Abstract. Electromagnetic radiation in deep space, such as starlight, constitutes a propagated disturbance in the prevailing background magnetic field. EM waves can therefore either be directed along the magnetic lines of force, or perpendicular to them, or at any angle in-between. With reference to the double helix theory of the magnetic field [1], the common denominator as between perpendicular radiation and parallel radiation will be established.

The Electromagnetic Wave Equations

I. The original electromagnetic wave equation for wireless radiation,

\[ \nabla^2 \mathbf{H} = \mu_0 \varepsilon_0 \frac{\partial^2 \mathbf{H}}{\partial t^2} \]  

was derived in 1864 for the magnetic intensity vector \( \mathbf{H} \) by Scottish physicist James Clerk Maxwell. It appeared in his 1865 paper “A Dynamical Theory of the Electromagnetic Field”, and it was derived in connection with Ampère’s Circuital Law, \( \mathbf{J} = \nabla \times \mathbf{H} = -\varepsilon_0 \frac{\partial^2 \mathbf{A}}{\partial t^2} \), and the magnetic induction equation, \( \nabla \times \mathbf{A} = \mu_0 \mathbf{H} \), where \( \mathbf{A} \) is the electromagnetic momentum [2]. Since \( \mathbf{H} \) is a vorticity in the momentum field, equation (1) must be describing the propagation of angular acceleration through a sea of tiny aethereal vortices that pervades all of space [3], [4], [5], [6].

This is further confirmed by the fact that another EM wave equation can be derived for the electric field vector \( \mathbf{E} \), where \( \mathbf{E} = -\frac{\partial \mathbf{A}}{\partial t} \), but only providing that \( \nabla \cdot \mathbf{E} = 0 \). This could be the case for a radial \( \mathbf{E} \) if it obeys an inverse square law in distance, but then this would mean that \( \nabla \times \mathbf{E} = 0 \), whereas the derivation requires that \( \nabla \times \mathbf{E} = -\mu_0 \frac{\partial \mathbf{H}}{\partial t} \) (Faraday’s Law). The only alternative is that \( \mathbf{E} \)
represents a force that accelerates $A$ transversely or axially to the polar origin, as would be the case in the context of a vortex that is undergoing angular acceleration. We will call the force $E_K$ in order to distinguish it from the radial electrostatic force, $E_S$. In a steady state magnetic field, the momentum density, $A$, will represent the aether circulation within the individual vortices and no transfer will be taking place between neighbouring vortices, but in the dynamic state where angular acceleration takes place, there will be an overflow of aether from the vortices into their immediate neighbours. This is known as time varying electromagnetic induction and it is the basis of electromagnetic waves.

The speed of these waves is $c$, where $c^2 = 1/\mu_o\varepsilon_o$, with $\mu_o$ representing magnetic permeability and $\varepsilon_o$ representing electric permittivity, and where $c$ is the speed of light. The magnetic permeability is related to the magnetic flux density while the electric permittivity is inversely related to the elasticity and the dielectric constant. The equation $c^2 = 1/\mu_o\varepsilon_o$ is then essentially Newton’s equation for the speed of a wave in an elastic solid, equivalent to $E = mc^2$ in the context [3].

**Perpendicular (Equatorial) EM Radiation**

II. In general the proposition is that space is a dielectric filled with tiny dipolar aether vortices that act like miniature electric circuits [3], [4], [5]. The aether itself is the fundamental electric fluid from which all matter is made, and hence its composition cannot be expressed in terms of observable matter other than to say that it is the stuff that gives fluids their characteristics. Each vortex would comprise of an aether sink (electron) in orbit with an aether source (positron). This would enable the operation of both Faraday’s Law and Ampère’s Circuital Law, by providing miniature circulating electric currents to be present everywhere in space. The time-varying electromagnetic induction process would take the form of an overflow of aether from one vortex to its neighbour, in conjunction with angular acceleration [6].

This then brings us to the issue of alignment and anisotropy. It needs to be shown how the electromagnetic wave propagation mechanism is the same, no matter what the orientation is between the ray and the prevailing background magnetic field lines, whether it be perpendicular or parallel. As per the double helix theory of the magnetic field [1], the vortices will all be spinning in the same direction as their immediate neighbours while aligned along their mutual rotation axes which trace out the prevailing solenoidal magnetic lines of force. In the case of a single magnetic field line in the steady state, there will be a cancelling flow of aether in both directions along the double helix, from positron to electron, while there will be zero flow between vortices in the equatorial plane. Since two neighbouring vortices will be rotating in the same direction, then in the equatorial plane they will be pressing against each other with centrifugal force while striving to dilate, in the manner that the water in
Newton’s rotating bucket presses outwards from the inside. This accounts for magnetic repulsion between like-magnetic poles since the field lines from each like-pole meet laterally.

However, in the dynamic state when electromagnetic radiation is passing through, the vortices will be angularly accelerating. The initial angular acceleration will have been caused at some point by the tangential action of an accelerating aethereal electric current (see Appendix I), and each subsequent angular acceleration along the line of the wave will be accompanied by an overflow of aether from vortex to vortex. This net flow is what gives EM radiation its mass.

In the case of perpendicular radiation, the process begins with Ampère’s Circuital Law in an AC emission circuit. This law describes how the tiny vortices in the space surrounding the conduction wire seek to align themselves around the electric current in the wire, such that their mutual rotation axes trace out the magnetic $\mathbf{H}$ field lines which form solenoidal concentric rings around the electric current. It is suggested here that excess aether flows from the wire into the vortices at the start of the process. The automatic alignment will be due to some fundamental gyroscopic effect in fluid dynamics that lies at the root of Ampère’s Circuital Law. In the steady state, Ampère’s Circuital Law will make sure that the circulating aether in the vortices, at the point of contact, will be flowing in the opposite direction to the aethereal current in the wire. This will prevent any further aether exchange between the conducting wire and the magnetic field since aether cannot pass laterally through itself. This is the fundamental hydrodynamical basis behind centrifugal force. There will be no radiation in the steady state, and when the power is switched off, the magnetic field, acting in the manner of a flywheel, will discharge its excess aether back into the conducting wire again, giving the current a final forward surge.

Aether transfer from conducting wire to vortices only occurs in the transient state when the vortices are precessing. In an AC emission circuit, this precession occurs when the electric current changes its direction, and so the vortices will therefore undergo a 180 degrees precession once every half-cycle, at the moment of the reversal. When the current reverses its direction it will then be flowing in the same direction as the aether in the adjacent vortices. The electron in each of these vortices draws the aether in, and this is the basis of the transverse $\mathbf{E}_K$ field that triggers the EM radiation process. Initially the $\mathbf{H}$ field, which is derived from the vorticity of each tiny vortex, will be perpendicular to the $\mathbf{E}_K$ field, and this will continue, within the context of the vortex, as $\mathbf{H}$ rotates on an axis perpendicular to the direction of propagation. At the 90 degrees stage in the cycle, vorticity, $\mathbf{H}$, and hence the kinetic energy will be maximum, while $\mathbf{E}_K$, being a force per unit charge which represents the potential energy factor, will have vanished. During the next quarter cycle, as the aether flow direction in the vortex begins to align with that of the next vortex further out, pressurized aether emerges from the positron and pushes against that next vortex. An $\mathbf{E}_K$
field is induced on it transversely, with a corresponding reaction against the first vortex. This back-EMF causes an angularly decelerating torque to act on the first vortex, so that by the time it has completed a 180 degrees precession, it will have returned once more to a state of minimum vorticity. Its excess aether will have been drawn across to the next vortex further out by that vortex’s electron. The EM radiation process will have begun.

Beyond the wire, the cycle of events as the EM wave radiates outwards, is in line with Faraday’s Law and Bernoulli’s Principle. The state of the aether in the vortices alternates between pressure, \( \mathbf{E}_\mathbf{K} \), and flow, \( \mathbf{A} \), where \( \nabla \times \mathbf{A} = \mu \mathbf{H} \). It therefore alternates between potential energy and kinetic energy. The aether that swirls from the positron of one vortex into the electron of the next vortex further out is *Maxwell’s displacement current*, known to Maxwell as the *electromagnetic momentum*, but known today in the textbooks as the *magnetic vector potential*, and represented by the vector field, \( \mathbf{A} \). The Poynting vector, \( \mathbf{E}_\mathbf{K} \times \mathbf{H} \), will remain positive throughout the process because of the reversal of both signs during the precession.

In summary the stages are, (i) pressurized aether from the conducting wire is drawn into the electron of the receiving vortex, (ii) this causes precession in line with Ampère’s Circuital Law, (iii) receiving electron drains the pressure away and the vortex swirls faster, (iv) maximum vorticity is reached after a quarter-cycle, (v) precession continues on its own angular momentum, (vi) excess pressurized aether emerges from the positron, (vii) vorticity begins to decrease as pressurized aether presses against the next vortex along the line, where the cycle then repeats.

This fine-grained vortex process explains why EM radiation at the fundamental level is totally coherent. It is a highly tuned mechanism that prevents the random scattering of the flowing aether. The process also demonstrates that the fundamental root of Faraday’s law of time-varying EM induction lies in Bernoulli’s Principle. Pressure and flow are interchangeable. This is the basis of the law of conservation of energy. The changing magnetic field, that is the cause of inducing an electric field in Faraday’s Law, can be seen to be a particular case of the changing of velocity that accompanies a change in hydrostatic pressure as per Bernoulli’s Principle. This fine-grained vortex process further exposes the Faraday time-varying electric field, \( \mathbf{E}_\mathbf{K} \), as being a transverse component in a vortex, where the radial component would be the Coulomb electrostatic field \( \mathbf{E}_\mathbf{S} \). The circumferential speed of the electrons and positrons in the vortices is the same as the average flow speed of aether between the positrons and electrons, and this speed is the speed of light, \( c \), and so it should not make any difference whether EM radiation in space is perpendicular or parallel to the prevailing magnetic lines of force.
Parallel (Axial) EM Radiation

III. Once the EM waves have left the vicinity of the emission source, they can pass through the prevailing background magnetic field lines at any angle. It is proposed that the mechanism described in Section II above applies equally to EM radiation propagating at any angle relative to the prevailing magnetic lines of force. This is possible if the precession axis in the active electron-positron vortex is perpendicular to the wave propagation direction. The point can be illustrated in the case of EM radiation propagating axially along a magnetic line of force in conjunction with the same stages described in Section II above, as in (i) pressurized aether is drawn into the electron of the receiving vortex, (ii) the initial effect of the pressure will be to cause the receiving vortex to precess while, (iii) its electron drains the aether pressure away and the vortex swirls faster, (iv) maximum vorticity is reached after a quarter-cycle, (v) precession continues under its own angular momentum, (vi) excess pressurized aether emerges from the positron, (vii) vorticity begins to decrease as pressurized aether presses against the next vortex along the line, where the cycle then repeats along the double helix.

Conclusion

IV. It is generally accepted that light is an electromagnetic wave and that hence it involves the propagation of electric and magnetic fields. However, since there are no apparent source electric circuits in deep space, questions are often asked regarding the geometry and physical nature of these propagating electric and magnetic fields in cases such as starlight or long wavelength radio waves.

We have certain electromagnetic relationships that help us to determine the physical structure of the luminiferous medium. \( \nabla \times \mathbf{A} = \mu \mathbf{H} \) and \( \mathbf{E}_K = -\partial \mathbf{A}/\partial t \) suggest that \( \mathbf{A} \) is a momentum corresponding to Maxwell’s displacement current \( \mathbf{E}_K \), and that \( \mathbf{H} \) is a vorticity/angular momentum. These relationships paint a picture of energy flow in connection with the angular acceleration of a vortex. This angular acceleration could be a precession, or a change of magnitude in the vorticity, or both.

In the proposed theory that space is densely packed with electron-positron vortices, it follows therefore that the electromagnetic wave equations apply on the picoscopic scale of the individual vortices, and that the electric and magnetic field vectors must be understood on this scale and in this context, and as such, the magnetic field vector \( \mathbf{H} \) refers to the vorticity of the individual tiny vortices. The plane wave sinusoidal solutions of Maxwell’s EM wave equations indicate that \( \mathbf{E}_K, \mathbf{H} \), and the direction of propagation are mutually perpendicular, and that \( \mathbf{E}_K \) and \( \mathbf{H} \) are in phase. In Section II however, it was explained that they are in fact out of phase by 90 degrees. This discrepancy is explained on the basis that the sinusoidal solutions are only looking at projections of \( \mathbf{E}_K \) and \( \mathbf{H} \) at
right angles to the direction of propagation. As each vortex precesses on an axis perpendicular to the direction of propagation, it actually reaches maximum vorticity, H, when H is parallel to this direction, while EK is minimum.

People ask why we cannot measure the magnetic field in a radio wave. It is because the magnetic field implied in the EM wave equation in H is not on the scale of the radio wavelengths. The electromagnetic quantities in the EM wave equations apply to the tiny electron-positron vortices that make up the luminiferous medium. There is no propagation of magnetic fields on the large scale. In fact, no magnetic fields propagate at all. A disturbance propagates through an already existing magnetic field and Maxwell’s equations in connection with EM radiation operate in the context of a single vortex. This contrasts with the case of transmission line pulses in which the magnetic, H, and electrostatic, ES, fields are observable on the laboratory scale [9] and travel in their own right. In the case of high frequency gamma rays, in certain circumstances, resonance with the natural frequency of the individual vortices can split them into an individual electron and an individual positron [7].

References


[4] Whittaker, E.T., “A History of the Theories of Aether and Electricity”, Chapter 4, pages 100-102, (1910) “All space, according to the younger Bernoulli, is permeated by a fluid aether, containing an immense number of excessively small whirlpools. The elasticity which the aether appears to possess, and in virtue of which it is able to transmit vibrations, is really due to the presence of these whirlpools; for, owing to centrifugal force, each whirlpool is continually striving to dilate, and so presses against the neighbouring whirlpools. It will be seen that Bernoulli is a thorough Cartesian in spirit; not only does he reject action at a...
distance, but he insists that even the elasticity of his aether shall be explicable in terms of matter and motion. This aggregate of small vortices, or "fine-grained turbulent motion," as it came to be called a century and a half later, * is interspersed with solid corpuscles, whose dimensions are small compared with their distances apart. These are pushed about by the whirlpools whenever the aether is disturbed, but never travel far from their original positions. A source of light communicates to its surroundings a disturbance which condenses the nearest whirlpools; these by their condensation displace the contiguous corpuscles from their equilibrium position; and these in turn produce condensations in the whirlpools next beyond them, so that vibrations are propagated in every direction from the luminous point. It is curious that Bernoulli speaks of these vibrations as longitudinal, and actually contrasts them with those of a stretched cord, which, "when it is slightly displaced from its rectilinear form, and then let go, performs transverse vibrations in a direction at right angles to the direction of the cord." When it is remembered that the objection to longitudinal vibrations, on the score of polarization, had already been clearly stated by Newton, and that Bernoulli’s aether closely resembles that which Maxwell invented in 1861-2 for the express purpose of securing transversality of vibration, one feels that perhaps no man ever so narrowly missed a great discovery. Bernoulli explained refraction by combining these ideas with those of his father. Within the pores of ponderable bodies the whirlpools are compressed, so the centrifugal force must vary in intensity from one medium to another. Thus a corpuscle situated in the interface between two media is acted on by a greater elastic force from one medium than from the other; and by applying the triangle of forces to find the-conditions of its equilibrium, the law of Snell and Descartes may be obtained. * Cf. Lord Kelvin's vortex-sponge aether, described later in this work."


“Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception and filling all space - the Akasha or luminiferous ether - which is acted upon by the life-giving Prana or creative force, calling into existence, in never ending cycles, all things and phenomena. The primary substance, thrown into infinitesimal whirls of prodigious velocity, becomes gross matter; the force subsiding, the motion ceases and matter disappears, reverting to the primary substance”.
http://www.rastko.rs/istorija/tesla/oniell-tesla.html
http://www.ascension-research.org/tesla.html

This quote is in relation to the speed of light, “The most probable surmise or guess at present is that the ether is a perfectly incompressible continuous fluid, in a state of fine-grained vortex motion, circulating with that same enormous speed. For it has been partly, though as yet incompletely, shown that such a vortex fluid would transmit waves of the same general nature as light waves — i.e., periodic disturbances across the line of propagation — and would transmit them at a rate of the same order of magnitude as the vortex or circulation speed” (Sir Oliver Lodge, 1937) The article then goes on to cite Lord Kelvin, “The Vortex Theory of Ether,” Phil. Mag. (1887) and Math. and Phys. Papers, vol. iv. and passim; also G. F. FitzGerald, Proc. Roy. Dub. Soc. (1899), or Collected Papers, pp. 154, 238, 472.
Appendix I

It is proposed that the aether is the ancient electric fluid that was abandoned in the nineteenth century, and that electric current is primarily a flow of pure aether. Positive particles are pushed along with the flow while negative particles eat their way in the opposite direction. These electric particles adopt the acceleration of the electric current, but due to resistance R (Ohm’s law $V = IR$), they reach a terminal speed much below the speed of the current itself.

Appendix II

(Cause and Effect in Faraday’s Law and Ampère’s Circuital Law)

It is well known that a changing magnetic field causes an electric field. This is expressed in Faraday’s law of electromagnetic induction,

$$\nabla \times \mathbf{E}_k = -\mu_0 \frac{\partial \mathbf{H}}{\partial t}$$

(1A)

It is also claimed that Ampère’s Circuital Law in connection with Maxwell’s displacement, as in,

$$\nabla \times \mathbf{H} = \varepsilon_0 \frac{\partial \mathbf{E}_k}{\partial t}$$

(2A)

means that a changing electric field causes a magnetic field. This is not in fact true. An electric current causes a magnetic field, and the electric field which drives this electric current does not have to be changing. Both of these two equations cover the situation where a changing magnetic field is causing an electric field. The induced electric field in question will necessarily be changing too, but that is incidental and nothing to do with any cause. The correct general rule, applying equally to both equations, is that,

(1) A changing magnetic field causes an electric field.

(2) An electric field causes a changing magnetic field.