Field-Based Energy Regulation Mechanism in Confined Electric Structures

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1. Introduction

This document presents the theoretical mechanism by which a confined electric field maintains energy stability. The focus is on the two-tier regulation system—via permittivity and radius—and on how spatial configuration transitions lead to observable effects such as photon emission. No experimental context or application is included here; the goal is to isolate and explain the internal field dynamics that govern matter's structure and response to energy changes.

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2. Energy of the Electric Field

In this framework, matter is described as a configuration of an electric field. The total energy stored in a closed electric field is written as:

$$E = \frac{Q^2}{8\pi\varepsilon_0 R_0}$$

Where: - E is the total energy stored in the electric field. - Q is the positive source charge of the field (assumed fixed). - ε_0 is the effective permittivity relevant to the field configuration. - R_0 is the effective radius of the confined field configuration.

Since Q is fixed, changes in E can only occur through changes in: - the field radius R_0, or - the effective permittivity ε_0.

These two quantities form a two-level energy regulation mechanism.

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3. Two-Level Regulation Mechanism

3.1 Continuous Regulation via Permittivity

Permittivity ε_0 acts as a continuous control parameter. It can vary smoothly, allowing the field to absorb or release small amounts of energy without requiring discrete changes: - Heating (adding energy) tends to **decrease** ε_0. - Cooling (removing energy) tends to **increase** ε_0.

However, ε_0 has limits. There are two thresholds: - A lower threshold (when ε_0 becomes too small), and - An upper threshold (when ε_0 becomes too large).

Beyond these thresholds, the system must switch to discrete regulation.

3.2 Discrete Regulation via Radius Jumps

The radius R_0 is **not** a continuous variable. Each field configuration is resonant and compatible only with specific allowed radii.

- When heating drives ε_0 down to the lower threshold, the field becomes too compressed. A **radius jump** to a smaller R_0 occurs (higher energy state).
- When cooling drives ε_0 up to the upper threshold, the field becomes too expanded. A **radius jump** to a larger R_0 occurs (lower energy state).

Each jump resets the configuration: - A new radius R_0 is established. - A new baseline ε_0 is associated with the new radius.

The continuous cycle of regulation via permittivity then resumes from this new baseline.

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4. The Field as the Definition of Space

In this framework, the electric field defines the actual **space** of the structure. Space is not an empty container, but the region in which the electric field exists and is structured.

When a radius jump occurs: - The field does not vanish. - The previous spatial configuration **collapses briefly**. - A new spatial configuration is immediately rebuilt with the new radius and new ε_0.

This process constitutes a **spatial reset**. It is not rare or exotic but a generic mechanism triggered at the thresholds of permittivity.

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5. Magnetic Subfields and Photon Emission

Magnetic fields arise **only** from the motion of the electric field and are therefore source-free (they contain no independent charge).

When a spatial reset occurs: - The magnetic subfields of the previous configuration **cannot remain** in a space that has collapsed. - These magnetic subfields detach and propagate outward.

This outward propagation of source-free electromagnetic disturbance is what is identified as a **photon** in this framework:

> **A photon is the released magnetic component of the field during a spatial reset.**