The Photonic Universe Hypothesis (PUH): A Cyclic, E■-Lattice Cosmology with Jet-Driven Rotation and Net-Zero Energy

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Abstract

The Photonic Universe Hypothesis (PUH) presents a cyclic model of the universe in which photons fold within a 248-dimensional E■ lattice during the rebound of a final Planck star. This process generates matter and antimatter, seeds cosmic structure through magnetic-field-driven jets, and induces a measurable cosmic rotation. PUH preserves net-zero total energy by reabsorbing all matter, photons, and spacetime curvature during the contraction phase (~100–186 Gyr). The model aligns with JWST early galaxy detections ($z \approx$ 10–14), Planck CMB anomalies, DESI BAO scales, Voyager plasma densities, and DAMA annual modulation. It produces falsifiable predictions for JWST, LISA, XFEL, and other instruments. PUH addresses limitations of ΛCDM, including the Hubble tension, early galaxy formation, and the entropy growth problem.

1. Introduction

The standard cosmological model (ΛCDM) successfully explains much of cosmic evolution but struggles with several observations: the Hubble tension, early galaxy formation, and the lack of a complete energy conservation framework. PUH introduces a cyclic cosmology powered by the rebound of a Planck star formed from ~$1.15\times10^{\blacksquare\blacksquare}$ primordial black holes. Its key innovations are: (1) photon folding into matter via an E■ lattice, (2) magnetic-field-driven jets that seed cosmic rotation, and (3) a net-zero energy principle ensuring all energy is recycled.

2. Theoretical Framework

2.1 Photon Folding and E■ Lattice

Photon folding is modeled as energy localization within an E■ root lattice, where curvature radius r_c sets the particle mass via $m = h / (2\pi\ r_c)$. For $r_c \approx 3.867\times10^{\blacksquare 13}$ m, the electron mass emerges naturally. The energy per fold (~$1\times10^{\blacksquare 1\blacksquare}$ J) is consistent with dark photon/axion-scale candidates. Folds occur at a characteristic frequency $f_{E8} \approx 1.6\times10^{\blacksquare\blacksquare\blacksquare}$ $s^{\blacksquare 1}$, representing rare but fundamental quantum-geometric events.

2.2 Planck Star and Magnetic Field

The final Planck star has mass $M_{shell} \approx 2.5\times10^{\blacksquare 1}$ kg and radius $r_{shell} \approx 7.4\times10^{2\blacksquare}$ m. A spacetime bubble of radius $r_{bubble} \approx 2.01\times10^{2\blacksquare}$ m sustains a magnetic field $B \approx 1.47$ μT. Magnetic energy density $u_B = B^2 / (2\ \mu_\blacksquare)$ yields jet powers $P \approx 4.215\times10^{1\blacksquare\blacksquare}$ W, ejecting $M_{jet} \approx 2.5\times10^{\blacksquare\blacksquare}$ kg at $v \approx 0.45c$ with angular momentum $J_{jet} \approx 2.5\times10^{\blacksquare\blacksquare}$ kg·m²/s.

2.3 Cosmic Rotation and Hubble Tension

Asymmetric jets induce a cosmic rotation with $\omega_{universe} \approx 6.34\times10^{\blacksquare 2\blacksquare}$ rad/s (~1 turn per 500 Gyr). This rotation modulates the observed Hubble constant, reconciling local (73.04 km/s/Mpc) and CMB (67.4 km/s/Mpc) measurements without dark energy modification.

2.4 Energy Conservation

PUH enforces net-zero energy: $E_{total} = E_{photons} + E_{matter} + E_{spacetime} \approx 0$. During contraction, all matter and radiation are reabsorbed into the Planck star, ensuring no net energy gain or loss over cycles.

3. Observational Matches

Matched phenomena: JWST early galaxies (z ~ 10–14), Planck CMB cold spot, DESI BAO (~150 Mpc), Voyager $n_\blacksquare \approx 0.05$–$0.11$ $cm^{\blacksquare 3}$, DAMA annual modulation, RHIC Breit–Wheeler pair production. These are consistent with PUH parameters but require further statistical testing.

4. Testable Predictions

Prediction	Instrument	Observable
Chiral GW background (10■■–10■^{1} Hz)	LISA	Net polarization bias
Galaxy spin bias at z ~ 8–14	JWST	≥60% clockwise bias
Photon scattering at 10■^{1}■ J	XFEL	E■ lattice perturbations
Fe/Mg/O ratios in early galaxies	JWST/NIRSpec	Non-ΛCDM metallicity evolution
BAO modulation by rotation	DESI/Euclid	67.4–73.04 km/s/Mpc H■ range

5. Conclusion

PUH offers a coherent, cyclic alternative to ΛCDM that unites quantum geometry, cosmology, and observational astronomy. Its predictions are falsifiable across multiple observational windows, making it suitable for immediate testing by existing instruments. Given its alignment with recent anomalies, further investigation by the physics community is warranted.