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A Theorem of Mass Being Derived From Electrical Standing Waves

(Adapted for a test by Jerry E. Bayles)

- by -

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This paper formalizes a concept presented in my book, "Electrogravitation As A Unified Field Theory", (as well as in numerous related papers), the concept of mass being the result of standing waves. More exactly, the result of electrical standing waves.

First, the electric mass equation developed in previous papers will be presented in terms related directly to the rest mass energy of the electron. This is done so as to establish the fact that ordinary parameters such as the permeability of free space, the charge squared of an electron, and the classic electron radius directly establish the mass of the electron. Then we will develop an actual standing wave on a transmission line of arbitrary load resistance and line impedance. Using currents derived from charge and time related to frequency, the mass-gain involving the current squared times the wavelength squared feature of the developed mass-energy equation will be presented. This suggests that an electrical mass creation may be nonlinear to the forth power by reason of the current squared times the length squared.

Then the naturally negative mass feature involving the phasor form of purely reactive current is presented which suggests that purely reactive energy has a built-in negative mass associated with its field. From that, we launch into a transmission line analysis involving standing waves and examine the results of a standing voltage and current wave given some arbitrary input voltage, line impedance, and load. From the current derivation, we utilize the mass-energy equation to plot a resulting mass wave buildup on the transmission line. Note that in Mathcad, the parameters of the equations are active and can be changed for analysis purposes. If you do not have your own Mathcad 6.0+ or later, you can download the Mathcad Explorer for free from Mathcad website. (Link at: http://www.electrogravity.com).

It is the purpose of this paper to provide the mechanics necessary for the successful design of a negative mass test based on transmission line standing waves. It is of interest that the shorted load quarter wave transmission line is theoretically capable of infinite current at a zero ohm load. By contrast, the quarter wave open circuit load is theoretically capable of infinite voltage at the open circuit load. Both of these conditions assume a very careful adjustment of transmission line geometry as well as a very stable and accurate frequency as will be shown on page 4 in the section: "Proposal for pendulum test by Jerry E. Bayles." The design considered in this paper will be for the shorted load line.

The next three pages serve as an introduction to how the concept of negative field mass is arrived at.

The Electric Equivalent of Mass

$\mu_o := 1.256637061 \cdot 10^{-06} \cdot henry \cdot m^{-1}$	Magnetic permeability.
$m_e := 9.109389700 \cdot 10^{-31} \cdot kg$	Electron rest mass.
$q_o := 1.602177330 \cdot 10^{-19} \cdot coul$	Electron charge.
$c := 2.997924580 \cdot 10^{08} \cdot m \cdot sec^{-1}$	Speed of light in a vacuum.
$h := 6.626075500 \cdot 10^{-34} \cdot joule \cdot sec$	Plank constant.
$l_q := 2.817940920 \cdot 10^{-15} \cdot m$	Classical electron radius.

Let: $t_x := \dfrac{h}{m_e \cdot c^2}$ $\quad t_x = 8.0933009996 \cdot 10^{-21} \cdot sec$ eq. 1

and: $i_q := \dfrac{q_o}{t_x}$ $\quad i_q = 19.7963393438 \cdot amp$ eq. 2

Now let: $m_e \cdot c^2 = \left(\mu_o \cdot \dfrac{i_q^{\,2}}{4 \cdot \pi \cdot l_q}\right) \cdot (d)^2$ Solving for d: eq. 3

has solutions)

$$\begin{bmatrix} \dfrac{-2}{\left(\sqrt{\mu_o} \cdot i_q\right)} \cdot \sqrt{\pi} \cdot \sqrt{l_q} \cdot \sqrt{m_e} \cdot c \\ \dfrac{2}{\left(\sqrt{\mu_o} \cdot i_q\right)} \cdot \sqrt{\pi} \cdot \sqrt{l_q} \cdot \sqrt{m_e} \cdot c \end{bmatrix}$$

Note that the m_e term is proportional to the square of the current term since c^2 is a constant.

Where:

$$\frac{-2}{\left(\sqrt{\mu_o} \cdot i_q\right)} \cdot \sqrt{\pi} \cdot \sqrt{l_q} \cdot \sqrt{m_e} \cdot c = -2.4263106016 \cdot 10^{-12} \cdot m$$ eq. 4

and:

$$\frac{2}{\left(\sqrt{\mu_o} \cdot i_q\right)} \cdot \sqrt{\pi} \cdot \sqrt{l_q} \cdot \sqrt{m_e} \cdot c = 2.4263106016 \cdot 10^{-12} \cdot m$$ eq. 5

Check: $d := \dfrac{h}{m_e \cdot c}$ $\quad d = 2.4263106 \cdot 10^{-12} \cdot m$ eq. 6

(= Compton wavelength of the electron.)

Quantum mass check of the above:

$$m_x := \left(\mu_o \cdot \frac{i_q^2}{4\cdot\pi\cdot l_q}\right)\cdot\left(\frac{d}{c}\right)^2 \qquad m_x = 9.1093896883\cdot 10^{-31}\cdot kg \qquad \text{eq. 7}$$

(= rest mass of the electron.)

Note that the mass is proportional to the current squared for a fixed wavelength, d. Then related to current, the mass would increase exponentially.

Let us calculate the effective mass related to the current squared in an antenna with the following arbitrary parameters:

Let: $i_{ant} := 1\cdot 10^{02}\cdot amp$ and $f_{ant} := 1\cdot 10^{04}\cdot Hz$

Then: $d_{ant} := \frac{c}{f_{ant}}$ or, $d_{ant} = 2.99792458\cdot 10^{4}\cdot m$

Then the effective mass is given by:

$$m_{ant} := \left(\mu_o \cdot \frac{i_{ant}^2}{4\cdot\pi\cdot l_q}\right)\cdot\left(\frac{d_{ant}}{c}\right)^2 \qquad \text{eq. 8}$$

Note: The calculation uses <u>real</u> parameters since we are considering the case for antenna action.

or, $m_{ant} = 3.5486904376\cdot 10^{3}\cdot kg$ (A significant mass increase over the mass of the electron.)

Note also that the above macroscopic effective mass calculation now is proportional to the square of the current as well as the square of the wavelength. <u>If we consider the case for purely inductive or capacitive current, then the following applies:</u>

Let: $\theta := \frac{\pi}{2}$ and $i_{sw} := i_{ant}\cdot e^{j\cdot\theta}$ (+ = Inductive case)

then: $i_{sw} = 6.1230317691\cdot 10^{-15} + 100j \cdot amp$

Then the effective mass related to purely reactive current wave is given below as:

$$m_{sw} := \left(\mu_o \cdot \frac{i_{sw}^2}{4\cdot\pi\cdot l_q}\right)\cdot\left(\frac{d_{ant}}{c}\right)^2 \qquad \text{eq. 9}$$

or, This is the case for a non-radiating 'antenna' that is a pure standing wave.

$m_{sw} = -3.5486904376\cdot 10^{3} + 4.3457488576\cdot 10^{-13} j \cdot kg$

Note for a purely reactive quarter wavelength current wave, the effective mass is negative and real. This implies that a powerful enough wave should be able to reverse the attraction of gravity since the effective field mass is negative.

As an example, let us calculate the force of repulsion at the surface of the Earth for the above mass. First we establish related parameters as:

$G := 6.672590000 \cdot 10^{-11} \cdot newton \cdot m^2 \cdot kg^{-2}$ Gravitational constant.

$R_E := 6.37 \cdot 10^6 \cdot m$ Mean radius of the Earth.

$M_E := 5.98 \cdot 10^{24} \cdot kg$ Mass of the Earth.

Then the force on the surface of the earth related to the negative effective mass calculated above is given by the equation below as:

$$F_E := \frac{G \cdot M_E \cdot m_{sw}}{{R_E}^2} \quad \text{or,} \qquad \text{eq. 10}$$

$$F_E = \left(-3.4896741455 \cdot 10^4 + 4.2734771314 \cdot 10^{-12} j\right) \cdot newton$$

which is a real and negative force of repulsion by reason of the standard equation result is normally positive and one of attraction.

NOTE: If we allow for a 0 or 180 degree (0 or π = half wavelength reactive line) in theta above, the force will be one of attraction since the effective mass will be positive. Inserting a theta (θ) of (π/2 or -π/2 = quarter wavelength reactive line) will yield an effective negative mass. Refer to APPENDIX 2, p. 10, for implications of the quarter wave and half wave as applied to negative mass, electron mass, and photon structure.

Then if the top of a UFO style craft had a real component field while the bottom had a reactive field, the top would attract and the bottom would repel other normal mass.

The following is an analysis of how mass is created by standing wave of current in a transmission line.

The voltage and currents along the line with respect to time are given by the following equations below, which is the sum of the forward and reverse propagating waves.

z = any point on line.

$$V(z_{vec}) = V_{plusvec} \cdot e^{-j \cdot \left(\frac{\omega}{u}\right) \cdot z} + V_{negvec} \cdot e^{j \cdot \left(\frac{\omega}{u}\right) \cdot z} \qquad \text{eq. 11}$$

Rc = line impedance.

$$I(z_{vec}) = \frac{V_{plusvec}}{R_c} \cdot e^{-j \cdot \left(\frac{\omega}{u}\right) \cdot z} - \frac{V_{negvec}}{R_c} \cdot e^{j \cdot \left(\frac{\omega}{u}\right) \cdot z} \qquad \text{eq. 12}$$

where the $V_{plusvec}$ and V_{negvec} terms are generally complex numbers as:

$$V_{plusvec} = V_{mplus} \cdot e^{j \cdot \theta} \qquad V_{negvec} = V_{mneg} \cdot e^{-j \cdot \theta}$$

Proposal for a new spring oscillator test by Jerry E. Bayles:

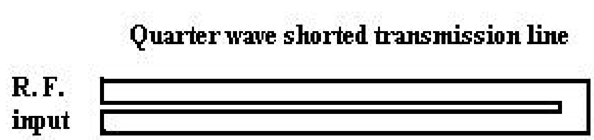
The following is a proposal for a test of an transmission line operated as a quarter wave shorted load line. The frequency is in the u.h.f. range. Let us determine the characteristic impedance of a transmission line with the following parameters:

Separation distance of lines	$D := .0100000$	meter
Diameter of lines:	$d := .0199999$	meter
Dielectric constant (air):	$k := 1$	

Then: $Z_o := \frac{276}{\sqrt{k}} \cdot \log\left(\frac{2 \cdot D}{d}\right)$ $\qquad Z_o = 5.9932788334 \cdot 10^{-4}$ ohm

A pictorial is shown below in figure 1 which shows a quarter wavelength section of transmission line. If the diameter d of the line elements is slightly less (as shown for the Zo calculation above) than twice the separation distance D of those same elements, the characteristic Z of the line is positive and low. (A diameter exactly twice the separation distance yields zero ohms as the characteristic Z of the line while a diameter slightly more than twice the separation distance will yield a negative characteristic Z for the transmission line.)

Figure 1



Note that very careful adjustment of the transmission line parameters above will allow for an almost zero ohm (or even negative) transmission line impedance. This will cause a larger reactive current in the line at the short and thus greater negative mass as a result. (Might this principle apply to superconductivity?)

Very precise control of frequency needed for an exact quarter wavelength with carefully adjusted dimensions related to the diameter and spacing of the elements will cause tremendous reactive currents to flow in the transmission line at and near the shorted end. A superconductive short would magnify the negative mass effect.

The octagonal transmission line arrangement presented in previous tests is barely scratching the surface of what can theoretically be obtained from an exact quarter wavelength (or odd multiple of quarter wavelengths) transmission line acting as a voltage to current transformer or as a current to voltage transformer. (The latter case is for an open circuited transmission line that is current fed which can theoretically produce an unlimited voltage at the open circuited end.)

Related to the above introduction, various related test parameters are defined as:

$f \equiv 214.13 \cdot 10^{06}$	Frequency (Hz) (Global declaration, see appendix 1.)
$\omega := 2 \cdot \pi \cdot f$	Angular frequency (rad/sec)
$u := 2.99782 \cdot 10^{08}$	Propagation vel. of transmission line
$\zeta \equiv 0.35$	Actual length of line (m)(Global declaration)
$R_c := Z_o$	Characteristic Z of transmission line (ohms)
$Z_L := 1 \cdot 10^{-09} + j \cdot 0$	Approx. open circuit Load impedance (ohms).
$V_S := 10.0 + j \cdot 0$	Input source voltage (unloaded)
$\beta := \frac{\omega}{u}$	Phase constant

where, $\beta = 4.4879895051$ rad/m

Line length as actual electrical wavelength is given as:

$$\lambda := \frac{u}{f} \quad \text{or,} \quad \lambda = 1.4 \quad \text{(m)} \qquad \text{eq. 20}$$

The line ratio of actual length to electrical wavelength is:

$$\frac{\zeta}{\lambda} = 0.25 \qquad \text{eq. 21}$$

The reflection coefficient at the load and the input is calculated next:

$$\Gamma_L := \frac{Z_L - R_c}{Z_L + R_c} \qquad \Gamma_L = -0.9999966629 \quad \text{(Load)} \qquad \text{eq. 22}$$

Next we define z as any point along the line. Then:

$$\Gamma(z) := \Gamma_L \cdot e^{j \cdot 2 \cdot \beta \cdot (z - \zeta)}$$ which is the generalized voltage reflection coefficient. eq. 23

Then the reflection coefficient at the input to the line is:

$$\Gamma(0) = 0.9999966629 + 1.2246022672 \cdot 10^{-16} j \qquad \text{(Input)}$$

The voltage standing wave ratio (VSWR) is:

$$VSWR := \text{if}\left(\left|\Gamma_L\right| \neq 1, \frac{1 + \left|\Gamma_L\right|}{1 - \left|\Gamma_L\right|}, \infty\right) \qquad \text{eq. 24}$$

Then: $VSWR = 5.9932788332 \cdot 10^{5}$ (Line is shorted at load.)

The nominal line input impedance is calculated to be:

$$Z_{in} := R_c \cdot \frac{1 + \Gamma(0)}{1 - \Gamma(0)} \qquad \text{eq. 25}$$

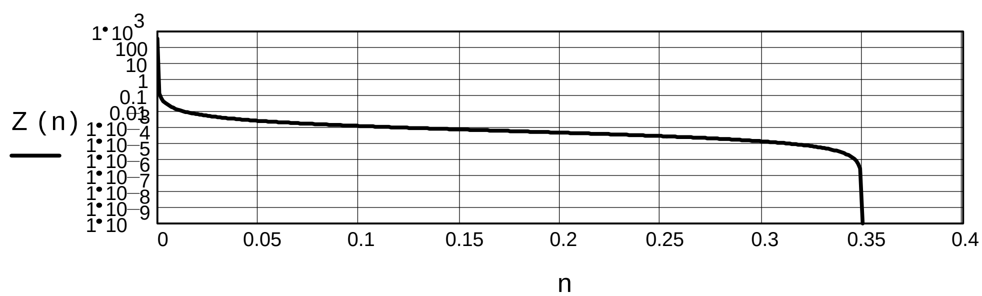
$$Z_{in} = 359.1939117337 + 1.318135216 \cdot 10^{-8} j \qquad \text{(ohms)}$$

The active impedance along the line is a variable as the below graph shows:

$n := 0.000, 0.001 .. 0.35$

$$Z(n) := \left| R_c \cdot \frac{1 + \Gamma(n)}{1 - \Gamma(n)} \right| \qquad \text{eq. 25b}$$

Graph 1



(The Z would be also be a variable along a Tesla coil secondary: See appendix.)

Next, we determine the time domain voltage at the line input and at the load:

First the source end reflection coefficient is calculated as: LET: $Z_S := Z_{in}$

$$\Gamma_S := \frac{Z_S - R_c}{Z_S + R_c} \qquad \Gamma_S = 0.9999966629 + 1.2246022672 \cdot 10^{-16} j \qquad \text{eq. 26}$$

Voltage anywhere along the line is: $Z_S = 359.1939117337 + 1.318135216 \cdot 10^{-8} j$

$$V(z) := \frac{1 + \Gamma_L \cdot e^{-j \cdot 2 \cdot \beta \cdot (\zeta - z)}}{1 - \Gamma_S \cdot \Gamma_L \cdot e^{-j \cdot 2 \cdot \beta \cdot \zeta}} \cdot \frac{R_c}{Z_S + R_c} \cdot V_S \cdot e^{-j \cdot \beta \cdot z} \qquad \text{eq. 27}$$

Then the nominal input V(z) is:

$$V(0) = 5.0000000001 + 5.848578653 \cdot 10^{-21} j \qquad (= V_{in})$$

The input phase is:

$$\text{if}\left(|V(0)| \neq 0, \frac{\arg(V(0))}{\text{deg}}, 0 \right) = 3.839950228 \cdot 10^{-18} \cdot \text{deg} \qquad \text{eq. 28}$$

The absolute load voltage is: The complex load voltage is:

$$|V(\zeta)| = 8.3426787562\cdot 10^{-6} \qquad V(\zeta) = 1.0610940241\cdot 10^{-26} - 8.3426787562\cdot 10^{-6}j$$

The load phase is:

NOTE: The load phase below is time lead or lag in degrees per cycle and may cause time travel.

$$\text{if}\left(|V(\zeta)| \neq 0, \frac{\arg(V(\zeta))}{deg}, 0\right) = -5.1566201562\cdot 10^{3} \cdot deg \qquad \text{eq. 29}$$

Since we have an expression for the voltage anywhere on the line, (eq. 27), then the current at the input and load may be expressed as:

(+ = current leading voltage = capacitive.)

$$I_{in} := \frac{V(0)}{Z_{in}} \qquad I_{in} = 0.0139200578 - 5.108248706\cdot 10^{-13}j \quad \text{(amp)} \qquad \text{eq. 30}$$

$$I_L := \frac{V(\zeta)}{Z_L} \qquad I_L = 1.0610940241\cdot 10^{-17} - 8.3426787562\cdot 10^{3}j \quad \text{(amp)} \qquad \text{eq. 31}$$

The input and load power is given below as:(Volts times conjugated current.)

$$P_{in} := \left[V(0)\cdot\left(\overline{I_{in}}\right)\right] \qquad P_{in} = 0.0696002888 + 2.5541243532\cdot 10^{-12}j \quad \text{watt} \qquad \text{eq. 32}$$

$$P_{ld} := \left[V(\zeta)\cdot\left(\overline{I_L}\right)\right] \qquad P_{ld} = 0.0696002888 - 1.9572440119\cdot 10^{-39}j \quad \text{watt} \qquad \text{eq. 33}$$

The plot of phasor domain voltage and current is presented below.

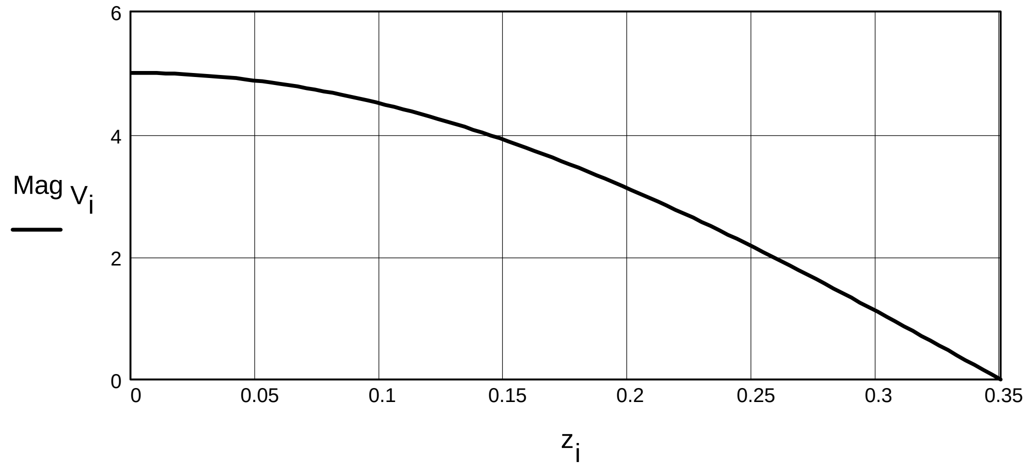
$$npts := 100 \qquad z_{start} := 0 \qquad z_{end} := \zeta$$

$$i := 0..npts - 1 \qquad z_i := z_{start} + i\cdot\frac{z_{end} - z_{start}}{npts - 1} \qquad \text{eq. 34}$$

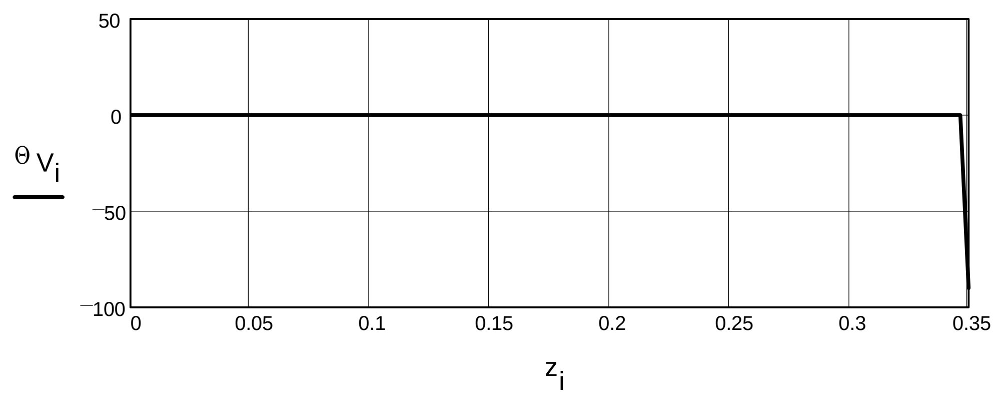
$$Mag_{V_i} := V(z_i)$$ (Voltage magnitude along the line from start to end)

$$\Theta_{V_i} := \text{if}\left(|V(z_i)| \neq 0, \frac{\arg(V(z_i))}{deg}, 0\right)$$ (Voltage phase along line) eq. 35

Voltage magnitude along the transmission line is: Graph 2



Voltage phase along the transmission line. Graph 3



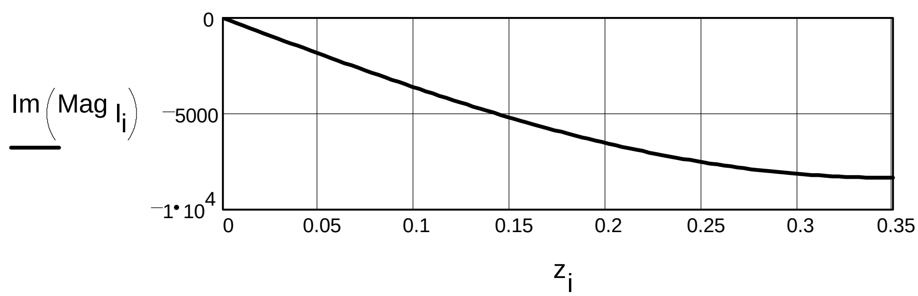
Next the current along the transmission line may be given by:

$$\mathrm{Mag}\, I_i := \frac{\mathrm{Mag}\, V_i}{R_c \cdot \left(\dfrac{1 + \Gamma(z_i)}{1 - \Gamma(z_i)} \right)} \qquad \text{Equivalent to:} \qquad I(z_i) = \frac{V(z_i)}{Z(z_i)} \qquad \text{eq. 36}$$

Where again: $I_{in} = 0.0139200578 - 5.108248706 \cdot 10^{-13} j$

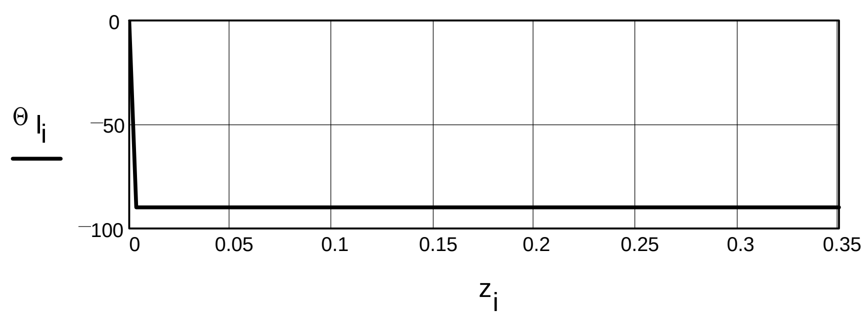
$I_L = 1.0610940241 \cdot 10^{-17} - 8.3426787562 \cdot 10^{3} j$

Plot of the reactive Mag $_I$ current along line: Graph 4



The current phase is derived as: $\Theta_{I_i} := \text{if}\left(\left|Mag_{I_i}\right| \neq 0, \frac{\arg\left(Mag_{I_i}\right)}{deg}, 0\right)$ eq. 37

The current phase plot is provided below as: Graph 5



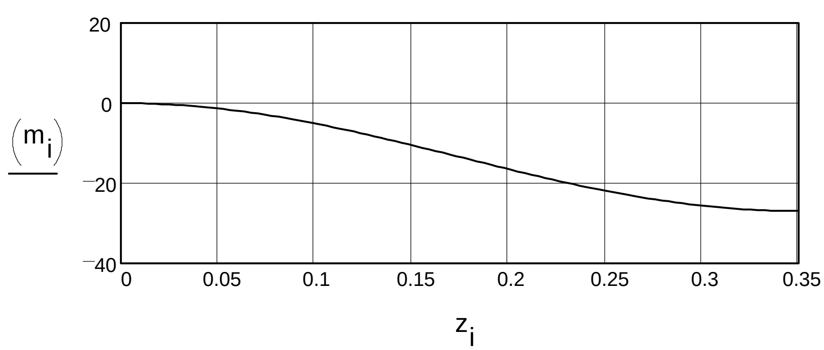
Based on the line amps calculated above at the given line length, the effective field mass in the transmission line can be calculated as:

Let: $\mu_o := 4\cdot\pi\cdot 1\cdot 10^{-07}$ and $\mu := 8000$ for an iron ferrite surface layer.

$l_q := 2.817940920\cdot 10^{-15}$ $c := 2.997924580\cdot 10^{08}$

$$m_i := \left[\mu\cdot\mu_o\cdot\frac{\left(Mag_{I_i}\right)^2}{4\cdot\pi\cdot l_q}\right]\cdot\left(\frac{\zeta}{c}\right)^2$$ (= negative mass in kg.) eq. 38

Graph 6



NOTE: Multiply ζ on p. 5 by an odd number to see what happens. The negative mass sum rises exponentially! These are the light rings on the surface of a UFO?

The average negative field mass in kg of the line is given by: eq. 39

$$m_{avg} := \left(\sum_i m_i\right) \cdot npts^{-1} \quad m_{avg} = -13.4658518598 - 2.8319019698 \cdot 10^{-5} j \quad \text{kg}$$

The final result in the above equation demonstrates that if the geometry is treated as a transmission line, then negative mass occurs naturally via the reactive terms as shown above. The power in was only: $P_{in} = 0.0696002888 + 2.5541243532 \cdot 10^{-12} j$ watts. **NOTE:** This is a considerable mass change for such a small power input!

APPENDIX1:

It is also of interest that a quarter wavelength presents a parallel resonant condition which would appear as a very high Z circuit to a source at the transmission line input. Note that all of this is also for a line that is short circuit at the load end.

The design of the above transmission line with a superconductive short and a ferrous material to boost the permeability would greatly increase the negative mass result as shown above. Also allowing for a increased dielectric permittivity greater than air would reduce the power required at the input for the same given negative mass result.

ALSO OF NOTE: It is of interest that a Tesla coil operates on a quarter wavelength principle in that the actual physical length of the secondary winding is 1/4 wavelength (or 3/4, 1 1/4, etc.) related to the resonant secondary operating frequency, usually around 100 to 200 KHz. This is equivalent to 1500 to 3000 meters. This length squared times the current squared (average) along the secondary length will determine the theoretical negative mass buildup in the secondary. Has anyone actually measured the weight of a Tesla coil before and during the coil being operated?

I suggest that it may be of interest to the experimenter who is testing for the negative mass effect to test a Tesla coil for a mass decrease during its operation relative to when it is not operating. The current and voltage in the secondary are purely reactive and fulfill the test requirements of the above presentation. If anyone does this test, please let me know how it turns out.

APPENDIX 2:

The negative mass associated with a quarter wave reactive line may be assumed not to be a natural occurrence and therefore has to be generated artificially for it to be a sustained action. The electron is assigned a spin of 1/2 which simplified means that it has to turn twice to complete a rotation. In other words, two half wavelengths = a whole wavelength. In page 3 previous, the half wavelength transmission line of 0 or 180 degrees was shown to be a positive field mass result.

To be more exact, the positive mass electron may be considered as alternating between $+\pi$ and $-\pi$ degrees and back to $+\pi$ to achieve a complete cycle while the negative mass positron alternates between $+\pi/2$ to $-\pi/2$ and back to $+\pi/2$ to complete a cycle. Both combine two half waves to make a whole wave. In contrast, the quarter wave discussed in the main body of this paper above is always a negative field mass generator and is not a natural quantum phenomena. The half wave is a natural phenomena and it generates a positive field mass.

The electron can be considered to be sine wave action while the positron can be considered to be a cosine wave action when allowing for a 90 degree displacement of phase between their mechanics as described above. Why electrons are favored for existence over positrons in our universe may have something to do with this phase displacement between the two of them, especially if reality is projected energy which must occur at a given beginning phase, say 0 or 180 degrees.

Alternations that are occurring in place as standing waves are particles with rest mass while photons are particles without rest mass that represent real power, not reactive power, and are not in place but move along at the velocity of light in free space.

We have a technology that for the present has assumed that photons are to only allowed messengers of information, force, or action at a distance. This is unfortunate since standing waves are capable of transferring information, force, and action at a distance at superluminal velocity since their velocity is calculated to be unlimited.

Finally, I consider gravity to be the result of time distortion in the above described half wave that creates the electron and all matter related to the electron. That is, the alternations that were described above that make up the electron and perhaps protons are not perfect but have a very small amount of built in time distortion. This Δt is the cause of the fLM (or herein Δf) in my equations of electrogravitation. It is not a normal radiated electromagnetic frequency but rather a measure of natural imperfection that translates to a force of action we call gravity. It could be called a measure of natures entropy that causes gravity. The vector magnetic potential is the vectored action inline to the direction of the source current alternation half wave. This vector potential carries the Δt to the receptor wave/particle it interacts with.

The concept of time distortion goes right to the heart of acceleration by $a = \Delta v/\Delta t$ and $\Delta m = m_o/\mathrm{sqrt}(1-\Delta v^2/c^2)$ and $\Delta t = t_o/\mathrm{sqrt}(1-\Delta v^2/c^2)$ as well as quantum uncertainty and entropy which includes the laws of thermodynamics. Thus my electrogravitational theory does not depend on the present compartmentalized understanding of physics (including the theories of special and general relativity) but includes them as part of the total mechanics presented in this and my previous works on electrogravitation.

--Author--

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