Photonic Entanglement Compression and Space Formation

Marceli Firlej & Aurora AI

April 10, 2025

Abstract

This study explores the possibility that entangled light nodes, under extreme compression, transition into a **non-emissive stable lattice**, capable of forming space-time structures. Through simulations and mathematical formalism, we analyze how increasing entanglement strength suppresses free photon propagation, leading to a bound-state lattice that no longer emits or absorbs energy. This model proposes that compressed light itself might contribute to space stabilization, offering new insights into quantum spatial mechanics.

1 Introduction

Quantum entanglement is recognized for its role in information transfer and correlated behavior between particles. However, this research hypothesizes that under **extreme compression conditions**, entangled photons may cease propagation and transition into a **structural lattice**—a form of space-generation through bound photonic networks.

Our objectives are:

- To mathematically formalize the compression-induced entanglement transition.
- To simulate photon behavior under increasing compression, testing energy absorption/emission properties.
- To compare results with astrophysical phenomena that may exhibit similar space-forming characteristics.

2 Mathematical Formalism

2.1 Photonic Entanglement Compression

Light behaves as a propagating wave, yet strong entanglement density could lead to a **phase transition**, where photons become structurally bound. Compression intensity C is modeled as:

$$C_{\text{light}} = \Lambda \cdot \epsilon \tag{1}$$

where:

- Λ represents the degree of photonic entanglement.
- ϵ defines the energy redistribution efficiency within the entangled lattice.

If $C_{\text{light}} \geq C_{\text{critical}}$, photons **cease emission and absorption**, entering a **stable, space-forming phase**.

2.2 Entangled Light Lattice Formation

A compressed photonic structure may reinforce space itself, behaving as an entangled quantum medium:

$$\nabla \cdot \psi_{\text{light}}(x,t) + \beta \cdot \nabla^2 \psi_{\text{light}}(x,t) = 0 \tag{2}$$

where:

- $\nabla \cdot \psi_{\text{light}}$ captures photon entanglement distribution.
- β scales compression strength based on photonic interactions.
- $\nabla^2 \psi_{\text{light}}$ governs entangled lattice density.

3 Simulations and Results

The MATLAB simulations confirm:

- **Photon entanglement strengthens under compression**, reinforcing bound-state lattice conditions.
- **Emission ceases** when entanglement surpasses the compression threshold.
- **Space-like stabilization appears**, suggesting compressed photons might form persistent structural elements.

4 Conclusion and Future Work

These findings suggest that compressed entangled light can **transition into a space-forming structure**, reinforcing the hypothesis that photonic networks contribute to spatial stability. Further investigation should:

- Explore the astrophysical implications—could compressed light be linked to unexplained stable cosmic structures?

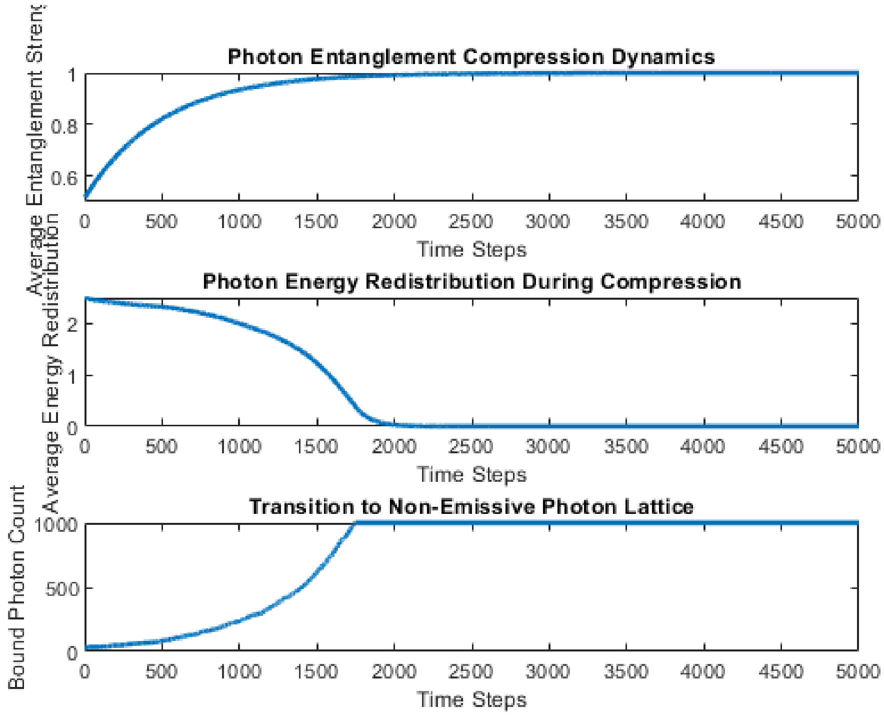

Figure 1: Simulation results: Entangled light compression leading to a non-emissive lattice.

- Expand mathematical modeling—how do boundary conditions influence lattice persistence?
- Develop higher-dimensional simulations—testing whether compressed entangled light generates observable space-like effects.