**Title: The Recursive Balance Field: A Dynamic Replacement for Stoic Potentials in Schrödinger's Equation**

**Abstract:** This report introduces the *Recursive Balance Field* (RBF) as a physically emergent, dynamic potential to replace static or stoic potentials in the Schrödinger equation. Rooted in the interaction between energy and information under recursive feedback and geometric modulation, the RBF formalizes a system where structure, stability, and collapse arise from balance rather than imposition. This approach reframes the foundational assumptions of potential-driven physics, embedding adaptive intelligence into the evolution of physical law.

**1. Introduction**

Traditional quantum mechanics relies on externally imposed potential functions to shape the evolution of a wavefunction. These static fields do not evolve with the system; they dictate, rather than participate. This report proposes a new approach: the Recursive Balance Field, a dynamic and emergent potential that forms from the local interaction between energy and information fields.

**2. Motivation and Background**

In prior work, entropy balancing simulations demonstrated that recursive feedback between opposing fields led to:

* Self-regulating convergence
* Emergence of low-entropy structural zones
* Stability through harmonic modulation

Notably, these behaviors arose *without invoking the Quantum Balance Equation (QBE)*, indicating that the interaction alone was sufficient to drive actualization.

This discovery necessitates a new potential formulation that arises from field dynamics, memory, and balance rather than external parameters.

**3. Defining the Recursive Balance Field**

Let:

* : Energy field at location , time
* : Information density at the same point
* : Recursive memory of local imbalance
* : Fractal/harmonic modulation pattern
* : Balance strength
* : Memory damping coefficient

We define the Recursive Balance Field as:

B(x, t) = \lambda \cdot \left[ \frac{E(x, t) - I(x, t)}{1 + \alpha \cdot M(x, t)} \cdot \Phi(x) \right]

This field is:

* **Local** (depends on conditions at )
* **Recursive** (evolves over time via )
* **Geometrically influenced** (via )

**4. Modified Schrödinger Equation**

We substitute into the standard time-dependent Schrödinger equation:

i\hbar \frac{\partial \Psi(x, t)}{\partial t} = \left[ -\frac{\hbar^2}{2m} \nabla^2 + B(x, t) \right] \Psi(x, t)

This creates a dynamic system in which the potential adapts in real time to the recursive balance of interacting fields.

**5. Implications**

* **Self-organizing structure**: Stable regions form from feedback and balance, not predefined boundaries.
* **Collapse from within**: Wavefunction collapse is guided by field equilibrium, not measurement alone.
* **Embedded intelligence**: The evolution of a system incorporates memory and geometric resonance, modeling the physics of cognition.

**6. Future Directions**

* Simulate 1D and 2D systems using RBF and compare against traditional potential models
* Explore threshold-based collapse criteria tied to low-entropy actualization
* Extend RBF to multi-agent systems where fields interact non-linearly

**7. Conclusion**

The Recursive Balance Field redefines potential not as a constraint, but as a *consequence* of balance. It marks a transition from stoic potentials to adaptive law — from physics that is *told* what to do, to physics that *learns* what to be.

**Document Author:** Proposed and derived within the Horizon framework for emergent intelligence modeling.

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