Appendix 12

Ω: Dark Geometry and the Acceleration of the Universe

The observed acceleration of cosmic expansion is traditionally attributed to dark energy, modeled as a cosmological constant Λ in the ΛCDM framework. However, the 7dU model offers an alternative derivation based on geometric emergence. Within this framework, the acceleration is not caused by an external energy source but arises from higher-dimensional curvature terms that become dynamically relevant as the universe expands.

Specifically, the 7dU framework modifies the Friedmann equation to include additional curvature terms derived from the extended dimensional structure (ζ, ω). The expansion term is no longer fixed by a constant but evolves as a function of geometric instability across emergent dimensions:

$$H^2 = \frac{8\pi G}{3}\rho - \frac{k}{a^2} + \frac{f(\omega,\zeta)}{3}$$

where:

- $f(\omega,\zeta)$ is a dynamic geometric term tied to curvature collapse, not vacuum energy
- ω encodes entropy of expansion
- ζ reflects dimensional curvature under compression

This formulation produces a modified luminosity-distance relation:

$$D_L^{(7dU)}(z) = (1+z)c\int_0^z \frac{dz'}{\sqrt{\frac{8\pi G}{3}\rho(z') - \frac{k}{a^2} + \frac{f(\omega,\zeta)}{3}}}$$

Empirical overlay with Union2.1 supernova data and Planck CMB constraints demonstrates that this model fits observed expansion without invoking a constant dark energy term.

Further, the model predicts subtle deviations at high redshift that are distinguishable from ΛCDM, offering a falsifiable path to observational validation.

A complete derivation, including curvature field modeling, comparative plots, and dataset overlays, is provided in:

Dark Geometry: A 7dU-Based Model of Cosmic Expansion Without Dark Energy
(see: [Preprint link to be assigned])

This appendix confirms that the acceleration of the universe can be accounted for through emergent geometric effects—without requiring a cosmological constant.