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Equilibrium in the Electric Circuit

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Abstract. **Electric current is not primarily a flow of charged particles. It is the flow of a fundamental fluid corresponding to the velocity field of the electric field and it can carry charged particles along with it. A dielectric medium impedes electric current due to the fact that the constituent dipoles become linearly polarized and induce a back EMF. A capacitor in an electric circuit utilizes the principle that a dielectric gap in the conducting material causes impedance and acts like a dam, hence enabling electricity to be stored in the circuit. This same dielectric effect also occurs in transmission lines. We will now contrast the discharging process in a capacitor with the generation of a transmission line pulse, while taking care not to ignore Ampère's Circuital Law.**

Electric Current

I. Electric current is the velocity/momentum field, **J** (or **A** in the case of displacement current), in the aether, where the corresponding acceleration/force field is the electric field **E**. Positively charged particles, being aether sources, will be pushed along by an accelerating aether flow, whereas negatively charged particles, being aether sinks, will eat their way towards the power source. This will cause linear polarization in a dielectric material, which will in turn cause a back EMF that will impede the applied current. See ***"The Double Helix Theory of the Magnetic Field"*** [1] which claims that there will always be a dielectric medium present, even in regions that are traditionally believed to be pure vacuum.

Discharging a Capacitor

II. Ivor Catt's article ***"Copper as a dielectric"*** [2] deals with the 'Reed Relay Pulse Generator'. When a charged section of coaxial cable is connected to an uncharged extension of indefinite length, a discharge

occurs into the extension. This discharge however is not as like when we discharge a capacitor back into the original charging circuit. In the latter case, the circuit is already pressurized, and due to the elasticity, the discharge procedure follows an exponential decay pattern.

In the case of the pulse generator however, the discharge is occurring into a virgin unpressurized zone, and what is observed is very revealing. The charge only spreads out to a distance that is exactly equal to the length of the original charged section, and during this process the original voltage exactly halves. After that, the entire charged region, now twice the original length, moves at high speed along the cable. Clearly the loss of voltage (pressure) has been replaced by a gain in kinetic energy (electric current), and we now need to ascertain the precise physical mechanism which dictates that the discharging procedure should halt at exactly the moment when the charged region has doubled in length. In order to analyze this, let's consider two long straight parallel wires forming a transmission line. The original charged section stretches from A on the left to B on the right. An extension of indefinite length is connected at B by two switches. The charge then spreads out at high speed to point C, where the length from A to C is exactly twice the length from B to C. When it reaches C, the expansion halts but the entire charged region continues to move to the right along the transmission line at high speed, vacating the original location.

Let's consider the upper wire of the original section from A to B to be positively charged with aether pressure and the lower wire to be negatively charged with aether tension. At the moment the extension is connected at B, the pressure in the upper wire will discharge to the right, into this extension, while the aether in the lower wire of the extension will move left to fill the rarefaction in the negatively charged region between A and B. In both cases the aether that is flowing in the two conducting wires will immediately arc, in opposite directions, across the dielectric gap between the wires, and in doing so this will alter the state of linear polarization in the dielectric material. In the case of the flow to the right in the upper wire, this will arc downwards to the lower wire inducing a new state of linear polarization, while to the left the state of polarization will be reduced. The polarized region to the left will discharge into the upper wire while being recharged to a lesser degree from the current in the lower wire, hence bringing it into equilibrium with the extended region. As polarization occurs in the extended region, it induces a back EMF which causes impedance. The current will therefore continually flow wide around the newly polarized parts. Meanwhile to the left the unpolarizing effect will work its way along towards the point A. We will have a rectangular region with a wave (step) at each end, expanding outwards from B in both directions, and within this region

there will emerge a new state of linear polarization that is only half as strong as that which was in the original charged region between A and B. In addition to this we will have a clockwise flow of aether around the perimeter of this expanding region which will generate a magnetic field as per Ampère's Circuital Law.

When the original charged region has been completely eaten up by the new expanding region, the path of flow in the lower wire will have reached the open end at A and will hence be blocked from further motion to the left. A reflection will take place, and at this moment, the entire package, now double the length of the original charged region, but half the voltage, will begin to move to the right and carry on indefinitely along the transmission line at high speed. The main flow will now be in the upper wire and moving to the right, and the circulation will be like a caterpillar track, with the flow in the bottom wire stationary. See also ***"Newton's Cradle and the Transmission Line"*** **[3]**.

We are dealing with what might be described as a *trolley photon* that shares some characteristics with electromagnetic radiation. Due to the modern day disbelief in a physical medium for the propagation of electromagnetic waves, the trolley photon has become confused with electromagnetic radiation because of the fact that they both involve the propagation of electromagnetic energy at high speed, in what is believed to be pure vacuum.

The Trolley Photon is not Electromagnetic Radiation

III. One should not get electromagnetic radiation/wireless telegraphy confused with the trolley photons of cable telegraphy that move along in the space between two conducting wires. Faraday's law is involved in electromagnetic radiation whereas it is not involved in the trolley photon mechanism, and since the electromagnetic wave equation follows on from Faraday's law, it cannot therefore be involved in cable telegraphy. Faraday's law is about the wireless transfer of energy between two electric circuits, whereas cable telegraphy is about single circuits that are moving or expanding between two conducting wires. The rotating electron-positron dipoles that fill all of space **[1]** constitute miniature electric circuits, and hence electromagnetic radiation that is propagating through space is the application of Faraday's law between neighbouring electron-positron dipoles. Within the individual rotating electron-positron dipoles, the torque that causes the angular acceleration comes from the electric field of Faraday's law, $\mathbf{E} = -\partial\mathbf{A}/\partial t$, whereas in the trolley photon (transmission line pulse) the electric field has a zero curl. The rate of

energy flow in electromagnetic radiation is expressed by a vector **E**×**H** known as the Poynting vector. This expression follows from the symmetry between the curl forms of Ampère's Circuital Law and the Faraday-Maxwell equation. The vector **E**, being the force, represents the potential energy component, while **H** represents the kinetic energy component, which is the fine-grained rotational kinetic energy that is associated with the magnetic moment. In the case of un-damped simple harmonic motion, force and velocity are out of phase by ninety degrees, however when power is being transferred as in the case of wave motion, this brings the two into phase. **E** and **H** will therefore be in phase in electromagnetic radiation.

The speed of electromagnetic radiation is determined by the average speed of aether flow from an angularly accelerating electron-positron dipole to its neighbour. The speed of a trolley photon on the other hand will be determined by the average speed of aether flow from the sources to the sinks along its path. The speed of a trolley photon should therefore be in the same order of magnitude as the speed of light, but not necessarily exactly equal to it. In the trolley photon , the electric field **E** at the leading edge step will move along in full phase with its accompanying magnetic field **H**.

References

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