AETHER, GYRONS AND THE PHOTON

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1 Introduction

As an alternative to the current unsatisfactory situation in physics and philosophy, I am introducing a new kind of aether. (Yes, aether, but this one is Lorentz invariant, and therefore the Michelson-Morley experiment does not invalidate its existence; on the contrary, it yields a correct model for the photon.) Also, there is no ether drag on matter, because matter does not fly through the aether, it is a rotational dynamic state in the aether.

In this model the known extent of the physical universe is filled with the aether, which is a very hot gas (gyron kinetic temperature on the order of 10^{32} K). The particles that make up this fluid are called gyrons because the necessary physical properties of the aether emerge from the gyroscopic behavior of these fundamental particles that have a special identical oblong form. The length of each gyron is assumed to correspond to the Planck length which is 1.616×10^{-35} meter. For example, the proton, with a size on the order of 10^{-15} m, which is considered to be a rotational dynamic state in the aether, is of galactic proportion relative to the gyron. Thus, such entities as the electron and proton, that are currently termed "fundamental particles", are viewed as particular rotational flows (vortices) involving large numbers of gyrons, whose motion represents the fundamental form of energy.

Due to the particular shape of the gyrons, the aether, as a fluid, has very complicated properties that account for all such phenomena as charge, magnetism, spin, gravitation, and neutrinos. Photons and deBroglie waves in turn correspond to different possible waves in this fluid.

Because the gyrons are axially symmetric, the kinetics of the aether can be described by a ten-dimensional phase space: 3 location, 2 orientation, 3 linear momentum, and 2 angular momentum coordinates. The gyrons are in perpetual motion in a manner that separately conserves their linear and angular momenta in mutual collisions. The rms speed of gyrons corresponds to the speed of light; individual gyrons, however, can move slower or faster. The local fluctuation in speed and density of gyrons comprising the aether, produces the Heisenberg uncertainties, and causes radioactivity; while the tendency of this gas to assume a minimum in the phase space, accounts for the principle of least action and, hence, Hamiltonian mechanics. Physical reality is then just dynamics of the aether.

Known facts for the photon:

$\partial V/\partial t + c^2\nabla \cdot \mathbf{A} = 0$	Lorentz gauge.
$\mathbf{E} = -\partial \mathbf{A}/\partial t - \nabla V$	Electric field.
	Where V is the scalar potential, that was thought to be zero. $\mathbf{A}$ is the vector potential. c is the speed of light, and t time.
$\nabla \cdot \mathbf{E} = 0$	Stating that $\mathbf{E}$ has no sources.
$\mathbf{B} = \nabla \times \mathbf{A}$	Magnetic field.
	$\mathbf{E}$ and $\mathbf{B}$ are orthogonal to each other, and to the direction of propagation; they are circularly polarized, and are zero in the direction of propagation.
$W = (\epsilon_\circ/2)(\mathbf{E}^2 + c^2\mathbf{B}^2)$	Energy density.
$w = \int_{-\infty}^{+\infty} W\, d\mathrm{Vol} = h\nu$	Energy
	$\epsilon_\circ$ is the permittivity of vacuum, h the Planck constant, and ν frequency.
$\mathbf{P} = \epsilon_\circ(\mathbf{E} \times \mathbf{B})$	Momentum density
$p = \int_{-\infty}^{+\infty} \lvert\mathbf{P}\rvert d\mathrm{Vol} = h\nu/c$	Momentum in the direction of propagation
$\mathbf{J} = \mathbf{r} \times \mathbf{P}$	Angular momentum density
$j = \int_{-\infty}^{+\infty} \lvert\mathbf{J}\rvert d\mathrm{Vol} = h/2\pi = \hbar$	Angular momentum, called spin.
$r = c/2\pi\nu = \lambda/2\pi$	Radius of the photon.
	λ is the wavelength.

The following scalar and vector potentials generate all the above facts: Expressed in cylindrical coordinates (r, φ, z),

$$\begin{aligned} V &= (\gamma - \gamma_0)c^2 \\ A_r &= +\gamma c \cdot \cos\theta \\ A_\varphi &= \mp\gamma c \cdot \sin\theta \\ A_z &= \pm\gamma c \end{aligned}$$

where

$$\begin{aligned} \theta &= \pm\varphi + \sigma \\ \sigma &= 2\pi(z - ct)/\lambda \\ \gamma &= (\Lambda/\lambda)\exp[-(\pi/8)\sigma^2] \\ \gamma_0 &= \text{undetermined constant} \\ \Lambda &= [h/(2c^3\epsilon_\circ)]^{1/2} \end{aligned}$$

In Λ, h is viewed as a unity in the phase space; while $\epsilon_\circ$, which is dimensionless, cannot yet be clearly defined in kinetic terms.

The above result is not an empirical discovery that fits the experimental data, instead it is derived from fundamental equations of fluid mechanics, namely the conservation equations for substance and momentum: then, using the following relationships between electrical and mechanical quantities

$$\begin{aligned} V &= (\gamma - \gamma_0)c^2 \\ \mathbf{A} &= \gamma\mathbf{v} \end{aligned}$$

the Lorentz gauge converts to the continuity equation

$$\begin{aligned} \partial V/\partial t + c^2\nabla \cdot \mathbf{A} &= 0 \Longrightarrow \\ c^2\partial\gamma/\partial t + c^2\nabla\cdot(\gamma\mathbf{v}) &= 0 \end{aligned}$$

and the definition of the electrical field, becomes equivalent to momentum conservation

$$\begin{aligned}\partial\mathbf{A}/\partial t + \mathbf{E} + \nabla V &= 0 \Longrightarrow \\ \partial(\gamma\mathbf{v})/\partial t + \nabla\cdot(\gamma\mathbf{v}\mathbf{v}) + \nabla(\gamma c^2) &= 0\end{aligned}$$

where γc^2 corresponds to fluid pressure, and the term $\nabla\cdot(\gamma\mathbf{v}\mathbf{v})$ represents the convective acceleration, corresponding to the electric field intensity.

The magnetic field intensity becomes

$$\mathbf{B} = \nabla \times \mathbf{A} \Longrightarrow \nabla \times (\gamma\mathbf{v})$$

However, note that γ does not stand for mass density, but instead represents a dimensionless occupation density defined as follows:

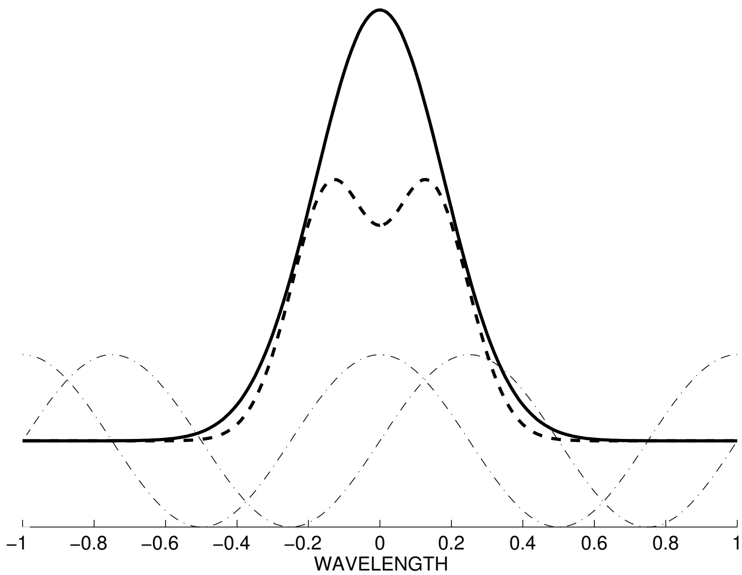
$$\gamma = vol_\circ/(vol - vol_\circ)$$

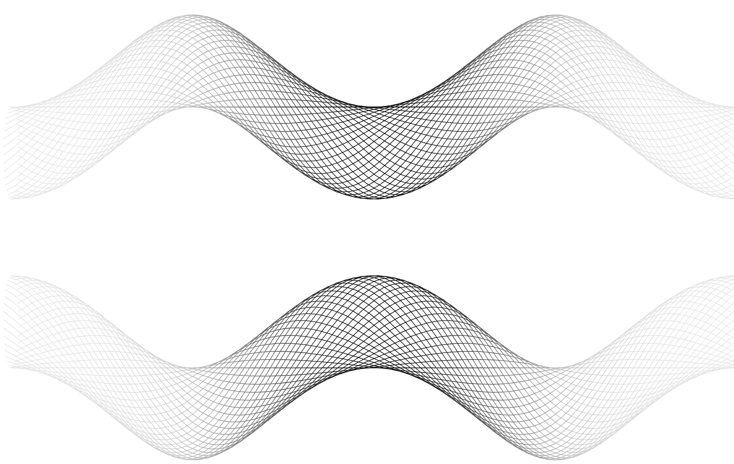
where vol is the volume of the void, and $vol_\circ$ is the volume occupied by the particles comprising the fluid, so that $1/\gamma$ represents its compressibility.

Thus, the fundamental particles that I call gyrons, are comprising the aether fluid (kinetically, a very hot anisotropic gas), and a solution of the conservation equations yields the above results, including circular polarization, while the diameter of the photon is determined from its stream function as follows:

$$\begin{aligned}\frac{dr}{dz} &= \frac{dr/dt}{dz/dt} = \frac{v_r}{v_z} = \frac{\gamma v_r}{\gamma v_z} = \frac{A_r}{A_z} = \cos\theta \\ r &= (\lambda/2\pi)\,|\sin\theta| \\ z &= \pm ct\end{aligned}$$

The figure below displays the flow pattern in the aether that generates the right- and left-polarized photons, with the associated plot of gyron and energy density.





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