Theory of Electromagnetism and Gravity

Modeling Earth as a Rotating Solenoid Coil

Greg Poole
Electrical Power Engineer
Pilot Hill, CA USA

Abstract—**Presented in this manuscript are conventional electrical engineering tools to model the earth as a rotating electrical machine.   Calculations using known parameters of the earth and measured field data has resulted in new understanding of the earths electrical system and gyroscopic rotation. The material makeup of the inner earth is better understood based on derived permeability and permittivity constants. The planet has been modeled as simple coils and then as a parallel impedance circuit which has led to fundamental insight into planetary speed control and RLC combination for Schumann Resonance of 7.83Hz.   Torque and Voltage Constants and the inverse Speed Constant are calculated using three methods and all compare favorably with Newtons Gravitational Constant.   A helical resonator is referenced and Schumann's Resonant ideal frequency calculated and compared with others idealism. A new theory of gravity based on particle velocity selector at the poles is postulated. Two equations are presented as the needed links between Faraday's electromagnetism and Newtonian physics. Acceleration and Speed Control of earth is explained as a centripetal governor. A new equation for planetary attraction and the attraction of atomic matter is theorized.   Rotation of the earths electrical coil is explained in terms of the Richardson effect. Electric power transfer from the sun to the planets is proposed via Flux Transfer Events. The impact of this evolving science of electromagnetic modeling of planets will be magnified as the theory is proven; and found to be useful for future generations of engineers and scientists who seek to discover our world and other planets.**

Index Terms— **Ampere, Biot-Savart, Centripetal Acceleration, Centripetal Governor, Dynamo, Earth, Einstein-de Haas Effect, Electric Field, Electromagnetism, Flux Transfer Events, Governor Control, Gravity, Gravitational Constant, Helical Resonator, Lenz Law, Lorentz, Lightning, Magnetic Field, Motor Constant, Parallel Impedance, Planet, Speed Control, Schumann Resonance, Richardson Effect, Solenoid, Speed Constant, Solar Power System, Torque Constant, Velocity Selector, Voltage Constant**

I. BRIEF HISTORY OF EARTH MAGNETIC FIELD

The great problem of the earth's magnetic field was first postulated as a giant bar magnet by William Gilbert (1544 – 1603) in his book *De Magnete*.   It was this book which inspired Galileo Galilei (1564 – 1642) who determined the earth rotated around the sun and performed his historic experiments of gravity from the Tower of Pisa.   Galileo's work in turn led to Isaac Newton (1643 – 1727) writing the infamous *Principia Mathematic* describing the three laws of universal laws of motion.   Later, scientific

consideration of the earth magnetic field was experimentally confirmed in 1838 when Carl Frederich Gauss (1777 – 1855) used spherical harmonics to prove that almost the entire magnetic field was to be of internal origin. Shortly after writing his special relativity paper in 1905, Albert Einstein (1879-1955), described the problem of the origin of the Earth's magnetic field as being one of the most important unsolved problems in physics. In 1919, the British physicist Sir Joseph Larmor (1857 – 1942) was the first to postulate the Sun's magnetism to a dynamo effect in analogy to conventional rotating generators of an electrical power station. Nikola Tesla (1856 – 1943) in preparation for a speech made a written statement in 1938 alluded to a theory of gravity and referred to forces and motion of heavenly bodies; but no theory was ever published. Quotes by Tesla regarding the earth being regarded as an "electric machine" or "solenoid" are noted, but a definitive source not established by the author. But most certainly the pivotal article *"The Earth as a Dynamo"* was published by *Scientific American* in May 1958 by renowned Physicist Dr. Walter M. Elsasser (1904 – 1991). This article was written based on Dr. Elsasser technical papers published in 1946-47. Many more recent scientists have progressed the understanding of the earth magnetic field using satellite imagery and computer modeling.

II. INTRODUCTION

The magnetic field of the earth is continually being addressed by geophysicist and scientist of multiple disciplines. This theoretical paper is a collection of idea's that is intended to explain the workings of the earth and solar system in electrical engineering parlance. The authors life experience is admittedly limited to his area of technical discipline, so it is likely to stir debate among scientist, geophysicist, astrophysicist and engineers. There are no disclaimers in theoretical research so the success or failure of the theory, in part or in full, is solely the authors. Discourse and controversy over new idea's which appear to depart from the norm is the nature of meaningful technical progress. However, upon careful examination it will be demonstrated that the work presented in this paper does not conflict with existing geophysical theories of the earth. The paper does attempt to expand on the foundational work of National Medal of Science winner Dr. Walter M. Elsasser who is considered the "*father*" of the electric dynamo theory. It is the authors opinion that the electrical engineering concepts presented add to the body of work and complement the existing geophysical theories.

The modus of operandi, and contribution, of this manuscript has been to consider our solar system as an electrical power system. From this perspective, the massive sun is viewed as a rotating electrical power generator providing electromagnetic energy to the planets which act as rotating machines, or electric dynamos. By imagining such a balanced energy system from afar this paper attempts to achieve a broader understanding of the universe as a system of solar systems, or power systems. Electromagnetism using flux transfer thru aether, is the universal life force that interconnect energy and matter. Citations to articles pertaining to

54 Flux Transfer Events between the Sun and the planets are included in the reference section which advance the novel concept of

55 transformer action between the sun and the earth. The author believes that the Suns electromagnetic energy is an additional

56 energy source to the earth via Flux Transfer Events. Flux Transfer Events may be the catalyst for sustained nuclear reaction and

57 geodesic synchronicity, but this is purely conjecture.

58

59 Reported here-in are simple electrical engineering models of the earth and applying well known laws of Faraday, Lorentz, Biot-

60 Savart and others. Three alternative magnetic fields are considered – simple loop, toroid and stacked coils which are represented

61 as a solenoid. Using measured data of the earth's magnetic field the loop coil equation derives the total earth current. These

62 values are then inserted into the toroid and solenoid model for comparison and calculations of the relative permeability of the

63 earth. Motational EMF calculations are generated for various latitudes to better understand the voltage gradient of the electric

64 field that surrounds the earth. Torque, Voltage and Speed Constants are calculated and compared to Newtons Gravitational

65 Constant. The earth's rotation due to the Richardson effect with rotating coils and DC commutation with the electric field at

66 positive and negative poles is postulated. Using an RLC circuit the earth is modeled as a constant speed machine. Schumann

67 Resonance is a known derivative of lightning and is calculated based on a permittivity of 1.1. It is then ideally calculated for a

68 helical resonator model. The approximate electrical power of the earth is presented as well as other characteristics of the earth

69 explained. The pole regions are a matter of keen interest as calculations suggest that deceleration through the electric field and

70 magnetic field bending are the mechanism for particles and electromagnetic waves and its potential relationship to gravity. Like

71 the RLC circuit which controls the speed of the earth, the electromagnetic field works as a velocity selector to filter out fast and

72 slow particles and let through when $v = E / B = 7920$ m / s; which when moving in a circle equates to an acceleration of 9.8 m/s2.

73 The electromagnetic circuit of the earth works hand in hand with the electromagnetic circuit of the atmosphere to maintain

74 rotational speed at 465.1 m/s and provide a centripetal governor, or what has historically been known as gravity. Known Flux

75 Transfer Events that establish a "magnetic rope" between the Sun and the Planets is explained in simple electrical engineering

76 terms as an additional source of sustainable electrical energy that continually powers the earths electromagnetic field, heats the

77 core, and provides motoring torque that rotates the earth.

78 ## III. GEO-DYNAMO THEORY

79 Per the US Geological Services, a scientific division of the Bureau of Reclamation, "The Earth's outer core is in a state of turbulent

80 convection as the result of radioactive heating and chemical differentiation. This sets up a process that is a bit like a naturally

81 occurring electrical generator (or motor), where the convective kinetic energy is converted to electrical and magnetic energy.

82 Basically, the motion of the electrically conducting iron in the presence of the Earth's magnetic field induces electric currents.

83   Those electric currents generate their own magnetic field, and as the result of this internal feedback, the process is self-sustaining so

84   long as there is an energy source sufficient to maintain convection." [1]

85
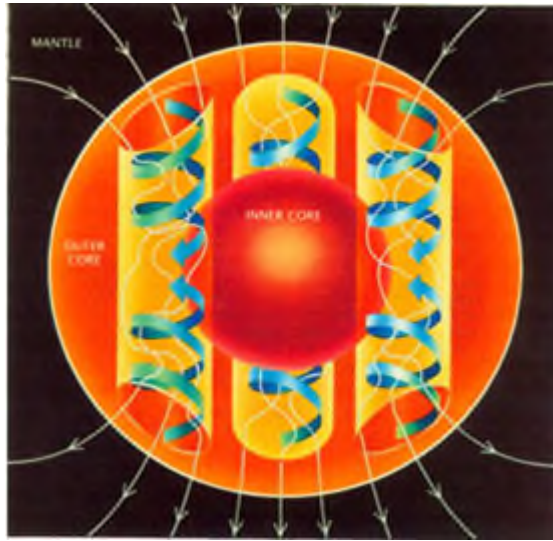
86
87
88
89   "The combination of convection and rotation produces the complex motion needed for self-excited dynamo action.   The rotation

90   effectively stretches the poloidal field into toroidal field lines (the w-effect). Most geo-dynamo models require a strong toroidal

91   field, about 0.01T, (or 100 Gauss), even though this field cannot be observed at the Earth Surface.   The toroidal field lines are

92   warped up or down due to the radial convective flow (assuming "frozen flux"); because of the Coriolis force this results in helical

93   motion, which, in fact, recreates a poloidal component from a toroidal one (this is known as the alpha effect).   The rotation controls

94   the motion in such a way that the dipole field is stronger than any other poloidal component and, averaged over a sufficient time,

95   coincides with the Earth's rotation axis." [2] "The basic idea behind the geo-dynamo is that the rapid motion of part of the liquid

96   (metallic iron) in an ambient magnetic field generates a current that induces a secondary magnetic field which is largely carried

97   along in the fluid low ("frozen flux") and which reinforces the original field.   In principle, this concept can be illustrated by

98   Faraday's disc generator."   [2]

99

100   Shown below is a typical Faraday Disc generator with magnetic field represented.   Electrical engineers are schooled early with the

101   notion that every generator is a motor, and every motor is a generator.   Changing the polarity of a Faraday Disc, or reversing

102   rotation is used to teach this elementary concept.   The Faraday Disc, designed by Michael Faraday (1791 – 1867) was the first

103   rotating electrical machine, from which Thomas Edison, Nikola Tesla, and Dr. Werner von Siemens (who first coined the term

104   electro dynamo) evolved their electrical DC and later AC machines that advanced the world.

105

106
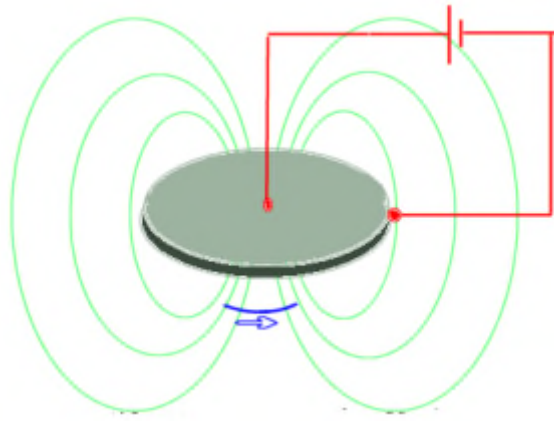
107   III. FIELD AT CENTER OF LOOP

108   A current carrying loop is known to produce a magnetic field in the same direction as shown below.

109

110

111
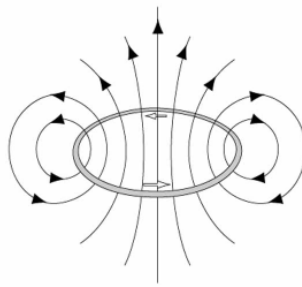
112   The Biot-Savart law determine the magnetic field and becomes

$$dB = \frac{\mu_0 I d\vec{L} \times \hat{r}}{4\pi R^2} = \frac{\mu_0 I dL \sin\theta}{4\pi R^2}$$

113

114   The integral at 90 degrees becomes

$$B = \frac{\mu_0 I}{4\pi R^2} \oint dL = \frac{\mu_0 I}{4\pi R^2} 2\pi R = \frac{\mu_0 I}{2R}$$

115

116                                      $\mu_0 = 4\pi \times 10^{-7} T \cdot m / A$

117

118   Integrating the z-component of the Biot-Savart law on the centerline of a current loop
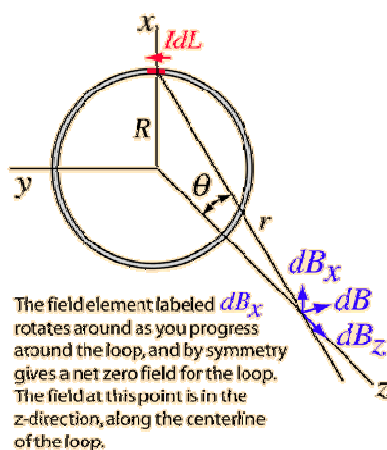
$$dB_z = \frac{\mu_0 I dL}{4\pi} \frac{R}{\left(z^2 + R^2\right)^{3/2}}$$

119

120   The magnetic field is then

$$B_z = \frac{\mu_0}{4\pi} \frac{2\pi R^2 I}{\left(z^2 + R^2\right)^{3/2}}$$

121

122

The field element labeled dB_x rotates around as you progress around the loop, and by symmetry gives a net zero field for the loop. The field at this point is in the z-direction, along the centerline of the loop.

123

124

$$dB = \frac{\mu_0}{4\pi} \frac{I dL}{r^2}$$

$$r^2 = z^2 + R^2$$

Substituting

$$dB_z = dB \sin\theta$$

and

$$\sin\theta = \frac{R}{\sqrt{z^2 + R^2}}$$

gives $dB_z = \frac{\mu_0 I dL}{4\pi} \frac{R}{\left(z^2 + R^2\right)^{3/2}}$
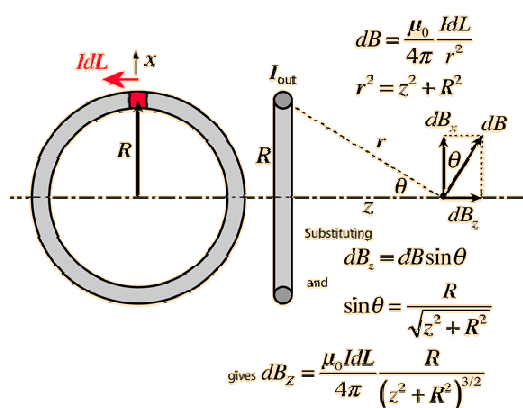
125

126

127

6

For a current I = 1730000000 Amperes and
loop radius **R** = 6378000 m, the magnetic field at the center of the loop is
B = 1.7042819977 x 10^ -4 Tesla = 1.704281997 Gauss.
At a distance z = 6378000 m out along the centerline of the loop, the axial magnetic field is
B = 0.6025546788 x 10^ -4 Tesla = 0.602554678 Gauss.

128

129

130 The current of 1,730,000,000 is the total current. So, for a coil of N turns, the current used is Ni where i is the current supplied to

131 the coil. We set N = 9.8 turns for our calculations. "An average lightning strike discharges about 30,000 amperes (20,000

132 amperes in the UK). NASA has recorded strikes of 100,000 amperes and there are other reports of strikes over 200,000 amperes."

133 [3]

134 The magnetic field of the earth ranges from 1.7 Gauss at the center of the earth to .60 Gauss near the surface. These values

135 compare favorably with measured values at the earth's surface of .25 to .65 Gauss.

136 IV. CALCULATE TORQUE CONSTANT

137
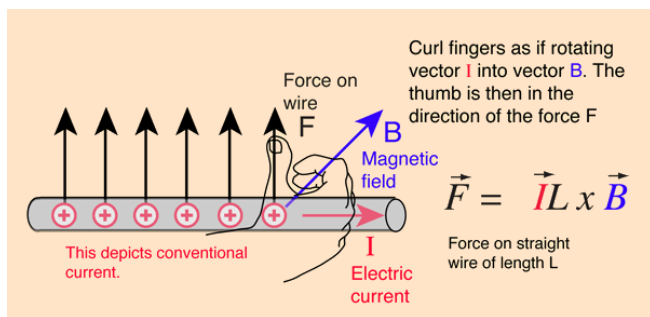
Force = Current x Length x B-field

For current I = 1730000000 A = 1.73 x 10^ 9 A
and length L = 40075000 x 10^ m
positioned perpendicular to a magnetic field B = .00006 Tesla = 0.6 Gauss
the force is F = 0.4159785 x 10^ 13 N.
If the angle between the current and magnetic field is 90 degrees
the force is F = 0.4159785 x 10^ 13 N.

138

If a force of magnitude F = 4159785000 N is applied
at a distance r = 6378000 m from the axis of rotation
in an orientation where r makes the angle θ = 78.5 degrees
with respect to the line of action of the force,
then the lever arm = 6249959.766 m
and the magnitude of the torque is τ = 2599848888 N m.

139

140

141

142 Torque = 25998488885508362000 Nm

143

7

144   *Kt* = Torque / Current

145

146   *Kt* = 2599848885508362000 Nm / 1730000000 Amps

147

148   *Kt* = 15028028257

149

150   *Ks* = 1 / Kt

151

152   *Ks* = 1 / 15028028257

153

154   *Ks* = 6.654 E-11

155

156   We can then compare to Newtons Gravitational Constant

157

158   G = 6.674 E-11

159

160   Percent error is less than 1%.

161

162   For confirmation, we will next calculate the Motational Emma and Voltage Constant as we know that the Torque Constant is equal

163   to the Voltage Constant and they both are equivalent to the inverse of the Speed Constant
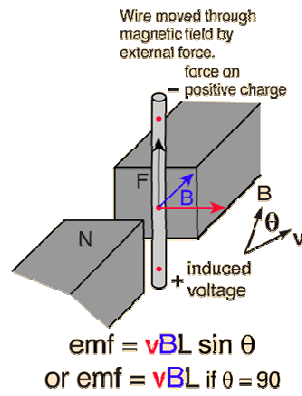
164

165    $$Ks = 1 / Ke = 1 / Ki$$

166   V.   MOTATIONAL EMF

167   Generated motational met occurs when a conductor moves through a magnetic field. The magnetic force is result of Faraday's

168   Law. If the entire length of wire moves through a uniform field, the voltage is given below:

169

8

Wire moved through
magnetic field by
external force.
force on
positive charge

induced
voltage

$emf = \mathbf{v}BL \sin \theta$
or $emf = \mathbf{v}BL$ if $\theta = 90$

170

171 The magnetic field is estimated to be .60 Gauss. The angle between rotation axis and magnetic field is approximately 11.5

172 degrees.

173

Generated voltage = emf = Velocity x B-field x Length

For a wire of length L = 40074152   m = 0.40074152 x 10^ 8   m
moving with velocity v = 465.1   x 10^   m/s
perpendicular to a magnetic field B = .00006   Tesla = 0.6   Gauss
the generated voltage is V = 1.118309285 x 10^ 6   V.
If the angle between the velocity and magnetic field is 78.5   degrees
the generated voltage is V = 1.095858896 x 10^ 6   V.

174

175

176 Changing latitude will reduce the length of L and increase the magnetic field B, thus for varying degrees and minutes we can

177 show individual coil voltages at relative magnetic field strength:

178

179 Equator =   1,095,858 Volts   @ .60 Gauss

180 Capricorn =   752,875 Volts   @.45 Gauss

181 Cancer   =   752,875 Volts   @.45 Gauss

182 Arctic Circle =   523,229 Volts   @.65 Gauss

183 Antarctic Circle =   523,229 Volts   @.65 Gauss

184

185 The average value of the five (5) voltages is approximately 730kv.

186   VI.   CALCULATE VOLTAGE CONSTANT

187 A voltage constant of *Ke* can be used to calculate a speed constant *Ks* of the earth and then compared to Newtons Gravitational

188 Constant.

9

189

190   Ke = Voltage / Speed (rad/s)

191

192   Ke = 1095858V/ 7.292 E-5

193

194   Ke = 15028222709

195

196    $Ks = 1 / Kv$

197

198   Ks = 1 / 15028222709

199

200   Ks = 6.654 E -11

201

202   We compare to the Torque Constant and Newtons Gravitation Constant and find they again closely match.

203

204   G = 6.674 E-11

205

206   Again, percent is less than 1%, which suggest G = Ks.   Put into words this implies that Newtons Gravitational Constant is derived

207   from a planets motor speed constant, which is inversely related to torque and voltage.

208

209   VII.   POTENTIAL POINT CHARGE

210   The electric potential energy per unit charge is a characteristic of the electric influence at that point in space. The potential

211   from multiple point charges is the sum of the point charge potentials of the individual charges. Based on 100V - 150 V/m, the

212   charge of the earth has been calculated to be in the range of 400,000 to 600,000 Coulombs. [4]

213

214

215

216 The earth sphere act as an energy storage device with positive polarity at the north pole and negative polarity at the south pole. A

217 burst of lightning of 704,574,474 Volts is theoretically possible and reports of 1 Billion may not be unreasonable. As a point of

218 comparison Nicolai Tesla calculated the voltage of the sun at 18 Billion Volts. [5]

219

220 For the sphere, we can calculate Capacitance at surface based on an average value of Q (Coulombs).

221

222 $C = Q / V$

223

224 C = 500,000 C / 704,457,447 V

225

226 C = 710 microfarads

227

228 The theoretical Power of the earth is approximately

229

230 P = V x I

231

232 P = 700,000,000 Volts x 1,730,000,000 Amps

233

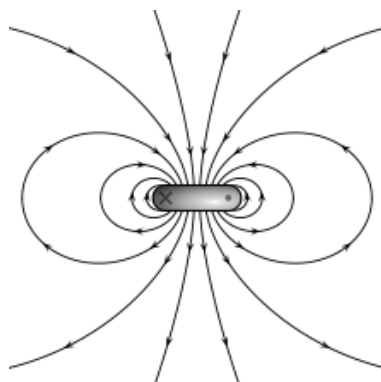234 P = 1.211 E18 Watts

235

236 Power of Earth = 1.2 Exawatts

237   I. MAGNETIC FIELD OF TOROID

238

239 Finding the magnetic field inside a toroid is function of Ampere's law. The current is the number of loops times the current in
240 each loop. The magnetic field equation is as follow
241

$$B2\pi r = \mu NI$$

$$B = \frac{\mu NI}{2\pi r}$$

242
243

244
245

For a solenoid of radius r = 6378000 m with N = 9.8 turns,
the turn density is $n = N/(2\pi r)$ = 2.445466356 turns/m.

If the current in the solenoid is I = 176395765 amperes

and the relative permeability of the core is k = 1,

then the magnetic field at the center of the solenoid is

B = ... Tesla = 0.542075414 gauss.

246
247
248 Setting the relative permeability of the core at k = 1, the magnetic field near the center of the Toroid is .54 which approximates the
249 surface of the earth.
250

251   VIII.   MAGNETIC FIELD SOLENOID CALCULATION

252 Winding multiple loops concentrates the magnetic field into what is called a solenoid.   The magnetic intensity at the center of

253 the coil is thus given.

$$B = k\mu_0 nI \text{ where } \mu = k\mu_0$$

254

255 and k is the relative permeability of the soil = 1, indicates there is no magnifying effect of the core.

256

257

258
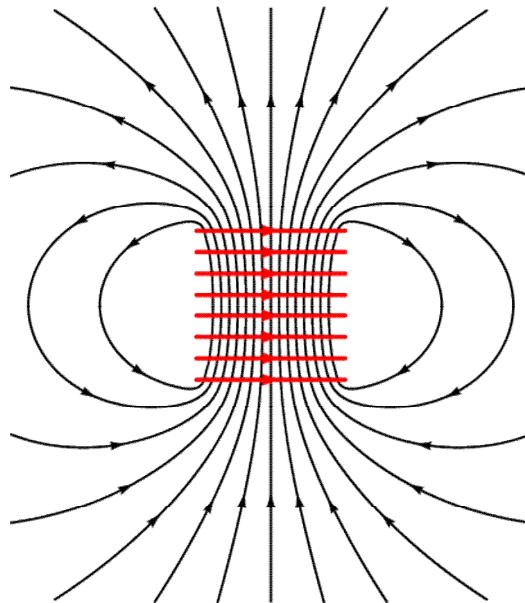
For a solenoid of length L = [12756000] m with N = [9.8] turns,
the turn density is $n=N/L=$[7.682659140] turns/m.

If the current in the solenoid is I = [176530612] amperes

and the relative permeability of the core is k = [1]

then the magnetic field at the center of the solenoid is

B = [0.00017042819] Tesla = [1.70428199534] gauss.

259

260

261   The magnetic intensity at the center of the earth is 1.7 Gauss.

262   IX.   INDUCTANCE OF SPHERE

263   The magnetic field intensity is uniform inside a spherical coil, which is the difference with the field of a long solenoid.   A solenoid

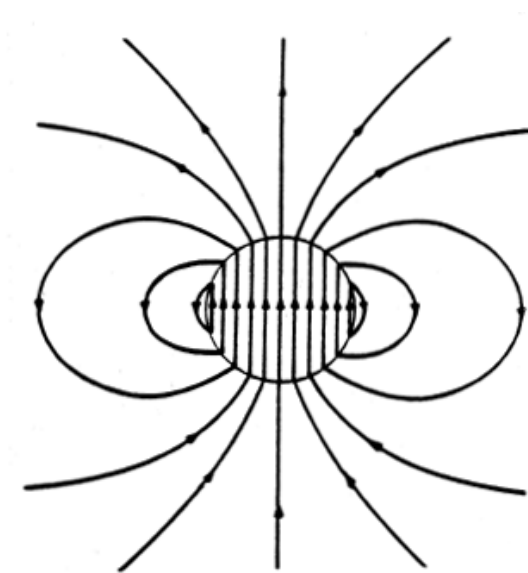264   is not uniform only due to the fringing field.

265

266

267

$$L \equiv \frac{2}{9}\pi N^2 \mu_o R \qquad\qquad (20)$$

268

269

270   N = 9.8 Turns

271
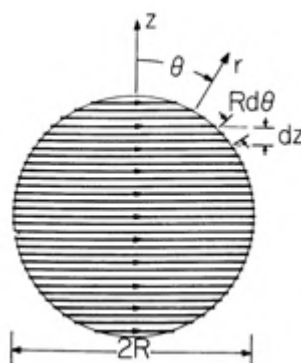
272   R = 6378,000 m (earth radius)

273

274     $\mu_0 = 1.2566370614...\times10^{-6}$ H·m^{-1} or N·A^{-2}

275

276   For the earth L = 537 Henry

277

278

279   "The exterior lines of magnetic field intensity are those of a dipole, while the interior field is uniform. Thus, the total picture, shown

280   above is one of field lines circulating from south to north inside the sphere and back from north to south on the outside." [6]

281

The inductance of a coil of wire is given by

$$L = \frac{\mu N^2 A}{\ell}$$

ℓ = length of solenoid

A = cross-sectional area

Solenoid length 1275600 cm with N = 9.8 turns,

Coil radius r = 13442000 cm gives area A = 5676460953 cm².

Relative permeability of the core k = 1 .

Then the inductance of the solenoid is

L = 537.0629087 Henry = [...] mH.

The average area of the earth's spherical coil is approximately 56,764,609,533 m2

X. EARTH DIPOLE AS PARALLEL IMPEDANCE

The earth is typically referred to in modern geophysics journal or articles as a magnetic dipole with a positive and negative orientation. The author takes no issue with this description of the earth and agrees that the earth is more complex than a simple bar magnet as first described by Gilbert in 1600. In electrical engineering practice, a rotating circuit with a positive and negative orientation can be modeled as a series or parallel circuit depending on the mechanical configuration of the rotating apparatus involved. Both series and parallel models have been considered; and though more difficult to model, the parallel RLC model was chosen for inclusion in this manuscript. A condition of resonance will be experienced in a tank circuit when the reactance's of the capacitor and inductor are equal. On a cosmic scale, it is theorized that the parallel impedance circuit is what maintains the earth, and perhaps other magnetic planets, at constant frequency and speed.
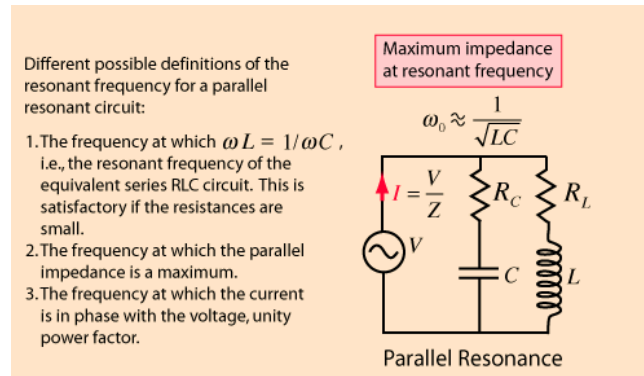
It is noteworthy that much of the earth's mantle is made up of quartz crystal. A quartz crystal works like an RLC circuit, with a narrow band resonant frequency.
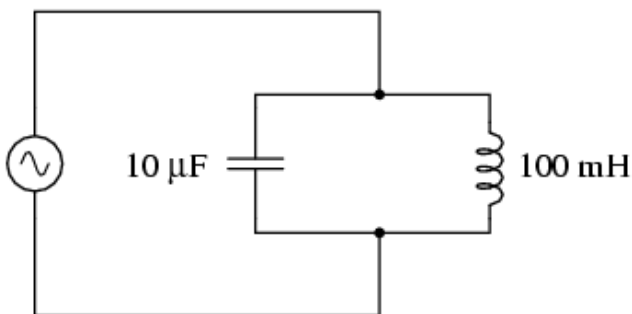
The following expression for the resonant frequency is obtained:

$$\omega_0 = \frac{1}{\sqrt{LC}} \left[\frac{R_L^2 C - L}{R_C^2 C - L} \right]^{\frac{1}{2}}$$

301

302

303   For a parallel RLC circuit it can be utilized where the frequency at which the impedance is maximum.

304

Different possible definitions of the resonant frequency for a parallel resonant circuit:

1. The frequency at which $\omega L = 1/\omega C$, i.e., the resonant frequency of the equivalent series RLC circuit. This is satisfactory if the resistances are small.
2. The frequency at which the parallel impedance is a maximum.
3. The frequency at which the current is in phase with the voltage, unity power factor.

Maximum impedance at resonant frequency

$$\omega_0 \approx \frac{1}{\sqrt{LC}}$$

$I = \dfrac{V}{Z}$ R_C R_L

V

C L

Parallel Resonance

305

306

307

308   The initial RLC model assumes 465.1 m/s which is equal to the angular rotational value of 7.292 E-5 radians/second.   L and C are

309   inserted and solve for Rc and Rl.

310

311

For C = 0.71 x10^ -3 F = 710 µF = ... pF
and L = 0.537 x10^ 0 H = 537 mH = ... microHenries
at angular frequency ω = 7.2921159 x10^-5 rad/s,
frequency = 1.16057629 x10^-5 Hz = ... kHz = ... MHz
and series resistances:
R_C = 0.4 x10^1 ohms = 0.004 kohms = ... Megohms,
R_L = 0.4 x10^1 ohms = 0.004 kohms = ... Megohms,

the impedance is

Z = 0.400000000 x10^1 ohms = 0.004000000 kohms = ... Megohms

at phase φ = -0.00059650 degrees.

The resonant condition is

Using the series resonant frequency
Angular frequency ω = 0.512134086 x10^2 rad/s,
Frequency f = 0.815086714 x10^1 Hz
Z = 0.965422535 x10^2 ohms
Phase φ = 0 degrees.

312

313

314   C = 710 microfarad

315

316   L = 537 Henry

317

318   Z = 4 ohm

319

320   Angular Frequency = 7.2921159 E-5 rad/s

321

322   f = 1.16 E-5 Hz

323

324   Phase Angle = 11 degree

325

326   I = V / Z

327

328   I = 704,574,474V / 4 ohm

329

330   I = 176,143,616 Amp

331

332   Calculate the Counter or Back Emf of Inductor:

333

334   Vemf = L di / dt

335

336   Vemf = 537 H x 176,143,616 A / 86,400s

337

338   Vemf = 1,094,781 Volts

339

340   Ke = 1,094,781 V / 7.292 E-5

341

342   Ke = 15013453099

343

344   Ks = 1 / 15013453099

345

346   Ks = 6.660E-11 (Newtons Gravitation Constant calculated a third time.)

347

348   The watts loss is I2R = 1.24 E17 watts.

349

350   Note that the resonant condition for this RLC configuration is 8.15 Hz. This closely matches the 7.83 Hz Schumann Resonant

351   frequency. Increasing C = 770 mF and keeping the inductance fixed will lower the resonant frequency to 7.83Hz. The difference

352   in capacitance values is likely due to permittivity. C has been calculated based on the permittivity of free space = 8.85 E-12.

353   Since the earth is a good conductor the relative permittivity is estimated to be 1.1 which then makes the following a closer electrical

354   analogy of the earth which corresponds to the known Schumann Resonant frequency.

For C = 0.76929999 x10^ -3   F = 769.2999999 μF = [...] pF

and L = 0.537   x10^ 0   H = 537   mH = [...] microHenries

at angular frequency ω = 7.2921159 x10^ -5   rad/s,

frequency = 1.16057629 x10^ -5   Hz = [...]   kHz = [...] MHz

and series resistances:

R_C = 0.4   x10^1   ohms = 0.004   kohms = [...] Megohms,

R_L = 0.4   x10^1   ohms = 0.004   kohms = [...] Megohms,

the impedance is

Z = 0.400000000 x10^1   ohms = 0.004000000 kohms = [...] Megohms

at phase φ = -0.00059947 degrees.

	Using the series resonant frequency
The resonant condition is	Angular frequency ω = 0.49199987 x10^ 2 rad/s,
	Frequency **f** = 0.78304211 x10^1 Hz
	Z = 0.89254647 x10^2 ohms
	Phase φ = 0 degrees.

355

356

357   XI.   RESONATOR FREQUENCY

358   A **helical resonator** is a passive electrical component that can be used as a filter resonator. Characterizing the earth's spherical

359   inductor as a helical resonator the frequency is determined as follows:

360   Wavelength = 2 x Length / m   m = 1, 2, 3,   [7]

361   f = c / wavelength = c / 2 x L / m =1

362   f = 3E8 / 2 x 12,756,240 m

363   f = 11.75 Hz

364   This is a number for a self supporting Helical Coil in air or vacuum. However, our coil is buried in the earths mantle. The

365   resonator frequency is a close approximation to Schumann Resonance of 7.83Hz.

366   The Schumann Resonant frequency ideally, is a function of the radius of the earth and the speed of light.

$$f_n = \frac{c}{2\pi a}\sqrt{n(n+1)}$$

367

[8]

368   f = 10.5 Hz @ n = 1

369   We note that our frequency calculation for a Helical Resonator approximates the ideal Schuman Resonant frequency.

370   XII.   ELECTRIC & MAGNETIC FIELDS AT POLES

371   Whenever charged particles are accelerated electromagnetic waves are produced. These waves interact with other charged particles

372   in the form of momentum, angular momentum and energy.

373

374

375
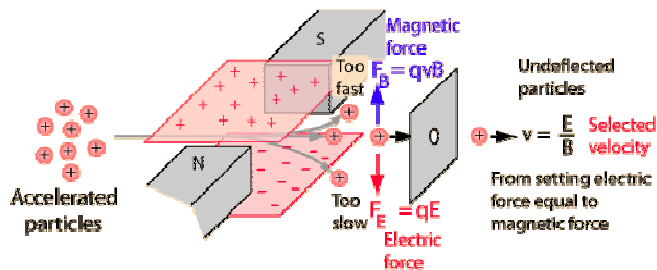
376   The concentration of magnetic field intensity at the North and South pole results in acceleration of particles into space. The

377   Electric Field has been measured at 100 – 150 V/m at ground level and then dissipates to as low as .1 micro volt at 85km in the

378   atmosphere. Particles are accelerated at ground level and then slow down as the Electric Field weakens and approaches zero in the

379   upper atmosphere. The Magnetic Field meets the Electric Field and begins to equalize forces somewhere between 20-30km. There

380   is a transition or handoff from one field to the other where the particles selected velocity equal the magnetic field divided by the

381   magnetic field.

382

383   V = E / B.

384

385   The Forces become equal and terminal velocity of the particle is achieved.   Particles that are moving too fast or too slow are

386   rejected and filtered away.   A circular arc is made around the globe where they reenter at the south poles magnetic field and then

387   accelerate back to earth. Billions of particles circumnavigate the globe at terminal velocity while being bent by the magnetic field.
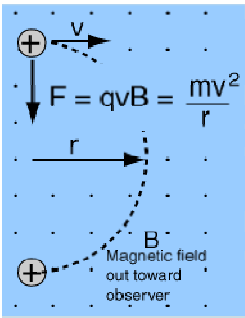
388

389

390 What is of interest is how the earth's natural velocity selector functions in the region of 20km to 30km and the average terminal

391 velocity of particles as they turn and make their way through the strong magnetic field at the poles.   The Magnetic Field weakens

392 near the equator and then transitions as the charged particles makes it way to the South Pole.

393 <div align="center">XIII.   CENTRIPETAL ACCELERATION</div>

394 Acceleration of an object moving in uniform circular motion, caused by a net external force, is called centripetal acceleration.

395 Centripetal is defined as "center seeking" or "towards center."

396

397
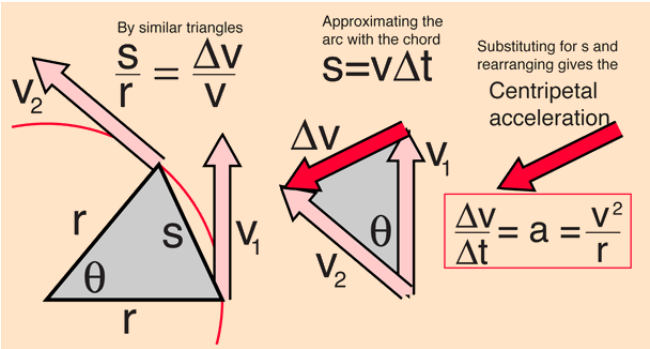
398 It has long been asserted that acceleration and gravity are one in the same.   We propose a theory of gravity based on the terminal

399 velocity of particles generated from the earth entering the atmospheres magnetic field at 22km above the earth at 7920 m/s.   This

400 is the ideal selector velocity to achieve an acceleration of 9.8m/s2 towards the center of the earth.   The radius of the earth at 22km

401 is equal to 6,400,000 meters which generates the following centripetal calculations for speed and acceleration:

402

403

404 "The magnitude of [the natural electric] field decreases with altitude; at 10 km, it has a value of about 3% of that at the surface,

405 whereas at 30 km it is about 300 mV/m and 1 μV/m at about 85 km (Raked and Uman, 2003)." [9]

406 Implementing the equation v = E / B for various elevation:

407 10 km   v = 150 V/m x .03 / .00005T = 90,000 m/s

408 22 km   v = 150 V/m x .00264 /.00005T = 7920 m/s

409 30 km   v = 150 V/m x .002 / .00005T = 6000 m/s

410 85 km   v = 150V/m x .0000001/.00005T = 3 m/s

411 At 22 km, the hand off occurs whereby the Electric Field is equal to approximately 400 mV and the Magnetic Field is equal to an

412 average of .00005 Tesla. The Electric Field continues to weaken rapidly and has no further effect on the speed of the particle.

413 The particle begins its circular pattern around the globe due to the force of the Magnetic Field located above the Electric Field.

414 Since the particle is travelling in a circle around the globe at 7920 m/s the acceleration pointing towards the center or towards

415 earth is 9.8 m/s or gravity.

416 The equation for gravity equates Faraday's electro-magnetism with Newtonian physics. Electrical Acceleration and Kinetic

417 Acceleration meet high in the atmosphere.

418 a = v2 / r

419 v = E/B

420 a = (E/B)2 / r

421   XIV.   Centripetal governor

422 The purpose of the earths electromagnetic RLC resonant circuit is to set the desired speed of the planet, and the purpose of the

423 atmospheric electromagnetic field is to maintain the speed of the planet through acceleration and deceleration.   These two

424 electrical systems work together to keep earth running as a constant speed planet. The speed of the earth is determined by the

425 tuned circuit of the earths parallel inductor and capacitor. Centripetal acceleration or gravity is needed to accelerate or decelerate

426 the earth to maintain the tuned speed of 465.1 m/s.   Gravity does this by increasing or decreasing its inward acceleration thereby

427 acting on the mass of the earth. By the equation F = m x a, we know that mass is constant so a change in acceleration will

428 increase or decrease the force acting towards the center of the earth. Gravity is a centripetal governor that acts as a dynamic

429 braking system on the earth. The brake lets off to speed up and pushes down on the earth to speed up. Fortunately for the

430 inhabitants of the earth the RLC circuit is well designed and the force inward or outward is not perceptible. Gravity or

431 centripetal acceleration does not have large swings so the tuned circuit is very stable and the servo control mechanism is tightly

432 controlled.

433 The acceleration rate of the earth is controlled by terminal velocity or E/B.

434 The steady state force of the governor can be calculated using Lorentz equation:

435 F = QE + QvB

436 F = 500,000 C x .00264v/m + 500,000C x 465.1m/s x .00005T

437 F = 1320 N + 11627 N

438 F = 12,947 N

439 The atmospheric electromagnetic field is connected to the earth via commutation or lightning, thus it is a closed- loop control

440 system. A simple closed-loop control system moves to correct its output is described by its frequency and damping ratio.

441 Monitoring of the Schumann frequency spectrum may show signature of acceleration or deceleration. Taken together these two

442 equations are what control the speed and acceleration of planets like rotating machines here on the surface of earth.

443   i. Mechanical Velocity = Electrical Frequency

444 $$\omega_0 = \frac{1}{\sqrt{LC}}\left[\frac{R_L^2 C - L}{R_C^2 C - L}\right]^{\frac{1}{2}}$$

445   ii. Mechanical Acceleration = Electromagnetic Field

446 $$a = (E/B)2 / r$$

447   XV.   TURNS RATIO CALCULATION

448

449      $V = L \, di / dt$

450

451      $V = (2 / 9 \times Pi \times N2 \times \mu_0 \times R) \times I / t$

452

453      $N2I = V \times 9 \times t / 2 \times Pi \times \mu_0 \times R$

454

455      $N \times 1.73 \text{ Billion Amps} = V \times 9 \times t / 2 \times Pi \times \mu_0 \times R$

456

457      $N \times 1.73 \, B \, A = V \times 9 \times t / 2 \times Pi \times \mu_0 \times R$

458

459      $N \times 1.73 \, B \, A = 1{,}095{,}858V \times 86{,}400s / 2 \times Pi \times \mu_0 \times R$

460

461      $N \times 1.73 \, B \, A = 852139180800 / 50.34$

462

463      $N \times 1.73 \, B \, A = 16927675423$

464

465      $N = 16927675423 / 1{,}730{,}000{,}000$

466

467      $N = 9.78$

468   XVI.   CALCULATE FORCES BETWEEN EARTH AND MOON

469

470 Comparison of electrostatic force and kinetic force of attraction between planets.

471

472   $F = Ke \, Q1 \, Q2 / R^2$ and $F = G \, M1 \, M2 / R^2$

473

474   $F = Ke \, Q1 \, Q2 / R^2$

475    $Q = 4\,\text{Pi}\,\varepsilon_o r^2\,E$

476    $K_e = 8.99 \times E9\ \text{N m2 C}{-}2$

477    $\varepsilon_o = 8.85418782 \times 10\text{-}12\ \text{m-3 kg-1 s4 A2}$

478    $4\,\text{Pi}\,\varepsilon_o = 1.1126501\ \text{E-10 F/m (earth)}$

479    $4\,\text{Pi}\,\varepsilon_o = 1.1126501\ \text{E-10 F/m (moon)}$

480   R = 3.844 E8 m (distance from earth to moon)

481   r = 6.378 E6 (earth)

482   r = 1.737 E6 (moon)

483   Mass earth = 5.974 E24 kg

484   Mass moon = 7.349 E22 kg

485   E earth = 100 V / m

486   E moon = 1 V / m (estimate)

487   Q earth = 1.1126501 E-10 F/m (6.378 E6 m)2×100 v/m   = 453,613 Coulomb

488   Q moon = 1.1126501 E-10 F/m (1.737 E6m)2 x 1 v / m   =   335 Coulomb

489   F = 8.99 E9 N m2 C−2 x 453,613 C x 335 C / (3.844 E8 m)2

490   F = 8.6 N

491

492    $F = GM_1M_2/R^2$

493   F = (6.674 E−11 N-m2/kg2) (5.974 E24 kg) (7.349 E22 kg)/ (3.844 E8 m)2

494   F = (2.930 E37 N-m2)/ (1.478 E17 m2)

495   F = 1.982 E20 N

496

497   The electrostatic force is far less than the kinetic force of attraction.   Clearly there is a missing magnetic force of attraction.

498   "From such a long distance both planets are small enough to be represented as single points then they can be represented as point

499   magnetic charges. Classically, the force between two magnetic poles is given by:" [10]

500

501                                  $F = \mu\,q_{m1}\,q_{m2\,/\,4\,\text{Pi r2}}$

502   Where:

503   *F* is force (SI unit: newton)

504   q_{m1} and q_{m2} are the magnitudes of magnetic poles (SI unit: ampere-meter)

505   *μ* is the permeability of the intervening medium (SI unit: tesla meter per ampere, henry per meter or newton per ampere

506   squared)

507   *r* is the separation (SI unit: meter).

508

509   "The magnetic force produced by a bar magnet, at a given point in space, therefore depends on two factors: the strength *p* of its

510   poles (**magnetic pole strength**), and the vector *l* separating them. The moment is related to the fictitious poles as:" [11]

511

512     $q_{m1} =$ magnetic moment / length

513

514     $q_{m1} =$ 8E22 Am^2 / 1,756,000m [12]

515

516     $q_{m1} =$ 6.27E15 A-m

517

518   A similar equation for the force between two wires carrying current I1 and I2 is as follows:

519

520                                 $F = \mu_0$ I1xI2 /2 Pi r

521

522   It is readily discernible that the force of attraction due to the Lorentz force, the force between point charges, magnetizing force

523   and force between wires is insufficient force to achieve that of Newtons Law of gravity using the mass of two planets.

524   XVII.   NEW EQUATION FOR PLANETARY ATTRACTION

525   The magnetic force of attraction of planets is most like two magnetic solenoid that are pulling towards each other. The magnetic

526   force is like Lenz law for solenoids but instead of attraction to a piece of metal we have two spherical magnetic solenoids

527   attracted to each other. The magnetic force is much larger in orders of magnitude then the electrostatic force, magnetizing force

528   or the force between wires. Those forces are additive to the force of the spherical coils, and should be considered, but for the point

529   of discussion are nearly inconsequential. What is proposed is a new theoretical equation for magnetic planets that more nearly

530   matches Newtons Law.

532 Newtons Law = Electromagnetic Law

534 Force of attraction mass = Force of attraction solenoid

536 $F = Gm_1m_2 / r^2 = k\, F_{m1}F_{m2} / 4r^2$

538 $F = Gm_1m_2 / r^2 = k\, (n*i)^2\mu_0A\, (n*i)^2\mu_0A/4r^2$

540 Solving for k:

542 $Gm_1 = k\, (n*i)^2\mu_0A/4$ (earth)

544 $k = Gm_1 / (n*i)^2\mu_0A/4$

546 $k = 6.674E\text{-}11 \times 5.974E24 / (1.73\ E9)^2 \times 1.2566E\text{-}6 \times 5.676E10 /4$

548 $k = 7.4E\text{-}9$

XVIII. GEO-DYNAMO AND RICHARDSON EFFECT

550 The **Richardson Effect** (after Nobel Laureate and Princeton Professor Owen Richardson), is a physical phenomenon involving

551 rotation that is characteristic of solenoids.   Albert Einstein and Wander Johannes de Haas confirmed experiments shortly after

552 Richardson paper, in the mid-1910s demonstrating magnetism, angular momentum, and spin of elementary particles. "The effect

553 corresponds to the mechanical rotation that is induced in a ferromagnetic material (of cylindrical shape and originally at rest),

554 suspended with the aid of a thin string inside a coil, on driving an impulse of electric current through the coil." [13]

556 The figure on the right is the electrical diagram of the experiment carried out by Einstein and Johannes de Haas.   The author

557 contends that this electrical diagram, when applied in a space vacuum would result in a rotating helical coil with a counter rotating

558 armature.   Thus, the electrical diagram will perform as an approximate analogy to the mechanical figure on the left which

559 represents the time scale motion of the Earth pole of rotation. [14] The rotation of the earth is therefore thought to be a derivative of

560 motor torque and acts as a rotating electrical machine in nature.

561   Earth

562 Earth

563
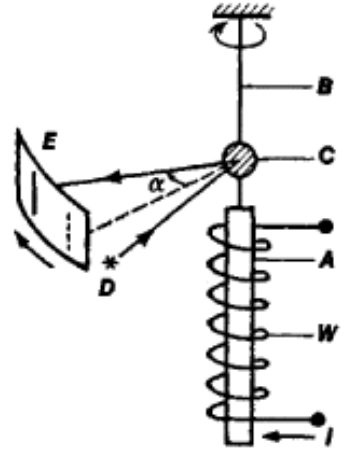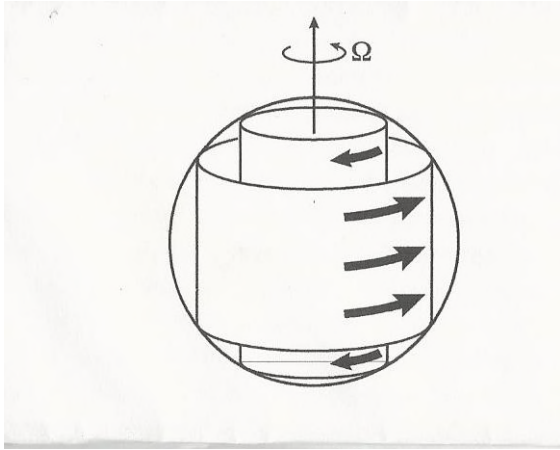
564   XIX.   SOLAR POWER SYSTEM

565 The sun and earth are electromagnetically connected just like a single-phase transformer with no iron.   The flux transfer between

566 the sun and planets occurs in the vacuum of space.   Imagine the coil on the left being the sun and the coil on the right being the

567 earth.   The sun coil is many times larger than the earths coil, and there are numerous planets that are also similarly connected.

568   The sun acts as a multi tap single phase transformer with several tertiary winding or planets.   Planets by being in a vacuum, and

569 the Richardson Effect for coils, the planets all rotate.   Orbits and positioning are a function of attraction to other like magnetic

570 bodies.   Thus, the sun is the power generator and the planets are motors all working much like a power system here on earth.

571 The sun has a surface area that is 12,000 times that of earth, and a magnetic field that is approximately double.   In simple terms,

572 the magnetic field of the sun is up to 24,000 times that of earth.   It is postulated that the electromagnetic field of the sun is so

573 great and so powerful that magnetic flux transfer occurs thru space and provides energy to motor the earth.   A picture of the

574 Solar System scaled to size and distance, gives a proportional perspective on the impact the Suns enormous electromagnetic field

575 will have on the miniscule planet earth magnetic field.
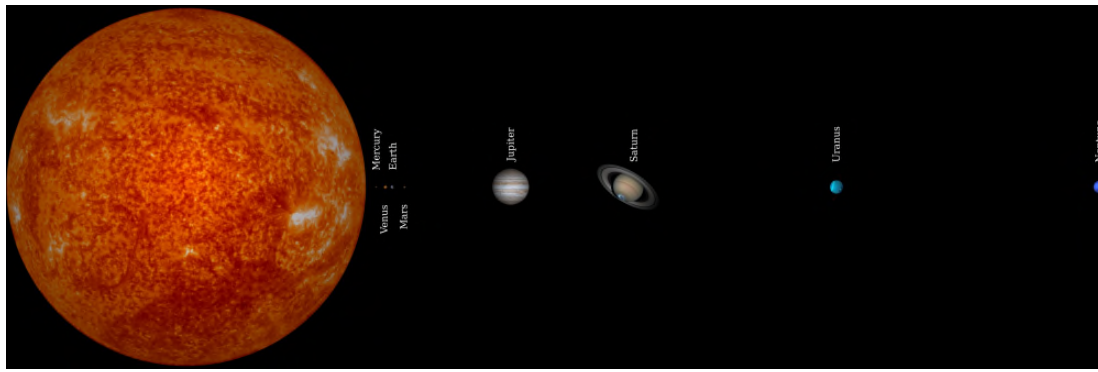
576

577 It is postulated that flux transfer between the sun and the earth is how the earth created and maintains its magnetic field.   The

578 magnetic field of the earth creates a magnetic force which attracts and repels the sun.   It is the balancing of magnetic fields

579 between planetary bodies, like standing magnets on a bench, that determines the distance between the planets, and their respective

580 orbits.

581 Below are simple dipole magnets that represent the sun and the earth.   Or, the earth and a nearby planet.   There is an attraction

582 of North to South from one magnetic dipole to the other.   But, there is also a repulsion of South to South and North to North.

583 Magnets or planets with such alignment have four vector forces continually existing that stabilize the physical distance and

584 positions of the planets relative to each other.   As shown the magnetic fields of planets press against each other, as described by

585 Nickola Tesla.   Fields that are aligned concentrate as shown.   Since the horizontal distance of repulsion is shorter than the

586 diagonal distance of attraction, there is always a slight repulsion of the planets.   We thus always have a gap between planets and

587 a slight pushing away from each other, which may help to explain our expanding universe.

588

29
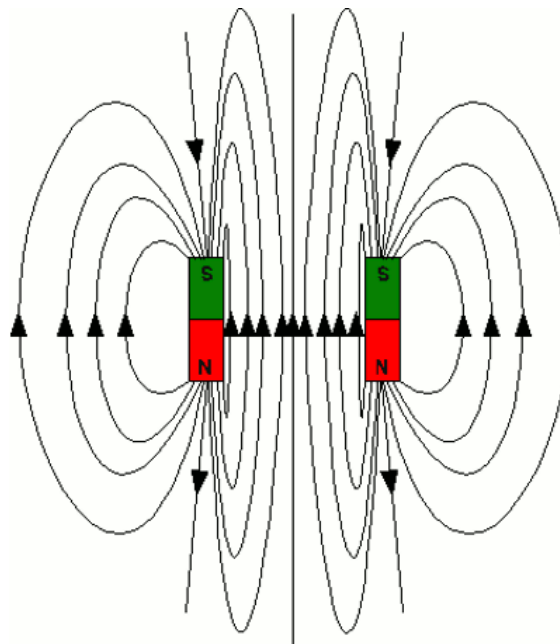
589

590 In 2008, David Sibek of the Goddard Space Flight Center first reported Flux Transfer Events between the Sun and the Earth were

591 occurring every 8 minutes.   A magnetic portal will open in the earth, linking the earth to the sun 93 million miles away.   Tons

592 of high energy particles are thought to enter through the opening.   [15]   This connection or "magnetic rope" has been observed

593 at Mars, Saturn, and all the way to Jupiter.   Flux transfer events at Saturn are like that of earth, but Mercury is reported to have

594 flux transfer events at ten times the rate of earth.   Earth's magnetosphere and the Sun's magnetic field are touching each other

595 continuously on the day side of Earth.   Approximately every eight minutes, these fields briefly merge, forming a temporary

596 "portal" between the Earth and the Sun through which high-energy particles or "magnetic flux" can flow. The portal takes the

597 shape of a helical cylinder up to 4 times the width of Earth. [16] The figures below demonstrate how the Sun and Earth work

598 similarly to how flux transfer occurs in a large power transformer.

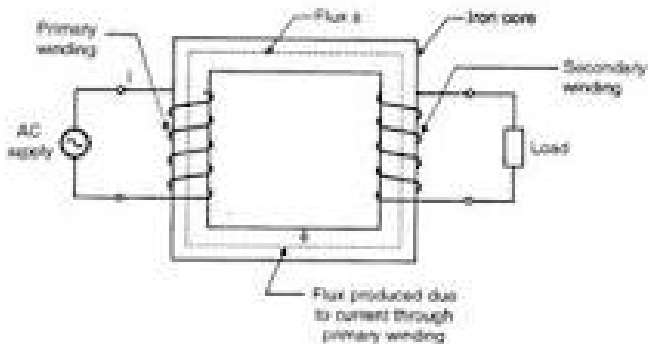599   Sun   Earth
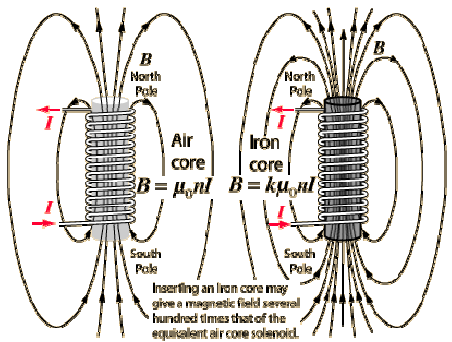
600

601   Sun   Earth

602

603   Based on the recent discovery of Flux Transfer Events it is conceivable that the Suns is the driving electromagnetic force behind

604   planetary speed of rotation.   Below is a table showing the magnetic fields and rotational speed of the planets in the solar system.

605   [17]

	Rotation Period (days)	Magnetic Moment (Earth=1)	Field at Equator (gauss)	Field Ratio Maximum / Minimum	Tilt of Dipole (degrees)
Mercury	59	0.0007	0.003	2	+14°
Venus	243	<0.0004	<0.0003	?	-
Earth	1.00	1	0.305	2.8	+10.8°
Mars	1.03	<2.5 x 10-5 f	<5 x 10^{-5}	?	-
Jupiter	0.41	20,000	4.2	4.5	-9.6°
Saturn	0.44	600	0.20	4.6	-<1°
Uranus	0.72	50	0.23	12	-59°
Neptune	0.74	25	0.14	9	-47°

Carl Frederick Gauss was correct when he reported that the earth's magnetic field was derived from the center of the earth. Such would als

a single-phase transformer.   But, what he and others may not have realized was that the flux transfer from the Sun to the Earth is the sou

earth. Calculations of a simple loop have shown that 1.7 Billion Amps are needed continuously to maintain a magnetic field of .25 to .60

continuous energy to rotate the earth, provide heat for the atmosphere and sustain the lifesaving electromagnetic field.   The author main

earth's magnetic field, he also believes that recent information suggests the Flux Transfer Events from the Sun are what helps power and syr

nuclear core may be the primary source of energy that self-propels the earth, based on calculations of 1.7 billion amps and nearly a billion vo

create a fusion core.   But, this is suggestive of a standalone perpetual motion machine fueled by an independent yet stable power source.

an electrical machine, that is infinitesimally small compared to neighboring machines, would generate and/or motor itself at near perfect sp

connection to nearby electrical machines.   Modern astrophysics should consider the electromagnetic coupling of the sun to the planets as

sustains thermal nuclear reaction of the core.   The solar power system view, as it relates to electrical engineering, is required to achie

geodesic synchronism of the planets.

"Electric power is everywhere present in unlimited quantities and can drive the world's machinery without the need of coal, oil, gas, or any o

XX.   CONCLUSION

606

607   The earth has an inductive coil wrapped around it periphery of 9.8 turns.   The rotation of the coil and the earth are attributed to

608   the Richardson Effect. The Einstein-de Haas test results confirmed the Richardson Effect and provide explanation for earth

609   rotation and helps to understand how the inner iron core spins in the opposite direction of the outer core, mantle and surface.

610   Due to the tilt of the earth the rotating coils nearest the equator will cross from the positive electromagnetic field of the north pole

611   to the negative field of the south pole.   The direction of current flow in the wires will reverse and commutation occurs.   This

612   commutation of the earth shows up in the form of lightning from ground to the opposite poles electric field. The normal running

613   current of the earth is very small, but the fault current of lightning is large. There are over 1.4 billion lighting strikes of various

614   ampacity every year. The rotating strikes are believed to be what charges the atmospheric electromagnetic field and give the north

615   and south poles their polarity. The Schumann Resonance of 7.83Hz is known to be related to lightning. The North and South

616   Pole act as fixed magnetic fields. Lightning occurs near the equator and up into the regions of Tropics of Cancer and Capricorn.

617   Above these latitudes the coils are too short in length and at such an angle that they cannot cross to opposite poles and as such

618   commutation or lightning does not occur.   The earth's parallel RLC circuit operates as a resonant circuit to precisely control

619   frequency which ultimately fixes the rotational speed of the earth.

620

621   The magnetic coil that extends from the south pole to the north pole is shaped somewhat like a helical resonator. It acts as a

622   particle accelerator and wave guide that generates the earth electromagnetic field at Schumann Resonant frequency, which is also

623   correlated to the frequency of the earth's commutation circuit or lightning. The electric field in the near atmosphere decelerates

624   the particles thru natures velocity selector and then transitions to the magnetic field when $v = E/B$. The earths electromagnetic

625   field at the poles acts as filter for particles with a velocity of 7920 m/s.   The magnetic field bends the particles around the earth.

626   Experimentation is suggested with mass spectrometry to assess select and terminal velocity of particles at known atmospheric

627   electric field values.   Studying the relationship of particles and electromagnetic waves may be fruitful in further unlocking the

628   secrets of gravity.   The workings of the earth's governor control to maintain constant speed has been described.   Research into

629   the earth's servomechanism and relationship to Shuman Resonance would be of interest.

630

A new equation has been developed for electromagnetic planetary attraction that is equated to Newtons Law.   It is conceivable under Ampere's hypothesis that all bodies are magnetic to some minute degree due to the circulating motion of electrons in the atom.   The new equation, just like Newtons law, would apply to all atomic matter. Thus, determining the inductance and current of an apple may be the explanation, and the answer to Newtons questions, as to the unseen force pushing the apple to earth. We now know the turns ratio of the earth is 9.8.

Flux Transfer Events are a contributing energy source to the Earth electromagnetic field.   Energy is being transferred from the Sun to the earth every 8 minutes via Flux Transfer in a way that is like the operation of a power transformer.   It is believed that the Sun acts as a fusion powered electrical generator that transmits energy to the planets which in turn act as rotating electrical machines.   The sun powers the earth and all other planets using electromagnetic energy and power transmission thru flux transfer.

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676   http://lasp.colorado.edu/~bagenal/3750/ClassNotes/Class13/Class13.html

677   [18] "Tesla 'Harnesses' Cosmic Energy" *Philadelphia Public Ledge*r, Nov 2, 1933

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679   **Greg Poole** was born in Auburn, Washington in 1959. He received the B.S. in electrical engineering from Washington State
680   University in 1982. In 1984, he worked for Westinghouse Electric Corporation and spent much of his career working for their
681   Engineering Service Division in the capacity of field engineer, sales and management. Mr. Poole was recipient of several awards
682   at Westinghouse including the prestigious Eagle Award in 1994 for his efforts in renovating the NASA Unitary Wind Tunnel
683   200,000Hp motors and the commercialization of industrial substations. He also managed field service offices for General Electric,
684   ABB and Square D prior to venturing into his own electrical engineering and testing company.   At General Electric, he was
685   involved in many AC drive upgrades of steel mills and paper plants in upstate New York. For the past ten years he has served as
686   President and co-owner of Industrial Tests, Inc. in Sacramento, California.   The company is a NETA certified electrical testing

687 firm that has been servicing northern California for nearly four decades. Over the span of his career Mr. Poole has done work for

688 research organizations such as SLAC, LLNL, and Sandia Labs.

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