STUDY OF GRAVITY

(CONTINUED part 2)

(SPESIF) Space Propulsion and

Energy Science International Forum

(BOE021510-074)

MIKE GAMBLE
3/17/11

BOEING Release Memo

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Sent: Tue 2/23/2010 12:13 PM

From: EXT-Pinkston, Patricia

To: Gamble, Michael A

Subject: Approved for Release: BOE021510-074

Hi Jill - Your reference BOE021510-074 "Study of Gravity part2" has been approved for Public Release.

Attached is a copy of your Approved "signed" ROI form.

<< File: GravityPrst2.ppt >>

IMPORTANT: Please keep all copies of the signed release documents (as these will be necessary if you submit another paper of a related topic).

Thank you and congratulations,

Patricia Pinkston staff analyst

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SPESIF PITCH NOTES 2/24/10

Figure 1A) This is the Boeing memo allowing the “Public Domain” release of this “Study of Gravity” (part 2). All Boeing documents have to be reviewed and approved before they can be presented or published.

STUDY OF GRAVITY (cont)

INTRODUCTION

Hello, my name is Mike Gamble, I am an electronics engineer for The Boeing Co. (Seattle). Would like to thank the chair person for having me back to present (part2) as the (part1) presentation of gravity was from a very different perspective, more of a macroscopic overview.

HISTORY

At the 2009 SPESIF conference I presented the “Study of Gravity” (part1). Starting with documentation of existing relevant data about gravity. Then proceeded with the mathematical analysis concluding with a four wave harmonic dipole accelerating field model. This presentation the “Study of Gravity” (part2) continues the mathematical analysis of gravity concluding with electromagnetic field equations of that same model. As some may not have seen last year’s presentation I have included a few charts from (part1) for review.

Mike Gamble (michael.a.gamble@boeing.com)

Steps in Understanding Gravity

- **Tutorials**
  - **Schumann Resonance**
  - **DC/AC Dipoles**
  - **Traveling /Standing Waves**
- **Acceleration data plot conversions:**
  - **X(equator) and Y(polar) to cylindrical coordinates**
  - **English to metric units**
  - **Most (EM) electromagnetic equations are in metric units and spherical coordinates**
- **E-field, B-field and F-field wave generation**
- **Gravity conclusions**
- **Proposed space drives**

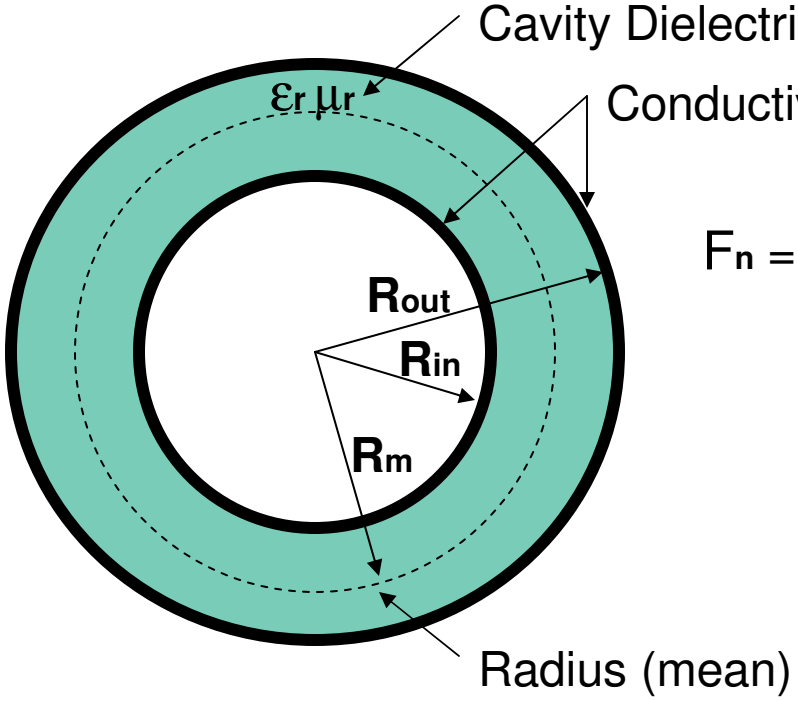
Figure 3) "Steps in Understanding Gravity" is an outline of the tasks preformed in part 2. It contains three tutorials and the main section on (EM) ElectroMagnetic field generation followed by a couple of proposed space drives. The first tutorial is a more in depth study of Schumann resonance as part 1 only mentioned it in passing. The second tutorial is on basic DC and AC dipoles including their detailed EM equations. The third tutorial is a detailed study of EM traveling and standing waves as they apply to this study. The main section on EM field generation takes the acceleration equations created in part 1 and converts them to cylindrical coordinates and metric units. This change makes the mathematics somewhat easier to work with as standard EM field equations are metric but in spherical coordinates. Part 2 concludes with a working EM accelerating force (gravity) equation which has very good correlation to the original proposed data from part 1. The presentation concludes with a couple of proposed space drives based on this information.

SCHUMANN RESONANCE

Figure 4) "Schumann Resonance" is a short tutorial on the subject of resonate waves and how they apply to this "Study of Gravity". It takes a more detailed look at what these waves contribute to the earth's operating system.

Spherical EM Resonate Cavity

Open Ended Cavity Supports All Harmonics



$$F_n = \frac{c\,[n(n+1)]^{0.5}\,[\mu_r / \varepsilon_r]^{0.5}}{2\pi R_m}$$

Equation Terms

F_n = Freq of osc

c = Speed of light

R_m = Radius (mean)

n = Harmonic number

μ_r = Magnetic permeability

ε_r = Electric permittivity

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Figure 5) "Spherical EM Resonate Cavity" is the standard textbook definition of a 3D circular (spherical) EM cavity oscillator. It will support all harmonic frequencies (fundamental, second, third, fourth, etc) as it is an open ended tuned structure. The cavity is composed of a dielectric media located between two electrically conductive surfaces. As it is circular in shape the transfer function uses the average radius (Rm) of the two surface radiuses (Rin, Rout). From the equation it can be seen that the frequency is determined by three variables: the mean radius (Rm), the electric permittivity (εr) and the magnetic permeability (μr).

Main points:

1) Open ended 3D tuned structure
2) Composed of a dielectric media between two conductors
3) Frequency is controlled by three variables: Rm, εr and μr

EARTH'S RESONATE CAVITY

R_{out} = 4063Miles (outer)
R_m = 4013Miles (mean)
(Re) R_{in} = 3963Miles (inner)

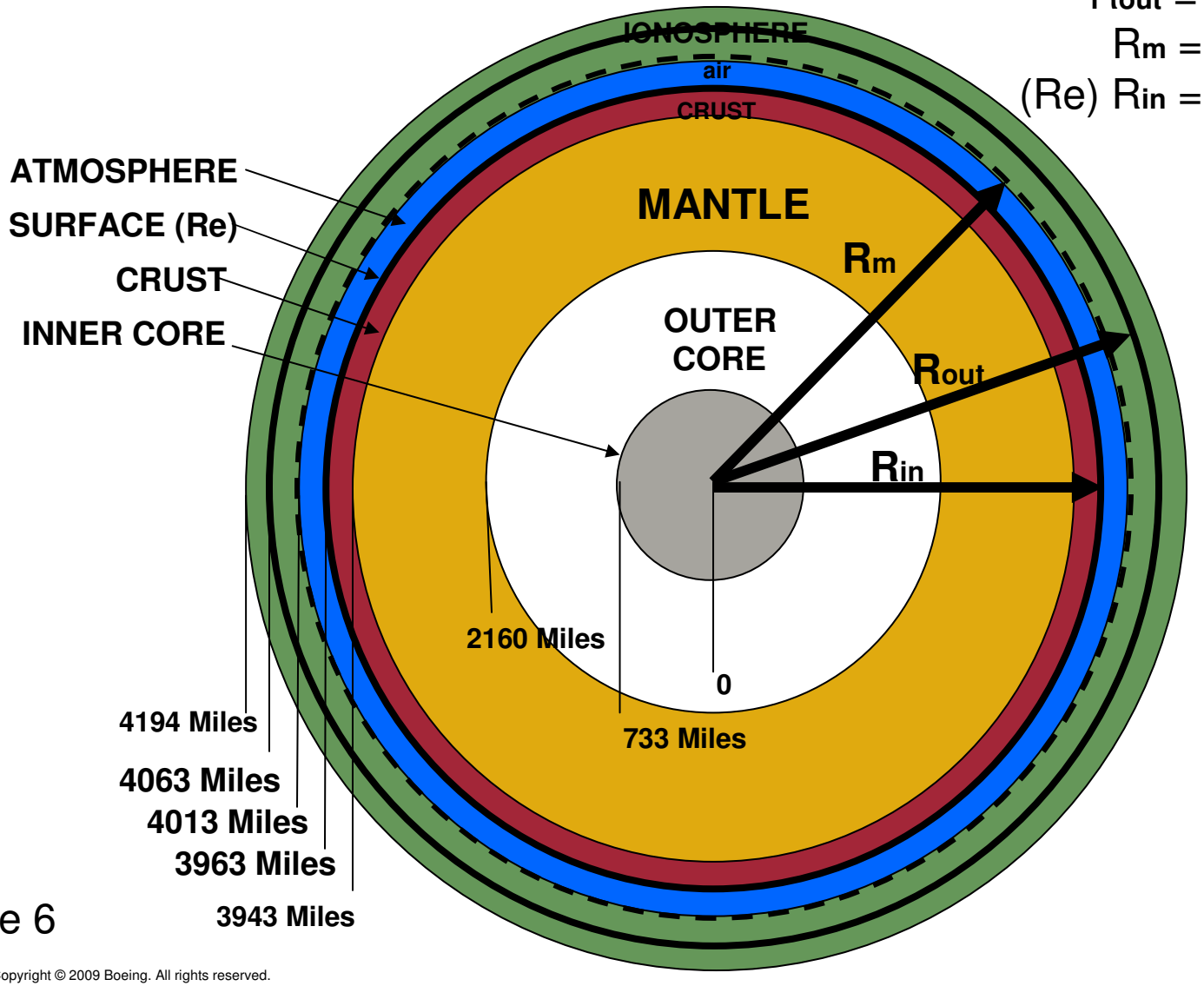

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Figure 6) "Earth's Resonate Cavity" shows the location of this cavity as it applies to the earth's system. The inner radius (Rin) is the earths surface (Re) as the crust is conductive. And the outer radius (Rout) is about the middle of the ionosphere where it is conductive around a 100miles out. That places the mean radius (Rm) around 50 miles or about the outer edge of the atmosphere. The magnetic permeability for most nonferrous materials like air is about ($\mu r = 1$) and the dielectric electric constant of air is ($\varepsilon r = 1$).

Main points:

1) Structure of earths cavity
2) Conductive surfaces are the crust and the ionosphere
3) Cavity mean radius is the edge of the atmosphere
4) Dielectric media constants: $\varepsilon r = 1$ and $\mu r = 1$

Earth's Resonate Cavity
Calculations

Plugging the numbers into the textbook equation

F_1 = 186,284(miles/sec) * [1([1]+1)]^.5 * [1/1]^.5 / 2π4013(miles) Hz
= 10.45Hz (perfect resonator)

Higher then Schumann Resonance of 7.83Hz

For a leaky (less then perfect) resonate cavity: gain/offset terms must be empirically adjusted [n(1*n+1) to n(.689n+.433)]. Outer conductor (ionosphere) has day/night variations, Dielectric (not homogeneous) arcs/sparks (lightning), Inner conductor (planet surface) composed of different materials soil and water. Soil not smooth contains mountains and valleys.

F_n = 186,284(miles/sec)[n(.689n+.433)]^.5 / 2π4013(miles) Hz

Schumann frequency numbers with the modified equation:

F_1 = 7.83Hz (fundamental)
F_2 = 14.07Hz (second)
F_3 = 20.25Hz (third)
F_4 = 26.41Hz (fourth)

Figure 7) "Earth's Resonate Cavity (calculations)" gives the Schumann resonance frequencies for the previous figure's estimated earth numbers. As can be seen the answer is 10.45Hz which is 33.5% greater then the measured value of 7.83Hz. The problem is that the earth is not a perfect resonate cavity for many reasons. First, the ionosphere is only a partial conductor which is affected by many things, to name a few: solar radiation, day and night cycles. Second, the inner conductor the earth's surface does not have a constant radius it has many mountains and valleys though the oceans are fairly smooth. Third, the dielectric material air is not homogeneous it contains many substances like dirt, dust, pollen and water that cause electrical short circuits, lightning being the worst case. If the gain and offset terms of the textbook equation are empirically adjusted the equation can be dialed in to the correct numbers. By reducing the gain term 30% down from 1.00 to 0.689 and reducing the offset term 57% down from 1.00 to 0.433 the modified equation now gives the correct answers. A 30% reduction in performance confirms the initial estimate that the earth is a poor resonate cavity operating at only 70% efficiency.

Main points:

1) The earth is a poor resonate cavity for many reasons
2) Cavity resonance efficiency is only 70%
3) Textbook frequency equation must be modified for real world conditions

Earth's Resonate Cavity
Calculations (cont)

If the driving freq (F_{dr}) is in the half power band (3db – "Q"point) of a resonant cavity [freq (F_{osc})] there is full energy transfer (gain = 100%). The further F_{dr} is from the "Q"point the less energy transferred.

	F_{osc}	"Q"band	F_{dr}	Delta	Gain
(fundamental)	7.83Hz	+/- .5Hz	7.07Hz	.76Hz	90%
(second)	14.07Hz	+/- .5Hz	14.14Hz	.07Hz	100%
(third)	20.25Hz	+/- .5Hz	21.21Hz	.96Hz	60%
(fourth)	26.41Hz	+/- .5Hz	28.28Hz	1.87Hz	30%

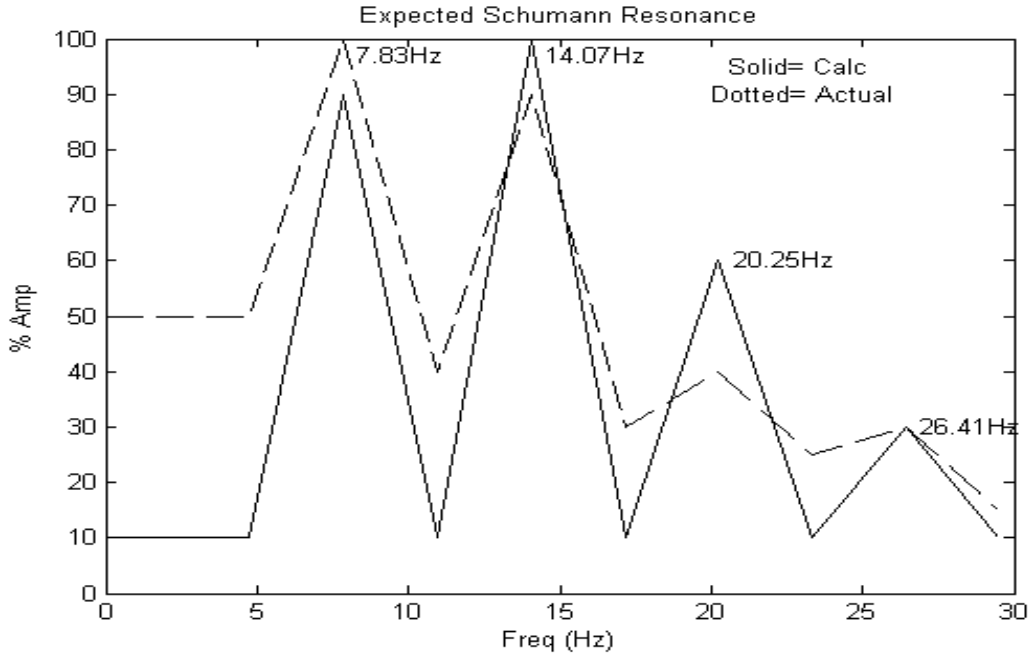

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Figure 8) "Earth's Resonate Cavity (calculations continued)" shows more numbers as to why the earth is not a good resonator. A resonate cavity only operates in a narrow band of drive frequencies close to its tuned resonate frequency called the Q-point. In this example the earths resonate cavity is tuned to the following Schumann frequencies of: F1= 7.83Hz, F2= 14.07Hz, F3= 20.25Hz and F4= 26.41Hz all with a Q-point bandwidth of about +/- 0.5Hz. If the driving or input frequencies of this cavity are assumed to be the EM accelerating force (gravity) frequencies of 7.07Hz, 14.14Hz, 21.21Hz and 28.28Hz then some of the harmonics will be amplified more then the others. The closer the driving frequency is to the resonate Q-point the more gain the cavity generates (i.e. more energy transfer). Comparing the numbers, the fundamental and second harmonic are close to their Q-points therefore their gains should be much higher while the third and fourth harmonics are not. In looking at the figure comparing the calculated to the actual Schumann numbers this is correct except for the third harmonic which is even less.

Main points:

1) Gives more proof why the earth is a poor resonator
2) Compares Schumann and gravity frequencies
3) Lower resonance at higher harmonics

SCHUMANN HARMONICS

Planet Structure

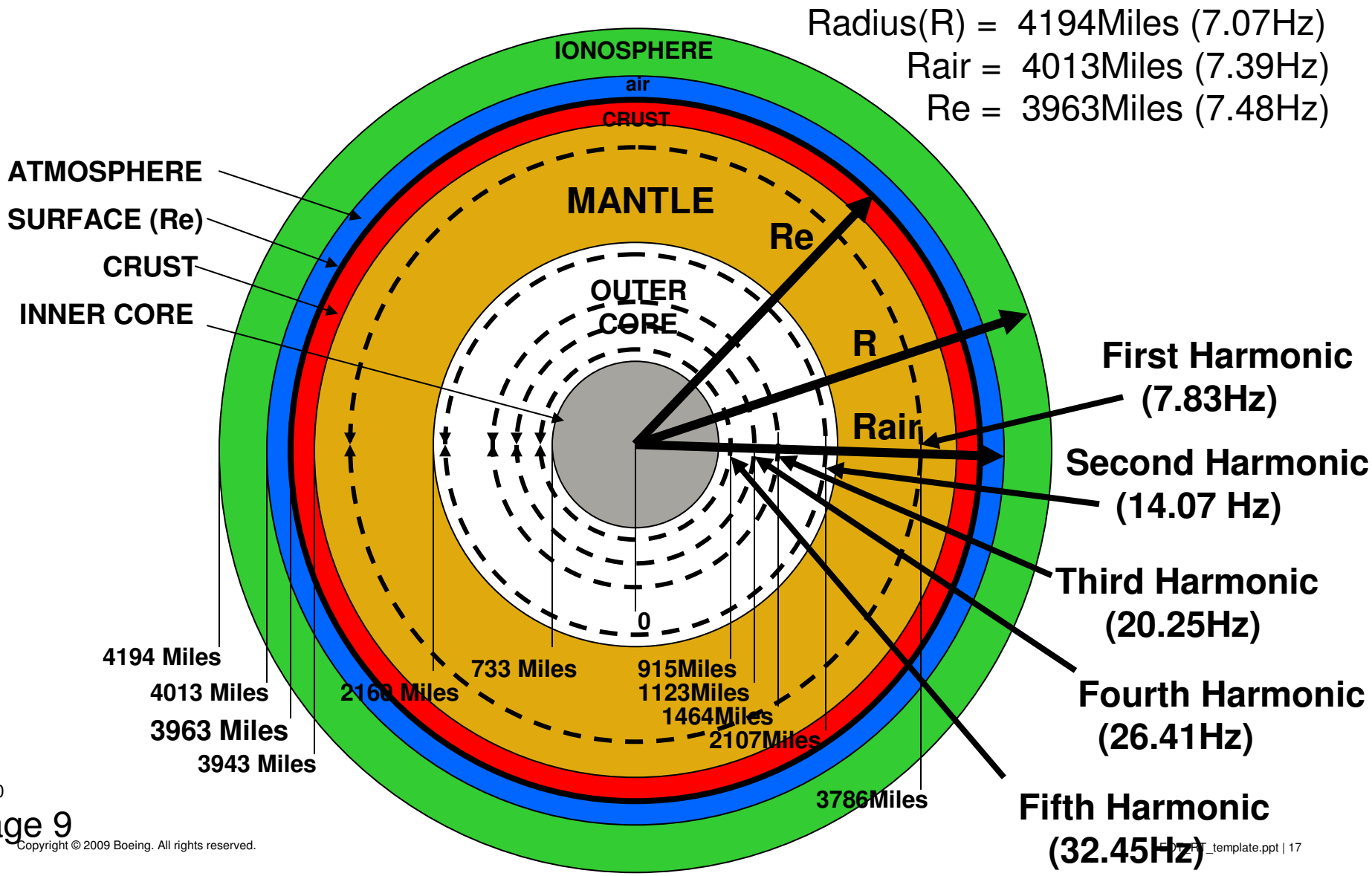

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Figure 9) "Schumann Harmonics (planet structure)" is a more detailed view of the earth's inner core with the five Schumann resonate frequencies superimposed on it. As can be seen from the figure the fundamental harmonic resides in the mantle region. This may make the crust region thicker or the upper mantle more ridged. All the other higher harmonics (second, third, fourth and fifth) reside in the liquid outer core region. It is all these standing waves and their different phasings that cause the majority of the earth's magnetic declinations and pole movements. Some substances in the crust also contribute minor magnetic anomalies.

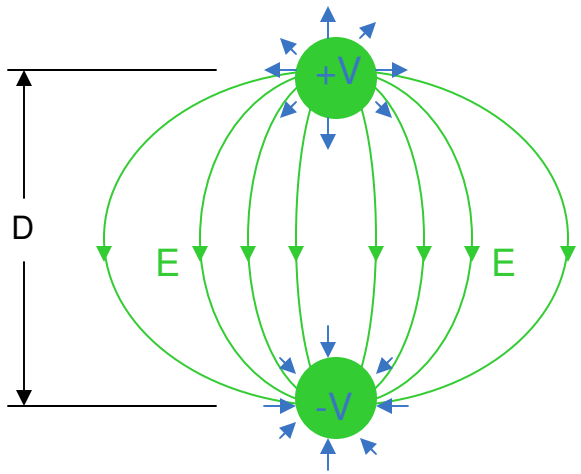
Main points:

1) Fundamental Schumann wave resides in the upper mantle
2) The higher harmonics all reside in the outer core
3) This standing wave phasing causes most of the magnet declinations
4) The different crust materials only cause minor magnetic anomalies

DC and AC EM Dipoles

Figure 10) "DC and AC (EM) ElectroMagnetic Dipoles" is a short tutorial on different types of dipoles. Starting with a description of a simple DC electric dipole and its equations then proceeding to a more complex AC magnetic dipole and its equations. This is background material for understanding the interactions between an accelerating force field and the electric and magnetic fields.

ELECTRIC DIPOLE (DC)



The **V** electric potential fields radiate outward (radial) from each pole decreasing with distance (radius). Polarity of **+V** field being the equal and opposite of **–V** field.

The difference (gradient) field between the two pole potentials is the **E** electric field which has components E_r in the radial direction and E_z in the axial direction.

The curl of the **E** electric field is the B_θ magnetic field which would be in the circular (theta) direction except its zero. As the **E** field is constant (DC).

Figure 11) "Electric Dipole (DC)" gives the textbook description as two electric charges of equal but opposite value separated by a distance "D". Cylindrical coordinates place the dipole on the Z-axis equally spaced about the origin (0, 0). The picture shows the positive (+) and negative (-) electric potential fields radiating outwards through space from the +V and –V charges respectively. At close range (small radius) these two electric potential fields interact causing a difference (or in mathematical terms a gradient [delta operator]) field which is defined as the electric field (E-field). As the system is steady state (DC) there is no magnetic field (B-field) generated.

Main points:

1) Dipole caused by two opposite charges that are separated
2) A potential field radiates from each of the charges (poles)
3) The E-field is the difference (gradient) of the two potential fields
4) The E-field has two components Er and Ez
5) The (DC) E-field does not generate a magnetic B-field

ELECTRIC DIPOLE (DC)
[equations]

V = Electric Potential (cyl)

V = K [1 / (r^2+ (z-D/2)^2)^.5
- 1 / (r^2+(z+D/2)^2)^.5]

E = Electric Field (cyl)

E = $-\nabla$ **V** Gradient of Electric Potential

$\mathbf{E_r}$ = K [r / (r^2+ (z-D/2)^2)^1.5
- r / (r^2+(z+D/2)^2)^1.5]

$\mathbf{E_z}$ = K [(z-D/2) / (r^2+(z-D/2)^2)^1.5
- (z+D/2) / (r^2+(z+D/2)^2)^1.5]

B = Magnetic Field (cyl)

B = $-j\omega\varepsilon\mu \nabla \times$ **E** Curl of Electric Field

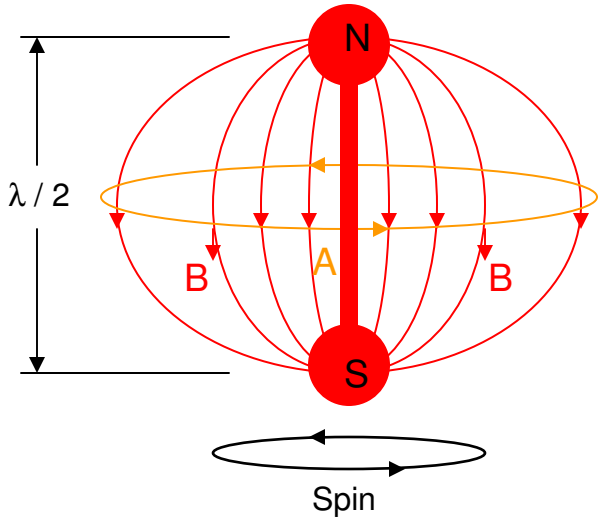
$\mathbf{B_\theta} = 0$

Figure 12) "Electric Dipole (DC equations)" is the full set of mathematical equations in cylindrical (cyl) coordinates that define these fields. They are composed of two interrelated terms. First, is the electric potential (V) which is measured in "volts" and decreases in value inversely as the distance (1/R). Because a dipole has two opposite polarities the equation also carries two terms one positive and one negative. Second, the electric field (E) is defined as the negative gradient [delta (or difference) operator] of the electric potential (V). It is measured in "volts/meter" and decreases in value inversely as the square of the distance (1/R^2). The gradient operation produces two terms (Er) in the R-axis and (Ez) in the Z-axis. Both of these equations also carry the two dipole polarity terms one positive and one negative. The magnetic field (B) is defined as the negative curl (delta vector cross product) of the electric field. As it is steady state or DC the frequency term ($\omega = 0$). Note the "gradient" and "curl" operations are standard calculus mathematical procedures.

Main points:

1) Full set of equations defining the DC electric dipole
2) Each equation carries a positive and negative term
3) The E-field attenuates inversely as the square if the distance (1/R^2), units being [volts/meter]
4) The E-field has components in both the R and Z axis
5) Frequency term (ω) equals zero for DC

MAGNETIC DIPOLE (DC)



The A_θ magnetic potential field is in the circular (theta) direction.

The curl of the **A** magnetic potential is the **B** magnetic field which has components B_r in the radial direction and B_z in the axial direction.

The curl of the **B** magnetic field is the E_θ electric field which would be in the circular (theta) direction except its zero. As the **B** field is constant (DC).

Field spins in the circular (theta) direction. Frequency is determined by dipole length.

Figure 13) "Magnetic Dipole (DC)" gives the textbook description as two magnetic potentials of equal but opposite value separated by a distance (λ/2). Cylindrical coordinates place the dipole on the Z-axis equally spaced about the origin (0, 0). The picture shows the positive (+) and negative (-) magnetic potential fields radiating (spinning) outwards through space from the "N" and "S" poles respectively. At close range (small radius) these two magnetic potential fields interact causing a difference (or in mathematical terms a gradient [delta operator]) field which is defined as the magnetic field (B-field). As the system is steady state (DC) there is no electric field (E-field) generated. The major difference between the magnetic and electric DC dipoles is that the magnetic one has a spinning field making the dipole separation distance (D) a tuned length (λ/2).

Main points:

1) Dipole caused by two opposite poles that are separated
2) A potential field radiates from each of the poles
3) The B-field is the difference (gradient) of the two potential fields
4) The B-field has two components Br and Bz
5) The (DC) B-field does not generate an electric E-field but it does spin

MAGNETIC DIPOLE (DC)
[equations]

A_θ = Magnetic Potential (cyl)

$$A_\theta = -\mu K \left[\frac{(z-\lambda/4)}{r\left(r^2+(z-\lambda/4)^2\right)^{.5}} - \frac{(z+\lambda/4)}{r\left(r^2+(z+\lambda/4)^2\right)^{.5}} \right]$$

B = Magnetic Field (cyl)

$\mathbf{B} = \nabla \times \mathbf{A}$ Curl of Magnetic Potential

$$B_r = \mu K \left[\frac{r}{\left(r^2+(z-\lambda/4)^2\right)^{1.5}} - \frac{r}{\left(r^2+(z+\lambda/4)^2\right)^{1.5}} \right]$$

$$B_z = \mu K \left[\frac{(z-\lambda/4)}{\left(r^2+(z-\lambda/4)^2\right)^{1.5}} - \frac{(z+\lambda/4)}{\left(r^2+(z+\lambda/4)^2\right)^{1.5}} \right]$$

E = Electric Field (cyl)

$\mathbf{E} = (1 / j\omega\varepsilon\mu) \nabla \times \mathbf{B}$ Curl of Magnetic Field

$E_\theta = 0$

f_θ = Spin Frequency

$f_\theta = C / \lambda$ Hz

Figure 14) "Magnetic Dipole (DC equations)" is the full set of mathematical equations in cylindrical (cyl) coordinates that define these fields. They are composed of two interrelated terms. First, is the magnetic potential (A) in the θ-axis which is measured in "webers" and decreases in value inversely as the distance (1/R). Because a dipole has two opposite polarities the equation also carries two terms one positive and one negative. Second, the magnetic field (B) is defined as the curl (delta vector cross product) of the magnetic potential (Aθ). It is measured in "webers/meter^2" and decreases in value inversely as the square of the distance (1/R^2). The gradient operation produces two terms (Br) in the R-axis and (Bz) in the Z-axis. Both of these equations also carry the two dipole polarity terms one positive and one negative. The electric field (E) is defined as the curl (delta vector cross product) of the magnetic field (B). As this is steady state or DC the frequency term (ω= 0). However, unlike the electric potential (V) the magnetic potential (A) spins according to the standard wavelength to frequency equation. Note the "curl" operation is a standard calculus mathematical procedure.

Main points:

1) Full set of equations defining the DC magnetic dipole
2) Each equation carries a positive and negative term
3) The B-field attenuates inversely as the square if the distance (1/R^2), units being [webers/meter^2]
4) The B-field has components in both the R and Z axis
5) Frequency term (ω) equals the speed of light (C) divided by the wavelength (λ)

DC to AC Equation Conversion

Eulers Equation converts AC (sin and cos) terms to exponentials which are easier to work with mathematically.

$$\exp(j[\omega t - 2\pi r/\lambda]) = \cos(\omega t - 2\pi r/\lambda) + j\sin(\omega t - 2\pi r/\lambda)$$

AC phaser notation uses only use the displacement term ($-2\pi r/\lambda$), the time term (ωt) is dropped as the wave amplitude is assumed to oscillate.

$$\exp(-j2\pi r/\lambda)$$

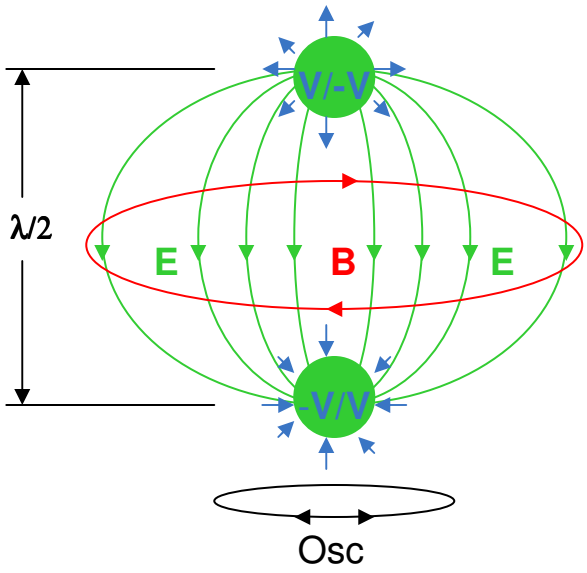
Multiplying the DC field equations with the phaser adds the AC component. The differentials now become more complicated with additional terms and imaginary numbers.

Figure 15) "DC to AC Equation Conversion" documents the three step process that is used to make the change to AC. First, using Euler's formula the sine and cosine frequency terms are converted into exponential terms. In calculus exponentials are easier to differentiate and integrate then sine and cosine terms. Second, is to reduce the equation down to AC phaser notation. EM field calculations use a simplification called AC phaser notation which uses only the position or displacement term ($-2\pi r/\lambda$) of the Euler's equation. The frequency or time term (ωt) is dropped as an AC wave is assumed to oscillate. Third, is to multiply the DC equations by the AC phaser which completes the DC to AC conversion process. The AC equations are more difficult to differentiate as they now have more terms to work with and also contain imaginary numbers.

Main points:

1) To convert from DC to AC is a three step process
2) Change sine/cosine terms to exponentials
3) Modify exponentials to make AC phasers
4) Multiply the DC equation by the phaser term
5) The AC equations are more difficult to work with

ELECTRIC DIPOLE (AC)



The V electric potential fields radiate outward (radial) from each pole decreasing with distance (radius). Polarity of +V field being the equal and opposite of –V field.

The difference (gradient) field between the two pole potentials is the E electric field which has components E_r in the radial direction and E_z in the axial direction.

The curl of the E electric field is the B_θ magnetic field in the circular (theta) direction.

As the fields are AC they oscillate, the B_θ magnetic field (back and forth) in the circular (theta) direction and the E electric field (up and down) in the axial direction. Frequency is determined by dipole length.

Figure 16) "Electric Dipole (AC)" gives about the same textbook description as for a DC dipole that of two electric charges of equal but opposite value separated by a distance "D" which now becomes half wavelength (λ/2). Cylindrical coordinates still places the dipole on the Z-axis equally spaced about the origin (0, 0). The picture shows the positive (+/-) and negative (-/+) electric potential fields which now oscillate radiating outwards through space from the V/-V and –V/V charges respectively. At close range (small radius) these two electric potential fields interact causing a difference (or in mathematical terms a gradient [delta operator]) field which is defined as the electric field (E-field). The big difference in the AC dipole system is that it now generates an orthogonal oscillating magnetic field (B-field) in the circular (θ) direction.

Main points:

1) Dipole caused by two opposite charges that are separated
2) The dipole separation distance is now λ/2
3) A potential field radiates from each of the charges
4) The E-field is the difference (gradient) of the two potential fields
5) The E-field has two components Er and Ez
6) The (AC) E-field generates a magnetic B-field (Bθ) in the θ-axis

ELECTRIC DIPOLE (AC)

V = Electric Potential (cyl)

$$V = K\left[\frac{1}{\sqrt{r^2+(z-\lambda/4)^2}}\exp\left(-j2\pi\sqrt{r^2+(z-\lambda/4)^2}/\lambda\right)\right.$$
$$\left.-\frac{1}{\sqrt{r^2+(z+\lambda/4)^2}}\exp\left(-j2\pi\sqrt{r^2+(z+\lambda/4)^2}/\lambda\right)\right]$$

E = Electric Field (cyl)

$E = -\nabla A$ Gradient of Electric Potential

$$E_r = K\left[\frac{r}{(r^2+(z-\lambda/4)^2)^{1.5}}+j2\pi\frac{r}{\lambda(r^2+(z-\lambda/4)^2)}\right)\exp\left(-j2\pi\sqrt{r^2+(z-\lambda/4)^2}/\lambda\right)$$
$$-\frac{r}{(r^2+(z+\lambda/4)^2)^{1.5}}+j2\pi\frac{r}{\lambda(r^2+(z+\lambda/4)^2)}\exp\left(-j2\pi\sqrt{r^2+(z+\lambda/4)^2}/\lambda\right)]$$

$$E_z = K\left[\frac{(z-\lambda/4)}{(r^2+(z-\lambda/4)^2)^{1.5}}+j2\pi\frac{(z-\lambda/4)}{\lambda(r^2+(z-\lambda/4)^2)}\right)\exp\left(-j2\pi\sqrt{r^2+(z-\lambda/4)^2}/\lambda\right)$$
$$-\frac{(z+\lambda/4)}{(r^2+(z+\lambda/4)^2)^{1.5}}+j2\pi\frac{(z+\lambda/4)}{\lambda(r^2+(z+\lambda/4)^2)}\exp\left(-j2\pi\sqrt{r^2+(z+\lambda/4)^2}/\lambda\right)]$$

B = Magnetic Field (cyl)

$B = -j\omega\varepsilon\mu\ \nabla \mathbf{x}\ E$ Curl of Electric Field or $E = 1 / j\omega\varepsilon\mu\ \nabla \mathbf{x}\ B$ Curl of Magnetic Field

$$B_\theta = -j\omega\varepsilon\mu K\left[\frac{(z-\lambda/4)}{(r(r^2+(z-\lambda/4)^2)^{.5})}\exp\left(-2\pi\sqrt{r^2+(z-\lambda/4)^2}/\lambda\right)\right.$$
$$\left.-\frac{(z+\lambda/4)}{(r(r^2+(z+\lambda/4)^2)^{.5})}\exp\left(-2\pi\sqrt{r^2+(z+\lambda/4)^2}/\lambda\right)\right]$$

f_θ = Osc Frequency

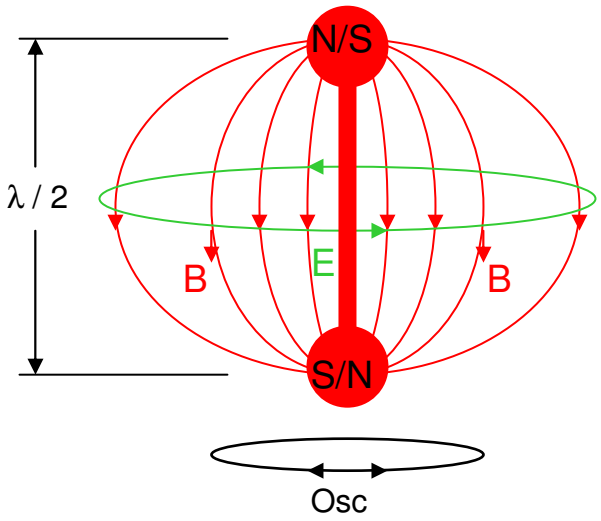
$f_\theta = C / \lambda$ Hz

Figure 17) "Electric Dipole (AC equations)" is the full set of mathematical equations in cylindrical (cyl) coordinates that define these fields. They are now composed of three interrelated terms. First, is still the electric potential (V) which is measured in "volts" and decreases in value inversely as the distance (1/R). Because a dipole has two opposite polarities the equation also carries the two terms one positive and one negative. However, these two terms are now multiplied by the AC phaser. Second, the electric field (E) is defined as the negative gradient [delta (or difference) operator] of the electric potential (V). It is measured in "volts/meter" and decreases in value inversely as the square of the distance (1/R^2). The gradient operation produces two terms (Er) in the R-axis and (Ez) terms in the Z-axis. Both of these equations also carry the two dipole polarity terms one positive and one negative. However, each dipole term now has an additional imaginary component and an AC phaser term. Third, the magnetic field (B) is defined as the negative curl (delta vector cross product) of the electric field. It is measured in "webers/meter^2" and decreases in value inversely as the square of the distance (1/R^2). The B-field equation also carries the two dipole polarity terms one positive and one negative both multiplied by the AC phaser. It oscillates according to the standard wavelength to frequency equation. Note the "gradient" and "curl" operations are standard calculus mathematical procedures.

Main points:

1) Full set of equations defining the AC electric dipole
2) Each equation still carries a positive and negative term
3) The E-field attenuates inversely as the square if the distance (1/R^2), units being [volts/meter]
4) The E-field has components in both the R and Z axis
5) Frequency term (ω) equals the speed of light (C) divided by the wavelength (λ)
6) The B-field has components in the θ axis
7) The B-field attenuates inversely as the square of the distance (1/R^2), units being [webers/meter^2]

MAGNETIC DIPOLE (AC)



The A_θ magnetic potential field is in the circular (theta) direction.

The curl of the **A** magnetic potential is the **B** magnetic field which has components B_r in the radial direction and B_z in the axial direction.

The curl of the **B** magnetic field is the E_θ electric field which is in the circular (theta) direction.

As the fields are AC they oscillate, the E_θ electric field (back and forth) in a circular (theta) direction and the **B** magnetic field (up and down) in the axial direction. Frequency is determined by dipole length.

Figure 18) "Magnetic Dipole (AC)" gives the same textbook description as for a DC dipole that of two magnetic potentials of equal but opposite value separated by a distance ($\lambda/2$). Cylindrical coordinates still places the dipole on the Z-axis equally spaced about the origin (0, 0). The picture shows the positive (+/-) and negative (-/+) magnetic potential fields which now oscillate radiating (spinning) outwards through space from the "N/S" and "S/N" poles respectively. At close range (small radius) these two magnetic potential fields interact causing a difference (or in mathematical terms a gradient [delta operator]) field which is defined as the magnetic field (B-field). The big difference in the AC system is that it now generates an orthogonal oscillating electric field (E-field) in the circular (θ) direction.

Main points:

1) Dipole caused by two opposite poles that are separated
2) A potential field radiates from each of the poles
3) The B-field is the difference (gradient) of the two potential fields
4) The B-field has two components Br and Bz
5) The (AC) B-field generates an electric E-field in the θ-axis

MAGNETIC DIPOLE (AC)
[equations]

A_θ = Magnetic Potential (cyl)

$$A_\theta = -\mu K [((z-\lambda/4) / (r(r^2+ (z-\lambda/4)^2)^.5))\exp(-j2\pi(r^2+ (z-\lambda/4)^2)^.5/\lambda) - ((z+\lambda/4) / (r(r^2+(z+\lambda/4)^2)^.5))\exp(-j2\pi(r^2+(z+\lambda/4)^2)^.5/\lambda)]$$

B = Magnetic Field (cyl)

B = ∇ x **A** Curl of Magnetic Potential

$$B_r = \mu K [(r / (r^2+(z-\lambda/4)^2)^1.5 + j2\pi (z-\lambda/4)^2 / (\lambda r(r^2+ (z-\lambda/4)^2)))\exp(-j2\pi(r^2+ (z-\lambda/4)^2)^.5/\lambda) - (r / (r^2+(z+\lambda/4)^2)^1.5 + j2\pi(z+\lambda/4)^2 / (\lambda r(r^2+(z+\lambda/4)^2)))\exp(-j2\pi(r^2+(z+\lambda/4)^2)^.5/\lambda)]$$

$$B_z = \mu K [(z-\lambda/4)*(1 / (r^2+ (z-\lambda/4)^2)^1.5 + j2\pi / (\lambda(r^2+ (z-\lambda/4)^2)))\exp(-j2\pi(r^2+ (z-\lambda/4)^2)^.5/\lambda) - (z+\lambda/4)*(1 / (r^2+(z+\lambda/4)^2)^1.5 + j2\pi / (\lambda(r^2+(z+\lambda/4)^2)))\exp(-j2\pi(r^2+(z+\lambda/4)^2)^.5/\lambda)]$$

E = Electric Field (cyl)

E = 1 / $j\omega\varepsilon\mu$ ∇ x **B** Curl of Magnetic Field

$$E_\theta = j2\pi(\mu/\varepsilon)^.5K [((z-\lambda/4) / (\lambda r(r^2+ (z-\lambda/4)^2)^.5))\exp(-j2\pi(r^2+ (z-\lambda/4)^2)^.5/\lambda) - ((z+\lambda/4) / (\lambda r(r^2+(z+\lambda/4)^2)^.5))\exp(-j2\pi(r^2+(z+\lambda/4)^2)^.5/\lambda)]$$

f_θ = Osc Frequency

$f_\theta = C / \lambda$ Hz

Figure 19) "Magnetic Dipole (AC equations)" is the full set of mathematical equations in cylindrical (cyl) coordinates that define these fields. They are now composed of three interrelated terms. First, is still the magnetic potential (A) in the θ-axis which is measured in "webers" and decreases in value inversely as the distance (1/R). The dipole still has two opposite polarities so the equation also carries two terms one positive and one negative. However, these two terms are now multiplied by the AC phaser. Second, the magnetic field (B) is defined as the curl (delta vector cross product) of the magnetic potential (Aθ). It is measured in "webers/meter^2" and decreases in value inversely as the square of the distance (1/R^2). The gradient operation still produces two terms (Br) in the R-axis and (Bz) in the Z-axis. Both of these equations also carry the two dipole polarity terms one positive and one negative. However, each dipole term now has an additional imaginary component and an AC phaser term. Third, the electric field (E) is defined as the curl (delta vector cross product) of the magnetic field (B). It is measured in "volts/meter" and decreases in value inversely as the square of the distance (1/R^2). The E-field equation also carries two dipole polarity terms one positive and one negative multiplied by the AC phaser. It oscillates according to the standard wavelength to frequency equation. Note the "curl" operation is a standard calculus mathematical procedure.

Main points:

1) Full set of equations defining the AC magnetic dipole
2) Each equation carries a positive and negative term
3) The B-field attenuates inversely as the square if the distance (1/R^2), units being [webers/meter^2]
4) The B-field has components in both the R and Z axis
5) Frequency term (ω) equals the speed of light (C) divided by the wavelength (λ)
6) The E-field has components in the θ-axis
7) The E-field attenuates inversely as the square of the distance (1/R^2), units being [volts/meter^2]

WAVE BASICS

Standing/Traveling

Figure 20) "Wave Basics (standing/traveling)" is a short tutorial on (EM) ElectroMagnetic waves. The following figures are all textbook examples of EM waves with orthogonal (90deg) electric and magnetic fields. The electric field (E-field) colored green is represented as a sine wave [E= -sin(ωt)] on the Z-axis with its polarity defined as (+) positive in the positive Z-axis (z= "+"). Likewise, the magnetic field (B-field) colored red is represented as a sine wave [B= sin(ωt)] on the Y-axis with its polarity defined as (+) positive in the positive Y-axis (y= "+"). Each of the following figures shows a different phase angle between these electric and magnetic fields. This is background material for understanding the interactions between an accelerating force field and the electric and magnetic fields.

Traveling Wave (E x B)
Forced to the right (0deg phase)

(3D) PLOT of a Classical TRAVELING WAVE (7.07Hz @ phase 0deg) [Force(blu)= (E X B)/5]

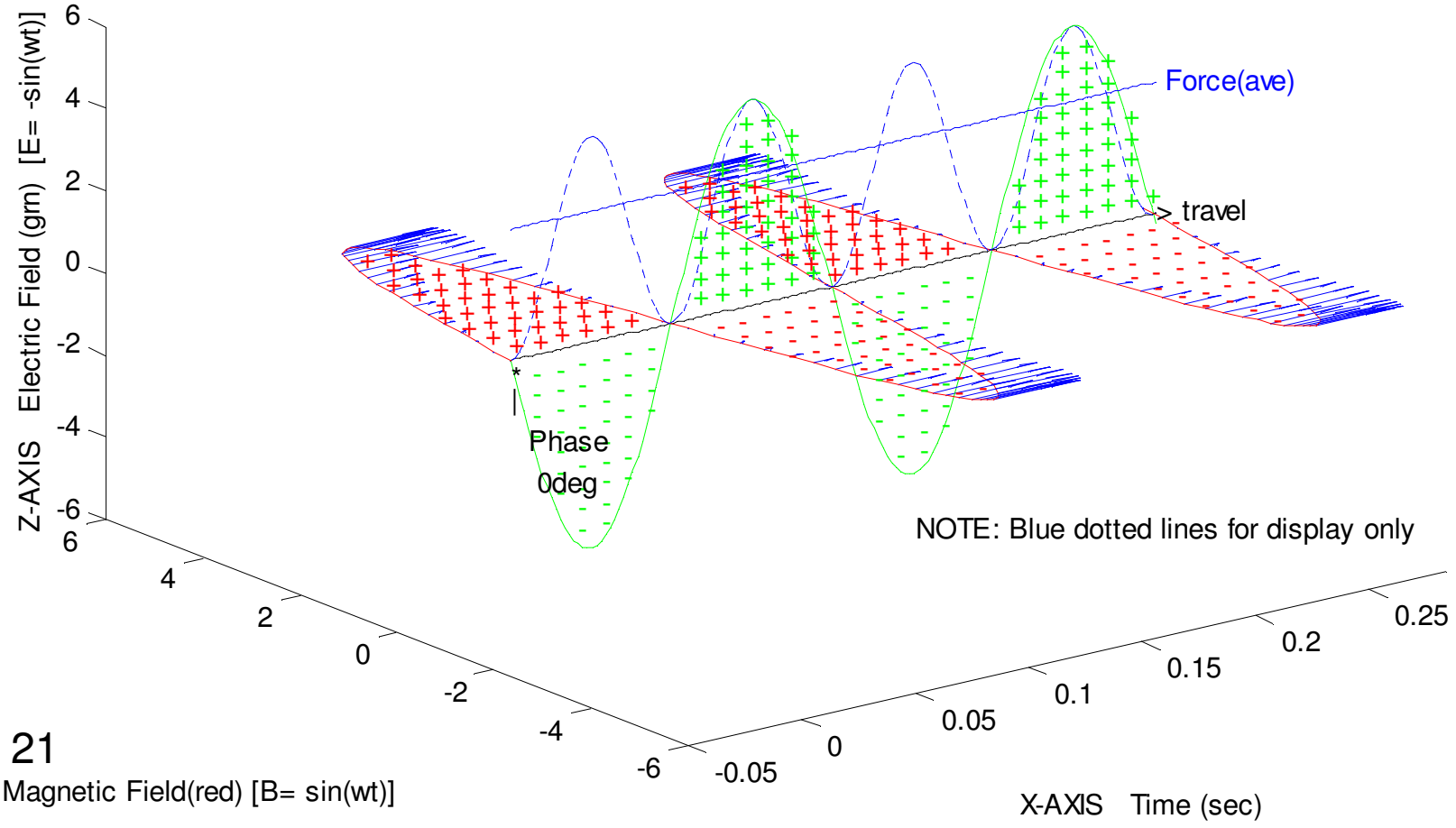


Figure 21) "Traveling Wave (0deg phase)" this figure shows 0deg phasing between the E-field and B-field which means that when the B-field is at a positive maximum value the E-field is at a negative maximum. The vector cross product of the E and B fields (F= E x B) generates a force field represented by the blue arrows in the positive X-axis direction causing the wave to travel to the right (x= "+") as all the force vectors push that way. The additional blue dotted wave representation of the force vectors is for display clarity only, it is not really present. However, as can be seen from this "display only" wave the force field is also a sine wave with a positive DC offset (average value) and twice the frequency (second harmonic) of the E and B fields. Thus the EM wave has two force pulses per cycle pushing it forward.

Main points:

1) 0deg phase generates a wave traveling to the right
2) The resultant force field is also a sine wave at twice the frequency
3) This force field has an average DC value pushing it forward

Standing Wave (E x B)
Force = 0 (90deg phase)

(3D) PLOT of a Classical STANDING WAVE (7.07Hz @ phase 90deg) [Force(blu)= (E X B)/5]

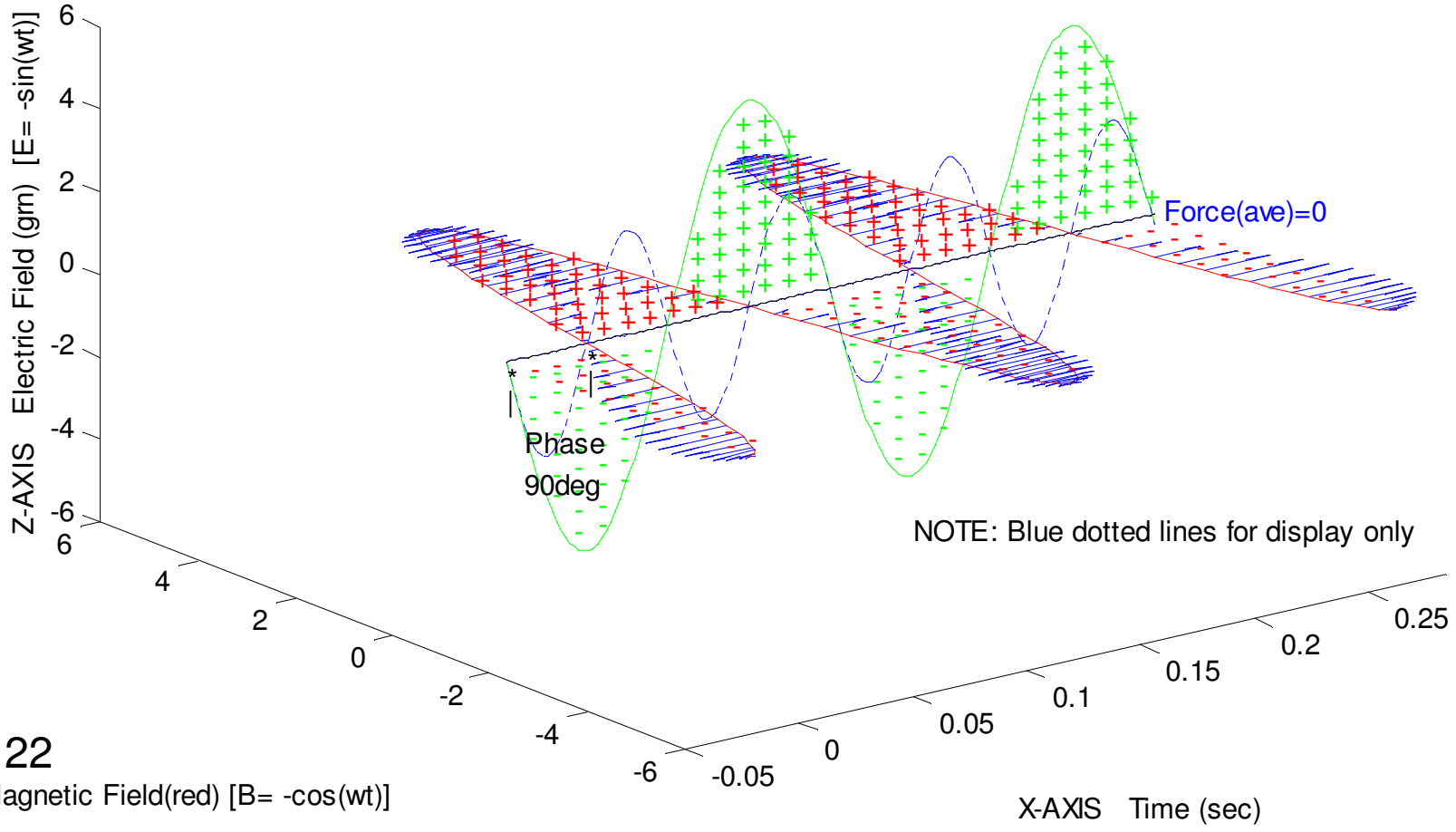


Figure 22) "Standing Wave (90deg phase)" this figure shows 90deg phasing between the E-field and B-field which means that when the B-field is at a positive maximum value the E-field is at zero. The vector cross product of the E and B fields (F= E x B) generates a force field represented by the blue arrows causing the wave to stand still as the positive and negative force vectors cancel. The additional blue dotted wave representation of the force vectors is for display clarity only, it is not really present. However, as can be seen from this "display only" wave the force field is just a sine wave with no DC offset (average value) and twice the frequency (second harmonic) of the E and B fields. As all the positive forces cancel the negative forces the EM wave has no force pulses pushing it in any direction.

Main points:

1) 90deg phase generates a standing wave
2) The resultant force field is also a sine wave at twice the frequency
3) This force field has no average DC value to push it anywhere

Traveling Wave (E x B)
Forced to the left (180deg phase)

(3D) PLOT of a Classical TRAVELING WAVE (7.07Hz @ phase 180deg) [Force(blu)= (E X B)/5]

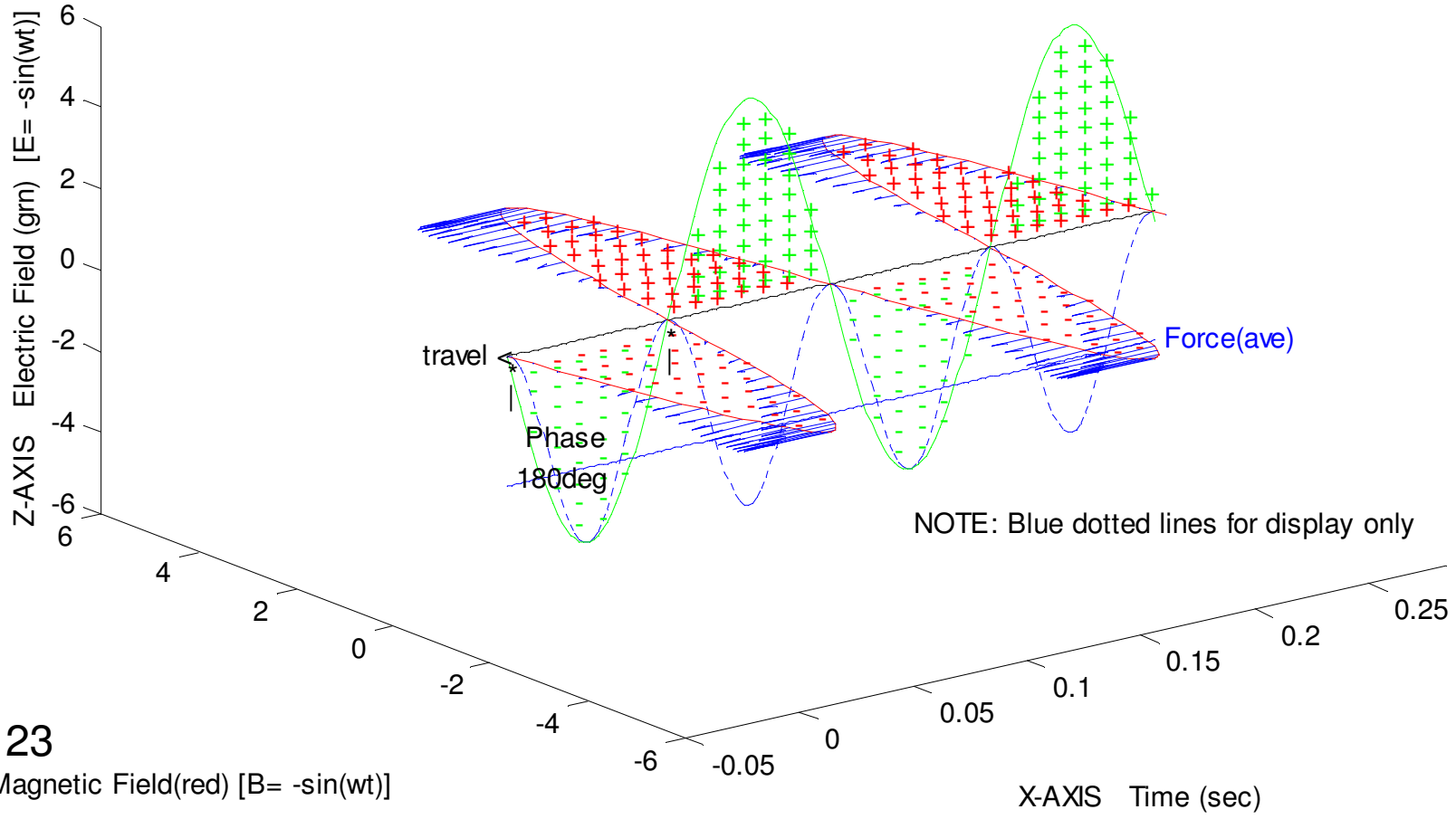


Figure 23) "Traveling Wave (180deg phase)" this figure shows 180deg phasing between the E-field and B-field which means that when the B-field is at a positive maximum value the E-field is at a positive maximum. The vector cross product of the E and B fields (F= E x B) generates a force field represented by the blue arrows in the negative X-axis direction causing the wave to travel to the left (x= "-") as all the force vectors push that way. The additional blue dotted wave representation of the force vectors is for display clarity only, it is not really present. However, as can be seen from this "display only" wave the force field is also a sine wave with a negative DC offset (average value) and twice the frequency (second harmonic) of the E and B fields. Thus the EM wave has two force pulses per cycle pushing it backwards.

Main points:

1) 180deg phase generates a wave traveling to the left
2) The resultant force field is also a sine wave at twice the frequency
3) This force field has an average DC value pushing it backwards

Standing Wave (E x B)
Force = 0 (270deg phase)

(3D) PLOT of a Classical STANDING WAVE (7.07Hz @ phase 270deg) [Force(blu)= (E X B)/5]

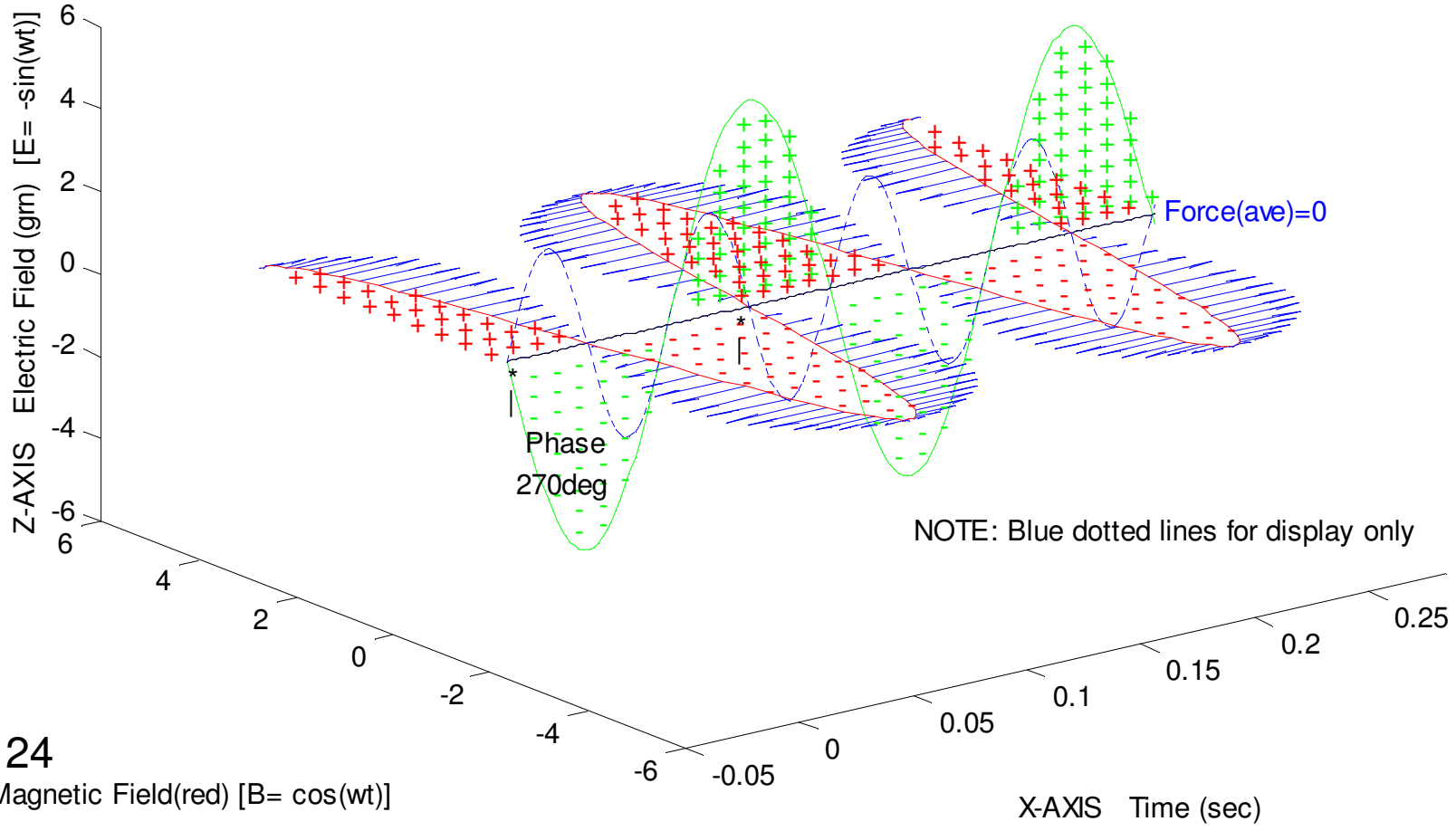


Figure 24) "Standing Wave (270deg phase)" this figure shows 270deg phasing between the E-field and B-field which means that when the B-field is at a positive maximum value the E-field is at zero. The vector cross product of the E and B fields (F= E x B) generates a force field represented by the blue arrows causing the wave to stand still as the positive and negative force vectors cancel. The additional blue dotted wave representation of the force vectors is for display clarity only, it is not really present. However, as can be seen from this "display only" wave the force field is just a sine wave with no DC (average value) and twice the frequency (second harmonic) of the E and B fields. As all the positive forces cancel the negative forces the EM wave has no force pulses pushing it in any direction.

Main points:

1) 270deg phase generates a standing wave
2) The resultant force field is also a sine wave at twice the frequency
3) This force field has no average DC value to push it anywhere

E x B Wave Phasing

- E-field and B-field in phase (0deg)
  - F-field pushing wave to the right
- E-field and B-field out of phase (90deg)
  - Standing wave (F-field = 0)
- E-field and B-field out of phase (180deg)
  - F-field pushing wave to the left
- E-field and B-field out of phase (270deg)
  - Standing wave (F-field = 0)
- Two F-field pulses per cycle (traveling wave)
  - Fast acceleration
  - Frequency multiplication (doubling)

Figure 25) "E x B Wave Phasing" gives the summary of all the previous individual wave phasing figures. First, if an EM wave has a phase shift of 0deg or 180deg it generates a traveling wave that will move forward or backwards. 0deg phase pushes it to the right and 180deg phase pushes it to the left. Second, if the wave has a phase shift of 90deg or 270deg it generates a standing wave and does not move at all. Therefore, phase shifting the E and B fields of an EM wave +/-90deg will change it from a traveling wave to a standing wave. And last but most important is the frequency doubling (second harmonic) of the generated force field as compared to the E and B field's frequency.

Main points:

1) The phasing of the E and B fields determines if its a traveling or standing wave
2) Phase shifting the wave by +/-90deg changes it from one to the other
3) The resultant force field has twice the frequency (second harmonic)

Data from:
Study of Gravity (part 1)

Figure 26) "Data from: Study of Gravity (part 1)" Starting with these equations and using the all the proceeding tutorials as background material the presentation continues toward the goal merging the earths accelerating force (gravity) field with (EM) ElectroMagnatics. However, the mathematics gets more complex as the EM field equations deal with calculus and imaginary numbers.

X-Axis Dipole Plot

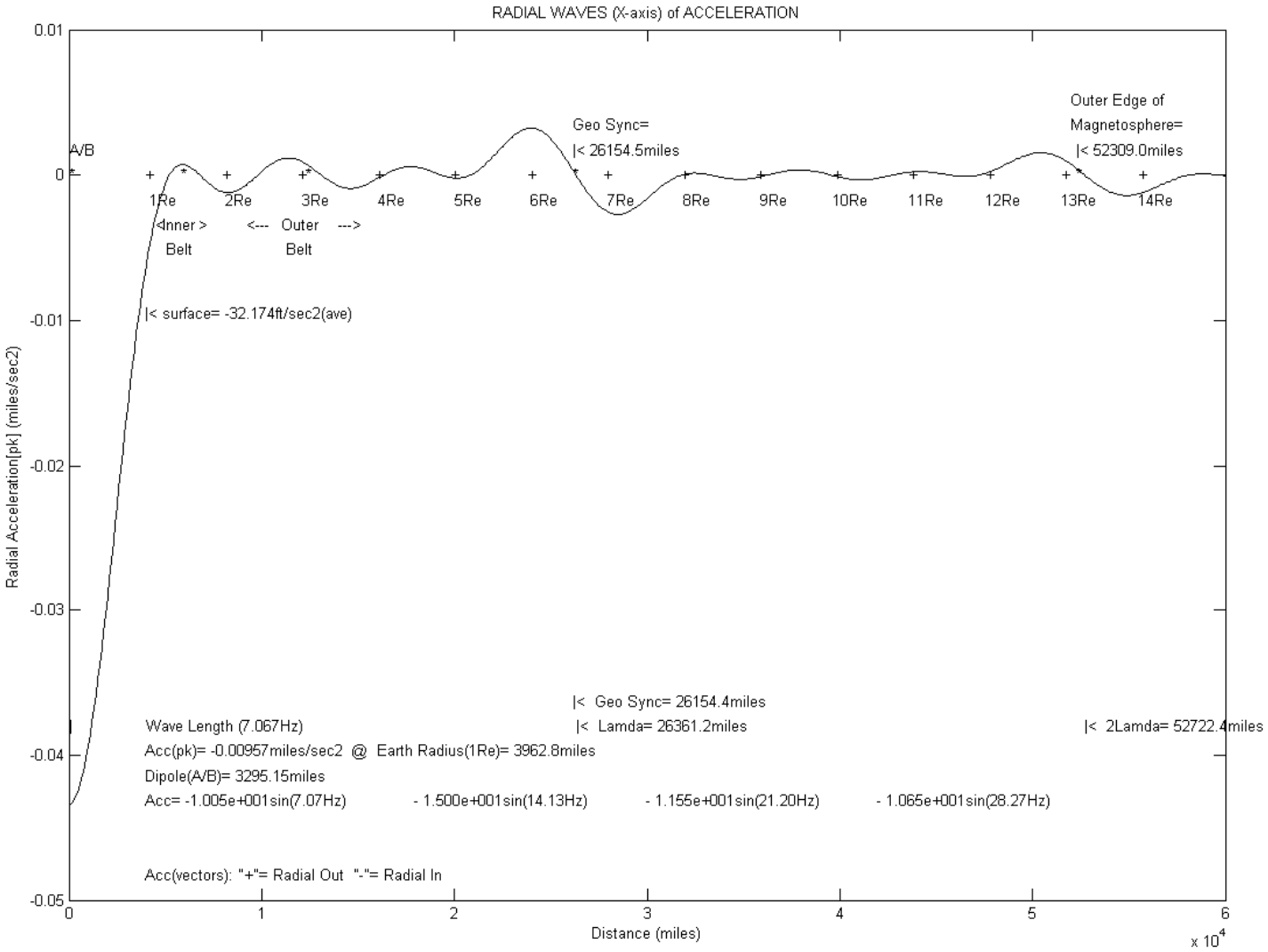


Figure 42) "X-Axis Dipole Plot" shows the results of combining the dipole feedpoints with the equations from figures 36 and 39 which are single feedpoint ones. Only the end of the dipole which is labeled "A/B" can be seen as it is located in the Y-axis (polar) however its effect is greatest in the X-axis (equator). Also, it cleaned up the inner and outer radiation belt curves much better than with a single feedpoint. The largest effect of the dipole is on the core type which changed from hollow core – thick crust to solid core (negative acceleration at R = 0). Plot scaling was reduced to include the magnetosphere edge (R = 2λ).

Main points:

1) Dipole feedpoints
2) Same Inner and Outer belt markers
3) Same GeoSync marker
4) Surface gravity slightly less
5) Core type changed to solid
6) X-axis plot now includes magnetosphere
7) More background ripple

Y-Axis Dipole Plot

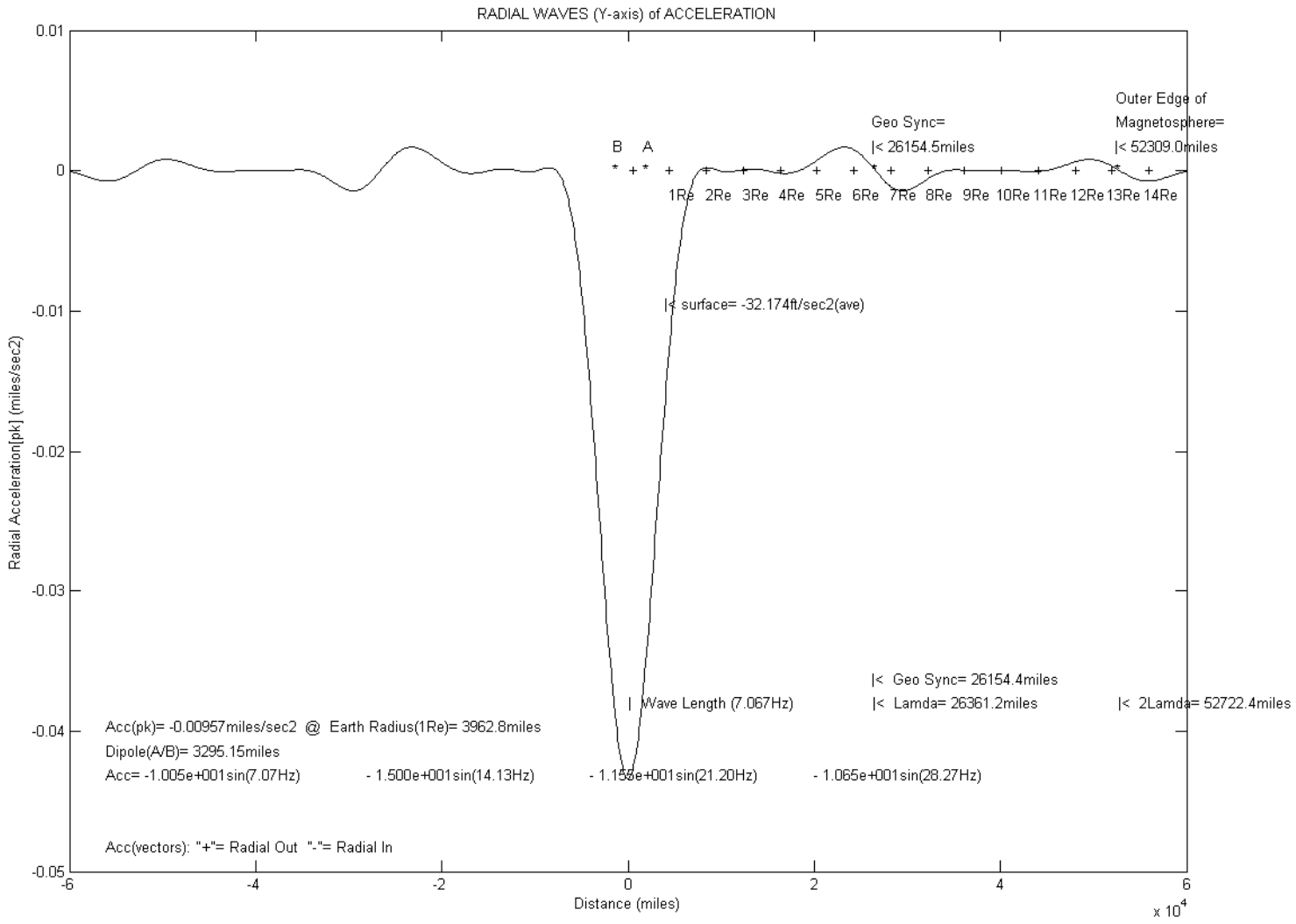


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Figure 43) "Y-axis Dipole Plot" shows the same dipole results as figure 42 only in the Y-axis (polar). The λ/8 dipole feedpoints labeled A and B are clearly marked at the origin (0, 0). The equation constants are now the same as the X-axis (equator) because the dipole arrangement corrected the differences. The Y-axis core type remains a solid. Plot scaling was reduced to include the magnetosphere edge (R = 2λ).

Main points:

1) Dipole feedpoints visible
2) Same GeoSync marker
3) Surface gravity slightly more
4) Y-axis core also a solid
5) Y-axis plot includes magnetosphere

3D Dipole Plot (normal)

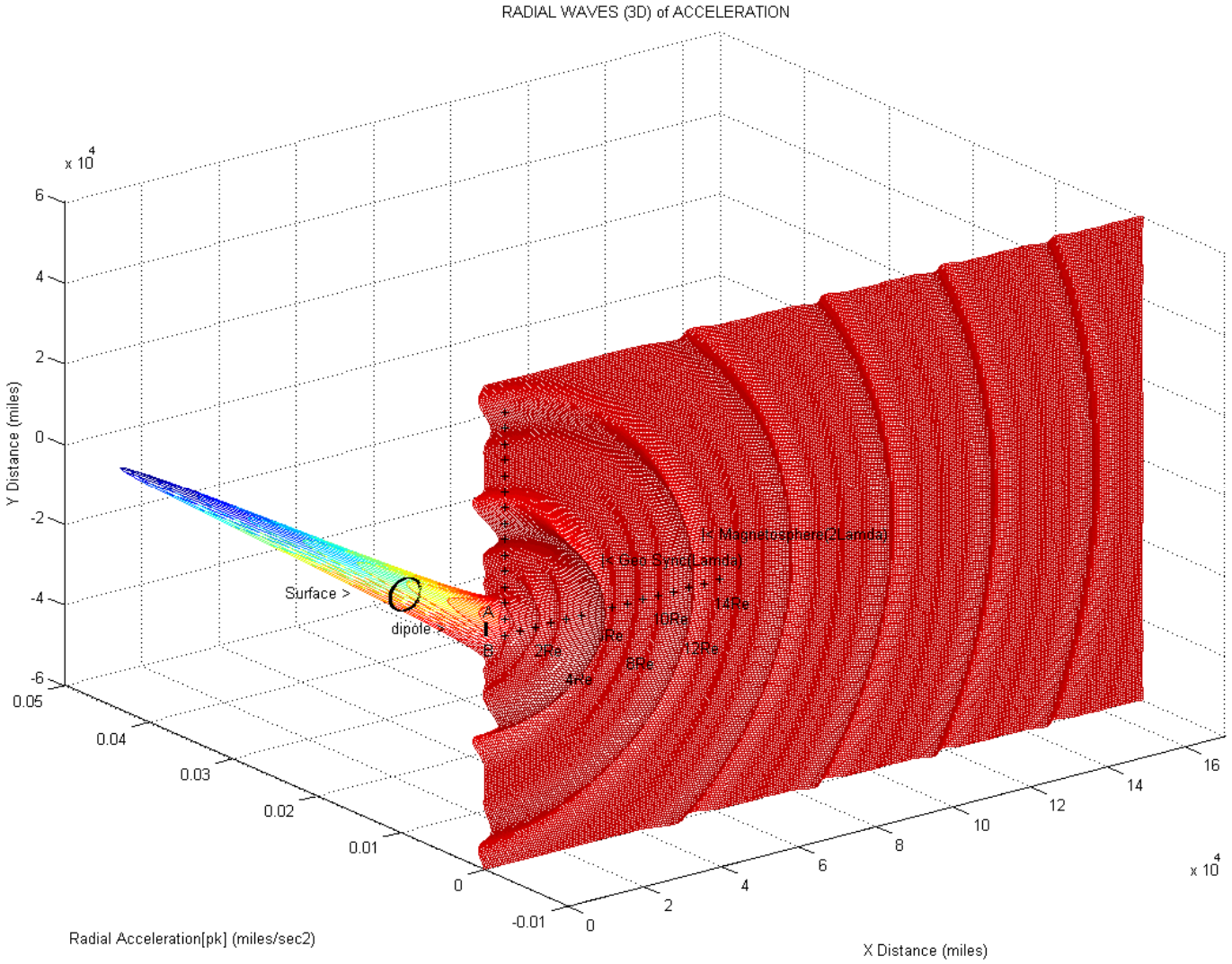

Figure 46) "3D Dipole Plot (normal)" is the space normal view with the dipole positioned vertical on the polar axis. It shows the spherical acceleration (gravity) waves radiating out into space from the dipole along with the earth surface and radius markers. Also visible is the big acceleration spike generating the solid core. Just visible but difficult to see because of plot scaling are the inner belt at 1.5Re and outer belt at 3Re.

Main points:

1) Earths gravity field pattern
2) Surface and radius markers
3) Core generation spike

WAVE HARMONICS
Planet Structure

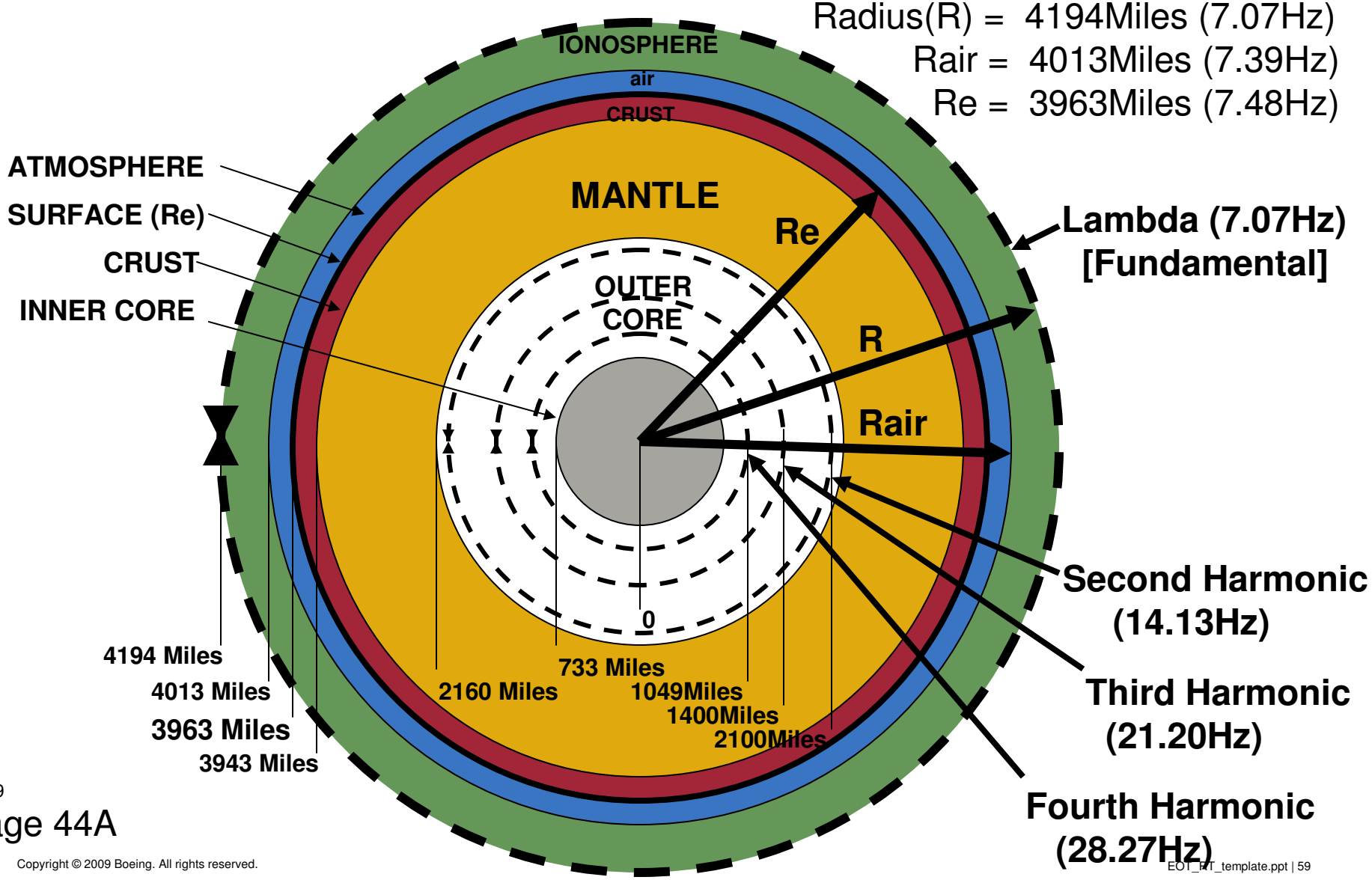

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Figure 44A) "Wave Harmonics (planet structure)" is a more detailed view of the earth's interior core. First, the crust material is solid and brittle. This brittleness is what earthquakes fracture making mountains and valleys. It also conducts electricity as all the world's power grids are "grounded" to it . Second, the mantle material is more plastic or pliable, viscous is the technical term. Its composition is mainly silicates with some traces of iron, if you can think of a granite rock frame as being flexible! This is also the molten material (igneous rock) that volcano's spew out as lava. The mantle is under both high pressure and high temperature. Third, the core material is composed of mostly iron and some nickel, the outer region being in the liquid state. In spite of the high temperatures the acceleration spike generates enough pressure to solidify the inner region making it a spherical iron center. As the core temperature is above the Curie point it can not maintain a magnetic field of its own but, being made of iron it will certainly be influenced by an electromagnetic one. This is the same planet structure data in figure 21A only with the four acceleration wave harmonics (gravity) superimposed on it. As can be seen from the figure the fundamental harmonic completely encloses the entire system including the ionosphere. Second, all the higher harmonics (second, third and fourth) reside in the liquid outer core region. It is all these wave harmonics mixing in the middle of the liquid outer core that cause it to rotate (spin), works just like the motor armature it is. As the core's rate of rotation (revolutions/hour) is much higher than the earth's rotation (revolutions/day) there is a friction line generated in the region of the outer core to mantle interface. It is this friction that causes the planets internal heat. Because it pliable the mantle functions as the earths dynamic spin balancer. If the crust moves out of alignment it causes internal pressures to build up in the mantle correcting it. Also has a built in safety valve, that when too much pressure builds up some volcano will pop (erupt) making a vent. When the heat generated equals the heat lost and spin power equals drag the system becomes stable.
Main points:

1) Fundamental wave encloses entire structure
2) Higher harmonics reside in the outer core
3) Wave mixing causes heat and motion

Gravity

- Generated by long (low freq) standing waves of radial acceleration
- Composed of a fundamental and three harmonics
  - Fund: 7.07 Hz - Second: 14.14 Hz
  - Third: 21.21 Hz - Fourth: 28.28 Hz
- Y-Axis dipole feedpoint – Lambda/8
- Solid core (Acc = negative @ R=0)
  - Dipole shifted Acc @ origin from 0 (hollow) to negative (solid)
  - Solid means - not hollow (might be liquid)
- Acceleration at surface not the same in X and Y axis
  - Dipole flattened polar (Y) axis
- First three (fund, second, third) harmonics generate the outer magnetosphere (shell)
- Fourth harmonic generates the radiation belts (donuts)
- Frequency determines Scale Factor (SF) - Size
  - Works for atoms (high Ghz)
- Electromagnetic origin (Tesla data)
  - Similar FFT plots

Figure 53) "Gravity" compiles and lists all the data and information obtained from the research and number crunching done in taking a detailed look into this subject. The gravitational system of earth is composed of an accelerating force generated by long (low frequency) standing waves which do far more than just make the 32ft/sec2 surface acceleration commonly called gravity. These waves extend out some 60,000miles (2 wavelengths) into space generating the complete Magnetosphere, a stable GeoSynchronous orbit and both the inner and outer Van Allen radiation belts. This waveshape is composed of four frequencies a fundamental and three higher harmonics. The numbers being 7.07Hz for the fundamental, 14.14Hz for the second harmonic, 21.21Hz for the third harmonic and 28.28 for the fourth harmonic. Looking the other way towards the center of the earth the fundamental frequency determines the outer edge of the ionosphere while the three higher harmonics reside in the planets outer core region. This wave mixing causes the internal heat, pressure, forces and rotation of the planet. These waves are sourced or concentrated at dipole feedpoints located on the Y-axis centered about the origin (0, 0); dipole distance being $\lambda/8$ at the fundamental frequency. The dual feedpoints cause a number of modifications to the system. First, it changes the core type from hollow (thick crust) to solid. Solid meaning not a hollow structure could be liquid or a combination of liquid and solids. Second, it causes a flattening of the polar region changing a round sphere to egg shaped or an ellipsis. Third, it generates the crescent shaped inner and outer radiation belts. The first three harmonics primarily determine the planets structure, GeoSync orbit and the magnetosphere while the fourth harmonic contributes the two radiation belts.

In doing the data reduction and number crunching two other facts were uncovered that are not directly related to the gravity study but need to be documented as well. First, it appears that frequency determines the size or scale factor of a structure. If this is true then atoms would have a similar type structure only much smaller in size (very high frequency – GHz). Second, the waves of accelerating force seem to be of electromagnetic origin. They track or correlate with the earth's electromagnetic waves discovered by Tesla and Schumann in both frequency and amplitude much too close not to be connected to them. The analysis of this electromagnetic connection is the subject of the "Study of Gravity" (part2).

Study of Gravity (part 2) Continues

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STUDY OF GRAVITY (Part 1)
Errata List

- **Misspelled the word lambda (not lamda)**
- **Left (not right) Hand Motor rule**
- **Acceleration field attenuation 1/R^2 or 1/R^3 (not 1/R)**

Figure 27) "Study of Gravity (part 1) errata list" In the time this study has been out in public domain three errors have been brought to my attention. First, miss-spelled the word "Lambda" as lamda. Second, the motor rule is defined as the "left" hand and the generator rule is the "right" hand. And third, The attenuation of the acceleration force field must be greater than linear (1/R) if it is connected with (EM) ElectroMagnetic fields as they attenuate as the square of the distance (1/R^2).

R-Axis Dipole Plots (part 1)
English to Metric conversion

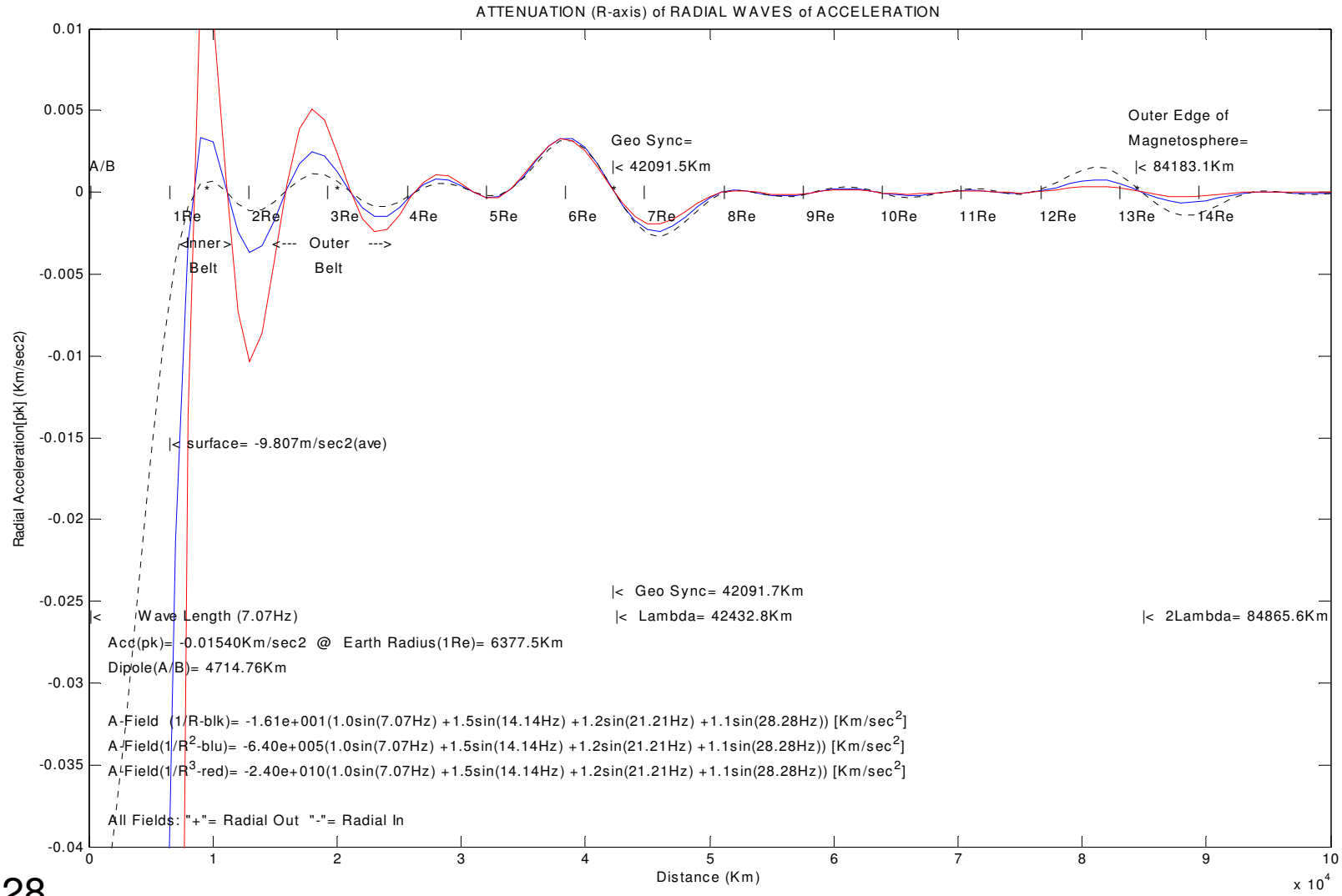


Figure 28) "R-Axis Dipole Plots" the black dotted line is the original "equator" data from part 1 with the following changes. First, the coordinate system was changed to the cylindrical system. The reason being poor definitions of the X (equator) and Y (polar) units used in part 1 could not support the 3D equations of EM field work. The cylindrical system definition as it now stands is: the equator direction equals the R-axis, the polar direction equals the Z-axis and the circular or spin direction equals the θ-axis. Second, the acceleration force units from part 1 were all converted from the English to the Metric system. Because most EM field pattern work is done in metric units.
Superimposed on the original black dotted line from part 1 which attenuates inversely as the distance (1/R) are two other wave attenuation factors. The blue line attenuates inversely as the square of the distance (1/R^2) and the red line attenuates inversely as the cube of the distance (1/R^3). Re-ran the part 1 data with these two curves to see what effect the attenuation factor caused. As can be seen from the figure the different attenuation factors mainly affect the size and shape of the two radiation belts and to a smaller degree the magnetosphere edge. They also increased the acceleration force field at the earth's center.

Main points:

1) R-axis data from part 1 with a coordinate and units change
2) Plots show different attenuation factors (1/R, 1/R^2, 1/R^3)
3) These factors mainly affect the radiation belts,
4) and the earth's center acceleration force

Z-Axis Dipole Plots (part 1)
English to Metric conversion

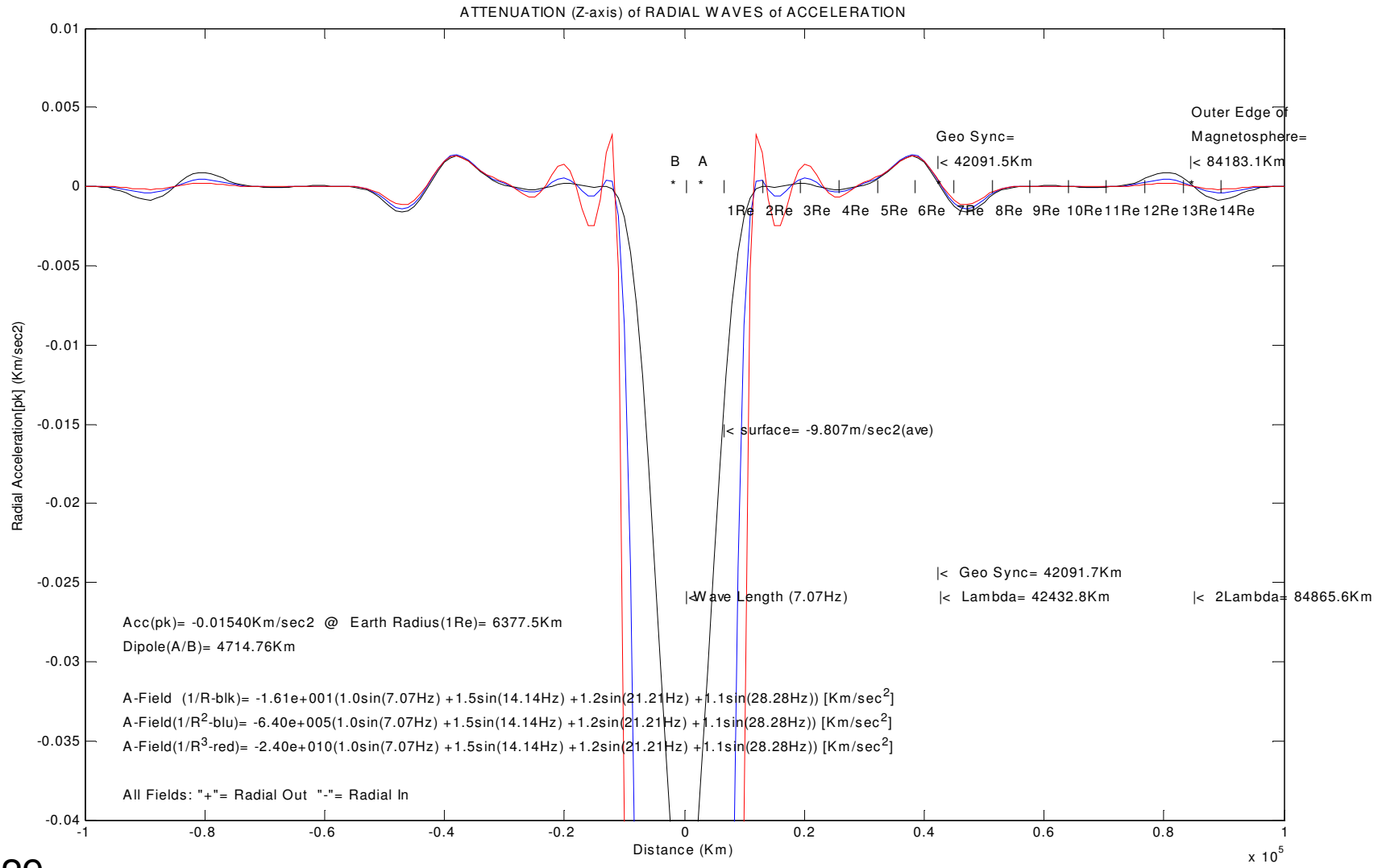


Figure 29) "Z-Axis Dipole Plots" similarly the black dotted line is the original "polar" data from part 1 with the exact same changes that were preformed on the previous R-axis figure and for the same reasons (cylindrical coordinates, metric system).
Superimposed on the original black dotted line from part 1 which attenuates inversely as the distance (1/R) are the same two wave attenuation factors. The blue line attenuates inversely as the square of the distance (1/R^2) and the red line attenuates inversely as the cube of the distance (1/R^3). Re-ran the part 1 data with these two curves to see what effect the attenuation factor caused. As can be seen from the figure the two different attenuation factors mainly affect the size and shape of the area close to the poles that being the region of the "Aurora Borealis" or as its more commonly called the northern and southern lights and to a smaller degree the magnetosphere edge. They also increased the acceleration force field at the earth's center.

Main points:

1) Z-axis data from part 1 with the same coordinate and unit changes
2) Plots show different attenuation factors (1/R, 1/R^2, 1/R^3)
3) These factors mainly affect the near earth region,
4) and the earth's center acceleration force

PHYSICS: Poynting Vector

- **Force Field Equation**

- **Starting with the Poynting Vector equation:**
- **P = (1/μo)*E x B [watts/m^2]**
- **Removing the 1/μo term reduces the E x B units [watts/m^2] to [newton-ohms/m^2]**
- **Free space resistance: Rs = (μo/εo)^.5 [ohms]**
- **Multiplying E x B by the reciprocal of resistance [1/Rs] produces the free space force field equation:**
- **F = (εo/μo)^.5*E x B [newton/m^2]**

Figure 30) "Physics: Poynting Vector" Straight from the textbook states that Power density (P) of an EM wave is equal to the vector cross product of the E and B fields divided by the magnetic permeability (μo) of free space, units being [watts/meter^2]. One method of deriving the force field equation (F= E x B) is to modify the Poynting vector equation as force, work and power are all closely related (change of constants). First, removing the magnetic permeability constant (1/μo) reduces the equation's units from [watts/meter^2] to [newton-ohms/meter^2]. Second, free space resistance (Rs) is equal to the square root of the magnetic permeability (μo) divided by the electric permittivity (εo) expressed in [ohms]. Third, multiplying the equation by the reciprocal of the free space resistance [1/Rs] produces the force field equation with the correct constants, units being [newtons/meter^2].

Main points:

1) Textbook Poynting vector equation, units being [watts/meter^2]
2) Power and force are related terms,
3) need only to change the constants to get force, units being [newtons/meter^2]

PHYSICS: Left Hand Motor Rule

$$\mathbf{F} = L^{*}\mathbf{I} \times \mathbf{B}$$

Force equals [L] length times [I] current "vector cross product" Magnetic [B] field

- **Ohms Law: I = V / R**
  - **Where V = E[volts/meter] * L [meters]**
- **Boundary conditions apply:**
  - **Field constrained in a conductor (i.e. wire)**
  - **Length (L) of conductor in B-field**
  - **Resistance (R) of conductor**
  - $\mathbf{F} = (L\text{^}2/R)^{*}\mathbf{E} \times \mathbf{B}$ **[newtons]**

Figure 31) "Physics: Left Hand Motor Rule" or as it's more commonly known the Lorentz force equation (F = L*I x B) which states that Force is equal the Length of a conductor in a magnetic (B) field multiplied by the current (I) flowing through it. The vector cross product makes all three terms orthogonal (90deg). This is another method of deriving the force equation. Remembering ohms law which states that current (I) is equal to the Voltage divided by the Resistance (voltage and current in phase). Making this substitution Force is now equal to the conductor Length in the magnetic (B) field multiplied by the Voltage across it and divided by the conductor Resistance. In a conductor the Voltage is equal to the integral of the Electric field over (multiply) the Length of the conductor. Making this last substitution Force is now equal to the square of conductor Length in the magnetic (B) field multiplied by the Electric field around it and divided by the conductor Resistance, units being [newtons].

Main points:

1) Textbook Lorentz force equation, units being [newtons]
2) Equation modified with ohm's law substitution
3) Boundary conditions apply (not free space),
4) These changes correctly balance the force equation

Force Vector Product
(cylindrical coordinates)

$$\mathbf{F} = \mathbf{E} \times \mathbf{B} = (E_\theta B_z - E_z B_\theta)\,\hat{r} + (E_z B_r - E_r B_z)\,\hat{\theta} + (E_r B_\theta - E_\theta B_r)\,\hat{z}$$

$$\mathbf{F} = (\varepsilon_o/\mu_o)^{.5}[-(E_z B_\theta)\,\hat{r} + (E_r B_\theta)\,\hat{z}] \qquad E_\theta = B_r = B_z = 0$$

$$\mathbf{F} = (\varepsilon_o/\mu_o)^{.5}[(E_\theta B_z)\,\hat{r} - (E_\theta B_r)\,\hat{z}] \qquad E_r = E_z = B_\theta = 0$$

Two possibilities either the B-field or E-field is in the theta direction.

Figure 32) "Force Vector Product (cyl)" is the full blown mathematical vector cross product for force in cylindrical coordinates. As can be seen it has four terms in each orthogonal axis. Also, each of the individual E and B fields have multiple terms along with imaginary numbers so the complete equation gets very complex to number crunch. However, the equation does have two general solutions depending on the boundary conditions used. Both solutions put the Force vector components in the R and Z axis but differ as to which EM field E or B is in the circular θ-axis. First cut solution is to put the B-field in the R and Z axis as this is the normal position of the earth's magnetic field in cylindrical coordinates.

Main points:

1) Complete force vector equation in cylindrical coordinates
2) The solution is complex as it has many terms some being imaginary
3) Only two general solutions possible, E or B field in the θ-axis

Wave Mixing

When two waves are mixed (multiplied) the output is the original frequencies (doubled) plus the sum and difference frequencies

$$B = -B0 - B1\cos(\theta) - B2\cos(2\theta)$$

$$E = E2\sin(2\theta)$$

$$F = E \times B$$

(diff) (θ doubled) (sum) (2θ doubled)

$$F = -F1\sin(2\theta-\theta) - F2\sin(2\theta) - F3\sin(2\theta+\theta) - F4\sin(4\theta)$$

$$F1 = .5*E2*B1 \qquad F2 = E2*B0$$

$$F3 = .5*E2*B1 \qquad F4 = E2*B2$$

Figure 33) "Wave Mixing" shows the results of mixing (multiplying) two waves. The first wave the B-field is composed of a fundamental [B1*cos(θ)] and second harmonic [B2*cos(2θ)] along with a constant [B0], all terms being negative. The second wave the E-field is composed of only a fundamental [E2*sin(2θ)] which is the second harmonic of the B-field. Note the 90deg phase shift between the two waves (cosine vs sine). Multiplying (vector cross product) these two wave together results in a wave the F-field with four terms, all negative sines. This mathematically shows the frequency doubling and phasing of the sum/difference products of beat frequencies (mixing). This equation supports the "Wave Basics (stand/traveling)" tutorial showing that the accelerating force has twice the frequency as its (EM) ElectroMagnetic components (two pulses per cycle). Also, not shown is the correlation of the F-field constants: F1= E2*B1/2, F2= E2*B0, F3= E2*B1/2, F4= E2*B2.

Main points:

1) Wave mixing doubles the original frequencies
2) and generates sums and difference frequencies
3) Mathematical proof that the force field operates on the second harmonic of the E and B fields
4) Equates the four force field constant terms to the E and B field constants

Equator F = E x B Vectors

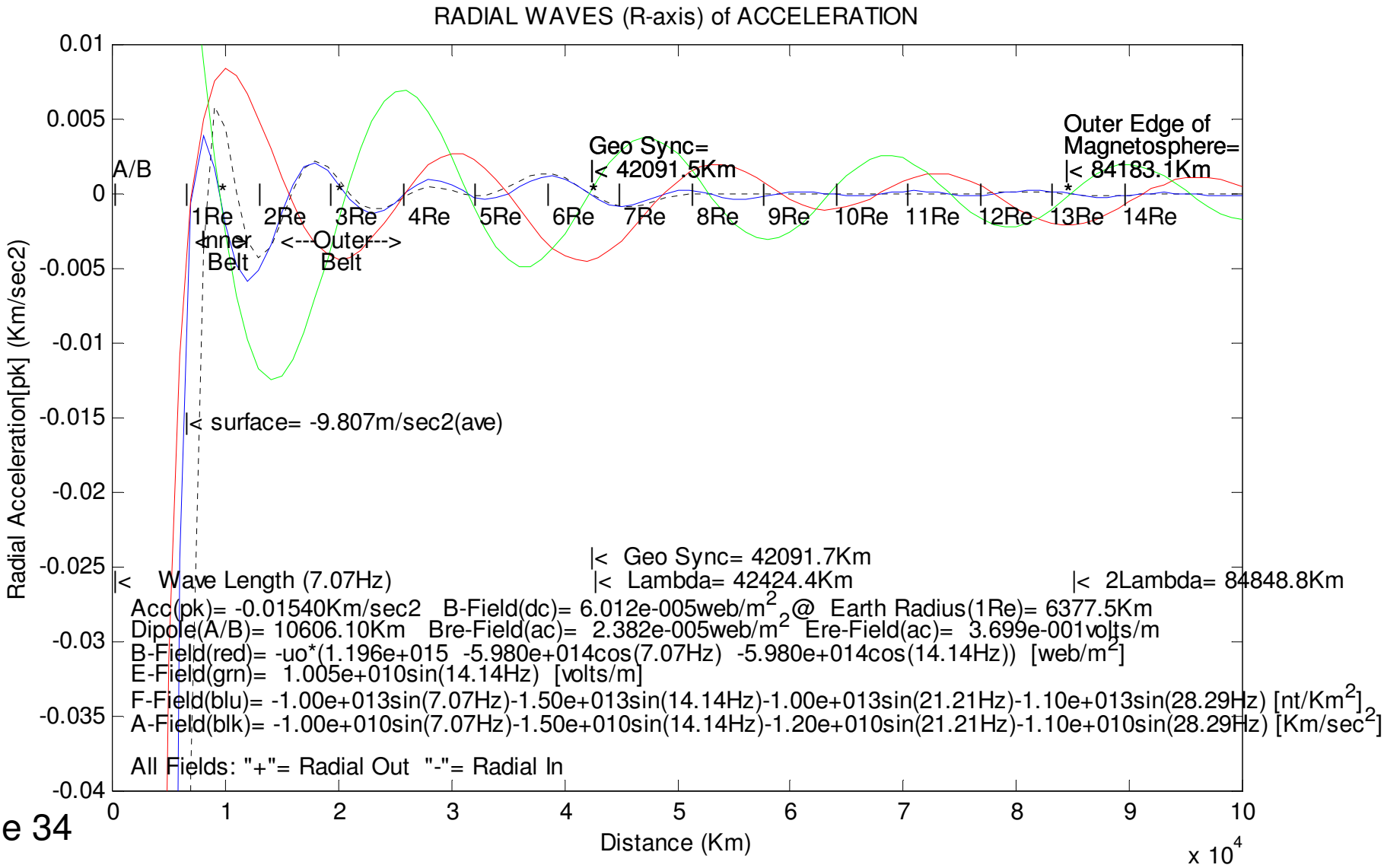


Figure 34) "Equator F = E x B Vectors" this figure is important as it shows the complete set of "Gravity" waves in the radial direction. The displayed equations are the simplified ones mainly to show the constants, but all the computations were done with the complete complex set. The Acceleration A-field[blk] is the original equation from part1 with the same relative term constants of A1= 1.0, A2= 1.5, A3= 1.2 and A4= 1.1. However, there are three modifications: first the coordinate system was changed to cylindrical, second the units were changed to metric and third the attenuation factor was changed to the inverse of the square of the distance (1/R^2). The Force F-field[blu] tracks or generates the proposed A-field almost exactly with very similar relative constants of F1= 1.0, F2= 1.5, F3= 1.0 and F4= 1.1. The third harmonic is a little lower which moved the inner radiation belt back to its correct position. As can be seen from the figure at distances less then the surface radius (Re) the (DC) Magnetic B-field[red] tracks the Force F-field[blu] however, at distances greater then the surface radius (Re) it starts oscillating (AC). The same is true for the Electric E-field[grn] only its phasing is different. In looking at the equation constants they all have numbers to high powers which generate very strong fields at the earth's center (R= 0), but attenuate rapidly in the 3963 miles to the surface (R= Re) going down to uWebers for the Magnetic B-field and mVolts for the Electric E-field.

Main points:

1) Plots the complete set of gravity waves
2) Calculations run with the complex equations
3) Attenuation factor is 1/R^2
4) High forces at the earth's center (R= 0)
5) and low forces at the surface (R= Re)
6) Force field closely tracks the acceleration field
7) Corrects the inner belt location

FFT Acceleration of Gravity (part 1)

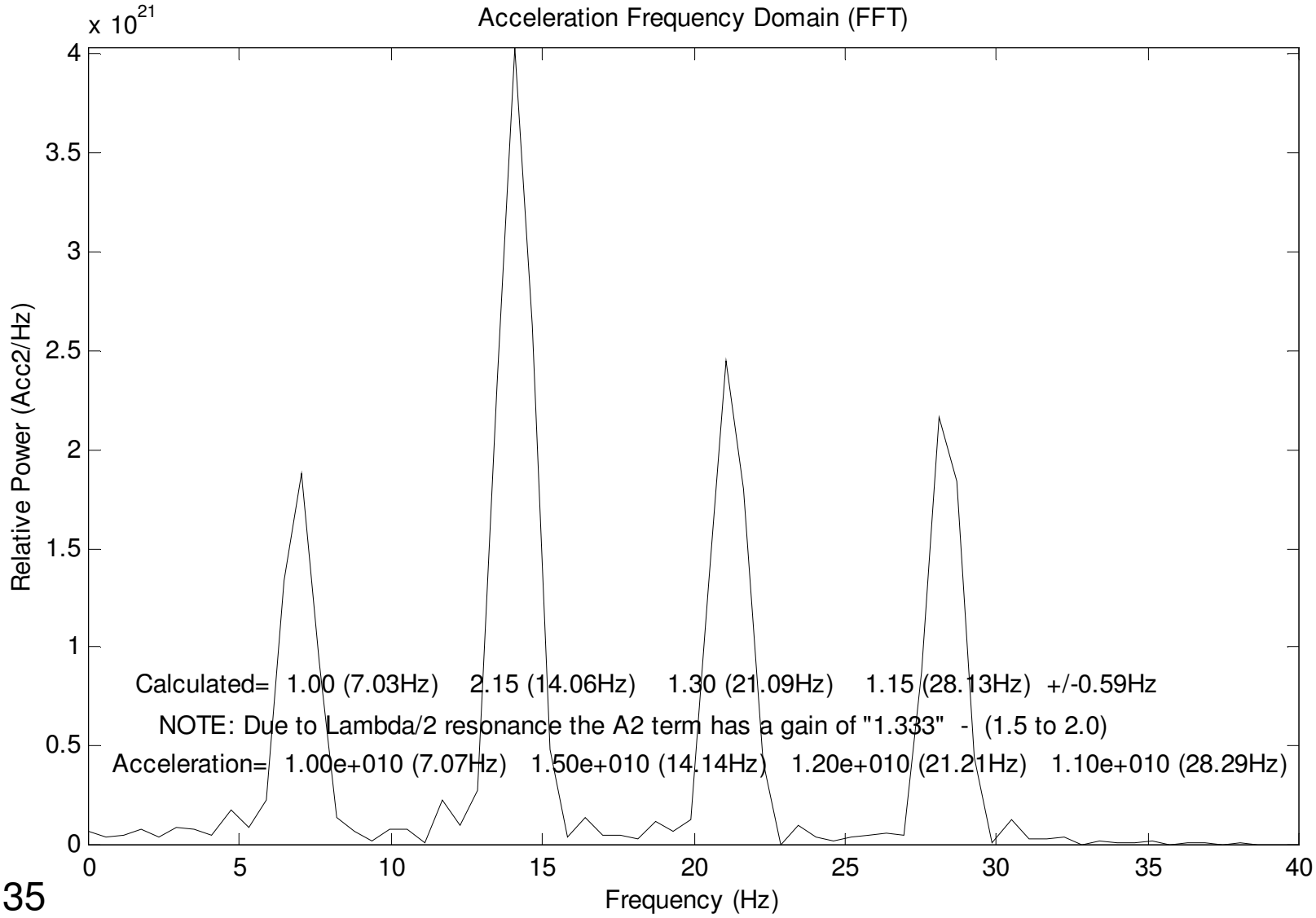


Figure 35) "FFT Acceleration of Gravity (part1)" shows the acceleration data from figure 34 only now in the frequency domain. It is composed of the same four harmonics emphasizing their relative amplitudes. As can be seen by comparing the Acc and Calc equations their constants are about the same except for the second harmonic. The second harmonic shows a resonant gain (2.15 vs 1.5) as the dipole is tuned to this frequency. Dipole length is λ/2 at the second harmonic or λ/4 at the fundamental frequency.

Main points:

1) Four harmonics: (7.07Hz, 14.14Hz, 21.21Hz, 28.28Hz)
2) Relative constants: (1, 1.5, 1.2, 1.1)
3) The dipole is tuned to the second harmonic
4) causing resonate gain at this frequency

FFT Gravity Force Field

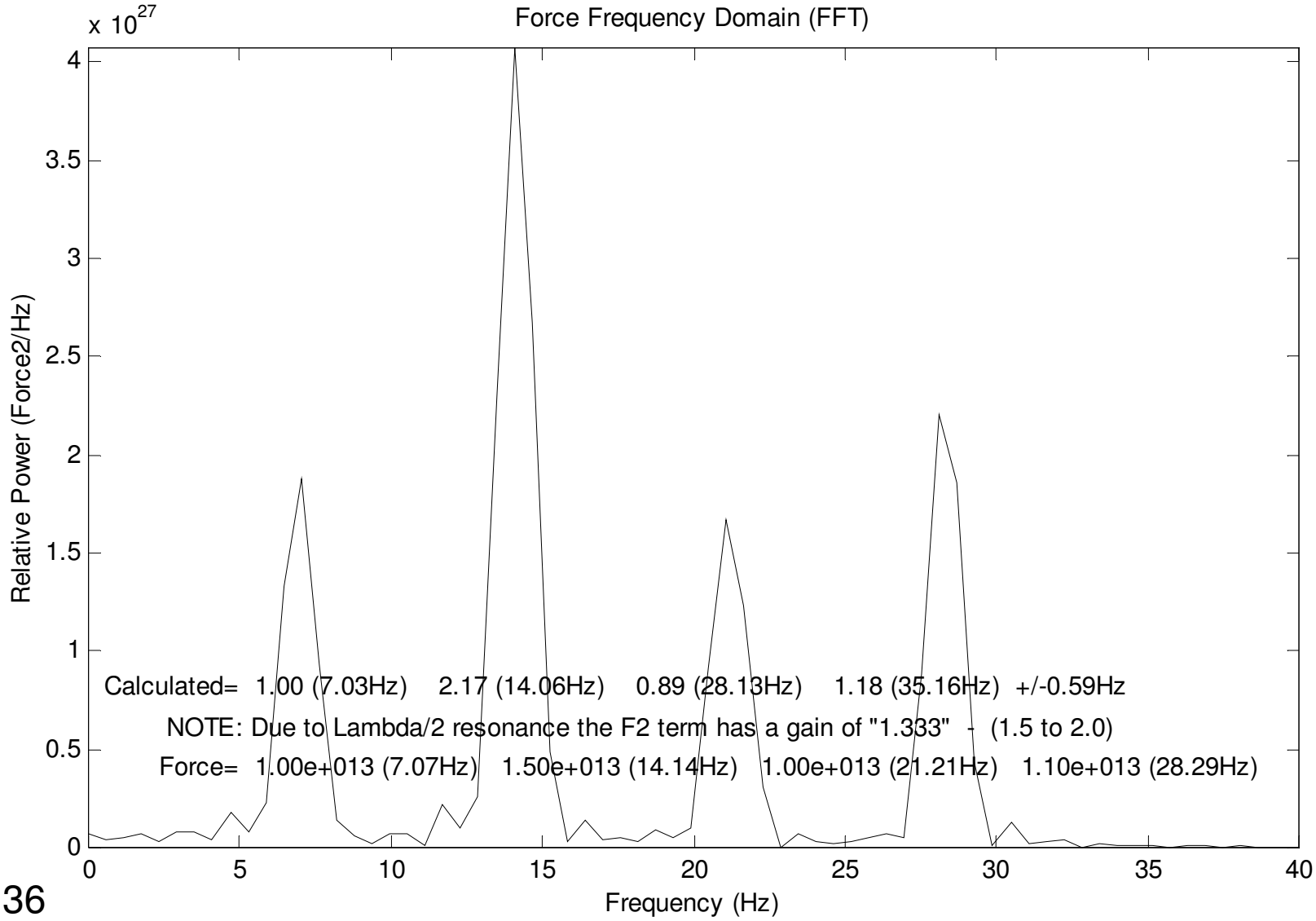


Figure 36) "FFT Gravity Force Field" shows the force data from figure 34 only now in the frequency domain. It is composed of the same four harmonics emphasizing their relative amplitudes. As can be seen by comparing the Acc and Calc equations their constants are about the same except for the second harmonic. The second harmonic shows a resonant gain (2.17 vs 1.5) as the dipole is tuned to this frequency. The only difference between the previous acceleration figure and this force one is the amplitude of the third harmonic and the units.

Main points:

1) Same four harmonics: (7.07Hz, 14.14Hz, 21.21Hz, 28.28Hz)
2) Relative constants: (1, 1.5, 1.0, 1.1)
3) The dipole is tuned to the second harmonic
4) causing resonate gain at this frequency
5) Difference in third harmonic amplitude (Acc vs Force)

Complete EM Dipole Br-Field Equation

- **Br0 = μoB0rz 2 / (r^2+z^2)^2 [dc term]**
- **Br1 = μoB1rz[3 / (r^2+z^2)^2 [first harmonic]**
  +i2π / λ(r^2+z^2)^1.5
  –i3λ / 2π(r^2+z^2)^2.5]exp(-iθ)
- **Br2 = μoB1rz[3 / (r^2+z^2)^2 [second harmonic]**
  +i4π / λ(r^2+z^2)^1.5
  –i3λ / 4π(r^2+z^2)^2.5]exp(-i2θ)
- **Br = Br0 +Br1 +Br2 [total]**

Figure 37) "Complete EM Dipole Br-Field Equation" in cylindrical coordinates, it is composed of three terms a constant (DC) and two (AC) harmonics. The real part (far field pattern) of all three terms attenuates inversely as the square of the distance (1/D^2). Both harmonics also carry two complex (imaginary) terms (near field pattern) which attenuate inversely as the third (1/D^3) and fifth (1/D^5) powers of the distance respectively. Their effect is mainly at small distances (< λ/2) which is where the planet and radiation belts are located so they must be included in the calculations. The relative ratio of the coefficients: B0 is equal to double (2x) B1.

Main points:

1) B-field in the R-axis is composed of three terms: a constant and the first and second harmonics
2) The far field pattern (real) attenuates (1/R^2), effects more at distances greater than λ/2
3) The near field pattern (imaginary) attenuates faster (1/R^3, 1/R^5), effects more at distances less than λ/2
4) Relative ratio of B-field constants: B0= 2*B1

Complete EM Dipole Bz-Field Equation

- **Bz0 = μoB0 (z^2-r^2) / (r^2+z^2)^2 [dc term]**

- **Bz1 = μoB1[(2z^2-r^2) / (r^2+z^2)^2 [first harmonic]**
  –i2πr^2 / λ(r^2+z^2)^1.5
  +iλ(2z^2-r^2) / 2π(r^2+z^2)^2.5]exp(-iθ)

- **Bz2 = μoB1[(2z^2-r^2) / (r^2+z^2)^2 [second harmonic]**
  –i4πr^2 / λ(r^2+z^2)^1.5
  +iλ(2z^2-r^2) / 4π(r^2+z^2)^2.5]exp(-i2θ)

- **Bz = Bz0 +Bz1 +Bz2 [total]**

Figure 38) "Complete EM Dipole Bz-Field Equation" in cylindrical coordinates, it is also composed of three terms a constant (DC) and two (AC) harmonics. Likewise the real part (far field pattern) of all three terms attenuates inversely as the square of the distance (1/D^2). Both harmonics also carry two similar complex (imaginary) terms (near field pattern) which attenuate inversely as the third (1/D^3) and fifth (1/D^5) powers of the distance respectively. Their effect is mainly at small distances (< λ/2) which is where the planet and radiation belts are located so they must be included in the calculations. The ratio of the coefficients is also B0 is equal to double (2x) B1.

Main points:

1) B-field in the Z-axis is also composed of three terms: a constant and the first and second harmonics
2) The far field pattern (real) attenuates (1/R^2), effects more at distances greater than λ/2
3) The near field pattern (imaginary) attenuates faster (1/R^3, 1/R^5), effects more at distances less than λ/2
4) Relative ratio of B-field constants: B0= 2*B1

Complete EM Dipole E_θ-Field Equation

- E_θ = E2r[1 / (r^2+z^2)^1.5 [second harmonic]
  -i4π / λ(r^2+z^2)]exp(-i2θ)

Figure 39) "Complete EM Dipole Eθ-Field Equation" in cylindrical coordinates, it is composed of only the second (AC) harmonic term. There are no constant (DC) or first harmonic term. The real part (far field pattern) attenuates inversely as the square of the distance (1/D^2). This harmonic also carries a complex (imaginary) term (near field pattern) which attenuates inversely as the cube (1/D^3) of the distance. Its effect is mainly at small distances (< λ/2) which is where the planet and radiation belts are located so it must be included in the calculations.

Main points:

1) E-field in the θ-axis is composed of only one term: the second harmonic
2) The far field pattern (real) attenuates (1/R^2), effects more at distances greater than λ/2
3) The near field pattern (imaginary) attenuates faster (1/R^3), effects more at distances less than λ/2

Gravity F = E x B Vectors

EM Equations (simplified)

- B = -uo 6e14 (2 +1cos(θ) +1cos(2θ)) / (r^2+z^2)^1.5 [web/m^2]
- E = 1e10 sin(2θ) / (r^2+z^2)^1.5 [volts/m]
- F = -1e13 (1.0sin(θ) +1.5sin(2θ) +1.0sin(3θ) +1.1sin(4θ)) / (r^2+z^2)^1.5 [nt/Km^2]
- A = -1e10 (1.0sin(θ) +1.5sin(2θ) +1.2sin(3θ) +1.1sin(4θ)) / (r^2+z^2)^1.5 [Km/s^2]
- F = M A
- Constant: M = [Kg/Km^2] ???<field mass density>???

Figure 40) "Gravity F = E x B Vectors" shows the simplified versions of the previous complex E[grn] and B[red] field equations along with the resultant force F-field[blu] from all the wave mixing (vector cross product). As can be seen by the equations and previous figures the Force field[blu] tracks the original Acceleration field[blk] almost exactly. However, there are three differences. First, there is a small change in relative value of the third harmonic coefficient from 1.2 to 1.0. Second, there is a change to the power of the constant term from 1E10 to 1E13. And third, is a difference in units nt/Km^2 vs Km/S^2.

According to Newton's law (F= M*A) Force and Acceleration are equivalent with Mass being the constant of proportionality, in theory this equation should also work with fields. Rearranging the equation and reducing the units, shows the Mass term to have units of [Kg/Km^2]. Reducing it further to [grams/meter^2] gives mass per area or some type of field density. The mass term could equal to the total earth mass and the area term equal the total earth surface area or it might be some kind of circular shaped integrating element where the fields combine. This is the one loose end in the entire "Study of Gravity".

Main points:

1) Simplified terms highlighting the equation constants and attenuation factor
2) The force and acceleration equations almost identical
3) One loose end, mass term units [Kg/Km^2] and definition

EM Dipole B-Field (Br and Bz)

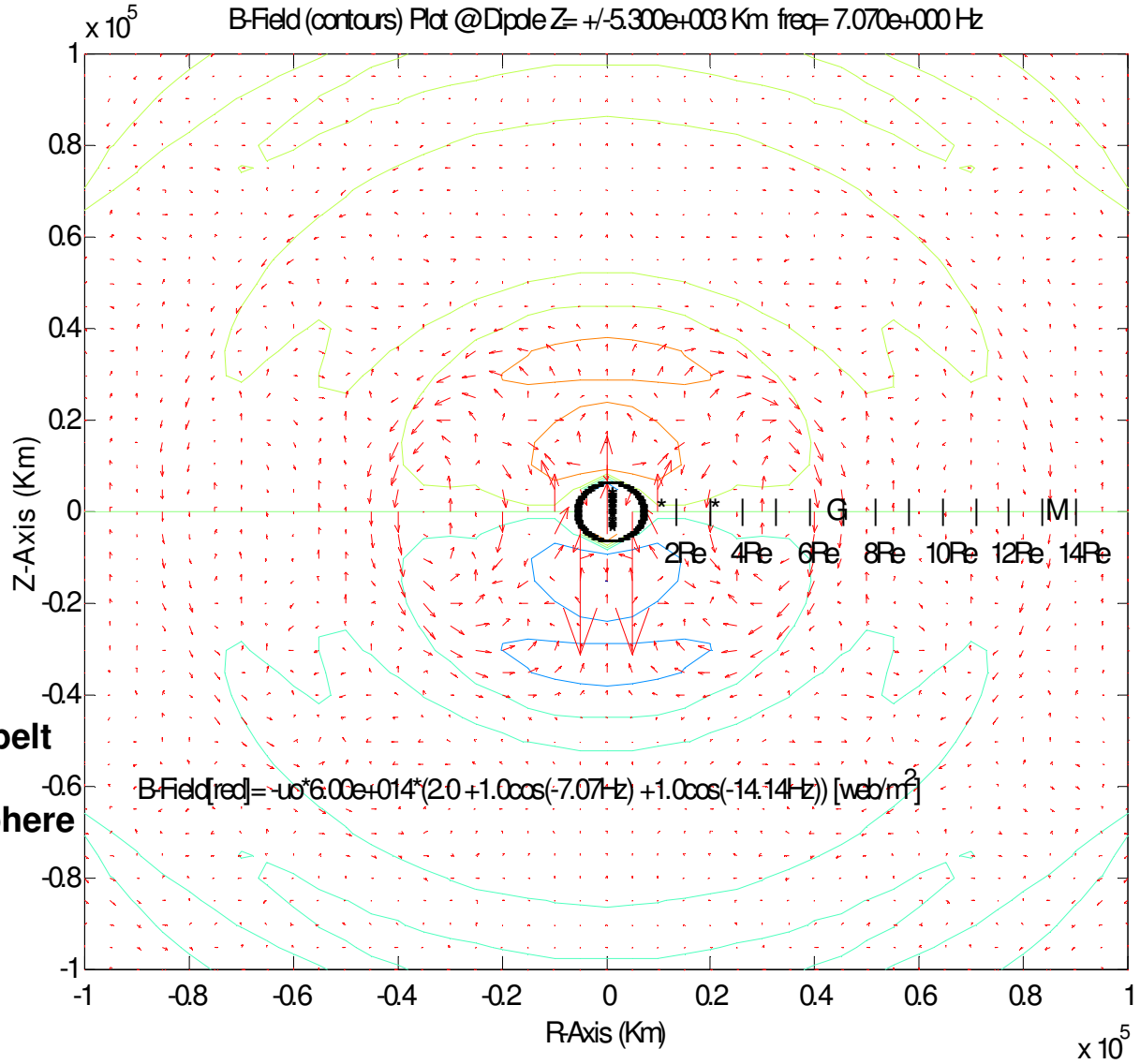


Figure legend:
circle[blk]= earth
line[blk]= λ/4 dipole
"*"= center of radiation belt
"G"= Geosync orbit and
"M"= edge of magnetosphere

Mg10

Figure 41) "EM Dipole B-field (Br and Bz)" shows the complete (AC) magnetic B-field[red] vectors (arrows) and constant contour plots in 3D space. As can be seen from the figure there are maximum magnetic potentials at each dipole end one positive (N) and one negative (S) both attenuating to zero at (z= λ) on the Z-axis. Similarly, there is a negative B-field maximum at the inner radiation belt center (λ/4) and positive maximums at the outer radiation belt center (λ/2), at Geosync (λ) and the magnetosphere (2λ). The (AC) dynamic terms (real) cause the magnetic field to group or cluster at the harmonic intervals rather then evenly distributed like (DC). While the complex terms (imaginary) cause the field to rotate or move in loops and sub-loops at distances less then λ. However, the overall magnetic field does attenuate inversely as the square of the distance (1/R^2). Note the figure only shows half the AC cycle. In the next half cycle the magnetic field vectors all reverse direction.

Main points:

1) Complete magnetic B-field vectors out to 2λ
2) N and S magnetic dipole potentials
3) The (AC) causes the B-field pattern to cluster at harmonic intervals
4) Near field pattern (< λ) loops caused by complex terms
5) B-field attenuates as the square of the distance (1/R^2)
6) Only a half cycle of (AC) shown, fields reverse next half cycle

EM Dipole B-Field (Br and Bz)
[Detailed View]

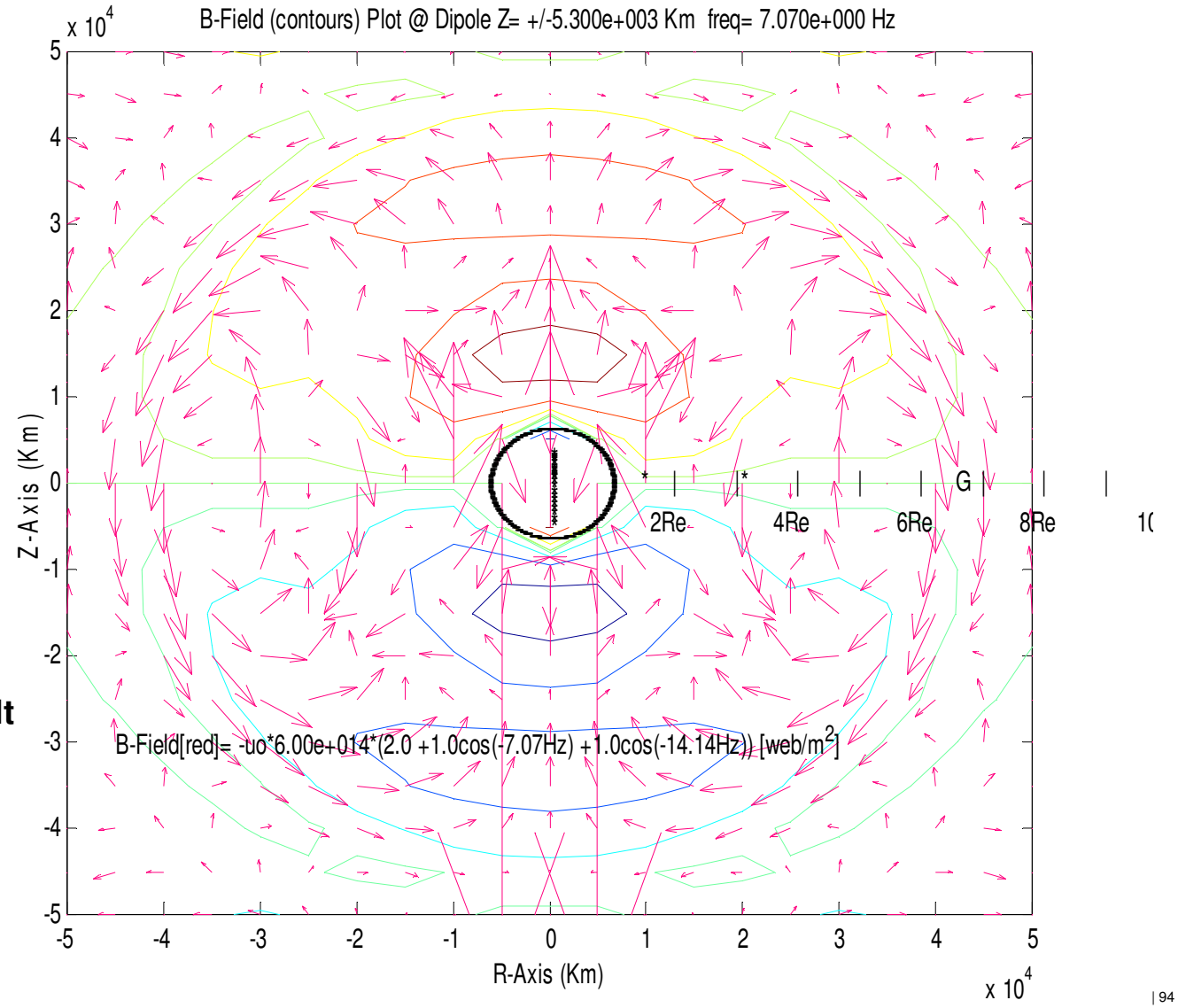


Figure legend:
circle[blk]= earth
line[blk]= λ/4 dipole
"*"= center of radiation belt
"G"= Geosync orbit

Mg10

Page 41A

Figure 41A) “EM Dipole B-Field (Detailed View)” is the same B-field data as in figure 41 showing only a 50,000Km close-up. This detailed view displays the Magnetic B-field vectors and potential contours more clearly.

EM Dipole E-Field (Eθ)

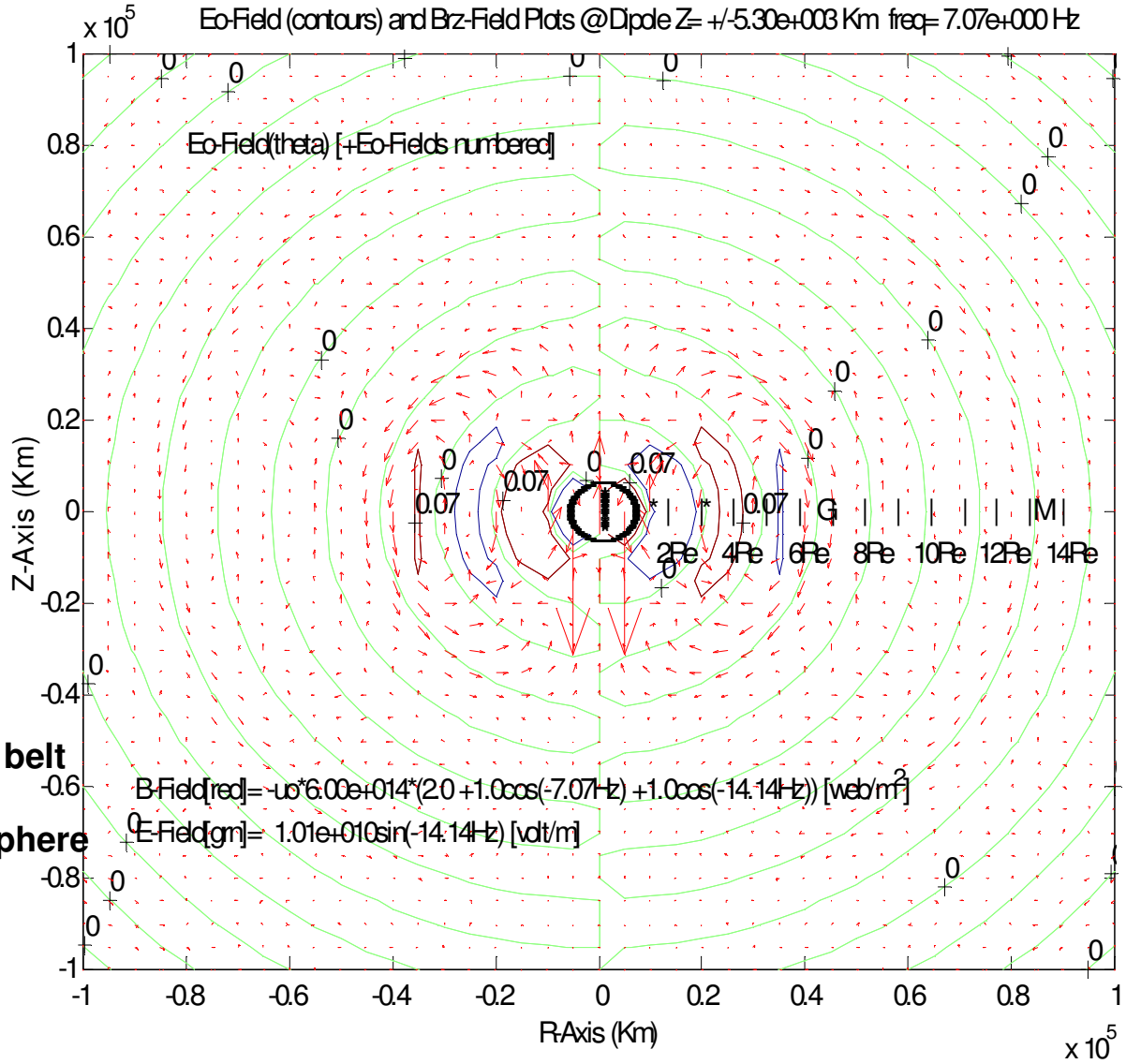


Figure legend:
circle[blk]= earth
line[blk]= λ/4 dipole
"*"= center of radiation belt
"G"= Geosync orbit and
"M"= edge of magnetosphere

Figure 42) "EM Dipole E-field (Eθ)" shows the same (AC) magnetic B-field[red] vectors (arrows) with the electric E-field[grn] superimposed on it. As can be seen from the figure the complete electric E-field is composed of shells of alternating spin polarity with nodes at the magnetic dipole ends. Only the positive part (green outline) of the shell is shown for clarity. Positive is defined as rotating into the page. Similar to the (AC) magnetic B-field harmonic clustering the (AC) electric E-field shell pattern rotates at the second harmonic (2θ). Also, the overall electric field does attenuate inversely as the square of the distance (1/R^2). Note the figure only shows half the AC cycle. In the next half cycle the magnetic field vectors all reverse direction and the electric field shells oscillate the other direction.

Main points:

1) Complete electric E-field and magnetic B-field vectors out to 2λ
2) The (AC) causes the E-field to form alternate polarity spherical shells
3) that oscillate at the second harmonic frequency
4) E-field also attenuates as the square of the distance (1/R^2)
5) Only a half cycle of (AC) shown, both fields reverse next half cycle

EM Dipole E-Field (Eθ)
[Detailed View]

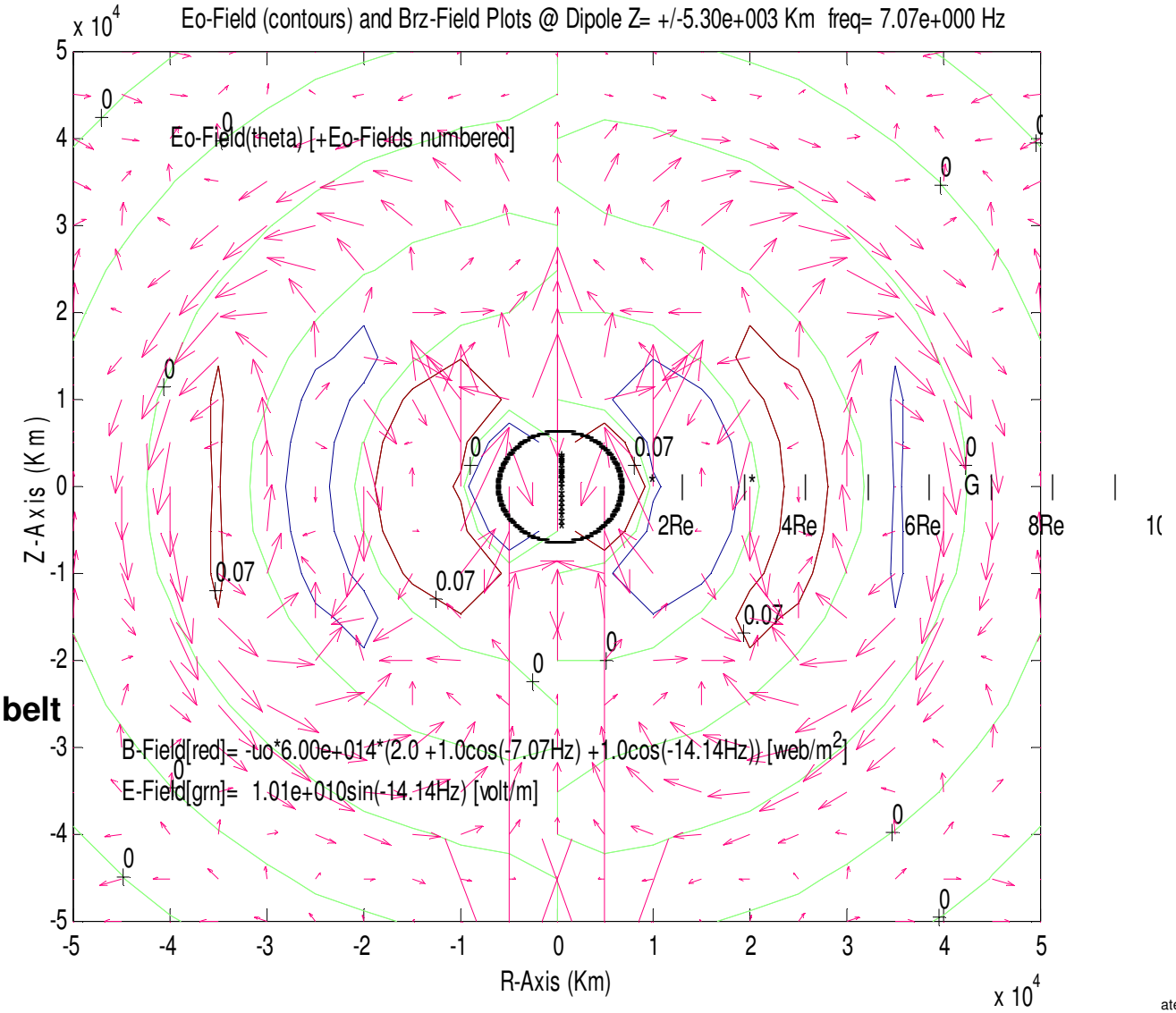


Figure legend:
circle[blk]= earth
line[blk]= λ/4 dipole
"*"= center of radiation belt
"G"= Geosync orbit

Figure 42A) “EM Dipole E-Field (Detailed View)” is the same E-field data as in figure 42 showing only a 50,000Km close-up. This detailed view displays the Magnetic B-field vectors and Electric contours more clearly.

EM Dipole All Fields

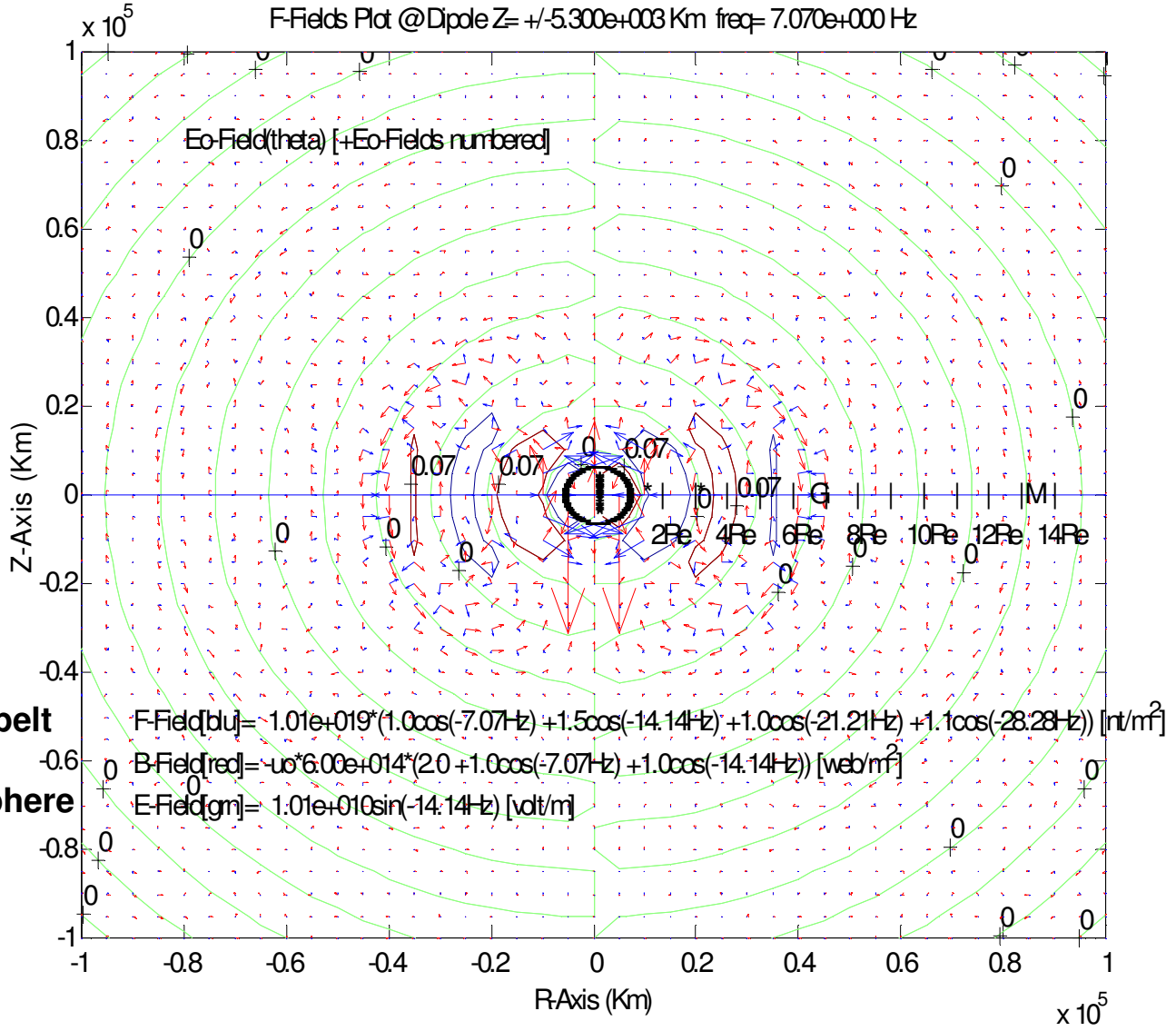


Figure legend:
circle[blk]= earth
line[blk]= λ/4 dipole
"*"= center of radiation belt
"G"= Geosync orbit and
"M"= edge of magnetosphere

Figure 43) "EM Dipole All Fields" shows the same (AC) magnetic B-field[red] vectors (arrows) with the electric E-field[grn] superimposed on it plus the force F-field[blu] vectors. As can be seen from the figure the complete force F-field is the result of the (E x B) operation and as such is orthogonal (90deg). This is true for the far field pattern ($R > \lambda$); look at the vectors around Geosync and the magnetosphere radius. However, the near field pattern ($R < \lambda$) they move off 90deg some; look at the vectors around the earth's surface and radiation belts. This offset from orthogonal or imbalance is what causes rotation and movement of the fields. Also, the overall force field attenuates inversely as the square of the distance (1/R^2) because the fields that generate it do. Note the figure only shows half the AC cycle. In the next half cycle the magnetic field vectors all reverse direction and the electric field shells oscillate the other direction. However, as the resultant of (F= E x B) the force F-field vectors do not.

Main points:

1) Complete electric E-field, magnetic B-field vectors and force F-field vectors out to 2λ
2) F-field also attenuates as the square of the distance (1/R^2)
3) Only a half cycle of (AC) shown, both the E and B fields reverse next half cycle
4) however the force F-field does not

EM Dipole All Fields (B, E, F)
[Detailed View]

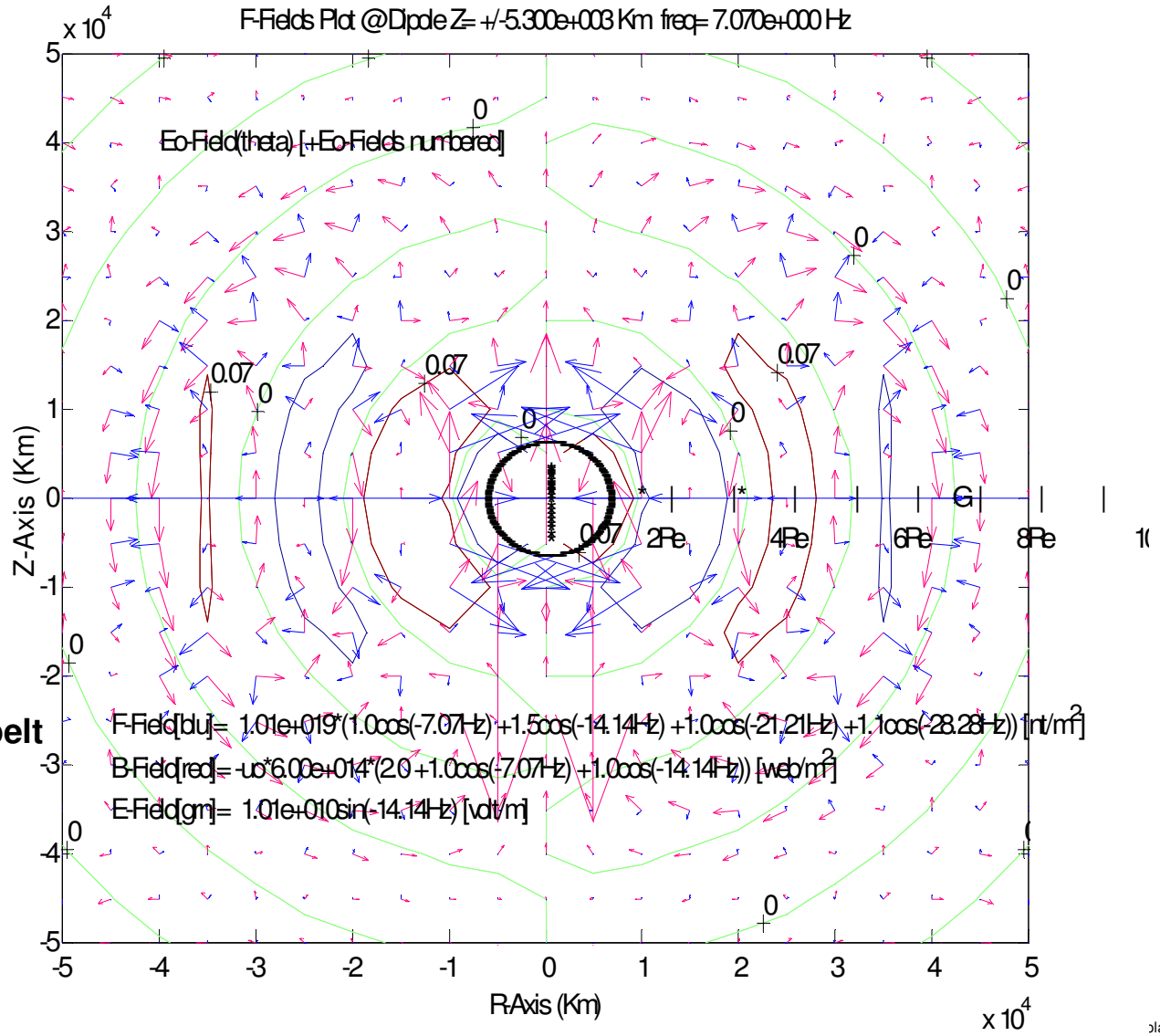


Figure legend:
circle[blk]= earth
line[blk]= λ/4 dipole
"*"= center of radiation belt
"G"= Geosync orbit

Figure 44) “EM Dipole All Fields (Detailed View)” is the same all fields data as in figure 43 only showing a 50,000Km close-up. This detailed view displays the Magnetic B-field[red] vectors, Force F-field[blu] vectors and Electric contours[grn] more clearly.

Gravity Conclusions

- **At wavelengths less then one lambda the fields are not at a perfect 90deg angle.**
- **Because the imaginary part of the EM field equations is greater (has more effect) then that of the real part.**
- **This imbalance causes the fields to precess (rotate) in these areas:**
  - **Planet**
  - **Inner radiation belt**
  - **Outer radiation belt**
- **At wavelengths equal to or greater then one lambda the fields stabilize (90deg angle):**
  - **Geo Sync Orbit**
  - **Edge of Magnetosphere**
- **Magnetic dipole length $\lambda/4$ (10,606Km)**

Figure 45) "Gravity Conclusions" These are the findings and results of the "Study of Gravity (part 2)" the accelerating force field is indeed connected to the (EM) ElectroMagnetic fields. However, at distances less then lambda (λ) the field vectors are not orthogonal (90deg) because the near field pattern (imaginary part) has more control. This results in an imbalance causing the near field patterns to precess and rotate (spin). The near field forces mainly affect the planet and the two radiation belts. Further out at distances of lambda (λ) or more the far field pattern stabilizes things; the field vectors become orthogonal (90deg). The far field forces mainly affect Geosync orbit and the magnetosphere shell. The earth's magnetic dipole length is λ/4 at the fundamental frequency or λ/2 at the second harmonic. The preceding figures show the complete electric, magnetic and force field interactions.

Main points:

1) The accelerating force is connected to the EM fields
2) The near field pattern (< λ) effects the planet and radiation belts
3) The far field pattern (>= λ) effects Geosync orbit and the magnetosphere
4) The earth's magnetic dipole length is λ/4 at the fundamental frequency

Gravity Conclusions (cont)

- **Gravity is an accelerating force field which appears to be generated by a circular ($E\theta$) electric field and polar dipole (Br, Bz) magnetic fields. These electric and magnetic fields are composed of (AC) waves. The electric field is only the second harmonic. While the magnetic field has a (DC) term along with two (AC) harmonics. The E and B fields are then mixed (ExB) to produce the four harmonic beat frequencies that produce the accelerating gravitational force field.**
- **This field in turn drives a leaky resonate cavity system known as "Schumann Resonance". This standing wave pattern determines the structure of the planet, effects the weather and human life itself. NASA has Schumann oscillators on board the space shuttles for this reason.**

Figure 46) "Gravity Conclusions (cont)" the accelerating force commonly called "gravity' seems to be the resultant force generated from the interaction (F= E x B) of the earth's electric and magnetic fields. The electric E-field oscillates (AC) in the circular direction (θ-axis) at the second harmonic frequency. Kind of like the agitator in a washing machine (back and forth). E-field is shell shape with maximums at the equator and nodes at both the poles; these shells alternate in polarity and therefore spin direction. The magnetic B-field oscillates in the polar direction (R and Z axis) with a constant term (DC), a fundamental term and second harmonic with relative amplitudes of: B0= 2*B1. These two (E and B) orthogonal fields are then mixed producing a third or resultant orthogonal field. This accelerating force "gravity" field consists of four heterodyne (beat) frequencies with relative amplitudes of: F2= 1.5*F1, F3= F1 and F4= 1.2*F1. The force F-field in turn drives the earths leaky resonate cavity system (70% efficient) producing four harmonic standing waves known as "Schumann Resonance". These waves determine magnetic anomalies, pole movements, weather patterns and effect human life itself.

Main points:

1) Gravity is the result of the earth's electric and magnetic fields
2) The electric E-field is composed of one second harmonic term
3) The magnetic B-field is composed of three terms: a constant, fundamental and second harmonic
4) The accelerating force field is composed of four harmonic terms: fundamental, second, third and fourth harmonics
5) The earth's resonate cavity generates the waves known as "Schumann Resonance"
6) NASA has Schumann oscillators onboard the space shuttle

APPLICATIONS

The design of the following space drives are based on data from the preceding study of gravity along with other current technologies.

Figure 47) "Space Drives" The following figures propose two possible applications for the information gained from this "Study of Gravity" along with other current technologies. The first space drive system is the Tesla Drive which is based on his electric motor design along with the gravity harmonics. Its operation would be limited to near earth applications. The second space drive system is the Warp Drive which is based on a synchrotron design. Its operation is intended for deep space applications.

TESLA DRIVE

Figure 48) "Tesla Drive" is a proposed space drive based on the information gained from this "Study of Gravity". Its operating principle is based on that of the electric AC induction motor invented by Tesla (hence the name). The electric motor design has been around for about a century so it is nothing new, only this application is! The primary difference being the motor is now turned on end with the force vectors in the vertical direction rather than circular (rotary). The next few figures are a short tutorial on electric motor basics starting with a standard rotary motor followed by a linear one. This is background material for understanding how the basic motor principle can be modified.

ELECTRIC MOTOR
Side View

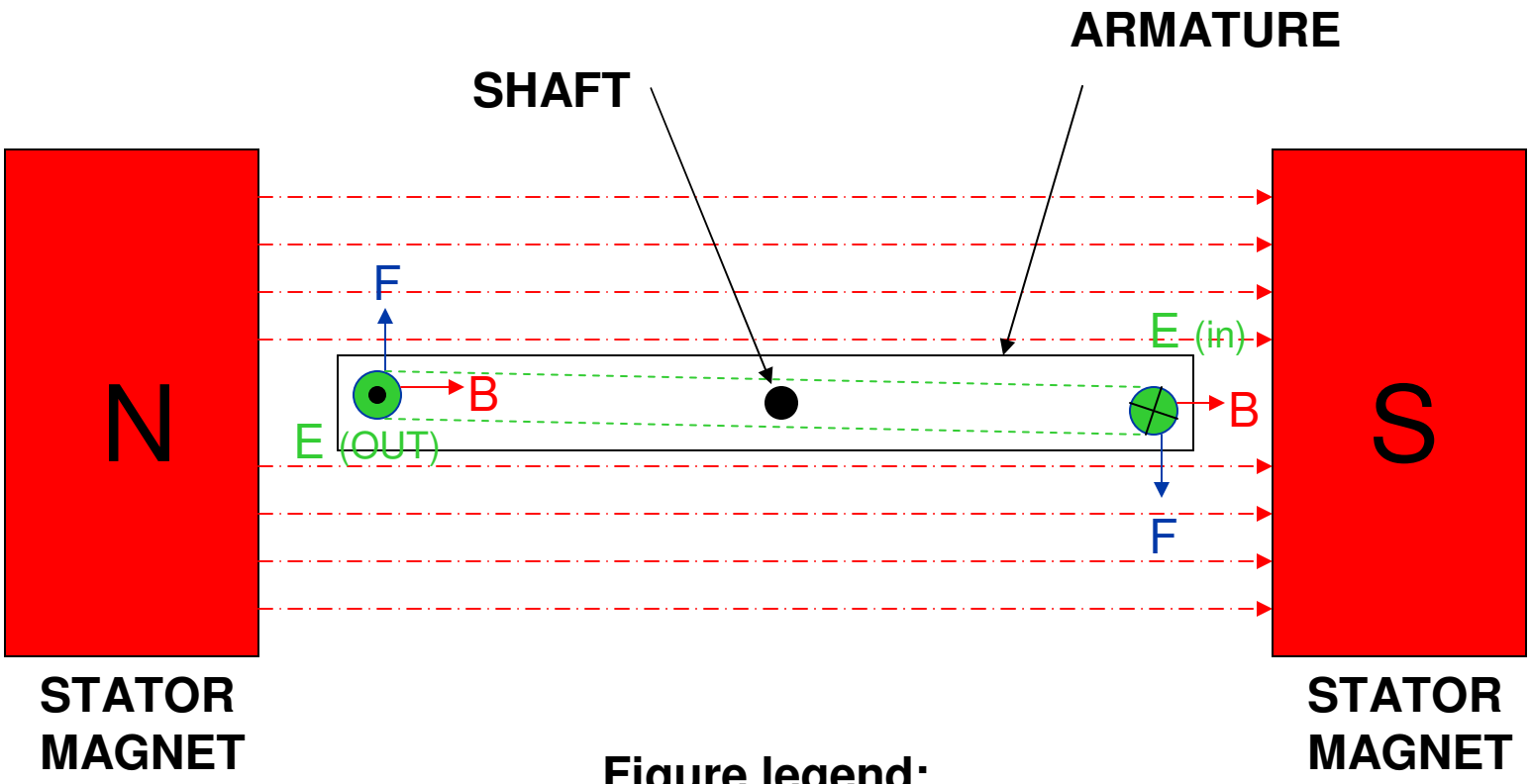


Figure legend:
green= E-field, red= B-field, blue= F-field
"dot"= out of page and "X"= into page

ELECTRIC MOTOR
Top View

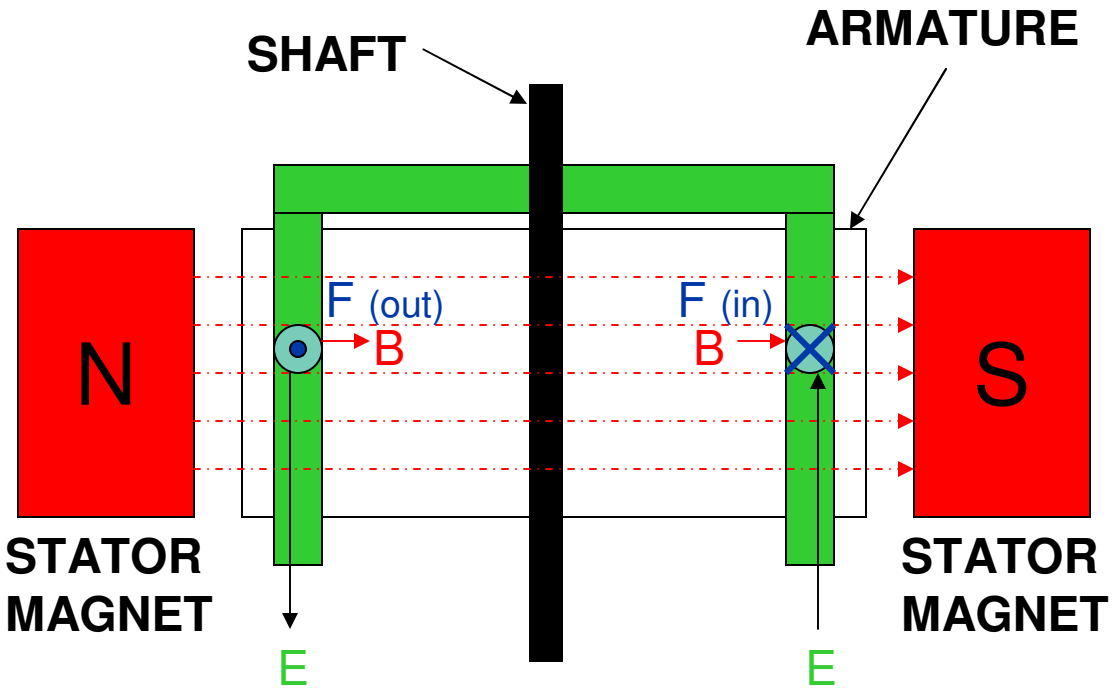


Figure legend:
green= E-field, red= B-field, blue= F-field
"dot"= out of page and "X"= into page

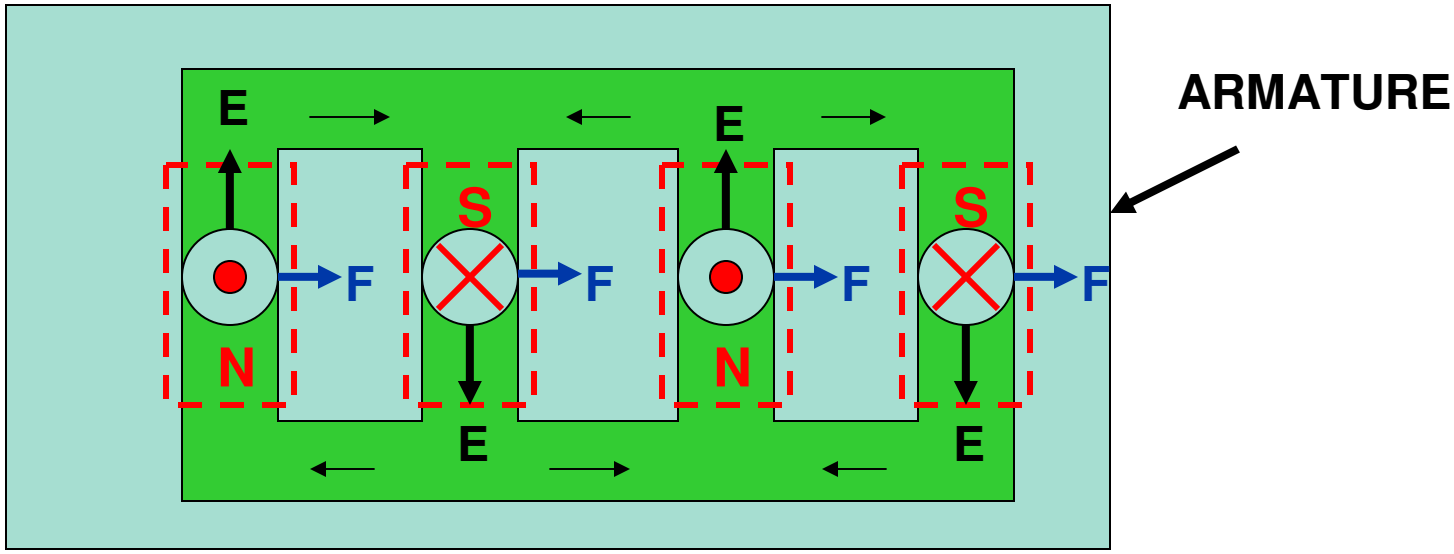
Figure 49/50) "Electric Motor" shows the two stator (stationary part) poles that generate the magnetic B-field[red]. The stator's laminated frame is not shown for clarity. The armature (moving part) consists of many conductor pairs arranged circularly at its opposite ends. Only one armature pair is shown for clarity. The entire armature assembly is immersed in the stators B-field but perpendicular to it. When connected to an electric E-field[grn] current flows causing a force F-field[blu]. By the "left hand motor rule" (F= E x B) the forces are all orthogonal. As can be seen from the figure the armature (pair) forces are in opposite directions causing it to rotate in a (CW) ClockWise direction around the shaft. Note the figure only shows half the AC cycle. In the next half cycle both the electric and magnetic fields reverse directions but the resulting forces do not.

Main points:

1) The motor has two parts a stationary stator and a moving armature
2) All the fields (B, E, F) are orthogonal
3) Both the E and B fields reverse (AC) but the resultant Force field does not

LINEAR INDUCTION MOTOR

Side View



Front side stator magnets removed for clarity

Figure legend:
green= E-field, red= B-field, blue= F-field
"dot"= out of page and "X"= into page

LINEAR INDUCTION MOTOR

Top View

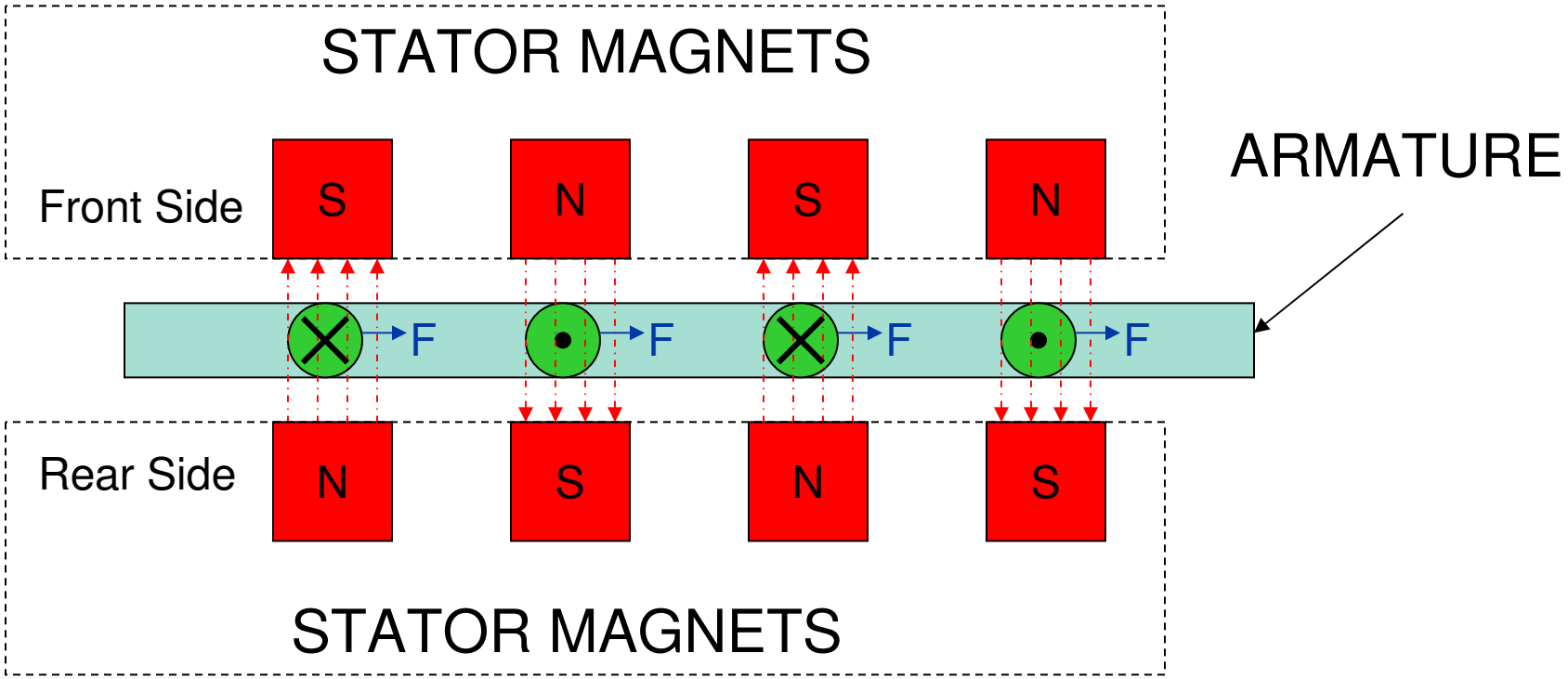


Figure legend:
green= E-field, red= B-field, blue= F-field
"dot"= out of page and "X"= into page

Figure 51/52) "Linear Induction Motor" is a motor design that has had its circular armature and stator unwrapped and laid flat (linear). The armature is now a flat conductive plate which is still located between the stator pole magnets and is immersed in its B-field. The linear motor functions on the same "left hand motor rule" so all the resultant orthogonal forces now push the armature to the right. The front side magnets are not shown for clarity so the electric (eddy) current path in the armature can be seen. Note the figure only shows half the AC cycle. In the next half cycle both the electric and magnetic fields reverse directions but the resulting forces do not.

Main points:

1) The motor has two parts a stationary stator and a moving armature
2) All the fields (B, E, F) are orthogonal
3) Both the E and B fields reverse (AC) but the resultant Force field does not
4) In principle a linear motor functions identical to a rotary one

TESLA DRIVE
Side View

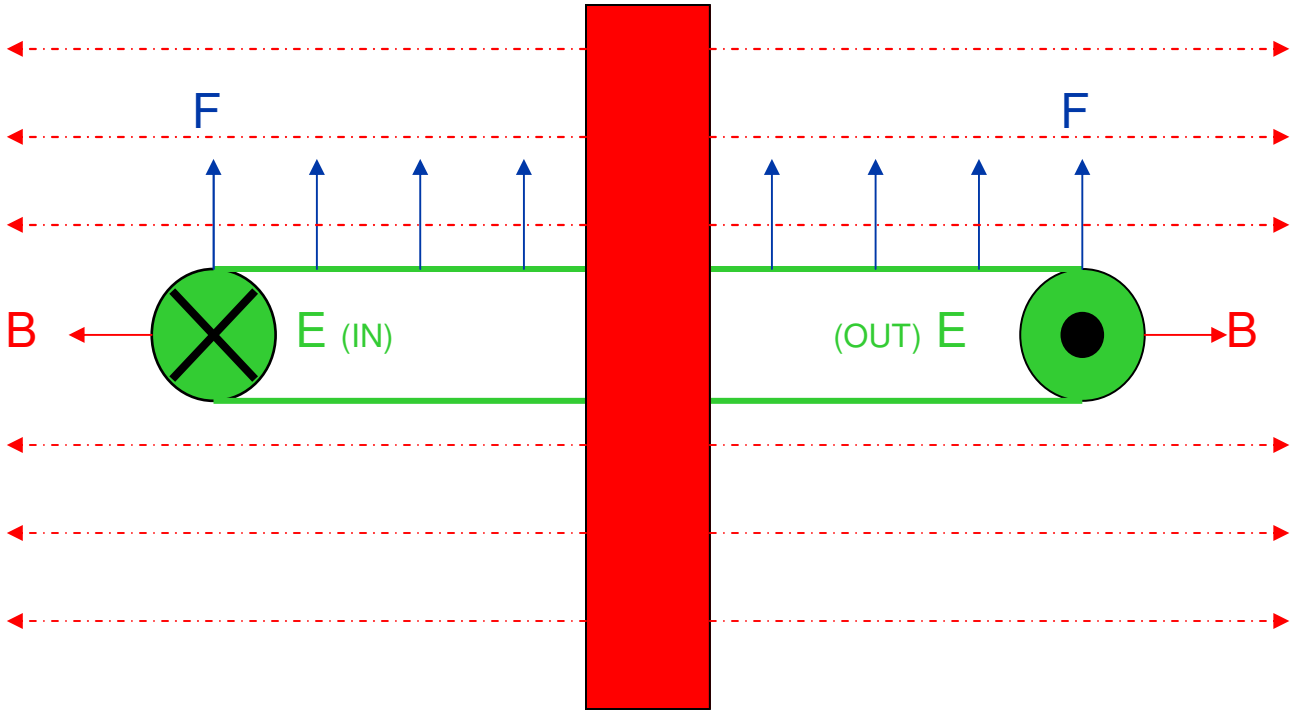


Figure legend:
green= E-field, red= B-field, blue= F-field
“dot”= out of page and “X”= into page

TESLA DRIVE
Top View

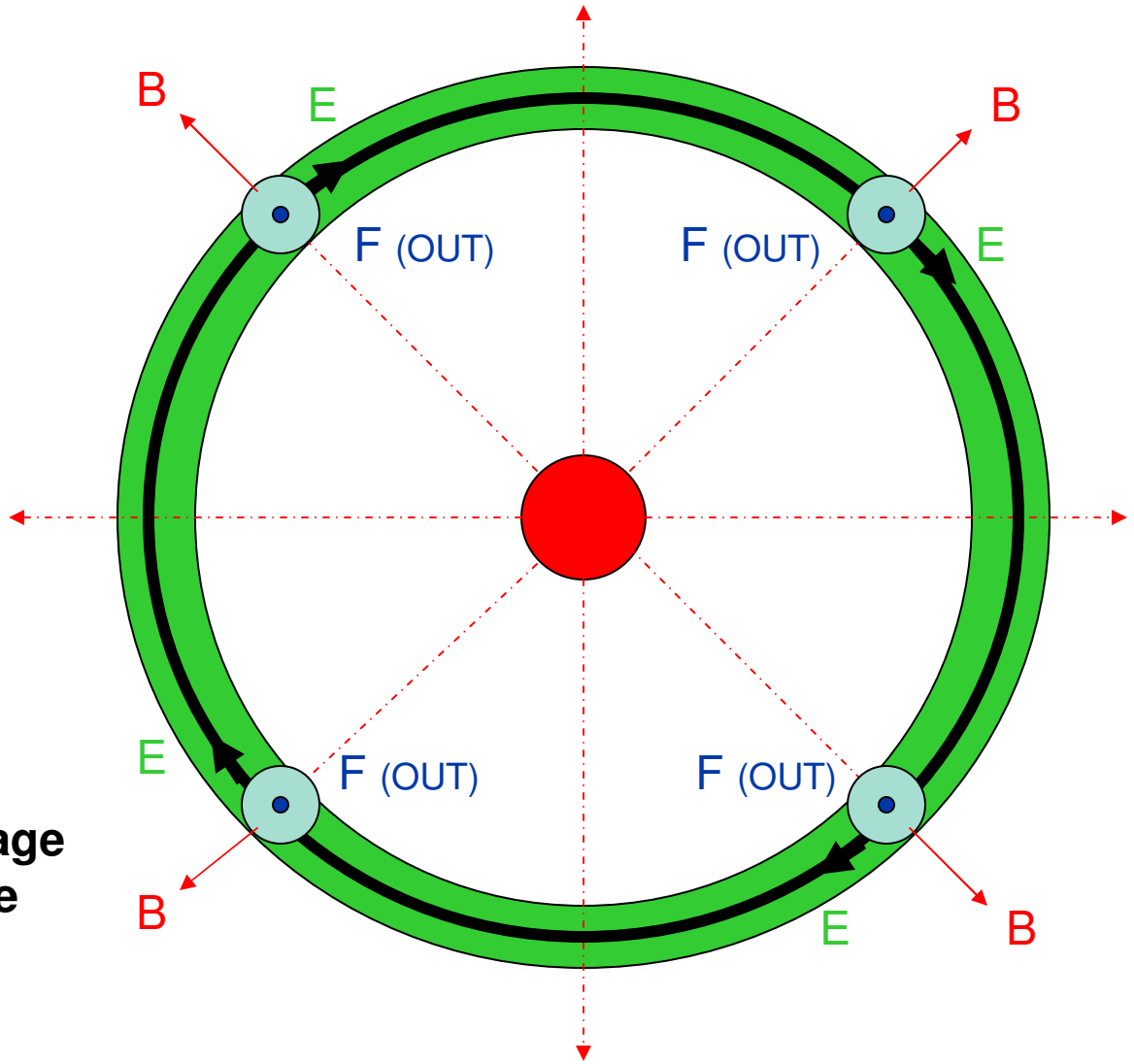


Figure legend:
green= E-field
red= B-field
blue= F-field
"dot"= out of page
"X"= into page

Figure 53/54) "Tesla Drive" is a motor design that has had its armature winding (conductive ring) rotated 90deg so all the resultant forces now point in the same direction (up) similar to the linear motor but still in a circular shape. Likewise the armature is immersed in the magnetic field which is now radial. One advantage of this configuration is that it allows the motor to be run in a tuned or resonate mode. If the magnetic pole is half wavelength long and the ring is one wavelength in circumference the system will resonate at its fundamental frequency. The operating frequency varies inversely as the size of the motor. If the center of mass and the center of force coincide then nothing happens, but if don't then there is a force generated. The easy part is getting the resonate device running, the difficult part is synchronizing it to the earth's harmonics so it has something to push against. Note the figure only shows half the AC cycle. In the next half cycle both the electric and magnetic fields reverse directions but the resulting forces do not.

Main points:

1) Circular shaped armature coil (lift ring)
2) All the fields (B, E, F) are orthogonal – "left hand motor rule"
3) Both the E and B fields reverse (AC) but the resultant Force field does not
4) Configuration allows for resonance mode operations
5) In principle it would function identical to a rotary motor
6) Must be synchronized to the earth's field

TESLA DRIVE

- **SPECS**
- **Based on electric motor design**
- **Top Speed: 15,000 miles/hr**
- **Range: 50,000 miles**
  (restricted to planet's gravitational field)
- **Uses:**
  - **Travel to space station (200 miles)**
  - **Travel to geo sync orbit (20K miles)**

Figure 55) "Tesla Drive" lists some of the general specifications for this propulsion system. The major one being that it is based on tried and true 100 year old motor technology nothing new. Therefore, it has a high probability of running with good reliability. This reliability is further increased by the fact that it has only one moving part. Reliability is one of the primary requirements for space operated systems, as service calls are to say the least difficult! Rough numbers show a top speed around 15K miles/hr which is capable of achieving (LEO) Low Earth Orbit. The problem is that its operation is restricted to the earths gravitational field so its maximum range is therefore less than 50K miles. However, it still would be a travel improvement to and from the space station or further out to GeoSync orbit.

Main points:

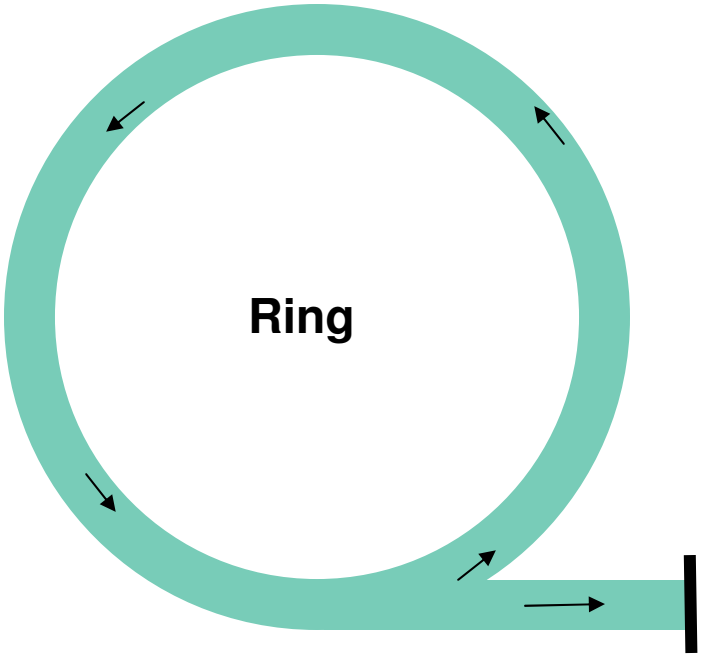
1) Based on 100 year old motor technology
2) Simple reliable design good for space operations
3) Range limited to the earth's gravitational field

WARP DRIVE

PARAMOUNT PICTURES: STAR TREK

Figure 56) "Warp Drive" is another proposed space drive that could be used for deep space propulsion as it is not restricted to a planet's gravitational field. Being an old Star Trek fan have to give credit for the name where it's due. The operating principle is based on that of the synchrotron or as it is more commonly called an atom smasher. This design has been around for about a half century so it is also nothing new, but this application is! The problem with space travel is the great distances involved, to get anywhere in reasonable time you must go (very) fast. According to physics the maximum speed possible is the speed of light (C= 186,284 miles/sec). In looking around the only machines that operate anywhere close to this speed are atom smashers so this becomes the starting point of the design.

SYNCHROTRON
(ATOM SMASHER)



COLLIDER / DETECTOR

Matter is spun in a ring close to the speed of light, then the beam is collided at the detector.

Figure 57) "Synchrotron (atom smasher)" shows the general outline of the machine to be ring shaped. The operating principle is as follows: matter mainly hydrogen is accelerated in a ring (around and around) until its speed approaches that of light (.8-.9C). The beam of matter is then diverted out of the ring to collide with a target which contains a detector to record what happened. It is a laboratory device used in the study of sub-atomic particles and nuclear physics.

Main points:

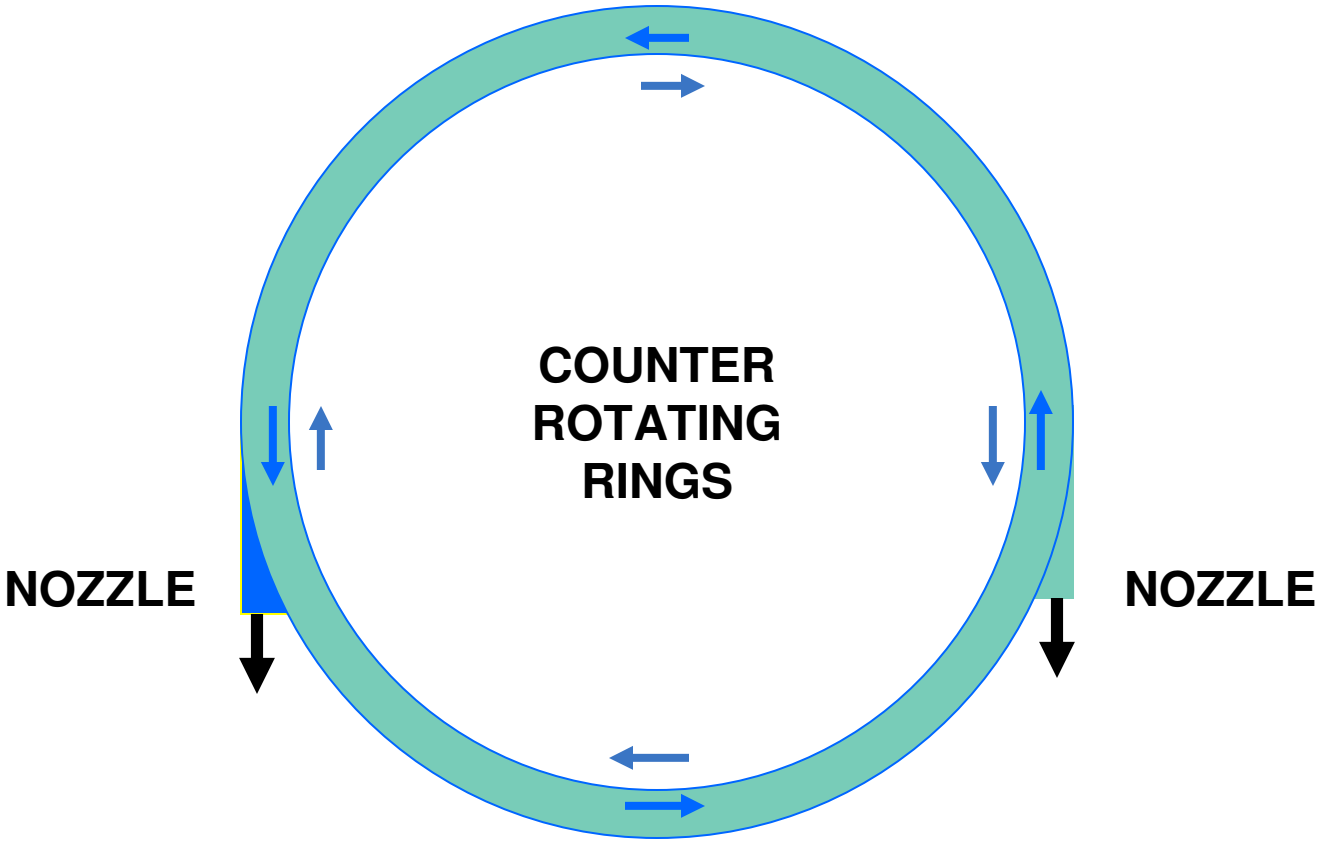
1) Ring shaped device
2) Accelerates matter close to the speed of light
3) Beam is diverted to target/detector
4) Used in the study of sub-atomic particles

WARP DRIVE
SIDE VIEW

Matter is spun in counter rotating rings close to the speed of light, then the beams exit through rocket nozzles.

Figure legend:
"dot"= out of page and "X"= into page

WARP DRIVE
TOP VIEW



Matter is spun in counter rotating rings close to the speed of light, then the beams exit through rocket nozzles.

Figure 58/59) "Warp Drive" Shows the major working parts of this propulsion system. It is similar to the synchrotron's operation in that matter is spun up in rings. Each ring spins in opposite directions to counter act (null out) circular torque, they must be operated in pairs. The difference is that instead of crashing into a target the beams now exit through rocket type nozzles producing thrust. The two nozzles are on opposite sides of the device and both pointing in the same direction to produce a combined forward movement. The difficult part of this design is impedance matching the nozzles to space conditions to achieve maximum thrust.

Main points:

1) Similar to a synchrotron's operation of ring acceleration
2) Counter rotating matter rings to null torque
3) Dual thrust rocket nozzles
4) Nozzles tuned for maximum thrust

WARP DRIVE

- **SPECS**
- **Based on Synchrotron design**
- **Top Speed: 0.5c (300,000,000 miles/Hr)**
- **Range: (limited to size of fuel tank)**
- **Uses:**
  - **Space exploration**
  - **Interplanetary travel**

Figure 60) "Warp Drive" lists some of the general specifications of this propulsion system. The major one being that it is based on tried and true 50 year old synchrotron technology nothing new. Therefore, it also has a high probability of running with good reliability. If the nozzles can be correctly matched (tuned) it should be possible to convert approximately half the ring velocity into forward thrust giving it a top speed around .4-.5C. The problem is that it is an open loop system so matter is lost in the propulsion process, this limits its range to the size of the gas tank in this case water! However, (miles/sec) miles per second are a big improvement in speed over (miles/hr) miles per hour when it comes to the distances of space travel.

Main points:

1) Based on 50 year old synchrotron technology
2) Also a simple reliable design good for space operations
3) Nozzles must be tuned and operated in pairs
4) Open loop process
5) Range limited to the size of the gas tank
6) Safe fuel – water

Thank you