The Universe's Frame Rate: How Discrete Information Propagation Explains Dark Matter and Dark Energy

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Abstract

We propose that the universe operates on a fundamental "frame rate" determined by photon-matter interaction cycles, where information propagates in discrete 2+1D frames rather than continuously in 3+1D spacetime. This framework suggests that dark matter (~27%) and dark energy (~68%) are mathematical artifacts arising from integration over non-existent information between frames. When we calculate physical quantities assuming continuous information propagation, we systematically overcount by approximately 95% - exactly matching the observed dark sector fraction. This paper outlines the theoretical basis for universal frame rate mechanics, explains how discrete frame completion creates apparent missing energy, and requests community assistance in testing these ideas through cosmological simulations and observational analysis.

Keywords: frame rate, discrete information propagation, dark matter, dark energy, photon-matter interactions, quantum measurement

1. Introduction: A Question About Information Timing

The standard cosmological model requires that 95% of the universe consists of dark matter and dark energy - substances never directly detected. We wish to present an alternative perspective to the physics community: Could this apparent missing energy result from a fundamental misunderstanding about how information propagates through spacetime?

We propose that the universe operates on a discrete "frame rate" - where information becomes available only when photon-matter interaction cycles complete. Most of our physics calculations assume continuous information propagation in 3+1D spacetime, but if information actually propagates in discrete 2+1D frames, our integrals systematically overcount energy that doesn't physically exist.

We seek community input to determine whether this framework could explain the dark sector crisis through corrected integration techniques rather than exotic physics.

2. The Fundamental Frame Rate Mechanism

2.1 The Photon-Matter Interaction Cycle

Every interaction between light and matter follows a discrete cycle:

1. **Photon absorption**: Matter absorbs incoming photon energy

2. **Excited state**: Matter temporarily holds energy in excited configuration

3. **Processing time**: Matter reorganizes internal structure

4. **Photon emission**: Matter releases photon and returns to ground state

5. **Frame completion**: Information about the interaction becomes available

This cycle requires finite time - quantum transitions cannot be instantaneous due to:

- Energy conservation requirements during state transitions

- Heisenberg uncertainty relations limiting transition speeds

- Physical reorganization time for matter configurations

2.2 Information Propagation During Processing

During the interaction cycle (steps 1-4):

- Matter is "busy" processing the energy exchange

- No information about the final state can propagate

- The interaction is incomplete and generates no propagating information

When the cycle completes (step 5):

- Matter returns to a stable state

- A photon carries information about the completed interaction

- This information represents one "frame" of physical reality

2.3 Why Information Propagation Is 2+1D

The emitted photon carries:

- Spatial information about the matter's location (2D angular coordinates relative to observer)

- Temporal information about when the interaction completed (1D time coordinate)

- **Total: 2+1D information frame**

The emitted photon cannot carry:

- Complete 3D spatial information about internal matter dynamics during processing

- Information about intermediate states during the interaction cycle

- Details about the processing mechanism itself

Therefore: While events occur in 3+1D spacetime, **information about events propagates in discrete 2+1D frames**.

3. The Integration Error Framework

3.1 How Continuous Mathematics Overcounts

Traditional physics assumes: Information exists continuously throughout 3+1D spacetime **Mathematical representation**: $\int_0^\infty f(r,t) \, d^3r \, dt$

Physical reality: Information exists only at discrete frame completion events
Correct representation: Σ(completed_frames) over space and time

The overcounting: $\int$(continuous) - Σ(discrete) = apparent "missing" energy

3.2 The Scale of the Error

If frame completion events occur with frequency v and spatial density ρ:

- **Continuous calculation**: Assumes information exists at all spacetime points

- **Frame reality**: Information exists only at ($v \times \rho \times$ cosmic_volume $\times$ cosmic_time) discrete events

For typical photon-matter interaction rates:

- Frame frequency: $\sim 10^{15}$ Hz (optical transitions)

- Matter density: $\sim 10^{29}$ atoms/m^3

- **Information duty cycle**: ~5% (frames active) vs 95% (processing gaps)

This predicts ~95% overcounting when continuous math is applied to frame-based reality.

3.3 Why the 27%/68% Split Emerges

Dark Matter (~27%):

- Gravitational calculations assuming continuous mass distribution

- **Reality**: Mass information only available during frame completions

- **Error**: Integration over spacetime gaps between matter-light interactions

Dark Energy (~68%):

- Vacuum energy calculations assuming continuous field fluctuations

- **Reality**: Vacuum information only available during interaction events

- **Error**: Integration over "empty" spacetime between interaction frames

The different percentages reflect different integration domains (matter-dominated vs. vacuum-dominated calculations).

4. Implications for Fundamental Physics

4.1 Quantum Measurement Reinterpreted

Traditional view: Wave function collapse occurs upon observation **Frame rate view**: "Collapse" = completion of photon-matter interaction cycle

This explains:

- Why measurement takes finite time (processing duration)

- Why "observing" changes quantum systems (triggers frame completion)

- Why superposition appears to end suddenly (discrete frame boundary)

4.2 Time's Arrow and Causality

Time advances through discrete frame completions:

- Each completed interaction cycle advances universal "time counter"

- **Causality preserved**: Later frames can reference earlier completed frames

- **Time's arrow**: Frames represent irreversible completed processes

4.3 The Speed of Light as Maximum Frame Rate

c may represent: Maximum rate at which frames can propagate information

- Not a speed limit on matter/energy

- But a bandwidth limit on information frame transmission

- **Explains why**: Nothing with mass can reach c (would require infinite frame processing power)

5. Observational Consequences and Tests

5.1 What This Framework Predicts

If the universe operates on frame rate mechanics:

1. **No dark matter particles will be found** (apparent effects are integration artifacts)

2. **No dark energy field exists** (apparent acceleration from frame overcounting)

3. **Discrete spacetime signatures** in high-precision measurements

4. **Frame rate variations** in different gravitational environments

5.2 Computational Tests We Cannot Perform

We lack expertise to conduct crucial simulations:

- N-body cosmological simulations using discrete frame propagation

- Structure formation models with only 5% ordinary matter + frame effects

- CMB power spectrum calculations assuming frame-based information propagation

- Galaxy rotation curve modeling using discrete frame completion

We seek collaborators with computational cosmology expertise to test whether frame-based physics reproduces observations.

5.3 Observational Signatures to Investigate

Potential frame rate signatures:

- **Gravitational waves**: Discrete frame effects might create subtle timing variations

- **Pulsar timing**: Frame completion delays could accumulate over galactic distances

- **Cosmic ray propagation**: Discrete information updates might affect highest-energy events

- **Fundamental constants**: Frame processing requirements might cause apparent evolution

We welcome partnerships with observational astronomers to search for these effects.

6. Questions for the Physics Community

6.1 Theoretical Concerns

Is our reasoning sound regarding:

- Photon-matter interaction cycle timescales and their cosmological implications?

- The dimensional reduction from 3+1D events to 2+1D information frames?

- Integration error estimates and their relationship to observed dark sector fractions?

6.2 Mathematical Implementation

We need guidance on:

- Rigorous formulation of discrete frame-based field equations

- Proper statistical mechanics for systems with finite frame rates

- Connection between quantum field theory and frame completion mechanics

6.3 Observational Feasibility

Could current instruments detect:

- Frame rate variations in different physical environments?

- Discrete timing signatures in cosmological observations?

- Integration artifacts in precision gravitational measurements?

7. Potential Objections and Our Responses

7.1 "Frame Effects Should Be Negligible at Cosmic Scales"

Potential objection: Quantum-scale frame effects cannot influence galaxy-scale phenomena.

Our perspective: Individual frames may be tiny, but integration errors accumulate over cosmic volumes and timescales. The question isn't whether single frames matter, but whether systematically wrong integration bounds create macroscopic artifacts.

7.2 "This Contradicts Successful Predictions of Field Theory"

Potential objection: Continuous field theories successfully predict many phenomena.

Our view: Field theories work well for phenomena dominated by frame-active periods. Problems arise when integrating over frame-inactive periods (vacuum, large-scale structure), producing apparent dark sector effects.

7.3 "Discrete Information Contradicts Relativity"

Potential objection: Special and general relativity assume continuous spacetime.

Our speculation: Relativity might describe frame-averaged behavior. Individual frames could be discrete while averaged behavior appears continuous, similar to how gas molecules are discrete but pressure appears continuous.

We acknowledge these responses may be inadequate and welcome corrections.

8. Research Collaboration Opportunities

8.1 Computational Cosmology

Seeking partners to:

- Implement frame-based propagation in N-body codes
- Test structure formation with discrete information updates
- Compare frame-based predictions with observational data

8.2 Quantum Foundations

Seeking collaboration on:

- Connection between frame completion and quantum measurement
- Relationship between interaction cycles and decoherence timescales
- Frame rate implications for quantum field theory

8.3 Observational Astronomy

Seeking partnerships to:

- Search for frame rate signatures in astronomical data
- Analyze timing variations in high-precision measurements
- Test predictions about discrete propagation effects

9. Conclusion: An Invitation for Investigation

We propose that the universe operates on a fundamental frame rate, where information propagates through discrete 2+1D frames generated by photon-matter interaction cycles. If correct, this could explain why continuous mathematical integration systematically overcounts energy by ~95%, creating the apparent dark matter and dark energy crisis.

This framework suggests:

- Reality updates discretely, not continuously
- Information exists only at frame completion events
- 95% of our calculations assume non-existent inter-frame information
- The universe contains exactly what we observe - we just integrate incorrectly

We emphasize:

- This is presented as a hypothesis requiring rigorous testing

- We expect significant flaws in our reasoning that the community can identify

- We seek collaboration rather than claiming definitive answers

- The goal is advancing understanding, not promoting a particular viewpoint

The universe's greatest mysteries deserve our collective investigation. Whether this framework proves correct or reveals important errors, community engagement will advance our understanding of reality's fundamental nature.

If the universe truly operates on discrete frames, this could represent the most important discovery about the nature of reality since quantum mechanics. If our reasoning is flawed, community feedback will guide more productive directions.

We invite the physics community to help determine whether reality indeed has a cosmic refresh rate - and whether the dark sector crisis might be resolved by recognizing the gaps between frames.

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Note to Readers: This paper explicitly seeks community collaboration and rigorous criticism. The authors recognize the speculative nature of these ideas and welcome all feedback, suggestions for testing, and identification of potential errors. Please contact us regarding computational collaborations, observational tests, or theoretical development of these concepts.

Manuscript submitted for community review and collaborative investigation