ON WHITTAKER'S REPRESENTATION OF THE ELECTROMAGNETIC ENTITY IN VACUO, PART V: THE PRODUCTION OF TRANSVERSE FIELDS AND ENERGY BY SCALAR INTERFEROMETRY

ABSTRACT

In the fifth part of this series, it is shown that transverse fields and energy can be produced in vacuo by the interferometry of two beams prepared in such a way that the only component present in each beam is the physical time-like potential, proportional directly to Whittaker's magnetic flux $\dot{F} = i\dot{G}$ under conditions of circular polarization in both beams. Under this condition, each beam carries the minimum amount of energy possible. When interference occurs, this condition no longer holds, and transverse fields and energy appear through the interference of the two beams. It is shown that energy is conserved in this process.

INTRODUCTION

In the first four parts of this series, it has been shown that the tenets of contemporary electromagnetic theory are overthrown by a careful consideration of the work of Whittaker {1, 2}. For example, there exist physical scalar and longitudinal potentials in vacuo, and there is no gauge freedom in the Maxwell-Heaviside theory. The potential is therefore physical on a classical level, as evidenced by Barrett {3} and Evans et al. {4} in numerous experiments. It has been shown that a self-consistent theory of electromagnetism requires an internal gauge space of O(3) symmetry that is a physical internal space {5-12}. In the fourth part of this series, it was shown that the energy of the electromagnetic entity is minimized when only the scalar potential is present. This quantity is defined by:

$$\phi_L = \dot{F} = i\dot{G} = -\omega \frac{A^{(0)}}{\sqrt{2}}(X - iY)e^{i(\omega t - \kappa Z)} \tag{1}$$

under conditions of circular polarization. Here F and G are Whittaker's magnetic fluxes {1,2}; $A^{(0)}$ is the amplitude of the scalar potential, X and Y define the radius (R) of the beam through:

$$R^2 = X^2 + Y^2 \tag{2}$$

The exponent is the electromagnetic phase, where ω is the angular frequency at instant t and where κ is the wave-vector at point Z in the propagation axis. Therefore the physical scalar potential propagates, and is internally structured. It obeys the massless Klein-Gordon equation for the classical field:

$$\Box\phi_L = 0 \tag{3}$$

which quantizes {13} to an ensemble of massless photons straightforwardly. These carry the energy of the beam, which is

$$En = \frac{1}{\mu_0}\int \boldsymbol{B}^{(3)} \cdot \boldsymbol{B}^{(3)} dV \tag{4}$$

where μ_0 is the permeability in vacuo and $\boldsymbol{B}^{(3)}$ the Evans-Vigier field {5-12} of O(3) electrodynamics. Therefore Whittaker's analysis leads directly to O(3) electrodynamics and removes the problems inherent in canonical quantization {13} as usually practiced.

SCALAR INTERFEROMETRY

In part four of this series, {8} it was shown that the energy of the beam is minimized to eqn. (4) under the condition:

$$\kappa^2 (Y\cos\phi - X\sin\phi)^2 = 1 \tag{5}$$

where ϕ is the electromagnetic phase:

$$\phi \equiv \omega t - \kappa Z. \tag{6}$$

Under this condition,

$$|A| = |B| = |E| = 0 \tag{7}$$

and the only entity in the electromagnetic beam is the structured time-like potential (1), which is the time derivative of the Whittaker flux. Therefore this is the only source of energy, and indeed gives a stream of photons {5-8}. The potential energy inherent in the transverse fields $\boldsymbol{E}$ and $\boldsymbol{B}$ is still:

$$En(\text{pot}) = \frac{1}{\mu_0}\int \boldsymbol{B}^{(1)}\bullet\boldsymbol{B}^{(2)} + \boldsymbol{B}^{(2)}\bullet\boldsymbol{B}^{(1)} dV \tag{8}$$

but is not manifest in the beam. It is shown in this paper that scalar interferometry releases this potential energy because this process releases the transverse fields $\boldsymbol{E}$ and $\boldsymbol{B}$ inherent in the beam. There is therefore conservation of total energy, kinetic plus potential.

If for simplicity of argument, we choose $X = Y$ condition (5) reduces to:

$$\sin 2\phi = 1 - \frac{1}{\kappa^2 X^2}. \tag{9}$$

It seems to be a straightforward matter to prepare a circularly polarized beam in this minimum energy condition. When this type of "scalar beam" interferes with another beam prepared similarly in a minimum energy condition, the phase changes to:

$$\phi_1 = \omega t - \kappa\bullet(\boldsymbol{r}_1 - \boldsymbol{r}_2) \tag{10}$$

so condition (9) holds no longer in either beam. The transverse electric and magnetic plane waves reappear, and the potential energy is released to give a total energy in each beam of:

$$En = \frac{1}{\mu_0}\int \boldsymbol{B}^{(1)}\bullet\boldsymbol{B}^{(2)} + \boldsymbol{B}^{(2)}\bullet\boldsymbol{B}^{(1)} + \boldsymbol{B}^{(3)}\bullet\boldsymbol{B}^{(3)} dV \tag{11}$$

DISCUSSION

By interfering two scalar beams in this manner, it becomes possible to produce energy and transverse fields at the point of interference. This result appears to have numerous applications in energy devices, and is based on the work of Whittaker in a logical manner. All that is required is that the distance $\boldsymbol{r}_1$ be not equal to the distance $\boldsymbol{r}_2$, as in any type of interferometry. In previous papers in this series, it has been shown that it is possible that potentials exist in electromagnetic beams without fields, and under the condition (9), the only entity present is the physical time-like potential. These results are derived from the Maxwell-Heaviside equations following Whittaker's procedure, with the exception of the $\boldsymbol{B}^{(3)}$ field, which requires extension of Maxwell-Heaviside to O(3) electrodynamics.

Therefore the property of creating energy by scalar interference is due to upsetting the equality (9) by interferometry, i.e. by changing the left hand side while keeping the right hand side the same. When the equality no longer holds, transverse fields appear, with concomitant energy. It has therefore been shown that a stream of photons can exist under the condition (9), and this conclusion modifies our understanding of the electromagnetic entity at a fundamental level. Photons are actually produced by canonical quantization of ϕ_L, which is governed by $\Box\phi_L = 0$. This makes sense because both G and H are longitudinally directed, and photons propagate longitudinally. The canonical quantization of ϕ_L leads to spin one bosons as required, so produces the spin of the photon, with normalized components -1, 0, +1 replacing the received -1 and +1 of the usual theory. This is because the field has physical longitudinal components such as $\boldsymbol{B}^{(3)}$ {5-12}, and this result also allows for the existence of finite photon mass.

Eqn. (11) reveals that the extra energy released by breaking the equality (eqn. (9)) with interferometry is the usual energy content of transverse propagating waves. When the transverse fields appear, their energy is released in the zone of interference. Outside this zone, the beams, consisting of the structured scalar potential, appear to be undetectable to contemporary receivers such as antennae set up to detect transverse waves of the Maxwell-Heaviside theory, now almost entirely discredited by this collection of papers. It is to be emphasized that the integral over the product $\boldsymbol{B}^{(3)}\bullet\boldsymbol{B}^{(3)}$ in eqn. (11) is the energy content of the time-like scalar potential, which under condition (9) is the **only** entity present, and undetectable by conventional receivers. When condition (9) no longer holds, extra energy is released due to the transverse waves. In a very powerful beam, the energy content of the time-like potential alone may release sufficient energy to ignite a flammable substance such as high octane fuel. In this case, a single beam is sufficient without interferometry. The latter causes transverse fields to appear and to interfere with control systems by jamming, for example. The incoming beam would be undetectable until it met the target.

This is a strictly logical consequence of the work of Whittaker.

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