The Refractive Plenum Gradient: Replacing the Spacetime Metric with Field Refraction

Carl Max Reed, M.D.
Independent Researcher
Six Mile, South Carolina, USA
cmxrmd@icloud.com

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Abstract

Within the strict, three-dimensional constraints of the Electromagnetic Energy Onlyverse (EMEO), Field Refraction is physically liberated from the abstract geometric constraints of a curved spacetime metric. Utilizing Robert Dicke's 1957 polarizable medium framework, space is recognized as nothing other than the electromagnetic field itself extending outward, while the localized velocity of light is governed entirely by the variable permittivity (ε) and permeability (μ) of this continuous field substrate. This paper demonstrates that a concentrated, self-sustaining toroidal soliton node modifies the local electromagnetic density of the surrounding continuous plenum, naturally generating a structural refractive index gradient ($n = \sqrt{\varepsilon\mu/\varepsilon_0\mu_0}$). When an independent electromagnetic wavefront passes through this high-density region, its velocity drops non-linearly, forcing the wavefront to refract and steer symmetrically inward toward the density of the field concentration. Field Refraction and orbital trajectories emerge natively as a pure optical refraction phenomenon within a material medium, completely eliminating the necessity for a curved geometric fabric or abstract quantum graviton exchanges.

Keywords: Polarizable Plenum, Refractive Index Gradient, Variable Permittivity, Non-metric Refraction, Self-Refraction, Continuous Field Medium

1 Introduction and the Refractive Material Medium

Mainstream general relativity asserts that observed orbital paths are a geometric consequence of a curved, four-dimensional spacetime fabric. This abstraction treats empty space as an active physical container capable of bending, stretching, and exerting mechanical forces on material objects.

The Electromagnetic Energy Onlyverse (EMEO) rejects this dualistic framework. Space possesses no intrinsic geometric metrics, active qualities, or structural curvature. Space is nothing other than the electromagnetic field itself extending outward. What physics misinterprets as curved spatial geometry is entirely a material phenomenon occurring within a continuous electromagnetic plenum. Grounded in Robert Dicke's 1957 framework, the medium behaves as a non-linear dielectric substrate whose localized density is directly modified by the presence of compressed energy configurations. The localized speed of light (v) is not a universal invariant, but a variable function determined strictly by the local scalar permittivity (ε) and permeability (μ) of the continuous field, which is light itself:

$$v = \frac{c}{n} = c\sqrt{\frac{\varepsilon_0\mu_0}{\varepsilon\mu}} \tag{1}$$

where c is the velocity of light in an unperturbed field state, and n represents the structural refractive index of the local medium. This non-linear field interaction signifies that the continuous plenum physically reacts to its own localized energy intensity. Unlike standard linear electrodynamics where independent wavefronts propagate without mutual interference, high local energy densities systematically alter the scalar permittivity (ε) and permeability (μ) of the medium, creating localized refractive gradients. This refractive index gradient belongs entirely to electromagnetic energy itself, because electromagnetic energy is the medium.

2 The Refractive Index Gradient and Inward Deflection

Let a stable, highly compressed toroidal soliton node—such as the Williamson–van der Mark electron vortex derived in Paper 2—exist within the continuous plenum. This concentrated localized energy packet alters the local field density of the surrounding substrate. This density modification decays non-linearly as a function of the distance (r) from the center of the loop, establishing a continuous, symmetrical field density gradient. Following the core electrodynamic scaling of Dicke's framework, the localized refractive index profile $n(r)$ as a function of the effective mass-energy equivalent M is expressed as:

$$n(r) = 1 + \frac{2GM}{c^2 r} \tag{2}$$

As a secondary, independent electromagnetic wavefront propagates through this field density gradient, it does not encounter curved spatial geometry. Instead, it experiences a localized variable refractive index that increases as the wavefront approaches the high-density center of the toroidal node. Because the index n is highest near the energy concentration, the local velocity of the wavefront drops non-linearly according to Equation (1).

This velocity differential across the spatial width of the wavefront forces a physical refraction. The segment of the wave closer to the high-density center slows down relative to the segment further away, causing the entire wavefront to steer and deflect symmetrically inward toward the higher density of the field. This material lens effect governs all paths of propagation through the medium, which is electromagnetic energy itself alone as its own medium. By evaluating this wave-front deflection under steady circular tracking conditions, the coordinate velocity (v) required for a propagation path to stabilize into a permanent circular trajectory of radius r emerges natively. Applying classical wave optics to this localized index gradient yields the exact orbital relation:

$$v_{\text{orbit}} = \frac{c}{\sqrt{n(r)}} \approx \sqrt{\frac{GM}{r}} \tag{3}$$

This derivation establishes that classical stable orbits are a pure structural consequence of optical refraction within a material medium, entirely independent of a spacetime metric.

3 Conclusion

By identifying this structural phenomenon as Field Refraction—driven directly by a variable refractive index gradient ($n = \sqrt{\varepsilon\mu/\varepsilon_0\mu_0}$)—the necessity for an active, curved spacetime fabric or an abstract quantum particle exchange is completely eliminated. Accelerations and orbital trajectories are shown to be pure optical steering manifestations emerging natively from the non-linear density variations of the continuous electromagnetic medium itself, which is light alone acting as its own medium.

References

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