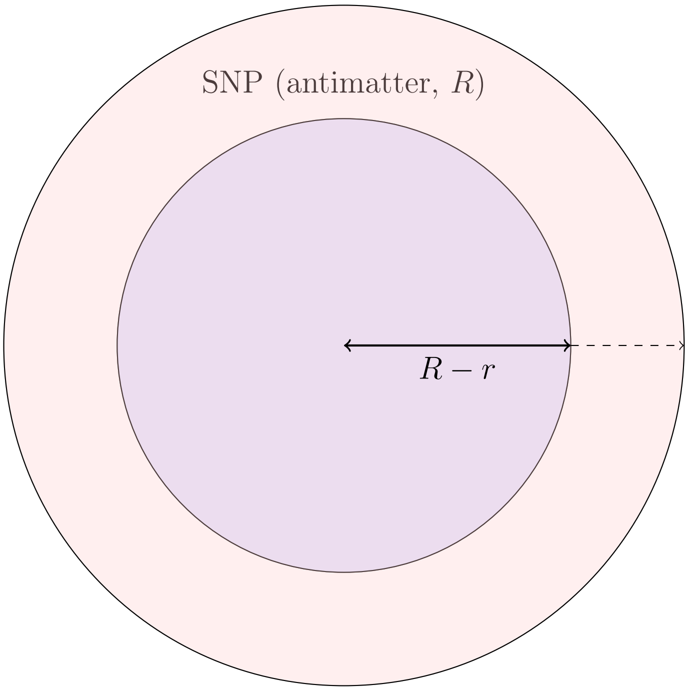

Figure 1: Gravitational capacitor model: spherical SNP (radius R) and observable Universe (radius r).

2.2.1 Spacetime dynamics

- **Dark energy density**:

$$\rho_{DE}(t) = \rho_\Lambda \left(1 - e^{-\gamma(R(t)-r(t))}\right), \tag{4}$$

  where $\gamma = 0.0205 \pm 0.0021$ determines the SNP curvature "discharge" rate.

- **SNP field equation**:

$$\nabla^2 \phi_{SNP} = -4\pi\kappa\rho_A. \tag{5}$$

2.2.2 SNP properties

- **SNP is not a mass source** – it's a higher-dimensional (5D) geometry that "adheres" antimatter through spacetime adhesion effects.

- **Spacetime curvature** manifests through:

  - Modified gravity constant for antimatter (G'')
  - Gravitational potential (ϕ) resulting from 4D-5D geometry difference

- These effects are **5-dimensional properties** and aren't subject to classical 4D theory constraints.

3 Observational consequences

3.1 SNP effect on Universe expansion

- **SNP's braking role**:
  - SNP expands slower than the Universe ($\beta \approx 0.9$),
  - Velocity difference $\Delta v = HR(1-\beta)$ generates "dark pressure".

- **Redshift**:

$$\frac{\Delta\lambda}{\lambda} \approx \underbrace{\frac{G''M}{R}}_{\text{SNP (5D)}} - \underbrace{\left(-\frac{GM}{r}\right)}_{\text{Matter (4D)}}$$

  When $G'' > G$ and $R \gg r$, SNP's contribution dominates – light undergoes redshift.

3.2 Numerical predictions

3.2.1 Redshift

- SNP-matter potential difference:

$$\Delta\phi \approx 1.57 \times 10^{16}\,\mathrm{m}^2/\mathrm{s}^2$$

- Gravitational redshift:

$$z_{\text{SNP}} \approx 0.17$$

- Redshift from SNP braking ($\beta = 0.9$):

$$z_{\text{exp}} \approx 0.03$$

- **Total effect**:

$$z_{\text{total}} \approx 0.2$$

3.2.2 Dependence on SNP parameters

$$z(R) \approx \frac{1}{c^2}\left(\frac{G''M}{R} + \frac{GM}{r}\right)$$

- For $R = 10^{28}$ m: $z \approx 0.17$
- For $R = 10^{27}$ m: $z \approx 0.25$
- **Limit**: When $R \to \infty$, $z \to \frac{GM}{c^2 r} \approx 0.01$ (matter only).

3.3 Hubble constant in the SNP model

$$H_0^{\text{observed}} = H_0^{\text{true}}\left(1 + \frac{(1-\beta)R}{r}\right)$$

- For $\beta = 0.9$, $R = 10^{28}$ m, $r = 4.4 \times 10^{26}$ m:

$$H_0^{\text{observed}} \approx 1.1 \cdot H_0^{\text{true}}$$

- **Resolution of the Hubble tension**

4 Discussion and testability

4.1 Key model predictions

- **No free antimatter** in the observable Universe (bound in SNP)
- **Modified expansion rate** for $z > 2$ (deviations from ΛCDM)
- **Anomalies in γ-ray distribution** at void boundaries

4.2 Experimental verification possibilities

- Measurement of G''/G in antimatter experiments (e.g., ALPHA-g)
- JWST spectral analysis for $z > 1$
- Euclid velocity field maps
- Search for antimatter signatures in cosmic rays

4.3 Interpretation of gravitational units

Gravifarad (GF) is a purely gravitational unit, independent of electromagnetism. Unlike farads, C_{GF} depends solely on geometry (R, r) and G:

$$1\ \mathrm{GF} = \frac{\mathrm{kg} \cdot \mathrm{s}^2}{\mathrm{m}^2}. \tag{6}$$

Example: For $R = 2 \times 10^{26}$ m, $r = 4.4 \times 10^{26}$ m:

$$C_{GF} \approx 2.1 \times 10^{62}\ \mathrm{GF}. \tag{7}$$

5 Summary

- The WAM model provides a consistent explanation for several unsolved cosmological problems
- The proposed gravitational capacitor mechanism connects geometry, dynamics, and antimatter physics
- The model generates testable predictions that can be verified in coming years

References

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