Electric Current and Dielectrics

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***Abstract*. 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 can also be used in transmission lines. We will now examine the discharging process in a capacitor with reference to a transmission line pulse, while taking care not to ignore Ampère's Circuital Law. A general principle will be proposed in which an electric circulation commences at the contact point of discharge, and that this circulation expands in two opposite directions, eating its way backwards into the original charged zone while simultaneously extending forwards beyond it, such as to create a region that is twice as long as the original zone, but exhibiting a lesser degree of linear polarization.**

Electric Current

I. Electric current is the velocity/momentum field, **J** (or **A**), in the aether, where the corresponding acceleration/force field is the electric field **E**. Positively charged particles, being aether sources, will be pushed along with the 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. Cathode rays are a beam of electrons in an electric field and they are known to be able to exhibit wave behaviour, hence adding evidence to the theory that space is already densely packed with electrons. See *"The Double Helix Theory of the Magnetic Field"* **[1]** which claims that there will 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 extension of indefinite length, the behaviour is not as might be expected. The charge doesn't spread out indefinitely along the length of the cable, but rather it 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 process which dictates that the discharging procedure should halt at exactly the moment when the original 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 entire charged region continues to move to the right along the 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 conducting wires will immediately arc 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 which is arcing downwards to the lower wire, this will induce a new state of linear polarization, while in the case of the flow to the left in the lower wire which is arcing upwards to the upper wire, this will be having the effect of undoing the already existing state of polarization and reducing it to the level that is being newly induced in the extended region. As polarization occurs in the extended region, it induces a back EMF which causes impedance. The aether will therefore continually flow wide around the newly polarized parts. In the case of the lower wire, the unpolarizing effect will be impeded when equilibrium is reached with the pressure coming from the upper wire, and so likewise, the aether flow will go wide to circumvent this impedance. This process will repeat on an ongoing basis and 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 state of linear polarization that is only half as strong as that which was in the original charged region between A to 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 with the lesser voltage, 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, **E** = −∂**A**/∂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. Hence, as in all simple harmonic motion, **E** and **H** in electromagnetic radiation will be ninety degrees out of phase with each other in time. In the trolley photon however, the electric field **E** at the leading edge step will move along in full phase with its accompanying magnetic field **H**. 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.

References

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