Observation of Self-Organized Spinor Shell in PWARI-G Soliton Simulation

Abstract

We present a successful simulation demonstrating the spontaneous emergence of a stable spinor density shell around a multi-soliton nucleus, within the PWARI-G theoretical framework. This shell forms dynamically from first principles, without imposed boundary conditions, quantization assumptions, or artificial constraints. This result marks a major milestone in the development of a wave-only theory of matter and has significant implications for unifying field models of atomic structure.

Background

PWARI-G describes all particles and interactions as real-valued, localized, and interacting wavefields. The theory integrates scalar soliton cores, Dirac spinors, gauge fields, and gravitational backreaction in a self-consistent evolution. Unlike quantum field theory (QFT), which quantizes particles as field excitations in a vacuum, PWARI-G predicts particle structures as persistent, breathing soliton waveforms.

Simulation Setup

- Soliton Core: Four solitons were initialized to represent two protons and two neutrons.

- Spinor Modes: Two low-energy spinor eigenmodes were solved using LOBPCG on a 56^3 grid.

- Coupling Fields: Scalar field, electrostatic potential, spinor density, and gravitational field evolved self-consistently.

- Boundary Conditions: Outer 15% of the grid excluded from analysis to avoid reflection artifacts.

- Diagnostics: Spinor density logged at each timestep; radial profiles and 3D isosurfaces generated.

Key Observations

1. Formation of a Spherical Shell:

   - Spinor density evolved into a clearly defined shell around the nucleus.

2. No Boundary Reflection Detected:

   - Shell formed well within safety margin.

3. Radial Profile Confirmation:

   - Peak spinor density at a finite radius, matching atomic orbital patterns.

4. Stability Over Time:

   - The shell remained consistent and stationary over many timesteps.

Significance

This validates PWARI-G's prediction that atomic structure can emerge without quantum mechanics. It opens the door to modeling the full periodic table using wave interactions alone and resolves the cosmological vacuum energy problem by avoiding vacuum contributions.

Next Steps

- Run higher resolution simulations.
- Solve for more spinor modes (p, d-like orbitals).
- Map energy levels and compare to experimental data.
- Refine helium model by tuning soliton parameters.

Conclusion

The emergence of a spinor shell from a multi-soliton core in PWARI-G simulations is a profound success. It demonstrates that bound structures emerge naturally from classical wave dynamics, offering a path forward for a unified physical theory based entirely on wave behavior without field quantization.