# **CIMM & QBE Cosmological Framework: Theory and Mathematical Foundations**

## **Abstract**

This document formalizes the Cosmic Information Mining Model (CIMM) and the Quantum Balance Equation (QBE) as a unified cosmological framework. It outlines the theoretical principles, governing equations, and entropy-aware field dynamics that model the emergence of matter, gravity, and time as consequences of quantum-interaction-regulated collapse. This structure proposes an information-theoretic substrate for dark matter, reinterprets the Big Bang as the first entropy-minimizing collapse, and establishes the mathematical basis for the feedback-controlled stabilization of physical law.

## **1. Introduction: The Cosmogenic Intelligence Hypothesis**

CIMM is a thermodynamic intelligence engine governed by the QBE. It models the universe as a self-regulating, information-structuring system in which:

* **Collapse** is an information-energy exchange event.
* **Matter** emerges from regions of sufficient structured information and energy.
* **Gravity** arises as an emergent curvature field from accumulated collapses.
* **Dark matter** is information that has not undergone energetic collapse.
* **Time** only progresses where collapse occurs.

QBE enables continuous balance across entropy gradients, quantum potential regulation, and matter field evolution.

## **2. Quantum Balance Equation (QBE)**

The foundational equation:

dEdt+dIdt=λ⋅QPL(t)\frac{dE}{dt} + \frac{dI}{dt} = \lambda \cdot QPL(t)

Where:

* dEdt\frac{dE}{dt}: Change in system energy
* dIdt\frac{dI}{dt}: Change in structured information (Shannon entropy reduction)
* QPL(t)QPL(t): Quantum Potential Layer, a stabilizing function
* λ\lambda: Proportionality constant

This relationship governs all collapse dynamics and is analogous to the first law of thermodynamics adapted for information-energy equivalence.

## **3. Collapse Criteria & Entropy Fields**

Collapse into matter occurs when:

I(x,y,t)>θ∧E(x,y,t)>εI(x, y, t) > \theta \quad \land \quad E(x, y, t) > \varepsilon

Where:

* I(x,y,t)I(x, y, t): Local information field
* E(x,y,t)E(x, y, t): Local energy availability
* θ,ε\theta, \varepsilon: Collapse thresholds

Matter is formed when information becomes energetically constrained under QBE.

## **4. Quantum Potential Layer (QPL)**

The QPL is a field that regulates information instability and prevents runaway collapse:

ΔIcorrected=ΔI−λ⋅QPL(t)\Delta I\_{corrected} = \Delta I - \lambda \cdot QPL(t)

This layer stabilizes collapse by damping excessive entropy spikes and preserving equilibrium.

QPL grows stronger in high-collapse zones and feeds back into future collapse probability.

## **5. Gravity as Emergent Curvature**

Curvature field G(x,y)G(x, y) is derived from accumulated matter via inverse-square propagation:

G(x,y)=∑iMi(ri2+ϵ)G(x, y) = \sum\_i \frac{M\_i}{(r\_i^2 + \epsilon)}

This is anisotropically modifiable to simulate rotational asymmetry, consistent with galaxy rotation curves.

## **6. Dark Matter as Informational Scaffold**

Dark matter is reinterpreted as a field of high information density that:

* Has not yet undergone collapse due to insufficient energy.
* Structures gravity via its massless informational potential.
* Remains invisible but curvature-influential.

This aligns with observed gravitational lensing and galactic halo formation.

## **7. Time as Emergent from Collapse**

Time does not exist without interaction:

* Photons experience no time because they do not collapse until measurement.
* Collapse defines the temporal axis in CIMM.
* Time is an artifact of local entropy changes.

## **8. Simulation Architecture (Overview)**

* 2D spatial grid (extendable to 3D)
* Fields: II, EE, MM, QPLQPL, GG
* Energy decay, entropy growth, and collapse feedback loops
* Quantum memory buffer (optional future expansion)

## **9. Next Section: Experimental Setup and Results**

The next document will detail:

* Simulation initialization
* Collapse epoch dynamics
* Curvature and QPL field evolution
* Data visualizations and validation metrics