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Source: http://www.energeticforum.com/renewable-energy/1631-peter-whatever-happened-eric-p-dollard-12.html
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Quote

08-18-2011, 01:11 AM #345 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Misinterpretation

Quote:

Originally Posted by **Raui**
Sorry I should have given a bit more explanation of the derivation and reasoning behind that number. First of all that number is a very rough number but should give one a rough idea of the ratio of strength if my reasoning is correct. Xenomorph is correct that I just did the ratio of permeability to permittivity. There is a possibility that it is not the number I gave before though. Heres a proof that argues against that number even if it's the most logical;

Imagine an inductor and a capacitor that are designed so that the electrostatic field in the capacitor contains the same energy as the energy surrounding the inductor in its magnetic field. That is to say mathematically;

$$\frac{Li^2}{2} = \frac{Cv^2}{2}$$

Where;
L is inductance
i is circuit current
C is capacitance
v is circuit voltage

We can remove the factor of 1/2 out because it's on both sides of the equation. While we do we'll expand inductance and capacitance into their components. For simplicity we'll assume only 1 turn on the solenoid. Now we have;

$$\frac{\mu A_i}{l} i^2 = \frac{\epsilon A_c}{d} v^2$$

Where;
u is vacuum permeability
Ai is inductor cross sectional area
l is conductor length
i is circuit current
e is vacuum permittivity
Ac is capacitor plate csa
d is capacitor plate separation.
v is circuit voltage

Now we must ensure that spatial relationships are irrelevant so we'll assume that Ai, l, Ac, d create an equal spatial relationship so we can rule out that the inductor or capacitor have more space/counterspace to work with than the other. Therefore these terms can be ignored;

$$\mu i^2 = \epsilon v^2$$

Therefore the ratio between voltage and current in terms of their ability to represent energy is given by;

$$\sqrt{\frac{\mu}{\epsilon}} = \frac{v}{i} \approx 376.730$$

I do think that 142372 sounds more correct but here the math says otherwise unless I've missed something. Can anybody find a flaw in my logic anywhere?

Raui

I did the math and there is a fundamental flaw in the chosen terms of V & A (V, Volts & A, Amperes).

Note that both E=Phi/time & e=Psi/C equal Volts and both i=Phi/L & I=Psi/time equal Amperes. One set is that of PROPORTION the other is that of INDUCTION. E & I are of induction where magnitude is relative to TIME or lines per second. Whereas e & i are proportions where magnitude is relative to the storage capacity and amount of lines stored. So for the measure of the stored dielectric energy it is (Ce^2)/2 or (psi^2)/(2C) and for the stored magnetic energy it is (Li^2)/2 or (phi^2)/(2L), the use of V for voltage is a bit misleading and quite common. The vagaries associated with "volts" and "amps" leads to confusion when dealing with two types of field energy (dielectric or magnetic) and should be avoid at all costs.

If you do the work properly you will find that e/i=sq root of (L/C) which simplifies to Phi/Psi=sq root of (L/C) both are in the form of NATURAL IMPEDANCE, of the circuit, Z(sub)0.

If simplified further, by taking capacity as C=((Permittivity)(Surface Area))/(Length) and inductance as L=((Permeability)(Length))/(Cross-section Area), we now have Phi/Psi=sq root of (Permeability/Permittivity) or the NATURAL IMPEDANCE OF SPACE (aka vacuum).

The last equation states that the quotient of the applied forces (or lines of force, phi & psi) equals the square root of the quotient of the storage of lines of force. This interpreted with Ohms Law, is shown to be an impedance Z and is that of the impedance of free space.

Note that both sides of the equation Phi/Psi=sq root of (Permeability/Permittivity) are in the form of "work" from the movement of the lines of force from one field energy to the other, or Magnetic to Dielectric and vice versa. This movement is not a dissipation such as a resistance r or a conductance g but is more similar to a reactance X and a suceptance B where energy isn't dissipated but stored and returned in an alternating fashion.

If the SI units e0=(10^7)/(4pi*c^2), Permittivity of Vacuum or Electric Constant, and u0=(4pi)/(10^7), Permeability of Vacuum or Magnetic Constant are used in the above equation for Permittivity & Permeability and where Psi is in Coulombs and Phi is in Webers then:

Weber/Coulomb=376.7303134617707... or Natural Impedance of Free-Space in Ohms, also known as Characteristic Impedance of Free-Space and its reciprocal is the Natural Admittance of Free-Space.

On a side note, I feel we need to stop looking at things as "numbers" and instead, as relationships between two quantities or geometries, because that's what your equations show, the relationship, or the somethings on the left are equal to the something on the right. The interpretation of electrical phenomena and its relationships are quite hard for most to take in, myself included, and any one relationship can have multiple meanings taken from it. I feel that the SI values of permittivity of vacuum e0 and permeability of vacuum u0 are a bit ambiguous because they are not taken to be the amount of dielectric or magnetic lines per area that vacuum can hold but based on the relationship of (speed of light) c =1/sqrt(e0/u0), using arbitrary values to denote e0 and u0, not direct measured values. Which is an interesting topic of its own. As to the exact meaning and usage of these equations and their effects on the dynamics of electricity, I currently don't feel confident to argue over, but felt compelled to point out a few things.

Garrett M

Last edited by garrettm4 : 02-22-2012 at 03:49 AM.

Quote

08-18-2011, 04:59 AM #348 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Quote:

> Originally Posted by **Web000x**
> *Do you mind elaborating on how you are seeing this quantity as equal/related to the speed of light?*
>
> *Thanks,*
>
> *Dave*

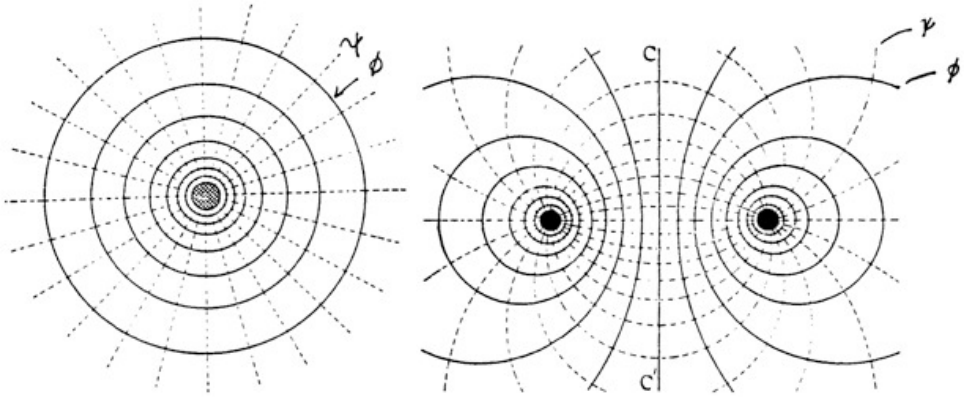
That equation is one of the fundamental components of JC Maxwells Dynamical Theory of the Electromagnetic Field which connected magnetism, electricity, and light into the now fundamental electromagnetic wave theory.

So as to my interpretation of e0, u0 & c, they merely show a relationship whose values ,e0 & u0, are arbitrarily chosen so that they equal the speed of light, c, when placed in the above equation. That doesn't mean they don't have practical value, but, they, e0 & u0, aren't defined to show anything useful about space around us, such as the actual permittivity or permeability of vacuum. So that is why I say their values and interpretation are a bit ambiguous and misleading, and is why, if you read on Wikipedia, they chose to call them respectively, magnetic constant and electric constant because they are not values taken from experimental measurement but theoretical proportions with arbitrary values (u0=4pi/10^7 & e0=10^7/4pi*c^2) that the theory uses.

Personally I think it would be best if those "constants" described the actual phenomena of the concentration of lines of force per unit area in the aether or vacuum. But, the concept of aether along with lines of force has been relegated to blaspheme in eyes of modern science. This can be seen from the concept of "polarization" (or storage of lines of force) of the vacuum is not possible because there is "nothing" to polarize, or something to that effect.

Note that my views on polarization (alignment of magnetic/dielectric domains/dipoles) lines of flux, permittivity and permeability are far from orthodox. I copied some of my personal notes below, to give some insight into how I perceive these, distinct yet interconnected, phenomena:

Flux lines never cross each other; they can be bunched, crowded, or thinned out over a large area. When they are bunched or crowded, each flux line has a repelling effect upon its neighboring flux line. This tends to keep them separated from one another. A flux line has tension. It can be stretched or constricted along the direction of the lines of force. This tension is somewhat like a stretched rubber band, prone to become as short as possible.



The Dielectric Circuit:

The energy of an electric-field is in the space outside of the "charged body", such as conducting wires or plates of a capacitor. Considering that all lines of dielectric force terminate on the surfaces of bounding conductors, the space between two charged bodies as the only seat of energy, then the expression "charged body" is best replaced by "terminal surface" of the field. These lines of dielectric force are directed inwards into the bounded insulating space and cause a mechanical attraction of conductor terminal surfaces.

Permittivity is the concentration of dielectric flux lines a specific dielectric is capable of supporting per cross-section area. This spatial concentration of dielectric flux lines is caused by the density of dielectric dipoles, or capacity per unit area a specific dielectric material has for flux lines. The action of spatially concentrating flux lines can also be looked at as the measure of ease by which a dielectric material may permit flux lines to enter or travel through it and is an analog of conductivity in an electric circuit.

The Magnetic Circuit:

The energy of a magnetic-field is in the space outside of the current conducting medium, such as a wire or coil. The energy of this field is composed of magnetic lines of force that form closed loops upon themselves and expand outward, from their source, into space. A collective of magnetic lines forms a magnetic flux.

Permeability is the concentration of magnetic flux lines, per cross-section area, a specific material is capable of supporting. This spatial concentration of magnetic flux lines is directly proportional to the density of magnetic domains a material has and inversely to its polarization or alignment of magnetic domains. The density of magnetic domains can be looked at as the capacity per unit area, a specific magnetic material has for flux lines and the magnitude of polarization as the capacity used. The action of spatially concentrating flux lines can also be looked at as the measure of ease by which a magnetic material will permit flux lines to enter or travel through it and is an analog of conductivity in an electric circuit.

I Hope that helps elaborate on what I wrote prior, granted I didn't really answer your question on how the above equation relates to the speed of light simply because I don't have an answer. Maybe you could tell me.

Garrett M

Last edited by garrettm4 : 01-11-2012 at 09:23 PM.

Quote

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Source: http://www.energeticforum.com/renewable-energy/1631-peter-whatever-happened-eric-p-dollard-13.html
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Quote

08-20-2011, 10:44 PM #370 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Syncronous Parameter Variation of Inductance L

Quote:

> Originally Posted by **7imix**
>
> *I think it is possible to reproduce the phenomena with solid-state components, but with much lower efficiency. Most solid state components will immediately be fried (I've fried tons) when switching an inductor with the change in voltage over time (dv/dt) required to produce the "opposite of dc" waveform, sharp impulses with a duty cycle as close to zero as practical. Components that are able to withstand the voltages required may not have the switching speeds needed to get close to the resonant frequency, much less the quarter wave. However components are continuing to improve and there may be a sweet spot of components -- a microcontroller, optocouplers or digital isolators, mosfet drivers and mosfets or IGBTs -- that will demonstrate the phenomena with less magnifying than the extremely high voltage spark gap setups.*

I have personally gotten a crude model of a synchronous parameter variation machine to work built using solid-state parts in a parallel capacitor/inductor configuration. I'll give more details in a bit, but first I want to talk about the problems encountered, why they happen and what to do about them.

From an engineering point-of-view you never want to commutate an inductance because as you have stated above the magnitude of differential voltage per differential time is outside of the specifications of any and all solid-state parts.

To help those who don't know why this takes place I have copied some more of my notes below on the subject:

... A constant quantity of current will hold a loop of force at a constant distance from the conductor passing the current, thus, no energy movement from expansion or contraction of the loop takes place. If the flow of current increases, energy is absorbed and stored by the field as the loops now push outward at a corresponding velocity. Because the energy is in motion an EMF must accompany the current flow in order for it to represent power or work. The magnitude of this EMF corresponds directly to the velocity of the field or the time-rate of expansion or collapse of the loops. If the current ceases to change in magnitude thereby becoming constant, no EMF accompanies it, as no power is being absorbed by the field or work being done. If the current decreases, this ***represents a negative velocity*** *or collapse of the field whereby the loops contract.* ***Because the EMF corresponds directly to the velocity of the magnetic-field, it reverses polarity, and thereby reverses power, whereby the stored energy now moves from the collapsing field back into the conducting wire by the action of "cutting"****. Since no power is required to maintain a field, only current, the static or stationary field represents stored energy and an expansion or contraction of the field or loops can be seen as power or work...*

Note that in the most basic sense, inductors take a current and produce a voltage, so a rapidly collapsing magnetic-field converts the energy stored (((n*Phi*10^-8)/i)i^2)f/2 into a voltage to over come any resistance present so as to release its stored energy. If an "infinite resistance" is "seen" which happens during commutation be it mechanical or transistorized, huge transients of voltage occur from the very nature of the beast... the faster the flux lines "cut" the conducting wire the greater the voltage produced as per the law of electromagnetic induction.

The point you will come to realize is that commutation is bad for transistors and also makes a lot of "electromagnetic noise" if mechanically done.

The Solution to the problem of "well how do I change the total in circuit value of inductance dynamically" would be to actually look at what constitutes an inductance and change that instead of commutating two inductors or the number of windings on an inductor. So for all those who don't know what actually comprises inductance of an inductor, the most quintessential form of inductance is in the form of:
L=(n*phi*10^-8)/i
(10^-8 is to give volts from flux lines one line is one maxwell and one hundred million or 10^8 lines is a weber, one weber per second is one volt)
where phi is composed of:
phi=uHA

u= permeability of A
H= magnetic-field intensity
A= Cross-Section Area of the magnetic-field

Or we now have:
(n*(uHA)*10^-8)/i

This formula can be arranged in many different forms, one of which, you will find of interest is the one, used by the Russians in their mechanical parametric apparatus and is of the form:

L=(n^2/R)10^-8
where n is uniform number of turns and R is reluctance which is formulated as:
R= l/uA
where
l= length of magnetic path
u= permeability of magnetic path
A= cross-section area of magnetic path

If you read what they wrote, the Russians found that in their rotary device that if permeability was used as the parameter for changing inductance that the device would not work, when they used iron to complete the magnetic path (magnetic path length remained the same). They then tested an aluminum disk having 7 blades and found the device would work. The reason I say they used reluctance is from the fact that, eddy currents generated by flux lines cutting the aluminum repelled the magnetic field making the magnetic path longer and shorter as it rotated in and out of the field, thus changing its inductance periodically.

For those who don't believe that the aluminum disk changed the parameter of reluctance take into consideration that:

No mutual attraction or repulsion between two bodies can result from flux lines of a magnetic-field unless each body has an independent magnetic-field. In other words, a magnetic field can only produce a force against another magnetic-field or a "magnetized body" can only exert force against another "magnetized body". Therefore any interaction a non-magnetized body displays in a magnetic-field is from an induced magnetic-field around the body. The Induced magnetic-field is caused by two distinct phenomena, one from the magnetic lines of force "cutting" all conducting surfaces in the field, indirectly causing electric currents, the other, by the magnetic lines of force passing through all materials in the field, causing polarization of the materials (magnetization).

Thus the flux lines of the magnetic-field were repelled by the induced field of the aluminum and pass around rather than through, thereby changing the length of the magnetic path. Here, a diamagnetic material such as pyrolitic-graphite or bismuth would be a better choice for the bladed disc used by the Russians. In theory, a non conductive or dielectric material that has diamagnetic properties or very very low permeability (lower than that of air) would be needed for maximum efficiency of design.

As to the static approach of changing the magnitude of inductance without changing the number of wires or number of inductors or even the physical dimensions of the core. We have learned that inductance is a compound entity, we can change notably the length of its magnetic path, the permeability of the area enclosed by the magnetic field or our applied magnetomotive force or displacement current, the latter not so useful for these kind of devices.

The solution is seen by changing only its internal factors rather than physical ones. One solution to the problem can be seen in the form of controlling the properties of the area in which the the magnetic-field encloses, thus the shape of the iron core and the use of its shape to control the length of the magnetic path or alternatively the overall storage capacity or relative permeability. If we follow what the Russians did, we would change the length of the path periodically. A common core design that uses changing lengths of a magnetic path is that of a ferro-resonant transformer, an "off the shelf" part that can easily be put to use. The use of a control winding that you short-out periodically is one way to use the ferro-resonant core design. Note, there are many draw backs to using a ferro-resonant transformer core but I won't get into them right now. A method of changing the relative permeability and not the length of the magnetic path, can be seen as an embodiment of the "magnetic amplifier" (amplifier as in a small force controlling a larger one) where you control the relative permeability or "inductive capacity" by its overall state of magnetization (or saturation) with a control winding. In this case you would apply power to the control winding periodically to control the over all inductance. The shape of a simple "magamp" is that of the "E-Core" where the control winding is wound around the center leg and the inductor windings go around the outer two legs. The specific details of its implementation are subject to personal choice, i.e. use of diodes and dc control or no diodes and ac control ect.

The assumption of the above design, is that you are "modulating" a "carrier wave", or more simply you have power flowing though the variable inductors and are indirectly controlling the inductance at specific times (2x frequency of carrier wave) along the current and voltage quadrature-wave-forms, as apposed to directly switching the inductance.

In closing, you don't have to commutate to change the in circuit inductance value. The information above is by no means complete or through and is just a rough place to start for those who would like to build a solid state variable inductor that doesn't destroy the control circuit.

Please read my earlier post on permeability and what it does, this may assist in the understanding of the above work.

Good luck,

Garrett M

Last edited by garrettm4 : 02-22-2012 at 04:01 AM.

Quote

Quote

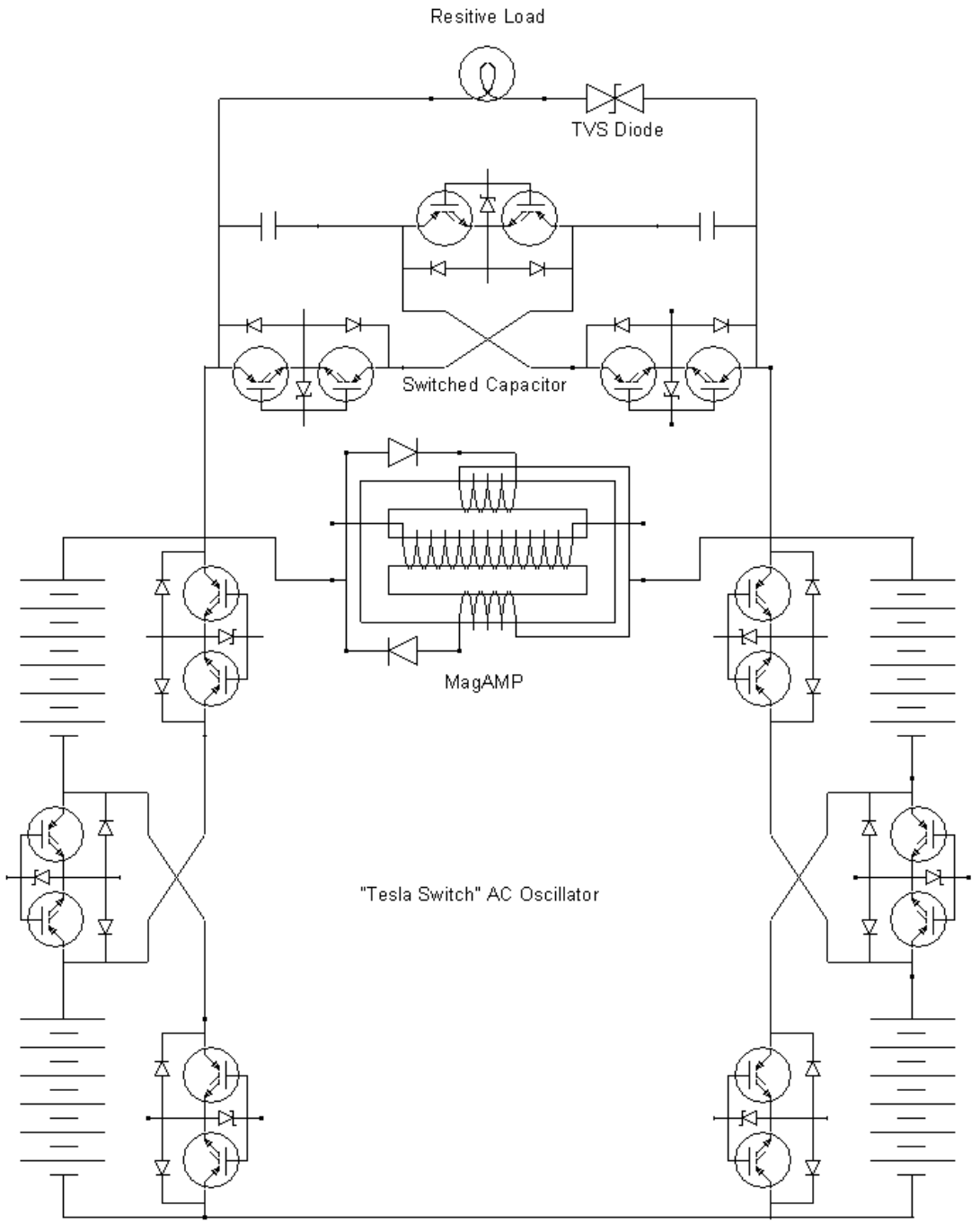
08-21-2011, 02:44 PM #373 (permalink)

garrettm4
Member

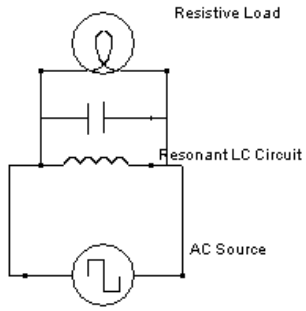
Join Date: Oct 2010
Posts: 38

Solid-State SPV Generator Design

For those who would like to know how I constructed my solid-state SPV generator take a glance at the circuit diagram:



Equivalent Circuit



Parameters L & C change
@ 2x AC oscillator freq

Switched Capacitor goes from
C0, large capacitance to
C1, small capacitance

MagAMP goes from
L0, small inductance to
L1, large inductance

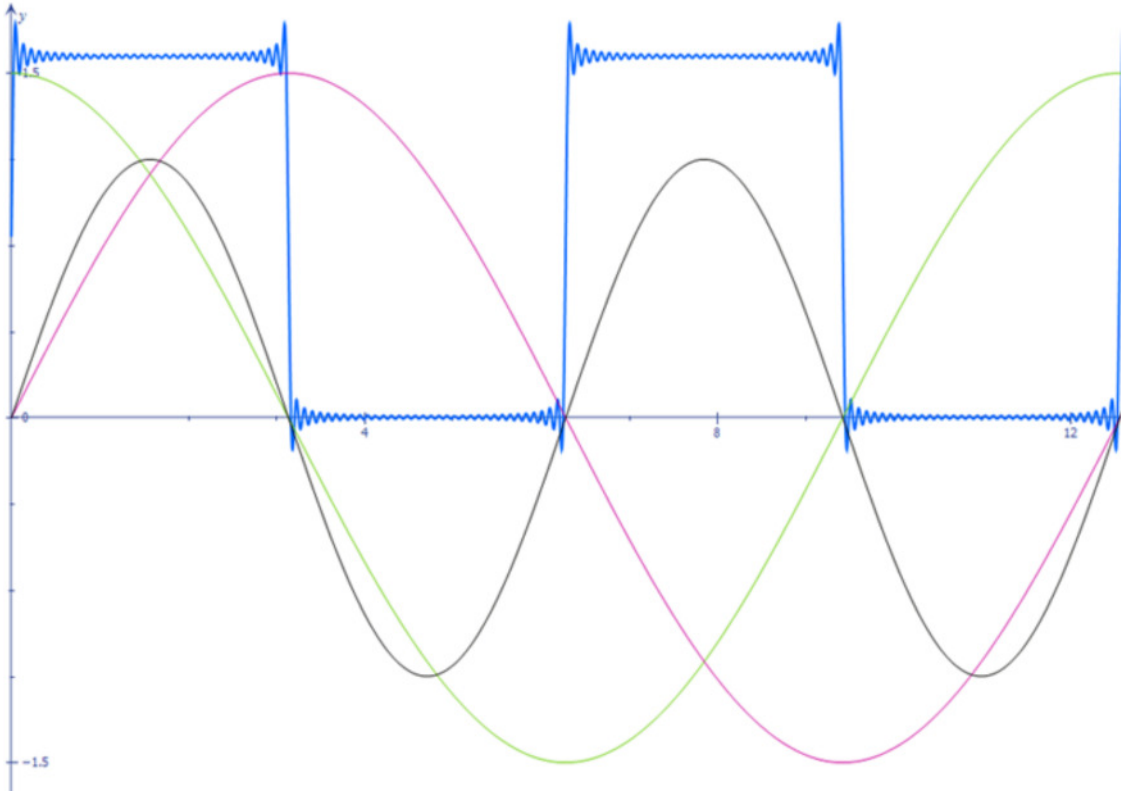
C1 discharges into L0
L1 discharges into C0

2 resonant frequencies exist
ResFreq1, L0 & C1
ResFreq2, L1 & C0

Title Syncronous Parameter Variation Generator		
Author Garrett M		
File 3E4~1\ELECTR~1\SYNCHR~1\SPVGEN~2.DSN		Document
Revision 0.01	Date 08-07-11	Sheets 1 of 1

While there are many improvement to make, the basic design does work, although it is a bit complex to control all the switching elements.

Some insight into how and when the switching should take place consider the diagram below:



This was graphed with Microsoft Mathematics for help on graphing this problem see "Graphing Syntax of Sine Waves"

The, 2x frequency, Blue-square-wave shown is one of the control signals for the circuit, it controls the operation of the Magnetic Amplifier (MagAMP) in the above circuit diagram. The Green-sine-wave is that of Voltage and is in a quadrature relation with the Purple-sine-wave of Current, this quadrature relation is the natural result (waveform) of circuits with large amounts of SELF-INDUCTION (L & C). The 2x frequency Black-sine-wave, is that of Power, something of interest, is that if the Power-waveform goes into both the top and bottom half of the graph, this represents Reactive Power or a surging to and fro of stored and returned energy. Something to take note of, is if, the Black-waveform is on one side or the other, top or bottom of graph with respect to the x axis, this would mean a unidirectional transfer of Power is taking place, or simply Active Power dissipating into a Load or Power transferred via Mutual-Induction. Dependent upon the actions taking place in the circuit, the Power-waveform can be any place along the y axis with respect to the x axis, the specific placement of this waveform dictates the magnitudes of the Active, Reactive, & Vector Power of the circuit. Thus you could see in a device that returns more Power than it consumes, such as in the circuit above, that the Power-waveform will be smaller on top and bigger down below where it is situated on the x axis. Thus the Source input becomes a quasi-load and the Load now a quasi-source. The understanding that Power is a product of Voltage & Current (with their phase angle taken into account) and the direction of its flow is fundamental in making one of these devices work. Back to the Blue control waveform, as seen above, the Current pulsed into the control winding of the MagAMP controls the relative-saturation or "inductive capacity" at any one moment in time. Thus you would saturate the core during the zero-crossing & rise-to-peak portion of the Purple-sine-wave and desaturate during the peak-to-fall & zero-crossing portion. Thus the inductance changed from L0 (low inductance) to L1 (high inductance) at the proper times. As for the switched capacitor, as can be seen in the circuit above, you would have a separate control signal that would be out-of-phase with the one controlling the inductance. Thus the capacitance would be C0 (large capacity) from zero-crossing & rise-to-peak

and change to C1 (small capacity) during the peak-to-fall & zero-crossing.

An excellent resource for more study on this topic:
E. P. Dollard - Symbolic Representation of Alternating Electric Waves [1985]

What you will notice is that there will be two resonant frequencies C1 & L0 and L1 & C0. Caused from C1 discharging into L0 and L1 discharging into C0.

Take into consideration the following equations:

$$\frac{C_1 E_b{}^2}{2} = \frac{L_0 i_a{}^2}{2}$$ *Correction: The big E, electromotive force, should be shown as little e, electrostatic potential!*

$$\frac{L_1 i_a{}^2}{2} = \frac{C_0 E_a{}^2}{2}$$

The first one shows the discharge of C1 into L0 with currentA and voltageB and the other shows L1 discharge into C0 at currentA and voltageA, this is caused from the fact that current remained the same during the point of parameter change for inductance but voltage changes at parameter change because both capacitors are either in series, voltageB or in parallel, voltageA. With the law of conservation of energy taken into mind, these equations state, that the maximum energy stored could only be that of the source energy, or L1 for C0 and C1 for L0. Thus excess energy can only come from the parameter change of inductance, for the above circuit, and nothing else, seeing as how a "normal switched capacitor" doesn't have useful parameter change values, C0 & C1, for production of extra work. For further discussion on this issue read the references listed at the bottom.

Note that if you can get one of these devices to work, they simply self destruct within a few seconds of operation, if you loop the two equations above you will see a exponential rise in oscillatory energy. Thus you need to properly load the circuit to remove the excess energy from the oscillatory system. The concept of positive feedback to build the oscillations and a negative feedback mechanism to control the magnitude of the output comes to mind. The best method would be to alter the phase angles of the control circuits and not their frequency so as to slightly alter where on the curves of the voltage and current you choose to change your parameter. So a microcontroller could, with some hard work, tame the circuit, at least in principle.

Errata present in the above, PLEASE READ:

"Switched Capacitor"

and

"Correction on Design and Use of a Switched Capacitor"

These are posted below as updates, with some corrections, to this topic.

Garrett M

Last edited by garrettm4 : 01-12-2012 at 06:53 PM.

Quote

Quote

08-21-2011, 03:18 PM #375 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Graphing of Sine Waves

To assist anyone who would like to graph these waveforms for further study I copied some of my notes on the graphing of sine wave in radians:

Graphing Syntax of Sine Waves

Sine wave Graphing in Radians

The fundamental equation for the graphing of sine waves:

$$y = \pm a \sin(\pm xf \pm b\pi) \pm d$$

y = sin(x), the actual Sine Wave, variable x can be positive or negative, polarity flips orientation of wave, usually assumed positive.

a, the Amplitude or height of the sine wave at its peak value along the y axis, positive or negative real numbers only, polarity flips orientation of wave, usually assumed positive, a cannot be zero.

f, the Frequency, or number of cycles per unit length of time, usually cycles per second, positive or negative real numbers only, polarity flips orientation of wave, usually assumed positive, f cannot be zero.

b, the Phase or wave's position along the x-axis, or horizontal axis, in products or fractions of π, π being the equivalent of 180 degrees, therefore, 2π equates to 360 degrees and $-\frac{\pi}{2}$, negative 90 degrees, if referenced alongside another wave that quantity b is not added to or subtracted from, b can equal zero and usually assumed to be zero

d, the "DC Offset" or position of the wave along the y-axis, or vertical axis, positive or negative real numbers only, d can equal zero and usually assumed to be zero

The above notes are intended to help anyone who didn't know how to graph a wave with dc offset or phase angle relations and are not meant to be a all in one source on the subject.

I hope someone finds them useful.

Garrett M

Last edited by garrettm4 : 01-11-2012 at 11:42 PM.

Quote

Quote

08-21-2011, 06:09 PM #377 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Swithced Capacitor

Quote:

> Originally Posted by **Web000x**
> *Do you have any test data from the circuit?*
>
> *I understand the possibility of using the Magamp to vary the inductance successfully, but do you really think that using two static caps being switched in and out of position will really work as a true capacity parameter variation?*
>
> *I have yet to do any extensive analyzing of the numbers, but from all of the math that I've worked with in the "Charge Conserving Capacitive Spring" thread suggests that you actually need to move capacitor plates in order to produce the effect that we are looking for.*
>
> *Dave*

In my view, which to some may seen crazy, it is the method of the implementation of any one thing that makes it useful, or in other words, it is how you use it and in what context. The two capacitors in series/charge, and parallel/discharge, is only used to lower the voltage of the design and raise the current of the variable inductor, but needs to be matched to the proper natural impedance or natural admittance of the circuit so as to be able to transfer the excess work of the variable inductance.

On a side note, the method of two capacitors, parallel/charge series/discharge, isn't very useful for charging batteries from my experience, although I have seen some strange effects, the battery will charge extremely fast after having been completely discharged in a sudo-"Tesla Switch" oscillator (described by "Bill & Ray" on one of Bill Jenkins radio broadcasts), as opposed to being discharged normally in a resistive load and then charged. So the thoughts of a battery as a giant electrolytic capacitor come to my mind and lines of dielectric force to describe why that the above use or method is quite a poor implementation. In my view, dielectric lines of force want to "move" into something like an inductor and thus a translation of energy takes place. John Bedini's battery charging method comes to mind although it is used in a different context, the thought can be retained of impedance matching and the use of one type of energy to generate another type, dielectric to magnetic and vice versa (if the idea of a battery as a giant electrolytic capacitor is used).

The point being, the circuit I gave was in a unique situation where there is a resonant tank shuttling energy across one storage element to another fed by a unique source (switched battery bank) that is able to absorb and store excess energy, if present. If the parametric variation is disabled or turned off the the LC tank will still build a high resonant current and voltage across its-self (but to the source seem as an infinite resistance, if it has a high Q), and if you modulate the right parameter at the right time, it is theoretically possible to get excess work but that doesn't mean the resistive load you hook up will use it properly. So the difference in my implementation is use of the switched capacitor merely as a means of translating the excess work of the variable inductor to match a single resonant frequency as opposed to two resonant frequencies from one value of capacity. The use of the unique transistor configuration (known as a solid state relay) is from the fact that a single transistor transfers power uni-directionally and not bidirectionally as would be required to transfer the excess energy back to the source, if present.

Now, I can say that I do think it is possible, under the right context of use, to use a switched capacitor and have a successful result. With out belaboring the issue, you will only know if you try, theory helps but doesn't dictate reality, and sometimes reality is quite harsh.

Please read "Correction on Design and Use of a Switched Capacitor" I posted below for a update to this general Idea

Garrett M

Last edited by garrettm4 : 01-12-2012 at 12:13 AM.

Quote

Quote

08-23-2011, 04:59 AM #382 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Correction on Design and Use of a Switched Capacitor

I would like to add a correction to my approach in the design of a synchronous parametric generator. The concept of charging in parallel and discharge in series is an interesting topic which can be debated in many ways, the concept I have come to see as being the most useful, is the exact opposite of the above, or charging in series and discharge in parallel. As many have pointed out, if you do the math on a switched capacitor you will see that the energy in terms of work is equal any way you do it, series/charge parallel/discharge or parallel/charge series/discharge. This fact comes from the inability to change the total value of capacitance to such a value that will be useful, i.e. if two 30uf are used, you will have 60uf in parallel and 15uf in series, both will yield equivalent "work". A rotary or spring type or even one akin to a MagAmp, if it existed, as others have described and debated, would be able to have a capacity change that would actually be useful.

With that said, I have come to realize the flaw in my current understanding, and would like to describe, what I believe, a useful situation a switched capacitance can provide. In a parametric oscillator, if you have an inductance that can change to two values that are not in the relationship of La=(Lb/2), it is possible to get one resonant frequency in the parametric oscillator with a switched capacitor (something not possible with a static capacitor). If for instance the switched capacitor has the values of Ca=60uf parallel/discharge, Cb=15uf series/charge (from two separate 30uf caps) and we have variable inductor values of La=0.1173h charge and Lb=0.4691h, discharge, and the oscillatory frequency of the system is 60 cycles per second, you will find that the discharge of Lb into Cb and Ca into La are of the same resonant frequency whereby the impedance of both dynamic values of L & C are matched and current into the inductor will rise exponentially as a result of the capacitors translating the excess energy of the MagAMP from a voltage E (EMF) to a current I (Displacement Current).

On their own, switched capacitors aren't terribly useful, but, when used in an appropriate system to match the RESONANT FREQUENCY of both storage components, you can facilitate the energy translation, here given, it can be a useful tool.

Garrett M

Last edited by garrettm4 : 01-11-2012 at 10:10 PM.

Quote

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Source: http://www.energeticforum.com/renewable-energy/1631-peter-whatever-happened-eric-p-dollard-28.html
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Quote

01-04-2012, 09:46 PM #824 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Capacity C, Elastance K, Enductance M & Inductance L

Quote:

> Originally Posted by **madhatter**
> *A primary coil of coax or braided wire would increase the skin effect via surface area and the capacitance would be the mutual link to the secondary coil of one with specific*

> *inter-turn capacitance and suppressed self induction. it would seem then that the goal is an oscillating Psi field of extreme frequency to raise potential while avoiding the magnetic field that would reduce the effect. a self induced capacitor with negligible resistance and FTL transmission.*

I believe the secondary is made up of maximal inter-turn MUTUAL-capacity K not self-capacity C, hence why you get two resonant frequencies, LC and MK, when doing a frequency sweep of the coil. With special reference to *Borderland Science - Transverse & Longitudinal Electric Waves [1988]* (Specifically, about 7 minuets into the video)

I might be wrong but, you could look at the secondary coil's individual loops as isolated metallic rings in which there is a mutual capacity K between all of them where the lines of dielectric induction are cut buy the individual "rings"(essentially a giant "elastor") frequency is in "per radians" as opposed to radians, next all the winding can be looked at as a single wire and their lines of dielectric induction interacting with the "ground" as a capacitance C, frequency in radians.

Its EASY to CONFUSE the two because you can look at an elastor as a capacitor when viewed from coil end-to-end. The understanding of self-induction and mutual-induction is the guiding light that clears this up.

Now there is the self-inductance L which is distributed along the coil's length, seen as a single long wire, next there is a mutual-inductance M between the individual windings, seen as a group of separate shorter windings. The magnetic induction of the self-inductance, L, is 90 degrees spatially out of phase of the magnetic induction of mutual-inductance, M. The LOOPS of magnetic induction for L are only along the wire's surface the LINES of magnetic induction M cut, or terminate on, each separate loop, the frequency of L is in radians whereas M is in "per radians". That takes winding a "coil" to the "next level", quite interesting if you ask me.

M & K are aligned in the same axis of propagation, both cut, or terminate on, separate "repetitive metallic structures" of the coil (other loops), L & C are 90 degrees spatially out of phase with M & K, and being in the form of self-induction as opposed to mutual induction the whole length of the wire is considered in their calculation as opposed to the individual structures of the coil. Quite complex if you ask me.

A helpful reference to the above description is:
E. P. Dollard - Condensed Intro to Tesla Transformers [1986] (With specific reference to "Analysis", Figures 6, 7 & 9 and pages 16-31)

Now we come to the quadra-polar view of "Voltage and Current" e & I and E & i. Note that Voltage is not the dielectric and current is not the magnetic. EACH TAKE BOTH FORM. The geometry of the space surrounding the ENERGY of DIELECTRIC or MAGNETIC determines whether they are seen as Volts or Amps. Confusing I know, possibly enlightening when fully digested.

Some more "food for thought" is looking at things as SERIES or PARALLEL (shunt) ENTITIES. Example; resistance, r, series element, inductance, L, series element, elastance, K, series element, conductance, g, parallel element, capacity, C, parallel element, enductance, M, parallel element. While you can "convert" a parallel element into a series element, such as an elastance into a capacitance, (by using its reciprocal) it doesn't change how the lines of induction are propagated in the element so the conversions are "mental gymnastics" that confuse the mind into thinking they are equivalent. ***Numerically they are equivalent, Spatially, in terms of axis of propagation, they are not equivalent****.*

In conclusion, an MK wave is different from an LC wave and theoretically you can have MC & LK waves as well. This probably predicts why you can have Transverse-Magnetic TM waves (with Longitudinal-Dielectric LD wave byproduct), Transverse-Electric TE waves (with Longitudinal-Magneto LM wave byproduct) and pure Transverse-Electro-Magnetic TEM waves. As for pure Longitudinal-Magneto-Dielectric LMD propagation, pure MK, little is known and even less is openly available on this subject, aside from Mr. Dollards work.

Hope this wasn't off the mark (I'm just a High School dropout so don't take my word for it), hopefully Mr. Dollard will point out any errors in my understanding (or misunderstanding).

Garrett M

Last edited by garrettm4 : 01-10-2012 at 02:29 AM.

01-04-2012, 11:21 PM #826 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Not What I Intended to "Get" Across

Quote:

> Originally Posted by **Kokomoj0**
> *so are you implying that M,K and L,C should be designed to operate at the same frequency?*

If that is what you got out of what I wrote... then I feel as though I have completely failed in my "explanation"!

*Note: I don't think it is possible to get LC and MK at the same frequency **in the same coil**, LC in Radians, MK in per Radians, one being TEM the other LMD. As for the intermingling of the two, if I am not mistaken, Heavyside's Telegraph Equation and the "wave factor", gamma, explains the situation quite well.* This topic is treated for the alternating current case (uses a subset of the telegraph equation) in Mr. Dollard's book *Symbolic Representation of Alternating Electric Waves*, specifically pages 15-18.

LC = Transverse-Electro-Magnetic TEM

MK = Longitudinal-Magneto-Dielectric LMD

LK = TM & LD

MC = TE & LM

This may be wrong but, Ideally you would want ZERO L & C and only M & K for the propagation of a pure Longitudinal-Magneto-Dielectric Wave. Now that from an engineering prospective seems impossible so we will always have some L & C and thus Transverse Wave "residue" and the possible mixture of the two or LK & MC, both of which may or may not be desirable.

As for a Tesla transformer there are three separate coils, a terminal capacity and a ground connection that each focus on one of those four possibilities, (LC, MK, LK or MC) with a design emphasis on one form of induction (L, M, C, or K) per afore mentioned system element. In this case the LC configuration is not used, as far as I am aware, although the terminal capacity would be that of C (with reference to the ground) and the extra coil appears to favor L. Basically, each coil is designed to get rid of one form of induction in favor of another to reach its desired goal as a COMPLETE SYSTEM with the terminal capacity and ground connection. As of yet, I haven't devoted enough time to the consideration of EACH coil to give my opinion as to what coil favors what form of induction and their specific goal as a SYSTEM.

I don't claim to be the "master and commander" of the Tesla transformer, I've never built one (I do plan on doing so soon). When in doubt, refer back to the two amazing works by Mr. Dollard, *Condensed Intro to Tesla Transformers [1986]* & *Oscillating Current Transformer [1986]*. These references fill in most of the missing design details.

If you listen to what Mr. Dollard says, you will start to see where I am coming from in what I wrote. Mr. Dollard says two big things, at least they seem quite important to me:

(1) There is a Quadra-Polar nature of VOLTAGE and CURRENT.

(2) MUTUAL-INDUCTION and SELF-INDUCTION are not the same thing.

Thus the dielectric is not voltage, the magnetic is not current, BOTH are SEEN as EACH, being dependent upon TIME and SPACE (geometry) of the METALLIC-DIELECTRIC boundary condition. The propagation of the differing "inductions" of the dielectric or magnetic are not on the same AXIS. Similar to the imaginary axis and the real axis, they coexist simultaneously but don't lie in the same direction, they intersect at 90 degrees. This doesn't mean that M K L & C have to all be in different directions only that the propagation of the

two inductions **of one form** (Dielectric or Magnetic) are in different directions. So that is why I say that M & K lie in the same axis of propagation, whereas M & L do not (at least in the case of a Tesla Transformer Secondary). With reference to Figures 6 & 7 and especially Figure 9 in Mr. Dollard's *Condensed Intro to Tesla Transformers*.

I hope that someone else who is more "in tune" with these concepts will "chime in" and give their opinion on what I have said so that we can contrast what I have gotten from the T-rex writings with what they understand so we can clear up anything that is incorrect. Which is what collaboration is all about.

Garrett M

Last edited by garrettm4 : 01-13-2012 at 06:52 AM.

Quote

Quote

01-05-2012, 01:07 AM

#827 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Question On Plank, Q with Respect to an Impulse Discharge of L or C into r

I don't believe this has been addressed yet, what is the relation of Plank, Q, during an impulse discharge of only one field energy i.e. DIELECTRIC or MAGNETIC? Where stored energy of a capacitor or inductor is discharged into an ohmic resistance.

Example for the Dielectric (with capacitor of "fixed" capacity):

Differential Voltage of Source via Law of Dielectric Proportion

$$de = \frac{d\psi}{C}$$

Differential Current of Discharge from Source via Law of Dielectric Induction

$$dI = \frac{d\psi}{dt}$$

Differential Current through Load resistance r via Ohms Law

$$\frac{de}{r} = dI$$

"Time" found by setting both "currents" equal

$$\frac{\frac{d\psi}{C}}{r} = \frac{d\psi}{dt}$$

When simplified

$$rC = dt$$

Time Constant, Tau

$$\tau = rC = dt$$

Tau Defined:

Its understood that the wave shape, of an Impulse Discharge, is that of an Asymptote, never reaching zero during discharge and never reaching 100% during charge. The TIME CONSTANT found in the above equation (rC) only relates to a graticule (one division) of time of this waveform, it does not represent the whole time, just a piece of time. It is considered that 5 of these pieces of time is the "practical" length of the discharge. Thus "time constant" tau equals rC and 5tau is the approximate length of the discharge in time, or 5 pieces of time (rC) is equivalent to the length of the discharge.

Union of Phi & Psi:

With the shape of the wave and the constants (r, C & tau) and variables (t, psi, e & I) considered, you will find that the field of MAGNETIC INDUCTION (phi) is nowhere to be seen. Thus Plank Q the unit of ELECTRIC Induction, or total electrification (union of psi and phi), is a perplexing quantity. Meanwhile, we still have Power P in watts and even energy in joules (if time is considered), all of which the plank is measured in.

So on to my question, am I a fool who can't see whats going on correctly or is an Impulse Discharge a "special" event where there is still Q in planks but in another form? Also, would I be wrong in calling this type of Impulse Discharge (C into r or g) a Transverse-Electric Impulse-Wave? If true, this would predict the existence of a Transverse-Magnetic Impulse-Wave (L into r or g).

Two Measurements of Power:

Usage of time with respect to power (shows the plot of the impulse discharge)

$$dP = (de)(dI) \quad \text{(eq1)}$$

When expanded to show all terms

$$dP = \left(\frac{d\psi}{C}\right)\left(\frac{d\psi}{dt}\right) \quad \text{(eq1a)}$$

Average Power (with respect to the whole discharge period, or 5Tau)

$$P_{avg} = e_{avg} I_{avg} = {I_{avg}}^2 r \quad \text{(eq1.1)}$$

Where via the Law of Dielectric Induction with respect to the Time Constant, tau and Ohms Law

$$I_{avg} = \frac{\psi}{(5\tau)} \quad \text{(eq1.1a) and } e_{avg} = I_{avg} r \quad \text{(eq1.1b)}$$

No time with respect to power

$$P = \frac{Ce^2}{2} \quad \text{(eq2)}$$

My next question comes from the second equation for power (no usage of time) which most people are familiar with, is this the sum of all stored power (with time taken into account) or is it the peak magnitude of stored power? I don't seem to get the same answers for both equations, maybe because we are dealing with asymptotes where we arbitrarily cut its length short due to it being infinitely long (in theory).

I hope I'm not crazy in asking these questions and hopefully Mr. Dollard or someone else smarter than me, may make some of these perplexities clear.

Garrett M

Last edited by garrettm4 : 01-10-2012 at 02:11 AM.

01-05-2012, 04:57 AM

#829 (permalink)

garrettm4
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Join Date: Oct 2010
Posts: 38

Question On Plank, Q Continued

Upon further algebraic examination, I have found some fascinating insight into this problem:

When we expand (eq2) (where time isn't used) from my prior post we get

$$P = \frac{\frac{C}{1}\frac{\psi}{C}\frac{\psi}{C}}{2}$$ (eq2a)

And when we simplify (eq2a) (this being a more esoteric form of the power equation (eq2), using only the lines of dielectric induction and its geometric confines to define power stored)

$$P = \frac{\psi^2}{2C}$$ (eq2.1)

Now the simplified form of (eq1a) (time considered with respect to power) from my prior post (this showing the lines of dielectric induction, with its geometric confines considered, moving in time to define Power with respect to time)

 (eq1b)

As can be seen, the two "simplified" equations look very similar, but yield different results! One being Static, (no time) showing the total stored energy, the other Dynamic, (time moving) showing the release of stored energy. *Where the number "1/2" comes from in (eq2) or when rewritten (eq2.1) I have no idea, its quite perplexing to me! If someone could direct me to the proof of equation (eq2) I would be much obliged!*

For the case of an Impulse Discharge, we can use Tau to define differential time, dt, in the above differential equation (eq1b) and thus (n denotes the number of units of time in Tau or number of elapsed Time Constants (total time of event). n being defined as greater-than or equal-to zero and equal-to or less-than 5)

$$P_{avg} = \frac{\psi^2}{(n\tau)C}$$ (eq1.2)

When we expand the above equation we find some interesting things (here is the Average Power of an Impulse Discharge of a capacitor C into a resistance r or the movement of lines of dielectric induction from its spatial metallic-dielectric housing through a load resistance as a displacement current)

$$P_{avg} = \frac{\psi^2}{nrC^2}$$ (eq1.2a)

If C is assumed fully charged and of fixed capacity and r a fixed resistance, then n or number of elapsed time constants is the only variable used to define Average Power of the Impulse Discharge (this is the case with a fully charged capacitor and modified for anything less than 100 percent charged). Some interesting phenomena manifest in the case of infinite resistance r and its reciprocal infinite conductance g with a finite capacity C. In the first case you will have ZERO POWER with INFINITE TIME of discharge the other ZERO POWER with ZERO TIME of discharge, this being the case when n is greater-than zero and regardless of the finite value of C. This of course can only be considered if capacity C has zero internal shunt-conductance and zero equivalent-series-resistance. Interestingly, both cases have ZERO POWER, one with no movement of the lines of induction the other with instantaneous movement.

Personal Insight:

Into deeper theoretical considerations, one could think of a "Super Conductor" as a medium in which lines of Dielectric Induction are in infinite circulation unable to dissipate (from infinite conductance, thus ZERO POWER) having a mono-polar diamagnetic field produced from a ZERO TIME Discharge of psi (in a unique form of amperes) which occludes lines of Magnetic Induction from entering. If this idea is looked at from the point of a Transverse-Electric Wave, we would now interpret the ZERO TIME Discharge as an “Instantaneous Movement” of the lines of Dielectric Induction in (or around the surface of) the infinite conductance g (if L is absent, which is the case for a superconductor). This Instantaneous Movement cannot happen in a dielectric medium if the finite velocity of light and its interaction with a dielectric medium are considered. This could explain how you can vary the strength of the diamagnetic field of a superconductor thus the psi per time (amperes) is now possible to calculate, from the finite velocity of c and its speed through a dielectric medium. Also a superconductor can be looked at as a special form of Capacitor in which the lines of dielectric induction are in motion as opposed to being static. This may or may not be an absurd accusation on my part, but, within the considerations shown on (eq1.2a) and conclusions I have developed from them it seem plausible.

With the above exercise, I have come to the conclusion that the measure of an Impulse Discharge's "Power" is an ambiguous quantity! This can be seen by considering the following; the greater the resistance, r, the more "stretched out" time becomes, the greater the conductance, g, the more "compressed" time becomes. All with respect to a finite capacity C and thus a corresponding finite amount of Energy. This "dilation" of time causes the different results for the measured magnitude of power, despite the same amount of lines of dielectric induction used. **More simply said, a limited amount of Energy can be "compressed" or "stretched" by the Time Constant of the circuit. This is clearly seen in the form of the Voltage and Current magnitudes with respect to time.** Also, I have come to the conclusion that resistance r "preserves" lines of dielectric induction (increasing magnitude of resistance r consumes progressively less psi per time) and conductance g "consumes" lines of dielectric induction (increasing magnitude of conductance g consumes progressively more psi per time). Whereas for the magnetic circuit this is the exact opposite, or resistance r consumes lines of magnetic induction (increasing magnitude of resistance r consumes progressively more phi per time) and conductance g preserves lines of magnetic induction (increasing magnitude of conductance g consumes progressively less phi per time). This is exemplified in the the cases of infinite resistance r for the rC circuit and infinite conductance g for the gL circuit, both have an infinite discharge time despite the finite storage of C or L. This somewhat predicts an LC oscillation, whereby a capacity C appears to be a conductance C/t to an inductance L and an inductance L appears to be a resistance L/t to a capacity C. Here, the lines of induction are not consumed but transformed from one form to the other as a storage and return of energy, whereby the conductance g consumes the energy of the capacity C and the resistance r consumes the energy of the inductance L causing the oscillation to eventually stop.

Generally considered, an Impulse Discharge would be useless and destructive for most situations, but, many interesting phenomena can manifest in their use (Tesla Transformers).

A few good references on this subject:
E. P. Dollard - Introduction to Dielectric & Magnetic Discharges in Electrical Windings [1982]
E. P. Dollard - Introduction to Dielectricity and Capacitance [1990] Mar-Apr JBR pages 10-13
Borderland Science - Free-Energy Research [1987] (Specifically, minuets 7 to 16 of video)

Power Developed Further:

One could take this topic further with consideration of the four different measurements of Power with usage of Heaviside's Telegraph Equation. A big thing to point out, is that TIME measurements and thus a corresponding frequency is based upon the wave-shape engendered by the circuit. Hence why the calculations for an Impulse Discharge are different than that of an AC Wave or even an OC Wave.

Vector Power (Volt-Amperes, Complex Plane Vector Measurement, "the sq root of the sum of the squares" or "Absolute Measurement") Voltmeter reading multiplied by Ammeter reading

$$P_{vector} = \sqrt{a^2 + jb^2} = |P_{apparent}|$$

Apparent Power (TOTAL Power, Re + Im Axis Measurement) Watt-meter reading plus VAR-meter reading

$$P_{apparent} = a + jb$$

Active Power (Consumed/Produced Power, Real Axis Measurement) Watt-meter reading

$$P_{active} = a$$

Reactive Power (Stored/Returned Power, Imaginary Axis Measurement) VAR-meter reading

$$P_{reactive} = jb$$

An excellent reference on this subtopic is of course:
E. P. Dollard - Symbolic Representation of Alternating Electric Waves [1985]

Garrett M

Last edited by garrettm4 : 03-18-2012 at 09:03 PM.

Quote

Quote

01-07-2012, 09:52 PM #836 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Quote:

> Originally Posted by **madhatter**
> *It's gone quiet...*
>
> *Also I was doing a bit more research and reading through Heaviside the other night I came across an interesting note, "Electrical notes Volume 3 Page 89"*
>
> *"There are several cautions to be expressed regarding the above. First the investigation has no reference to ordinary*

> *waves along wires. They do not behave in the above way, even if all resistance were done away with. The above waves are forced waves, whether u be less or greater than v, although only in the latter case is there permanent activity on the average. If we want to represent waves of this type along a wire, we require a continuous distribution of impressed electric force along the wire, or something equivalent. That is, the wire is to be a source of energy, instead of a sink, as is usually the case with waves along them, for the loss of energy by radiation of the heat is a separate matter, which does not come in question."*

That's quite a powerful quote if mentally digested. It reminds me of the "cold electricity" shenanigans people talk about. Whereby the load becomes a source and actively takes energy from the environment as opposed to actively giving back, all of which is in the form of infrared photons. One action is seen as heat released and the other as cooling or heat converted into electrical energy. (Or however you want to word it)

I thought I would share my goal for the Tesla Transformer. Personally I don't need power to be transferred across long distances or even super-luninal communication, instead I am looking for an apparatus to convert ordinary currents (read TEM Waves) into Tesla currents (read LMD waves) for use in dissociation of water (H2O) into H H O for various uses like heating my home and therapeutic effects of Browns Gas. With a possible secondary use for Electro-Therapeutics. Nothing fancy, but interesting to me none the less. I may post some of my design details in the future when I feel more confident of its construction.

Last edited by garrettm4 : 01-07-2012 at 09:54 PM.

Quote

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Source: http://www.energeticforum.com/renewable-energy/1631-peter-whatever-happened-eric-p-dollard-29.html
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Quote

01-10-2012, 07:28 PM

#859 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

LM Vs. TM

Quote:

> Originally Posted by **lamare**
> *Yes, the LMD wave does have a magnetic component. That is the TM mode I described above, the mode you CAN find in the textbooks. A mode that propagates at c, as you can also find in the textbooks, including Heaviside's referred to by madhatter.*
>
> *The pure longitudinal dielectric mode, LD, is a mode that propagates at pi/2 times c, which should not be confused with the LMD mode. It is a mode not caused by charges moving back and forth, because charges are some kind of localized TEM wave and therefore cannot ever travel faster than (local) c.*
>
> *So, the LD mode is a current-less mode.*

> *NO MOVEMENT OF CHARGE CARRIERS!*
>
> *That is why we need to kill the magnetic component in my antenna, so we essentially get a continuous transient, whereby the charge carriers inside your wires (electrons) simply cannot keep up with the propagating fields and therefore you get very low or perhaps even zero losses.*
>
> *I'm afraid even Eric's theory does not cover this charge-less, magnetic-less mode....*

A TM Wave has nothing to do with a LM Wave, or at least in an electrical circuit this is the case! Transverse Magnetic propagation involves an inductance L or a self-induction of the magnetic field (storage of magnetic energy) this being in series with the source of energy (lines of induction). Whereas the Longitudinal Magneto Wave involves an enductance M or mutual-induction of the magnetic field this being in parallel with the source of energy (lines of induction), the way it propagates isn't only 90 degrees spatially out of phase, it may propagate as a LINE or RAY as opposed to a LOOP from wire-to-wire. The LOOP action and potential RAY-like action of each differing induction may shed some light on this interesting debate. I think the inductance L APPEARS to slows down the propagation velocity of enductance M and so cannot be readily proven one way or the other. If you think of a transformer, its operation and the recent post by Mr. Dollard on self-induction and mutual-induction of ferrite, we have a new concept that is starting to emerge showing the divergence of the two inductions one as transfer of energy, the other as storage of energy, one seen as parallel and the other as series. The storage of LOOPS are done at the limiting velocity of c for L1 whereas the transfer of LINES to L2 via enductance M may be greater-than or equal-to c but the mutual core that they (L1 & L2) share builds up loops in reverse from the newly transferred energy of L2, opposing that of L1 and thus the standard transformer model can be seen here. So from input to output we only see a velocity equal-to or less-than c, but transfer between the two wires (L1 & L2) may be faster than c. The point being, the propagation velocities of the two inductions (L & M) may not be the same even while both are magnetic inductions. An interesting device to contemplate, is a transformer that isolates the individual self-inductions of L1 & L2 and only share a mutual-induction M directly between L1 & L2, thus only the transfer of energy can take place without any opposing self-inductions or reflection of the load, this could be a possible explanation for the Thane B Hinze Bi-Toroid transformer.

I wouldn't say that Mr. Dollard's theory doesn't cover this, although I can see why you say that. Mr. Dollard believes, like I have for a long time, that electrons are not a source of electrical energy, but the primary dissipators of electricity. They are the end-termini of the lines of Dielectric Induction and thus when terminating on a conducting surface these lines push the electron along the wire or at least agitate them into motion and the Drude Gas Model can explain from there. The biggest point he tries to make is that the real energy is outside the wire, thus minimal loss, and when in the wire a maximal loss caused by the movement of electrons, thus electrons are the enemy, the antagonist to the story of electricity. An analogy to this is the Edison DC Transmission System as opposed to the Tesla AC Transmission System.

The only way to get a PURE LD WAVE (with no TM residue) is to not have the lines of dielectric induction interact with a metallic surface. Or some how lockup all the electrons of the metallic media in which the lines of induction come into contact with. This may be how the Tesla Transformer works, by using mutual and self inductions and their differing axises of propagation with a complex metallic-dielectric structure to some how FREEZE-UP all the electrons from moving. This would then free or "fractionate" the dielectric field from the magnetic and thus the propagation velocity is now a minimum of c and a maximum of infinity dependent upon the secant of the angle of incidence, this may be the case for a pure LD Wave. This "velocity" may not actually be a velocity at all as Mr. Dollard has pointed out, new interpretation may need to be done to get an intelligible understanding of an LD Wave (or its cousins LMD & LM).

Just Because Mr. Dollard doesn't state exactly what everyone wants to hear doesn't make him or his theory wrong, personally the removal of mass was a godsend for me to hear, Ive had the same thoughts for a while now, and the new primary dimension of plank is of yet not developed to peak perfection where I believe you would find the answer to a magneticless propagation of electrical energy. Personally I am working on going through all the primary dimensions, secondary dimensions and tertiary dimensions with the various time functions to go along with them, in doing so I have found many interesting relationships that have yet to be talked about by Mr. Dollard or my self. I may in the future post some of the conclusions and insight I have gained but its quite troublesome to do so in an intelligible way without writing a book about it in the process.

The universe doesn't lift her skirt up to those who don't work hard and do their part in unraveling the mystery.

Garrett M

Last edited by garrettm4 : 01-12-2012 at 06:55 PM.

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Original source: http://www.energeticforum.com/renewable-energy/1631-peter-whatever-happened-eric-p-dollard-30.html
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01-13-2012, 01:36 AM #874 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Discharges of L & C and their Algebraic Solutions with Regards to Parameter Variation

I have, through the rearrangement by algebraic analysis of the Primary & Secondary Dimensions given by Mr. Dollard, from his T-rex "transmissions", come to some new personal insight into the analysis of parametric variation of storage parameters L & C with respect to Time.

Hopefully no one falls asleep on this one, because it will yield to anyone who can handle "school boy algebra" and basic differential equations some very interesting results and conclusions, that may assist those who are involved in building one of these devices!

Also by running through this exercise I came across the Natural Impedance, Natural Admittance & Natural Period of an LC circuit. This along with a perusal of Mr. Steinmetz 1911 paper *Electric Transients*, yields some very important information on the "Hair Pin" circuit of Tesla for use with the Primary Loop of the Tesla Transformer, as is currently being discussed on the forum.

This being taken up briefly, until further explained.

Natural Impedance of the Circuit:

Power Stored in the Dielectric Field of a Capacitor C

$$\frac{Ce^2}{2} = \frac{\psi^2}{2C}$$

Power Stored in the Magnetic Field of an Inductor L

$$\frac{Li^2}{2} = \frac{\phi^2}{2L}$$

These two equations, which are useful for many situations, are in my view no longer of use when dealing with the various time functions of the discharge of L into C and C into L and are especially useless when doing this with parameter variation of L or C. More simply said, when algebraically considered, they are a dead end for the visualization of what's going on in time.

Something useful that they do show is, when set equal to one another

$$\frac{Li^2}{2} = \frac{Ce^2}{2} \quad or \quad \frac{\phi^2}{2L} = \frac{\psi^2}{2C}$$

The above when rearranged and simplified, we find a CONSTANT that is in the form of ohms. This constant is the quotient of the proportion e (electro-static potential) per the proportion i (magneto-motive force) or the quotient of the magnetic lines of induction per the lines of dielectric induction, both coming out to be the same answer. (these same results will be found from my power equations shown later in this post)

$$\frac{e}{i} = \sqrt{\frac{L}{C}} \quad or \quad \frac{\phi}{\psi} = \sqrt{\frac{L}{C}}$$

This constant is of the nature of an impedance and is known as the NATURAL IMPEDANCE (or its reciprocal NATURAL ADMITTANCE) of an LC circuit.

$$Z_0 = \sqrt{\frac{L}{C}}$$

Reference on the above exercise:
C P Steinmetz - Electric Transients [1911] pages 39-54 of the Journal of the Franklin Institute July 1911
Click Here To Download

This topic will be taken into further consideration with reference to the "Hair Pin" circuit and the Tesla Transformer later on in a future post.

Before I get into any other equations I have two brief topics to go over first.

Ohms Law, the Law of Cause and Effect:

Ohms Law, when used in my algebraic analysis of the various secondary dimensions, has been found to be an AMAZING tool, which has derived many interesting circuit CONSTANTS out of the differential equations analyzed. Although, the PROPER understanding of the units of PROPORTION (spatial storage, e & i) and INDUCTION (movement in time, E & I) is a very important thing to point out, if no distinction is made between these two quantities, an algebraic analysis is HOPELESS! One must rid themselves of the " Volts and Amps" mentality, there's no "free energy" to be found when thinking like this.

NEGATIVE RESISTANCE, the Craziest Word I've Ever Heard:

Note that through my analysis I have come to the conclusion that the terms NEGATIVE RESISTANCE & NEGATIVE CONDUCTANCE are very WRONG. Resistance r and conductance g only take energy away from the circuit (at least with TEM waves considered) and if there was a possibility for them to give back, then the terms might be acceptable. As far as I am AWARE, unless you get into some "quantum" situations where electrons are not present this condition of negative resistance -r or negative conductance -g is an impossibility , hopefully we are done coming up with nonsensical words when describing esoteric situations of an electric circuit.

In the understanding of parametric variation of L & C, r & g don't come into question when dealing with where the energy is coming from, but instead, only where it was dissipated! The PROPER way to say it would be EXCESS LINES OF INDUCTION from an inductive REACTANCE X(sub)L or a capacitive SUSCEPTANCE B(sub)C, which are in the measure of ohms and siemens which resistance r and conductance g are also measured in. The thought that ohms only mean resistance r and siemens only conductance g needs to be erased in everyone's heads.

A less formal but more correct way to say it would be negative ohms & negative siemens. These instances are caused by the storage capacity NOT being in PROPORTION with the INDUCTION. In other words, MORE INDUCTION is produced than was STORED. THIS makes much more sense as to where the energy is coming from and can now be understood algebraically. Also, OHMS LAW is still found to be applicable, although new interpretation of its use is needed.

Next stop, equations and interpretations.

Power & Time:

From the use of Ohms Law and differential equations, I will describe some interesting situations of a Discharge of a capacity C into an inductance L with the reverse instance considered as well. These will have reference to parametric variation of their storage capacity when developed further.

First let's start off with finding the Power of the Dielectric Field *in motion* and the Magnetic Field *in motion* (or with Time considered).

Energy of the Dielectric Field in Motion as Power per Time

$$(de)(dI) = (de)^2 B_C = \frac{(d\psi)^2}{(dt)C}$$

Energy of the Magnetic Field in Motion as Power per Time

$$(dE)(di) = (di)^2 X_L = \frac{(d\phi)^2}{(dt)L}$$

If you have read my earlier posts "Question On Plank, Q" & "Question On Plank, Q Continued" you are already familiar with these Power equations, at least for the Dielectric case, and as can be seen they are very similar to the ones listed at the first of this post.

Reactance in ohm & Susceptance in siemen:

To further understand the above equations, we need to find how to get Inductive-Reactance X(sub)L and Capacitive-Susceptance B(sub)C

If we set the INDUCTION I of the Dielectric equal to the PROPORTION i of the Magnetic we find an imaginary resistance or REACTANCE, from inductance L.

$$I = i \quad or \quad \frac{(d\psi)}{(dt)} = \frac{(d\phi)}{L}$$

When rearranged. This shows how the "absorption" of the Dielectric Induction I is seen as an imaginary resistance X(sub)L, and how this takes Time to happen. This is the case when capacity C is discharged into an inductor L, what is also shown, is that the energy of Dielectric Induction I is converted into Magnetic Proportion i, thus no dissipation of energy only a conversion.

$$\frac{(d\phi)}{(d\psi)} = \frac{L}{(dt)} \qquad X_L = \frac{L}{(dt)}$$ Inductive-Reactance = Henry per Second, Ohm

If we set the INDUCTION E of the Magnetic equal to the PROPORTION e of the Dielectric we find an imaginary conductance or SUSCEPTANCE, from capacity C

$$E = e \quad or \quad \frac{(d\phi)}{(dt)} = \frac{(d\psi)}{C}$$

When rearranged. This shows how the "absorption" of the Mangetic Induction E is seen as an imaginary conductance B(sub)C, and how this takes Time to happen. This is the case when inductor L is discharged into a capacity C, what is also shown, is that the energy of Magnetic Induction E is converted into Dielectric Proportion e, thus no dissipation of energy only a conversion.

$$\frac{(d\psi)}{(d\phi)} = \frac{C}{(dt)} \qquad B_C = \frac{C}{(dt)}$$ Capacitive-Susceptance = Farad per Second, Siemen

I developed this Idea further in my second post "Question on Planck, Q Continued" under the section "Personal Insight", second paragraph. This may assist in the further understanding of this interesting relationship.

Note the case of two capacitors discharged into one another and the same situation with two inductors has not been described yet, this will be taken up in the future. ONLY situations using both L & C are considered in this post.

Differential Time Found:

The above differential Power equations are only for ONE field energy WITH respect to TIME (fields are in motion). Time can be found two ways, one is capacity C discharged into inductance L and two, inductance L is discharged into capacity C. Both yield the same result, thus a constant can be found, that of TIME.

Discharge of L into C. Here Magnetic Proportion i is the current drop of the inductor L and Magnetic Induction E is the voltage absorbed by suceptance B(sub)C. This can be interpreted as a conversion of Magnetic energy into Dielectric energy via the dimension of Time.

$$EB_C = i \quad or \quad \frac{(d\phi)C}{(dt)(dt)} = \frac{(d\phi)}{L}$$

Discharge of C into L. Here Dielectric Proportion e is the voltage drop of the capacitor C and Dielectric Induction I is the current absorbed by reactance X(sub)L. This can be interpreted as a conversion of Dielectric energy into Magnetic energy via the dimension of Time.

$$IX_L = e \quad or \quad \frac{(d\psi)L}{(dt)(dt)} = \frac{(d\psi)}{C}$$

BOTH simplify to

$$dt = \sqrt{LC}$$

The differential time constant shown above only applies to LC situations, solving for the differential time of the other three circuit configurations is the same as shown above.

Starting to emerge here, is a quadrature relationship of the visible (measured) Voltage & Current waveforms engendered by an LC circuit. This can be seen, if you carefully examine my above descriptions for the Time Constant of an LC circuit and those for Reactance & Susceptance.

This time constant forms a **piece** of what is called the NATURAL PERIOD of the LC circuit and is NOT in radians per second OR cycles per second, these values are DERIVED from the Natural Period.

Natural Period Defined:

It will be found that the value of differential time as shown for the time constant is only one "Arc Length" measure or one radian measure of time of the Natural Period. It is known that 2pi arc length measures or radians equals 360 degrees and 360 degrees is one full cycle. Thus we find that 2pi times the time constant equals the Natural Period, or one whole cycle, this value is in seconds and is denoted by T.

Natural Period (total Time of Cycle, in Seconds)

$$T = \frac{1}{f} = \frac{2\pi}{\omega} = 2\pi(dt)$$

For a continuation on the subtopic of Reactance, Susceptance & Time for all circuit configurations (L, C, M & K) my post "XB with reference to L & C and M & K" is an excellent read.

Garrett M

Last edited by garrettm4 : 01-20-2012 at 08:33 PM.

Quote

Quote

01-19-2012, 03:49 AM #893 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Beat Me to It!

The above T-rex transmission is a continuation of his prior work *Theory of Wireless Power [1986]* specifically from pages 34 to 69. If anyone wanted to understand what Mr. Dollard wrote further, reading that portion of the afore mentioned book is highly recommended. Also the reference I listed on my prior post by Mr. Steinmetz is a recommended read to accompany this recent T-rex transmission.

It would seem that my prepared post on Natural Impedance and the hair pin circuit seems unnecessary now, I don't think I could follow up after a post like that! I do hope to have the free time to finish my post on the clear headed solution of parametric variation of storage parameters L & C with respect to time t soon. (I don't feel that anyone has posted a good algebraic study and generalized solution to this yet, at least on this forum)

I hope everyone reads that post by Mr. Dollard very carefully, there is a mountain of useful information contained within and new terms that have popped up that were in need of consideration (Traveling Wave & Standing Wave) in the study of Tesla apparatus.

For a good reference on those new terms:
C.P. Steinmetz - Theory & Calculation of Transient Electric Phenomena & Oscillations 3rd Ed, 5th Imp [1920]

Section III: Transients in Space
Chapter II - Long Distance Transmission Line
Chapter III - The Natural Period of the Transmission Line

Section IV: Transients in Time & Space
Chapter V - Standing Wave
Chapter VI - Traveling Wave
Chapter VII - Free Oscillation
Chapter VIII - Transition Points & the Complex Circuit
Chapter X - Reflection & Refraction at Transition Point

Garrett M

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Original source: http://www.energeticforum.com/renewable-energy/1631-peter-whatever-happened-eric-p-dollard-39.html
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LinkBack Thread Tools

03-15-2012, 07:35 PM #1141 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Impulses NOT Pulses

Gestalt,

You gave an excellent response to Skaght's question, although I would have to somewhat agree with Kokomoj0 on the phasing issue of harmonics. I may, at some latter time, give my thoughts on that interesting problem. But for right now here's some basic considerations of an Impulse. When generally considered, you have two possibilities with super-imposed waves, constructive (additive) or destructive (subtractive) "interference". For an Impulse, the wave-front's steepness is determined by the parasitic capacity and inductance of the discharge path, the tail however is determined by the resistance or conductance of the discharge path and the storage capacity of the discharging medium. This matters because the rise time of the Impulse can be considered to be based upon the "bandwidth" of the wave-front (similar to a "Pulse", which is limited due to parasitic inductance & capacity) this would determine how many "waves" are composing the wave-front of the Impulse. If you consider radiation resistance, then you will have a certain amount of Hertzian waves emitted near (and progressively less further away from) the source of the disturbance (i.e. the discharging storage medium). As for a nearby circuit it will be affected by two entities, the radiated hertz waves and rapidly changing Dielectric and Magnetic gradients G & H this causing mutual coupling to the surrounding circuits. Here, with mutual and radiative coupling, the harmonics play a bigger role in my opinion, this followed with the understanding of FREE OSCILLATIONS (NOT "ALTERNATIONS") will give much more insight into the Tesla transformers workings.

Interestingly (for fun) you can HEAR the difference in bandwidth between a Sine, Impulse and Pulse with a pair of head phones (I actually did this experiment the other day while building a tube amp). The square wave will have more HIGHS and a consistent sound level. The Impulse will have Highs initially but then fade and sound level varies giving a super imposed "beat" to the sound. A sine wave is a "pure" tone (if you have a good signal generator) and its sound level doesn't "seem" to vary. The best tests are done at 30 to 100 hertz where you can easily tell if there shouldn't be any high frequency sound or secondary beats.

Here's my 2¢ on the subject of Skaght's question;

I think a lot of people confuse "Impulse" and "Pulse" when they're brought up in conversation. IMPULSES are SINGLE ENERGY TRANSIENTS they have little to no relation to PULSES, this may seem like pointless semantics but there is a difference between the two. An Impulse is the (sometimes explosive) release of energy from a dielectric (as a surge current psi/time) or magnetic (as a surge voltage phi/time) storage medium. Whereas Pulses are controlled signals, whether for use in digital or analogue circuits or even for power conversion in switch-mode power supplies.

NOTE, Impulses are almost NEVER used in engineering practice, although they do find use in RAIL-GUNS and other high-energy experimental devices that need explosive amounts of power.

Interestingly, Impulses and Pulses do share one commonality, they LOOK like DC, or more specifically they don't alternate between polarities (Negative and Positive) during their aperiodic duration (although they both can incite oscillations in the same circuit or even nearby circuits). Furthermore "DC" is not what people think it is, DC has NO FREQUENCY thus is TIME INVARIANT so ANYTHING that does something other than look like a horizontal "straight line" is not "DC". The term CONTINUOUS CURRENT is more accurate a term than DIRECT CURRENT. If the current varies in time it is no longer DC, but now AC, OC or IC superimposed upon DC, forming a "compound wave". Hence why you use AC filters on DC circuits to IMPROVE the DC "characteristics" or "cleanup the DC signal".

The understanding of PULSES comes from that of SINE WAVES and NOT ASYMPTOTES. In a general sense, Pulses can be described by odd-order harmonic sines superimposed upon a fundamental sine. DC Pulses are "DC Offset" AC square waves. The "rise time" and "fall time" of a square wave relates to its "bandwidth" or how many (odd-order) harmonics are superimposed upon the fundamental signal. Capacitance and Inductance act as filters, which slopes the edges of a perfect square wave, thus there will never be an infinite rise time square wave, if any amount of inductance or capacitance is present. Generally, in digital circuits, too fast a rise time can cause issues so the slope of the wave is carefully chosen to "play" well with the logic elements used.

Impulses are an interesting subject but for the sake of brevity and to not belabor the issue, I put up some (I believe to be excellent) references to the subject and links to them via my Scribd account.

Figure 3: Reproduction of Oscillogram of Propagation of Impulse Over Transmission Line; no Reflection. Voltage.

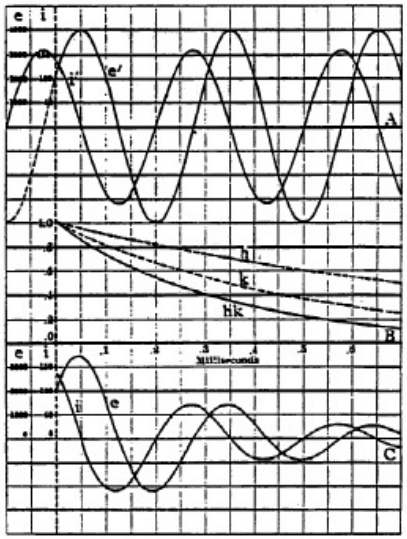

Figure 4: Alternating Wave, O.C. Envelope, and Oscillating Wave

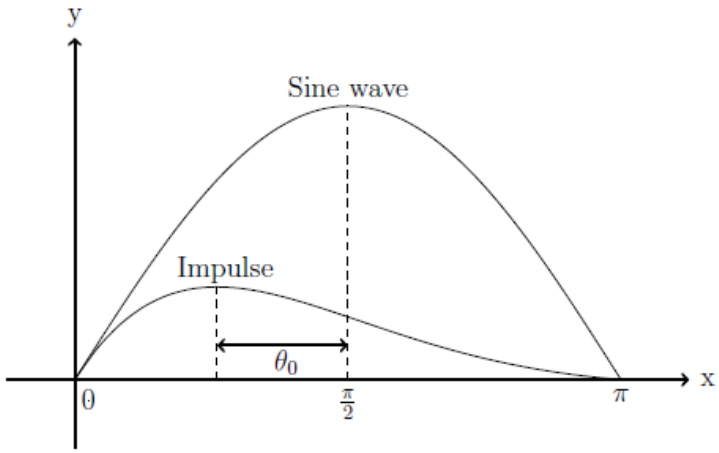

Figure 24: Comparison of Transient and Continuous Waves

By the way, I would like to give a HUGE shout of thanks to Jpolakow and Information_synthesis for "modernizing" and uploading the Generalized Electric Wave and other books of Mr. Dollard (to the yahoo N6KPH group). (They almost look like modern text books!)

REFERENCES:

EP DOLLARD;

Symbolic Representation of the Generalized Electric Wave [1985]

CP STEINMETZ;

General Equations of the Electric Circuit [1908] (This is Pt1)
Outline of Theory of Impulse Currents [1916] (This is "Pt2")
General Equations of the Electric Circuit Pt3 [1919]

5. ELECTRIC CONDUCTORS

OUTLINE OF THEORY OF IMPULSE CURRENTS

C. P. Steinmetz **Vol. xxxv—1916, pp. 1-20**

In Part I it is shown how, from the integral of the general differential equation of the electric circuit, which has been discussed in a previous paper, all types of electric currents are derived as special cases, corresponding to particular values of the integration constants.

In Part II an outline of the theory of impulse currents is given. They comprise two classes, the non-periodic and the periodic. The equations of both are given in different forms, by exponential and by hyperbolic or trigonometric functions.

A few special cases are discussed.

Discussion, pages 20-31, by Messrs. C. P. Steinmetz, M. I. Pupin, H. Pender, H. Lippelt and A. E. Kennelly.

A discussion of the advantages of the synthetic and analytic methods of studying engineering phenomena. A development of the special cases under impulse currents of the circuit having capacity in series.

Garrett M

Last edited by garrettm4 : 03-16-2012 at 10:56 PM.

Quote

Quote

03-17-2012, 01:46 AM #1148 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Archtype Electric "Waves"

General or Archtype Electric "Waves"

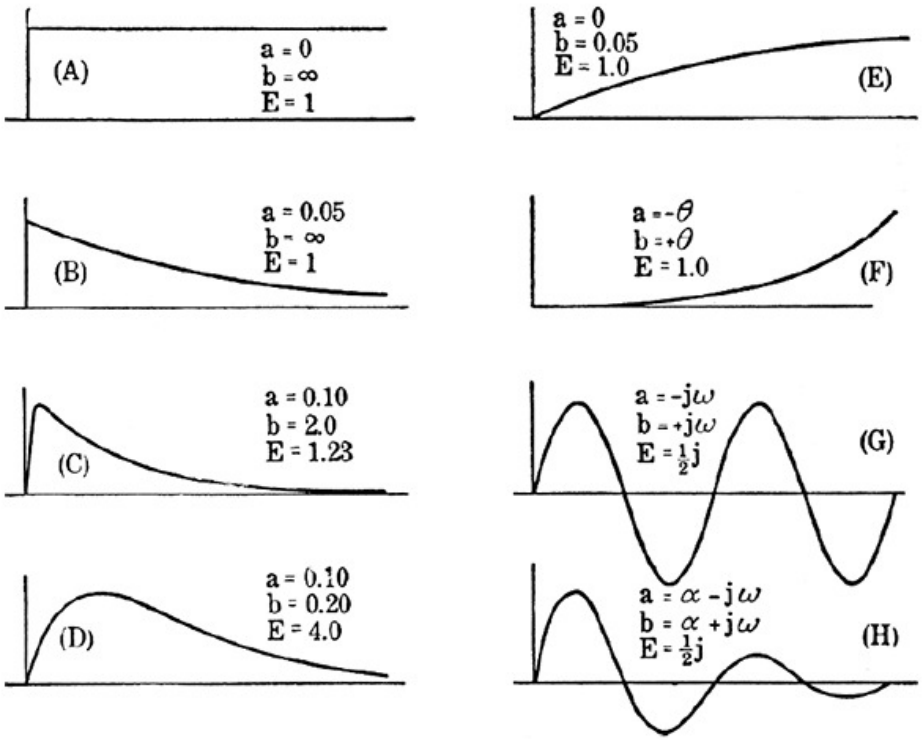

FIG. 4.—Empirical Wave Shapes Given by

$$e = E\,(\varepsilon^{-at} - \varepsilon^{-bt})$$

The Cyclic or Periodic variety:

1) Forced Alternations: (example, generator or alternator)
Alternating Current, Undamped - Continuous Level
Time: Radians per Second
Effective Field Energies: ONE, Magnetic OR Dielectric

1A) Constant Potential (this is what you use in your home)
RMS Current changes with load impedance, RMS Voltage remains constant

1B) Constant Current
RMS Voltage changes with load impedance, RMS Current remains constant

2) Forced Oscillations: (example, LC tank or coax)
Oscillating Current, Undamped - Continuous Level
Time: Radians per Second
Effective Field Energies: BOTH, Dielectric AND Magnetic

3) Free Oscillations: (example, LC tank or coax)
Oscillating Current, Damped - Logarithmic Rising or Falling Level
Time: Neper-Radians per Second
Effective Field Energies: BOTH, Dielectric AND Magnetic

NOTE for 2) & 3) in a distributed element network like a coaxial cable a harmonic wave (square wave) can develop rather than a fundamental sine, which a lumped LC tank would produce.

The Acyclic or Aperiodic Variety:

Impulses:

A)Magnetic Discharge (through an "effective resistance"), Damped - Logarithmic Rising or Falling Level with a Steep wave-front
Time: Nepers per Second
Effective Field Energies: ONE, Magnetic

B)Dielectric Discharge (through an "effective conductance"), Damped - Logarithmic Rising or Falling Level with a Steep wave-front
Time: Nepers per Second
Effective Field Energies: ONE, Dielectric

The Non-Cyclic or Non-Periodic Variety:

Continuous or Direct Current (NOT PULSED)
Time: NONE
Effective Field Energies: BOTH, Dielectric AND Magnetic

A)Constant Potential (a battery)
Current changes with load resistance, Voltage remains constant

B)Constant Current
Voltage changes with load resistance, Current remains constant

NOTE, All of the above can be simplified further (condensed to only 4 general types) but I thought it best to expand the General Archtypes a little bit to give more insight.

EVERYTHING ELSE:

Every other "wave" type is a combination of the above periodic, aperiodic and non-periodic types and can be looked at as compound waves.

Compound waves with DC Source (example):

Battery to BoomBox (radio) initial turn on is a Dielectric impulse, charging the filter capacitors. If on but not playing any music a quiescent current draw is DC. If playing music Load impedance changes dynamically, this causes a changing level in current draw and subsequently an AC signal is super-imposed upon the DC power signal from the battery. During turn off, if there was a high current draw as the switch was flipped off, then a Magnetic Impulse would be seen, although it would be very small due to low inductance.

Tesla Longitudinal Wave Energy [Video Transcript] Excerpt:

Mr. Dollard Giving a Lecture at a HAM Radio Meeting:

Now if we analyze these systems we find that [in] the longitudinal magneto dielectric system […] the electrostatic lines of force and the magnetic lines of force are directed in the same axis as the propagation of electrical energy. In the Hertzian system, the magnetic lines of force and the electrostatic lines of force exist at right angles to the direction of electrical energy propagation and this is what accounts for it's incredible losses. In [the LMD] system we have little or no losses. In [the TEM] system we have an extremely high level of losses, in fact by its very definition is resistance. It's called radiation resistance, a term familiar to many.

Also we have the waveforms that these devices produced. We are familiar with the conventional alternating current, and the alternating current has a real frequency in cycles per second, and it constantly cycles in a circular fashion back and forth. And then of course we know about the continuous current or the direct current which has no cycles per second. This would be called a scalar frequency. Scalar by definition is a quantity that does not vary in your system of variation, in either time or space or whatever variation you're talking about. An example would be atmospheric pressure. Atmospheric pressure is the same everywhere in this room and that's a scalar function. But if we take the function of the height of people in the room, obviously that's a spatial function, I can see all these waves moving around. so we have a scalar function and then we have a regular function of variation in this dimension of space within this room.

Now we have the waveforms that have been forgotten since the days of spark gap and wireless. One is the impulse wave, which is measured in decibels per second and has an exponential waveform. Where [the AC] waveform is expressed in sines and cosines, [the impulse] waveform is expressed in hyperbolic sines and hyperbolic cosines and never truly dampens out but always approaches zero asymptotically. Then we have the oscillating current waveform, and this is the one that was utilized by Tesla. This waveform is expressed in cycle-decibels per second. Now in Tesla's time, he had a concept which he called individualization where he would tune his resonant devices not only to respond to cycles per second but to the decibels per second and produce a second order of tuning where the waveform would become much more individualized.

Carrying this concept on further, if we take the resonant action of a simple LC circuit it produces a sinusoidal function. But if we take the resonant action of a quarter wave transmission line shorted at one end and open at the other, not only will it resonate at the fundamental frequency, but it will resonate at the third harmonic, fifth, and ninth and ad infinitum all the way up and it will produce [a square wave]. So we can see with the conventional tuning we're using the sine wave, in the transmission line tuning we end up with rectangular waves. Now if we take the resonance of a coil instead of a linear transmission line which is shorted at one end to ground and open at the other end, the harmonics are in phase and we end up with impulses. Now we find with the sine wave, the amplitude rather than being one, is the square root of two, $\sqrt{2}$, higher because of the peak to average ratio. With the rectangular wave it would be one. With the impulses, it's infinity.

Now what I attempted to show here is that in a measurable quantity of time like on an oscilloscope I've used the black to show what we would see on the screen. Now if we look at a square wave on the oscilloscope we know that this transition is not visible because the amount of time occupied is infinitesimal. Now with the impulse waveform, the pulses are of infinitesimal width.

What I'm trying to show with the shading here is the integration that shows that the energy contained in the wave is the area underneath it. There is no area on [the impulse waveform]. The amplitudes are infinite. And these are the waveforms that Tesla were working with and these waveforms would tend to punch through where the continuous waveforms wouldn't make it.

[end of excerpt]

Garrett M

Last edited by garrettm4 : 03-20-2012 at 01:57 AM.

Quote

Quote

03-20-2012, 09:40 PM #1154 (permalink)

garrettm4
Member

Join Date: Oct 2010
Posts: 38

Wire Diameter Error in Given Equations, Also Coil-Form Width Compensation Problems

This may have already been pointed out, but there is a minor error (~+8%) in the coil spacing for the wire diameter equation given by Mr. Dollard (caused from the divisors exact figure). I'm working out my transformer build and came across this problem, so I thought I would pass along the correct divisor and the step by step solution as well.

Algebraically, the wire diameter can be found by using:

$$h = (d * T) + (T - 1)(d * S)$$

Where,
h = coil height (20% of width given) (in meters)
d = wire diameter (soon to be found) (in meters)
T = number of turns (20 given) (numeric)
S = spacing factor (62% given) (numeric)

It can be seen that the wire diameter times the number of turns PLUS the spacing in-between the wires ("fill factor") should give the total height.

For given desired parameters (listed above):

$$h = (d * 20) + (20 - 1)(d * 0.62)$$

$$h = \frac{1589}{50} d$$

Wire Diameter:

$$d = \frac{h}{31.78}$$

Remember that the wire diameter d is given in meters, so be sure to move the decimal to the correct place if using cm or mm when looking for wire.

Thus for a 20 turn, single layer solenoid, with 62% coil spacing, the wire diameter is 3.1466331% of the coil height, where coil height is 20% of coil width.

The error of the original "32.8" divisor comes out to be a 67.36842% coil spacing factor instead of the specified 62%, which inadvertently causes a smaller wire diameter to be used than wanted. I believe this to be caused by a "double rounding up" mishap of the divisor when Mr. Dollard wrote it down (the 31.78 if accidentally rounded up "twice" would give 32.8). **It would seem Murphy's Law was the culprit here.**

Something else to point out, is that "a" given by Mr. Dollard is the "Fill Factor" NOT the "Spacing Factor". This is a debatable issue of "semantics", BUT, I think this should be explained a little better, so that there are less misunderstandings for those building the Tesla Transformer.

"Fill Factor":

$$a = T + (T - 1)S$$

Where,

a = Fill Factor (numeric) (this is the "dead space" or unused space)
T= Turns (numeric)
S = Spacing Factor (numeric) (this is the ratio of wire diameter to coil pitch) (62% given)

"Spacing Factor":

$$S = \frac{d}{P} = \frac{d}{d+l_2}$$

Where,
S = Spacing Factor (numeric) (62% given)
d = wire diameter (in meters)
P = coil pitch, the distance between the center of one turn and the next (in meters)

It can be seen that the "spacing factor" is the ratio of wire diameter to coil pitch. This ratio is found according to the Radiotron Handbook to be best for all coil types at 0.60.

Coil Pitch:

$$P = 2r + l_2$$

or

$$P = d + l_2$$

Where,
P = coil pitch (in meters)
r = wire radius (in meters)
d = wire diameter (in meters)
l_2 = distance in-between wires (in meters)

It can be seen that the pitch is the distance between the center of one turn and the next, or the sum of the radius of both wires and the arbitrary distance in-between each of these wires.

For given parameters of S:

Distance In-Between Wires:

$$l_2 = \frac{19}{31}d$$

I though this might help people who have already wound their coil, to see if they have the correct spacing, other wise this isn't all that useful. For coax users you need to factor out the jacket for this to be helpful.

NOTE FOR COAX USERS (specifically on the secondary winding):

I don't know if anyone has ran into this issue as well, but the coil-form's width (w_0) should be one wire-diameter length (d) smaller to accommodate the wire correctly.

(Original Coil-Form Width) - (2 * (Wire Radius)) = (Compensated Coil-Form Width)

Or

$$w_0 - d = w_1$$

where,
w_0 = the original coil-form width (derived from turn length) (in meters)
d = the wire diameter (in meters)
w_1 = the compensated coil-form width (in meters)

Coax with the jacket left on would exacerbate the alignment error and lower the coil Q due to dielectric losses of the jacket (the jacket should be removed, albeit a PITA to do). This becomes a bigger problem if large coax or more than 20 turns is used (greater offset error), the wire wont line up to be a perfect 20, or however many turns at the end, if the coil-form isn't compensated for the use of large diameter wires and also for the wire's jacketing.

With this adjustment, the CENTER of the wire will be placed EXACTLY at the previously calculated "imaginary cylinder SURFACE" of the Coil-Form w_0. If compensation is not done this may give rise to lower magnification factor because of "less complete turns" (the 20th turn would only be partially complete, getting worse with thicker jackets and larger wire diameter), although this really is only a problem for coax users, like myself.

Furthermore, the "turn length" l_1, is in theory a perfect ring of a minute diameter not a split and stretched ring (helix) with (potentially) substantial diameter like is seen on the coil-form while building (this is exacerbated with large spacing factors). This leads to the coil-form being too wide for the desired number of "complete turns" for the given length of wire used, this is still true even if you compensate for wire diameter. To make more clear what I am saying, the resultant helix is longer than the calculated circle, thus less turns are produced for a given length of wire.

I will put up the "helix correction factor" for the new compensated coil-form width in a bit.

I want to point out that the adjustments I have talked about are very minor and would only change the physical dimensions of the coil-form a very very small amount and with building tolerances considered they might not even be worth the extra effort to implement.

Garrett M

Last edited by garrettm4 : Today at 05:01 PM.

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garrettm4's posts from thread page 12 through 39 so far. some further pages I have on another harddisk - will come later with it.
pages 1 through 5 or so, 31 through 38 & 41 not yet included:
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