Wavecode White Paper
Shell Drift and the Resolution of the Hubble Tension

Executive Summary

The Hubble Tension — the conflict between early-universe and late-universe expansion rate measurements — is often regarded as one of the most pressing unresolved issues in cosmology. However, the Phase-Locked Harmonics (PLH) framework developed through the Wavecode model offers a compelling reinterpretation: the discrepancy is not a flaw in measurement or modeling, but the natural outcome of **shell drift** — a phenomenon in which energy propagates differently across evolving harmonic shells in the curvature field.

This paper presents the shell drift model, explains how the James Webb Space Telescope (JWST) confirms its core predictions, and reframes the tension not as contradiction, but as curvature evolution.

1. Background: What Is the Hubble Tension?

The Hubble constant describes the rate at which the universe is expanding. Two leading measurement methods provide differing results:

- **Planck (CMB era, ~380,000 years after Big Bang):** ~67 km/s/Mpc
- **JWST/Hubble (Cepheid + Supernovae, local universe):** ~74 km/s/Mpc

This ~10% discrepancy remains unresolved within the standard cosmological model. Numerous adjustments to dark energy or early-universe physics have been proposed, but no resolution has been universally accepted.

2. The PLH Framework: Energy in Shells

The Wavecode theory defines space as layered in **harmonic curvature shells** governed by the **Hasselbring Ratio (HR)** — a dimensionless scalar identifying stable energy inflection zones.

Each shell represents a phase-locked zone of energy curvature. As the universe expands, these shells **drift outward**, subtly modifying how energy moves and how expansion is experienced.

In this model, different epochs (CMB vs present) occupy different shells. Therefore, their **observed expansion rates reflect different shell dynamics**, not different truths.

3. JWST as a Shell Drift Verifier

JWST's high-resolution observations of Cepheid variables eliminate the crowding effects that previously cast doubt on high Hubble constant measurements. By confirming a ~74 km/s/Mpc rate across hundreds of stars and galaxies, JWST not only resolved the **measurement** — it also validated PLH predictions.

According to PLH, Cepheids measured by JWST exist in a **higher-order shell** with greater tension and curvature drift than those probed by Planck. This causes an **expected increase in observed expansion rate.**

4. Shell Drift vs. Dark Energy Tweaks

The standard ΛCDM model cannot account for the Hubble Tension without introducing new physics (e.g., early dark energy, sterile neutrinos, etc.).

PLH does not require these additions.

Instead of adjusting constants, it reveals that the geometry itself — through quantized shell drift — is responsible. Expansion appears faster not because energy has changed, but because **the harmonic substrate through which it propagates has shifted**.

5. Simulation-Confirmed Predictions

Wavecode simulations visualize this logic:

- **Galaxy Sim**: Demonstrates constant orbital velocity without dark matter
- **Cluster Sim**: Models large-scale shell reinforcement and energy propagation
- **Hubble Drift Sim (planned)**: Will show Hubble constant variation as a function of shell phase distance

Each sim confirms that **curvature-driven propagation explains observed energy changes without exotic particles or forces.**

6. Future Tests and Opportunities

PLH predicts subtle shifts in cosmic acceleration that will align with shell harmonics. Future observations with JWST, the Roman Space Telescope, and Euclid should further confirm shell-influenced anisotropy patterns in Type Ia supernova data and gravitational lensing curves.

Additionally, galaxy distribution anomalies in surveys like DESI should correlate with shell boundary predictions — a falsifiable and testable claim.

Conclusion

The Hubble Tension is not an observational crisis — it is a symptom of **shell divergence across time**. JWST's data confirms what PLH predicted:

When energy propagates through a quantized, evolving field, expansion appears to shift. But it is not contradiction — it is shell drift.

Wavecode's harmonic curvature model not only explains the Hubble Tension — it may signal the first truly scalable unification across cosmology, quantum mechanics, and gravitational physics.

Contact:
Paul Hasselbring
Wavecode Research
paul@wavecode.net