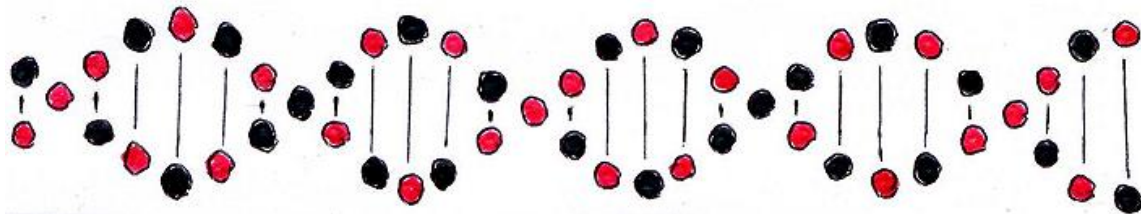


Electromagnetic Radiation in the Near Magnetic Field

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Abstract. This article follows on from the double helix theory of the magnetic field [1]. A closer look will be taken at the low energy electromagnetic radiation that is confined to a solenoidal path along the field lines within a near magnetic field.



Time Varying Electromagnetic Induction

I. Electromagnetic radiation is a propagation of energy through space. It involves an oscillation in the background magnetic field, and so we must assume that there is always a magnetic field present at every point in space between us and the most distant observable celestial objects. The electromagnetic wave equation, first derived by Maxwell in his 1864 paper [2], as well as involving the equation for time varying electromagnetic induction, also involves Ampère's Circuital Law. As such, it further follows that in deep space, at any point where starlight is passing through, there must exist a closed electric circuit, even though there is no visible presence of such. The electric circuit must therefore exist on a very small scale as part of the fabric of space itself.

In the laboratory, time varying electromagnetic induction can be observed when an alternating electric current in a primary circuit induces an alternating current in a nearby secondary circuit. Although the primary circuit will have its own magnetic field, which we will call *the near field*, the electromagnetic induction process does not

specifically depend on the secondary circuit being in the midst of the near field, as can be seen in the case of a toroidal transformer. In the toroidal transformer, the near field is wholly contained inside the primary solenoidal winding, whereas the energy transfer to the secondary winding occurs outside the primary solenoid. While the alternating near field represents the typical visual image of an alternating magnetic field, the actual alternating magnetic field in electromagnetic radiation is clearly occurring on a much smaller scale, even when the wavelength is very large such as in the case of radio waves.

Since electromagnetic radiation is believed to travel in straight lines irrespective of the intensity or orientation of the already existing background magnetic field that the radiation is passing through, we need to establish a more fundamental physical basis for the alternating magnetic field of the actual radiation itself, which doesn't depend on the geometry of the background magnetic field. This can be established by considering that space is a dielectric filled with tiny dipolar aether vortices that act like miniature electric circuits [3], [4], [5]. Each vortex would comprise of an aether sink (electron) in orbit with an aether source (positron). This would enable a miniature alternating electric current and a miniature alternating magnetic field to be present everywhere. 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. As per *the double helix theory of the magnetic field* [1], 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. Two neighbouring vortices will be rotating in the same direction, and so in the equatorial plane they will be pressing against each other with centrifugal force while striving to dilate. However, in the dynamic state when electromagnetic radiation is passing through, there will be a net flow of aether accompanied by an angular acceleration of the vortices. The net flow of aether is what gives EM radiation its mass. In the axial direction there will be an excess flow from positron to electron in one direction. The net spiral

flow that would ensue could account for the rotation of the plane of polarized light as was observed by Faraday and analysed in Part IV of Maxwell's 1861 paper [3].

In the equatorial plane, any overflow of aether could only follow a line along one side of a row of vortices, but since 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 [7], then the speed of the radiation will be much the same in the axial direction as in the equatorial direction.

In the case of a laboratory electric circuit, when the power is first switched on, the creation and inflation of the near magnetic field constitutes electromagnetic radiation. According to Maxwell in Part I of his 1861 paper, where he explains Ampère's Circuital law around about equation (9), the tiny vortices that already exist in space will re-orientate with their rotation axes tracing out solenoidal rings around the electric current. The creation of the near magnetic field is like the creation of smoke rings.

It is proposed that the aether is the ancient electric fluid that was abandoned in the nineteenth century, and that electric current is a flow of pure aether. Positive particles are pushed along with the flow while negative particles eat their way in the opposite direction. In a conducting circuit, the electric fluid that is flowing in the wire expands tangentially outwards into the surrounding space to create a magnetic field. The near magnetic field is akin to a storage tank. When the near magnetic field is forming during the dynamic state (accelerating state), the solenoidal field lines are expanding in length and so some of the radiation (aether flow) must necessarily be axial, flowing along the actual field lines themselves. Since the field is expanding in volume, some of the radiation must also be flowing in the equatorial plane of the vortices at right angles to the field lines. The axial radiation, while following the solenoidal path, will not be flowing in a straight line. It will be absorbed by the near magnetic field which it is in the process of forming. When the electric power is switched off again, the stored aether in the near magnetic field will be returned back into the circuit again and dissipated as resistive losses. An alternating near magnetic field is therefore an example of trapped electromagnetic radiation.

Far Field Radiation

II. The question remains as to what factors determine whether radiation will escape or remain trapped in the near field. Radiation is only formed in the dynamic (accelerating) state. If the current in an electric circuit were to rise indefinitely, then theoretically the near magnetic field would continue to expand, but due to resistive losses in the conducting wire, we never get to see this happening.

In the case of alternating current, after each half cycle, the aether could be either returned into the circuit again to be dissipated as resistive losses or radiated away as far field radiation. It is therefore proposed that there is a radiation pressure threshold above which the radiation escapes, and since radiation pressure increases with frequency, we might expect frequency to be a determining factor in whether or not radiation escapes from an AC circuit. We know that even in a low frequency resonant antenna circuit, radiation escapes, but it all comes down to whether the low frequency radiation in question is above or below the pressure threshold. The situation with escaped far field radiation has a degree of analogy with bodies moving in a hyperbolic path that have escaped from a gravitational field.

In certain contexts, the relationship between frequency and energy in electromagnetic radiation is established by the Planck law, $E = hf$, where E is energy, f is frequency, and h is Planck's constant. Care must however be taken, because this law is likely to have its origins within the electron orbital configurations of the atoms and molecules involved in the emission and absorption process. The idea that a frequency would be associated with a discrete energy contradicts classical wave theory unless the discrete energy packages have a direct association with a particular emission source. Otherwise, the only way that we could link energy to frequency would be if we were talking about energy density, as in pressure.

The Planck relationship is usually associated with what is believed to be the particle nature of radiation. A photon of light however, although possessing momentum and being emitted as a discrete quantized pulse, is not the same as a particle. A particle is a tangible and enduring sink or source that is surrounded by a force

field and which can be accelerated to arbitrary speeds. The light or gamma photon on the other hand has a fixed speed and no stationary existence, and unlike in the case of ordinary particles, two photons can pass right through each other. A photon is likely to be a discrete pulse of EM radiation associated with a particular energy transition within an atom or a molecule, or in the case of a gamma photon, with electron-positron pair production and annihilation, but primarily electromagnetic radiation has a wave nature.

Magnets in Motion

III. When a magnet moves, its magnetic field moves with it. There is a difference however, according to whether the magnet moves translationally or whether it rotates. In the case of translational motion any electromagnetic induction that occurs with respect to a test charge will involve the convective force $\mathbf{F} = q\mu_0\mathbf{v}\times\mathbf{H}$, hence suggesting that the electron-positron sea is entrained within the magnetic field during translational motion. For example, it makes no difference whether we move a bar magnet into a coil or whether we move the coil over the bar magnet. The result is the same. The velocity, \mathbf{v} , is measured relative to the electron-positron sea in both cases.

If, however a magnet rotates, other than about its axis of symmetry, the electron-positron sea will not rotate with it, and since a magnetic field is an alignment within this medium, the magnetic field will be continually re-aligning while its source magnet rotates. Any electromagnetic induction that occurs with respect to a test charge will involve the time-varying force from Faraday's Law, $\mathbf{E} = -\partial\mathbf{A}/\partial t$, where $\nabla\times\mathbf{A} = \mu_0\mathbf{H}$. This will result in electromagnetic radiation being emitted radially outwards from the centre of rotation. It will however be low energy radiation, and as like a planet in closed orbit, it will not escape from the rotating magnet's near field.

A DC transmission line pulse is a closed electric circulation moving like a caterpillar track between two conducting wires at a speed believed to be equal to the speed of light [8]. The surrounding near magnetic field is in a state of translational motion and so this electric

pulse is akin to a bar magnet trolling the transmission line like a trolleybus.

In mechanics, as a body follows its straight-line inertial path, it will similarly induce the background dipolar vortices to angularly accelerate as it shears past them, while inducing a centrifugal force field. This will cause a chain reaction like that which occurs in the case of the moving magnetic field, hence inducing a very low energy circular radiation flow.

Conclusion

IV. The idea that light travels in straight lines is true to the extent that it seems to be unperturbed by the intensity or orientation of the local magnetic field that it is propagating through. This can probably be attributed to the fact that light is a high frequency, and hence a high energy density (high pressure) radiation which easily escapes from both magnetic and gravitational fields. This is not necessarily the case with low frequency radio waves which are known to follow the contour of the Earth's surface. Light would never do that.

Angular acceleration seems to be closely associated with energy transfer. Mechanical collisions possess an analogy with time varying electromagnetic induction. In both cases, energy is transferred between two bodies in the form of waves of angular acceleration [9]. Inertial mass is analogous to inductance and the induction equation relating electric field to rate of change of current is analogous to Newton's second law.

The two transverse acceleration terms in orbital theory correspond respectively to the time varying term and the convective term in electromagnetic induction, the latter which is closely connected to Coriolis force [10]. In a Keplerian orbit there is no net angular acceleration and so the two terms cancel, therefore any radiation being emitted within the orbit is recycled into the internal motion and it does not escape. The possibility is however open that bodies being accelerated to an extremely high kinetic energy might leak energy by emitting inertial radiation that breaks out of its solenoidal path and escapes.

References

[1] Tombe, F.D., *“The Double Helix Theory of the Magnetic Field”* (2006)
Galilean Electrodynamics, Volume 24, Number 2, p.34, (March/April 2013)

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See also *“The Double Helix and the Electron-Positron Aether”* (2017)

<http://gsjournal.net/Science-Journals/Research%20Papers-Mechanics%20/%20Electrodynamics/Download/7057>

[2] Maxwell, J.C., *“A Dynamical Theory of the Electromagnetic Field”*, Philos. Trans. Roy. Soc. London **155**, pp 459-512 (1865). Abstract: Proceedings of the Royal Society of London 13, pp. 531--536 (1864).

Maxwell’s derivation of the electromagnetic wave equation is found in the link below in Part VI entitled *‘Electromagnetic Theory of Light’* which begins on page 497,

http://www.zpenergy.com/downloads/Maxwell_1864_4.pdf

[3] Maxwell, J.C., *“On Physical Lines of Force”*, Philosophical Magazine, Volume XXI, Fourth Series, London, (1861)

http://vacuum-physics.com/Maxwell/maxwell_oplf.pdf

[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."*

[5] O'Neill, John J., "**PRODIGAL GENIUS, Biography of Nikola Tesla**", Long Island, New York, 15th July 1944, quoting Tesla from his 1907 paper "**Man's Greatest Achievement**" which was published in 1930 in the Milwaukee Sentinel,

"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>

[6] Lodge, Sir Oliver, "**Ether (in physics)**", Encyclopaedia Britannica, Fourteenth Edition, Volume 8, Pages 751-755, (1937)

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.

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[7] Tombe, F.D., "**The Speed of Light**" (2014)

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[10] Tombe, F.D., "**The Coriolis Force in Maxwell's Equations**", (2010)

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