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Cosmic Wireless Power Transfer System and the Equation for Everything $E = mc^2 = vc^2/60 = a^3/T = G(M_1 + M_2)/4\pi^2 = (KE + PE)/1.0E15 = Q = PA/F = \lambda/hc = 1/2\,q = VI = 1/2\,LI^2 = 1/2\,CV = I^2R = \cdots$

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Abstract

By representing the Earth as a rotating spherical antenna several historic and scientific breakthroughs are achieved. Visualizing the Sun as a transmitter and the planets as receivers the solar system can be represented as a long wave radio system operating at Tremendously Low Frequency (TLF). Results again confirm that the "near-field" is Tesla's "*dynamic gravity*", better known to engineers as dynamic braking or to physicists as centripetal acceleration, or simply (g). Timewave theory is invented, and the relationship of reflected timewaves and time travel explored. A new law of the Sun is proposed as well as the merging of Einstein's equation with acoustics and cosmic superstring theory. A new law of cosmic efficiency is also proposed that equates vibratory force and pressure with volume acceleration of the solar system. Lorentz force is broken down into centripetal and gravitational waves. Ten-dimensional cosmic superstring theory is espoused versus the aging three-dimensional Maxwellian model. Spherical antenna patterns for planets are presented and flux transfer frequency is calculated using distance to planets as wavelengths. The galactic grid operates at a Schumann Resonance of 7.83 Hz, which is derived from the science of dark energy and dark matter. The Sun and the planets are tuned to transmit and receive electrical power like resonating Tesla coils. The Earth's stator winding has been modeled as a toroid tesla coil and the armature as a spherical armature. The equation for everything is born.

Keywords

Cosmic Efficiency, Equation for Everything, Flux Transfer Events, Inductive Coupling, Spherical Antenna, Time Wave, Velocity-Energy Equivalence, Wireless Power Transfer

1. Introduction

Benjamin Franklin harnessed the cosmic power of lightning with his kite experiment in 1751 and documented several observations regarding the nature of electricity [1] [2]. Over the next century Frederick Gauss, André-Marie Ampère, and Michael Faraday made important discoveries and wrote the basic equations of electricity and electromagnetism [3] [4] [5].

In 1856, Maxwell published his first paper *On Faraday's Lines of Force* [6] in which he compared the behavior of the lines of force to the flow of a liquid and derived equation that represented electric and magnetic effects. His second paper, in 1862, *On Physical Lines of Force* [7] was mainly concerned with constructing a mechanical model for the medium (known as the ether) that would account for the electrical and magnetic effects. Using this model, he considered the electromagnetic wave and found that its speed would be equal to the ratio of the value for an electric current measured in electrostatic units to the value of the same current measured in electromagnetic units. In 1864, James Clerk Maxwell provided a mathematical explanation with, *"A Dynamical Theory of the Electromagnetic Field"* [8], establishing a theory that unified electrostatic and magnetism to electromagnetism, predicting the existence of electromagnetic waves as the "wireless" carrier of electromagnetic energy. Maxwell read a memoir before the Royal Society in which the mechanical model was stripped away and just the electrical equations remained. It is interesting to note that Maxwell included a slightly different version of the Lorentz force as one of his early quaternion equations, but it is clearly recognizable [9]. He wanted to present the predictions of his theory about reflection and refraction of electromagnetic waves, but the requirements of his mechanical model kept him from finding the correct boundary conditions, so he never did incorporate this calculation [10].

During the same period, a patent with detailed drawings of an electrical tower was filed for power transfer and wireless signaling by William Henry Ward (1871). The inventors patent noted electrified atmospheric stratum accessible at low altitude connected with a return path using Earth currents that could also be used for telegraphy, lighting, heat, and electromotive power [11].

Etheric force is a term Thomas Edison used to describe a phenomenon he discovered while experimenting with telegraph; later understood as high frequency electromagnetic waves—effectively, radio. Edison believed it was this mysterious force that pervaded the ether. In 1876, Edison obtained U.S. Patent 465971 on a system of electrical wireless communication between ships based on

electrostatic coupling using water and elevated terminals. He later sold the patent rights to Marconi, which would become modern radio [12]. A more practical demonstration of wireless transmission via conduction came in Amos Dolbear's 1879 magneto electric telephone that used ground conduction to transmit over a distance of a quarter of a mile. This was followed on by Heinrich Rudolf Hertz's 1888 validation of Maxwell's theory, which included the evidence for radio waves. In 1893 Nickola Tesla proposed a system for transmitting intelligence and wireless power using the Earth as the medium. After field testing the concept in Colorado Springs, a full scale industrial plant was built in Wardenclyffe, near Long Island. But the massive high voltage Tesla coil was too expensive to manufacture, and the coil was never installed. The site was later demolished to pay off creditors. During the same time period, the Italian inventor Guglielmo Marconi built the first complete, commercially successful wireless telegraphy system based on airborne Hertzian waves (radio transmission). Marconi demonstrated application of radio in military and marine communications and started a company for the development and propagation of radio communication services and equipment [13].

J.J. Thomson, in 1893, published *Notes on Recent Researches in Electricity and Magnetism*. This work is often referred to as "the third volume of Maxwell" as it covered results obtained subsequent to the appearance of James Clerk Maxwell's famous treatise. Thomson was the first to describe the Earth's conduction pathway as a spherical coil [14]. The following year Oliver Heaviside published *Electromagnetic Theory*, where he modified Maxwell's equations into vector form. Heaviside correlated electromagnetism to gravity twenty-five years before Einstein wrote his paper on the subject and made note of electrical waves in sea water [15]. In 1895, Hendrik Lorentz derived the modern form of the formula for the electromagnetic force, called the Lorentz force which includes the contributions to the total force from both the electric and the magnetic fields [16]. Henri Poincaré was the first to present the Lorentz transformations in their symmetrical form. Poincaré discovered the remaining relativistic velocity transformations and recorded them in a letter to Hendrik Lorentz in 1905. Thus, he obtained perfect invariance of all of Maxwell's equations, an important step in the formulation of the theory of special relativity. In the same year, Poincaré first proposed gravitational waves (*ondes gravifiques*) emanating from a body and propagating at the speed of light as being required by the Lorentz transformations [17].

In 1897, Sir Joseph Larmor published *On a Dynamical Theory of the Electric and Luminiferous Medium* [18]. When any charged particle accelerates, it radiates away energy in the form of electromagnetic waves. For velocities that are small relative to the speed of light, the total power radiated is given by the Larmor formula. In 1906, the *Annus mirabilis* papers of Albert Einstein were published in the *Annalen der Physik* scientific journal. These four articles contributed substantially to the foundation of modern physics and changed views on

space, time, mass, and energy [19]. In 1919, Sir Joseph Larmor suggested that the Sun's magnetic field might be sustained by a mechanism similar to a self-exciting dynamo [20] [21]. Using Larmor papers as a guide, Dr. Walter Elsasser modelled the Earth as a simple Faraday Disc showing toroid and solenoid electrical currents which appeared in the May 1958 issue of Scientific America [22].

In 1969, an obscure letter by a noted English mathematician M.A Jawson appeared in Nature describing a new mechanical interpretation of Maxwell's theory and delved into the concept of MacCullaghs *plenum*, a precursor to dark matter that, in essence, explains how electro mechanical waves travel through a medium [23]. *Plenum*, one of the most interesting models, was the gyrostatic aether proposed by MacCullagh in 1837, a medium characterized by resistance to rotation but not to compression or distortion and designed to secure a dynamical foundation for wave theory. This proposal lay dormant until taken up again many years later by Fitzgerald (1880), followed by Kelvin (1892) and Larmor (1894), who assimilated it to Maxwell's field equations. MacCullagh researched the formal nature of the *plenum* by analyzing the optical phenomena of crystals. Based on optical theory the plenum must be the medium of transmission of radiation with its known finite velocity of the speed of light. In dynamical terms it must possess, when disturbed, energy of strain and energy of inertia. MacCullagh's optical equations are identical to those of the electrodynamic theory of optics developed by Maxwell suggesting the plenum vibratory functions takes up a state of strain as would represent electrostatic actions between charged particles, or such state of motion as would represent the electrodynamic action between currents [24].

Jawson's work was to provide a rational theory on matter by mathematical proof capable of assimilating charges and currents as well as fields, and thereby fulfilling the primary condition of an acceptable aether with mechanical and electrical properties.

2. Wireless Power Transfer System

Electric and magnetic fields are created by charged particles in matter. A stationary charge creates an electrostatic field in the space around it. A steady flow of direct current (DC) charges creates a static magnetic field around it. The electrostatic fields contain energy but cannot carry power because they are static; thus, the term electrostatic. However, time-varying fields can carry power, such as those found in an alternating current (AC). Accelerating charges of electrons in a wire create time-varying electric and magnetic fields in the space around them. These fields can exert oscillating forces on the electrons in a receiving antenna, causing them to move back and forth. The receiving antenna has alternating current which can be used to power a load.

A wireless power transfer system (**Figure 1**) consists of a transmitter which converts the power to a time-varying electromagnetic field, and one or more

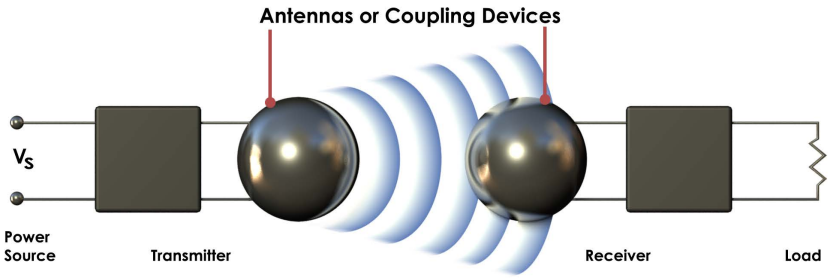

Figure 1. Wireless power transfer system.

receiver devices, which receive the power and convert it back to electric current which is used by an electrical load. At the transmitter the input power is converted to an oscillating electromagnetic field by an antenna. A similar antenna or coupling device at the receiver converts the oscillating fields to an AC electric current. An important parameter that determines the pattern of waves is wavelength, or length of the antenna, which determines the frequency [25].

In wireless communication technologies, small amounts of power reach the receiver. In contrast, with wireless power transfer the amount of energy received is important; hence, the efficiency of power transfer is the chief parameter. For this reason, cosmic wireless power transfer requires a huge source of electromagnetic power like the Sun's energy to cross the great expanse of distance to the planets. Cosmic wireless power uses the same electromagnetic fields and waves as wireless communication devices. Only cosmic power transfer operates in the Tremendously Low Frequency (TLF), which is much lower than radio technology. In radio communication, the purpose is the transmission of information. Hence, the amount of power reaching the receiver is not so important, as long as, the information is received intelligibly. For the cosmos, the transmission system is built for wireless electrical power.

3. Modeling Planets as Antennas

Flux transfer events are a characteristic set of perturbations in the magnetic field observed by satellites near the Earth's magnetopause. It has been observed that these events occur every 5 to 15 minutes [26]. Therefore, a time dependent electromagnetic wave theory is proposed by expatiating my previous electro dynamo paper by dually modeling the Earth as a rotating motor and a rotating spherical antenna [27]. It is theorized that the Sun acts as a transmitter of electrical energy and the Earth as a receiver. Energy is transferred across the vast distance of space by electromagnetic waves. The solar system is akin to a powerful radio, albeit operating at Tremendously Low Frequency (TLF).

If an oscillating electrical current is applied to a conductive planet, electric and magnetic fields will appear in space around that planet. If those fields are some distance into space the planet can be modeled as a spherical antenna. Such an antenna can be an assemblage of conductors in the planet, rotating as an electrical motor in space. The actual values of the electromagnetic fields in space

about the antenna are complicated and can change with distance from the planet in a number of ways. The oscillating electric and magnetic fields surrounding moving electric charges in a planet can be divided into two regions, depending on distance range from the planet. The boundary between the regions is not well defined. The fields have different characteristics in the near and far regions, and different approaches for transferring power.

Electromagnetic waves are synchronized oscillations of electric and magnetic fields that propagate at the speed of light through space. The oscillations of the perpendicular fields are in the direction of energy and wave propagation, forming a transverse wave. The wave front of electromagnetic waves emitted from a point source, such as a planet, is a sphere. The position of an electromagnetic wave within the electromagnetic spectrum can be modeled by either its frequency of oscillation or its wavelength [28]. Electromagnetic waves consist of energy and angular momentum [29]. In space they impart those quantities to dark matter with which they interact.

The principle of reciprocity theorem states that the pattern observed when a particular antenna is transmitting is identical to the pattern measured when the same antenna is used for reception [30]. Thus, the author concludes the Sun and the planets act both as transmitters and receivers exchanging energy and establishing a cosmic wireless power transfer system within our solar system (**Figure 2**). To represent the Earth, a folded spherical helix dipole antenna which is electrically self-resonant; exhibits a good impedance match with a low-quality factor, and "r" is the radius of a sphere that can completely encapsulate the antenna. The spherical antenna gives a superior visual representation of the Sun and planets and is helpful in communicating the concept of the Sun and planets acting as rotating antennas.

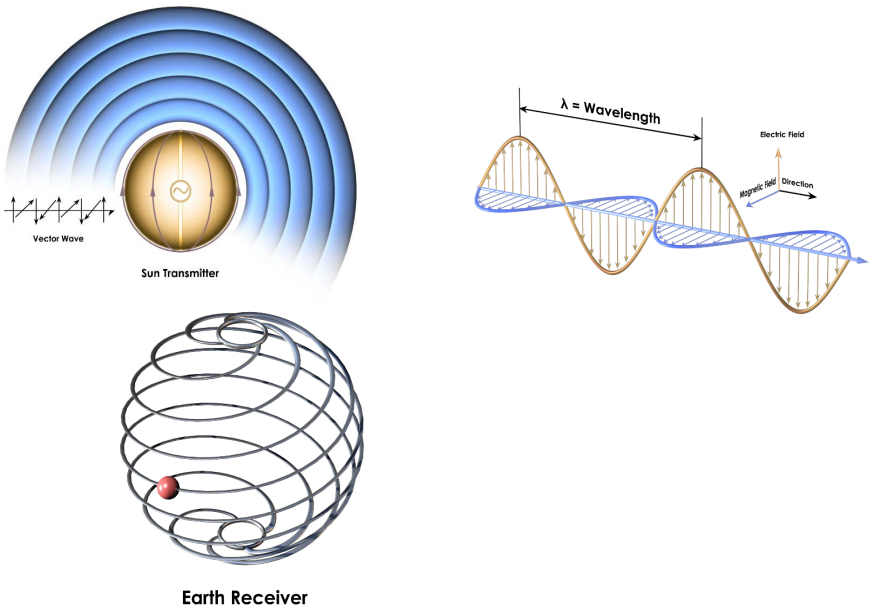

Figure 2. Solar system long wave radio.

Near-field or nonradiative region—This means the area within about 1 wavelength (λ) of the planet. In this region, the oscillating electrostatic field and magnetic field are separate. Power can be transferred via electric fields by capacitive coupling between the planet and atmosphere, or via magnetic fields by inductive coupling between planets which act like spherical coils of wire [31]. These two separate fields are not radiative, meaning the energy stays within a short distance of the transmitter. If there is no receiving device or absorbing material within their limited range to "couple" to, no power leaves the transmitter. The range of these fields is short and depends on the size and shape of the planet or body. Planets are modeled as spherical coils of wire. The fields, and thus the power transmitted, decrease exponentially with distance, so if the distance between the two planets' range is much larger than the diameter of the planet, very little power will be received.

Far-field or radiative region reaches beyond about 1 wavelength (λ) [32]. The electric and magnetic fields are perpendicular to each other and propagate as an electromagnetic wave. This part of the energy is radiative, meaning it leaves the Sun or planet whether or not there is a receiver to absorb it. The portion of energy which does not strike the receiving planet is dissipated and lost to the cosmos. The amount of power emitted as electromagnetic waves by a planet depends on the ratio of the planet's size to the wavelength of the waves λ, which is determined by the frequency: $\lambda = c/f$. At low frequencies where the planet is much smaller than the size of the waves, very little power is radiated. Therefore, the near-field of planets, which use lower frequencies, radiate almost none of their energy as electromagnetic radiation. Planets radiate power inefficiently, as the electromagnetic waves are radiated omnidirectionally, so if the receiving planet is far away, only a small amount of the radiation will hit it. For this reason, it is concluded that planets are located at about 1 wavelength or less, which means the near-field predominate in cosmic power transfer and far-field radiation has little effect on our own solar system and less on solar systems beyond. It is thought, but not confirmed, that far-field radiation is too inefficient to be of significance in cosmic power transfer.

For electromagnetically short antennas, such as Earth or the seven other planets, we can treat them as point antennas, the far and near regional boundaries are measured in terms of a simple ratio of the distance r from the radiating source to the wavelength λ of the radiation. For short antenna, the near-field is the region within a radius ($r \ll \lambda$), while the far-field is the region for which $r \gg 2\lambda$. The transition zone is the region between $r = \lambda$ and $r = 2\lambda$. The length of the short antenna is not important, and the approximation is the same. In short antennas, the short length means that charges and currents in each sub-section of the antenna are the same at any given time since the antenna is too short for the transmitter voltage to reverse before its effects on charges and currents are felt over the entire antenna length.

For antennas physically larger than half-wavelength of the radiation they emit,

such as the Sun, the near and far-fields are defined in terms of the Fraunhofer distance [33] and see **Figure 3**. The Fraunhofer distance, named after Joseph von Fraunhofer, is given by the following:

$$\text{Reactive Near Field} \le 0.62 \times \sqrt{\frac{D^3}{\lambda}}$$

$$\text{Radiating Near Field}\left(\text{Frensel Region}\right) \le \frac{2D^2}{\lambda}$$

$$\text{Far Field} \ge \frac{2D^2}{\lambda}$$

$$\lambda = \frac{\text{Speed of Light}}{\text{Frequency}}$$

where,

D = Antenna dimensions (Can be the length or diameter of the antenna)

f = Signal Frequency

λ = Wavelength

This distance provides the limit between the near and far-field. The parameter D corresponds to the physical length of an antenna, or the diameter of the Sun. Having an antenna electromagnetically longer than one-half the dominated wavelength emitted, considerably extends the near-field effects. Additionally, a far-field region distance d_f must satisfy these two conditions.

$$d_f \gg D$$

$$d_f \gg \lambda$$

where D is the largest physical linear dimension of the antenna and d_f is the far-field distance. The far-field distance is the distance from the transmitting antenna to the beginning of the Fraunhofer region, or far-field.

The Fresnel zone is one of a series of concentric prolate ellipsoidal regions of space between and around a transmitting antenna and a receiving antenna system. The concept is used to understand and compute the strength of electromagnetic waves propagating between a transmitter and a receiver. In the early 19th century, French scientist Augustin-Jean Fresnel discovered a method to calculate where the zones are. That is, whether a given obstacle will cause mostly in-phase or mostly out-of-phase deflections between the transmitter and the receiver.

Fresnel zone (**Figure 4**) clearance is in regard to the natural bending of waves, rather than the deflection of waves as discussed above. Environmental conditions can affect waves, and it is in these conditions, where waves are apt to bend, that Fresnel zone clearance becomes important. Although the electromagnetic waves are bending rather than bouncing, the impact upon the receiving antenna can be severe enough that it requires the consideration of the Fresnel zones.

The general equation for calculating the Fresnel zone radius at any point P in between the endpoints of the link is the following [34]:

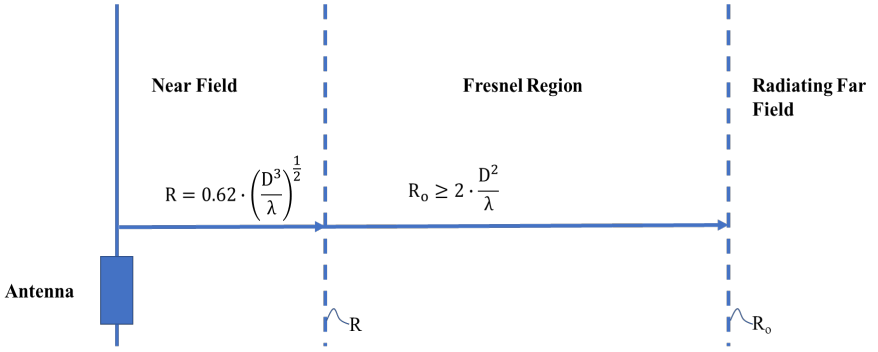

Figure 3. Long antenna diffraction zone: near- and far-field regions for an antenna larger (diameter or length D) than the wavelength of the ratio it emits, so that $D \gg 1$. Examples are radar dishes, satellite dish antennas, radio telescopes and other highly directional antennas.

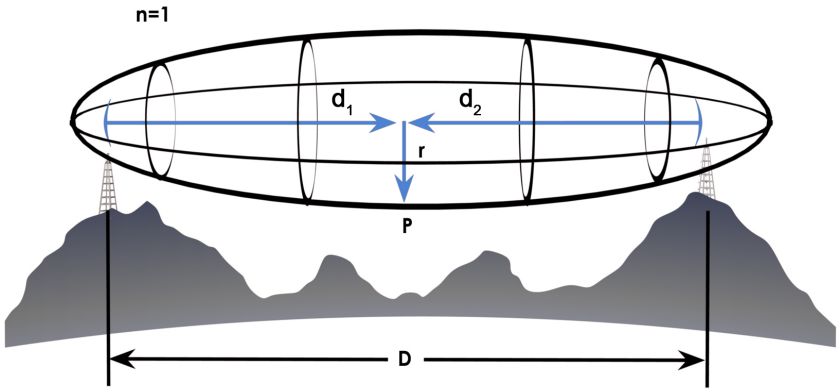

Figure 4. Fresnel zone.

$$F_n = \sqrt{\frac{n\lambda d_1 d_2}{d_1 + d_2}}, d_1, d_2 \gg n\lambda$$

The maximum radius of the first Fresnel zone can be calculated using the simplified equation,

$$F_1 = \frac{1}{2}\sqrt{\lambda D} = \frac{1}{2}\sqrt{\frac{cD}{f}}$$

In the case of the Sun we know the diameter at the equator to be 1.392×10^{12} meters, which is longer than the half-wavelength of the Earth or Mercury. Therefore, the Sun is treated as a long length antenna and the planets in our solar system are treated as short length, point source antennas. Having an antenna electromagnetically longer than one-half the dominated wavelength emitted considerably extends the near-field effects. When a long length antenna emits high frequency radiation, such as the Sun, it will have a near-field region larger than what would be implied by the shorter wavelength. Planets which resemble spherical rotating antennas operating at tremendously low frequency do not share the same characteristic of typical man-made antennas. Common antennas that we use on Earth usually operate at higher frequencies in the far-field range,

whereas planetary antennas transmit and receive at very low frequencies in the near-field. Shown below are the Sun and Earth frequency calculations using Fraunhofer equation that extends the reactive and radiative near-field, as well as the far radiative field, to its maximum distance. Since planets are considered electrical machines the inductive reactance power transfer seems to best fit the model. The calculations below show the dominance and tremendous reach of the near-field in wireless electrical power transfer from the Sun to the Earth.

Calculations for Reactive, Radiating Near-field Distance & Far-field Distance

For an Antenna length or diameter $(D) = 1.392 \times 10^{12}$ m

And Frequency $(f) = 0.002$ Hz

The following values are obtained:

$$\text{Wavelength} = 1.5 \times 10^{11} \text{ m}$$

$$\text{Reactive Near Field Resistance} = 2.63 \times 10^{12} \text{ m}$$

$$\text{Radiating Near Field Distance} = 2.59 \times 10^{13} \text{ m}$$

$$\text{Far Field}(\text{Greater than this distance}) = 2.59 \times 10^{13} \text{ m}$$

4. Near and Far-Fields

The near-field and far-field regions of the electromagnetic field around an antenna, such as the transmitting Sun or planet, are the result of radiation scattering off an object (Figure 5). Non-radiative near-field behaviors of electromagnetic fields dominate close to the antenna or scattering planets, while electromagnetic radiation far-field behaviors prevail at greater distances.

In a typical antenna, positive and negative charges have no way of leaving and are separated from each other by the excitation signal. This generates an oscillating electrical dipole, which affects both the near-field and the far-field. Typically, the purpose of antennas is to communicate wirelessly for long distances using far-fields, and this is their main region of operation. However, magnetic induction as seen in a power transformer can be seen as a very simple example

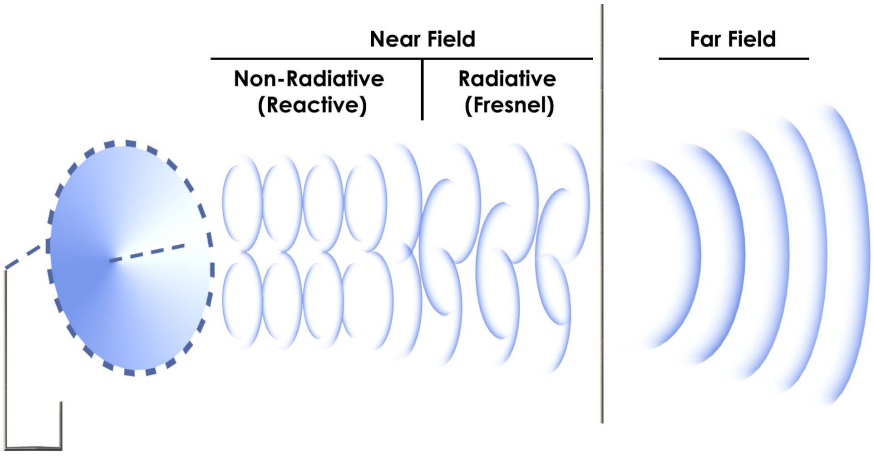

Figure 5. Near- and far-fields.

of near-field electromagnetic interaction. Thus, for cosmic power transfer the near-field is relevant as it most resembles the transformer and the flow of high power, as opposed to low power information signals we generally associate with antennas.

The near-field is governed by multipole type fields, which can be thought of as a magnet, as a collection of dipoles with a fixed phase relationship. Near-field E and B strength decrease rapidly with distance. The B field decreases by the inverse-distance squared, the E part by an inverse cubed law, resulting in a diminished power in the parts of the electric field by an inverse fourth-power and sixth-power, respectively. The rapid drop in power contained in the near-field ensures that effects due to the near-field essentially vanish a few wavelengths away from the antenna. The electric and magnetic fields can exist independently of each other, and one type of field can dominate the other. In the near-field region, absorption of radiation does affect the load on the transmitter and is fed back to the transmitter when no receiver is nearby. The near-field is a closed loop self-regenerative system [35].

The far-field is the region in which the field acts as electromagnetic radiation. In this region, it is dominated by electric or magnetic fields with electric dipole characteristics. Far-field E and B field strength decreases inversely with distance from the source, resulting in an inverse-square law for the radiated power intensity of electromagnetic radiation. In the far-field region of an antenna absorption of the radiation does not feed back to the transmitter. In the far-field region, each part of the electromagnetic field is associated with a change in the other part, and the ratio of electric and magnetic field intensities is simply the wave impedance.

The far-field electromagnetic radiation depends on a different mechanism for its production than the near-field, and upon different terms in Maxwell's equations. The magnetic field in electromagnetic radiation is due only to the local change in the electric field. In a similar way, while the electric field in the near-field is due directly to the charges and charge-separation in the source, the electric field in electromagnetic radiation is due to a change in the local magnetic field. Both processes for producing electric and magnetic far-fields have a different dependence on distance than do near-field dipole electric and magnetic fields. This is how come the electromagnetic radiation field becomes dominant in power several wavelengths from sources. The term far from sources refers to how far from the source, moving at the speed of light, any portion of the outward-moving electromagnetic field is situated. By the time that source currents are varied by the source potential, the source has therefore begun to generate an outwardly moving electromagnetic field of a different phase.

A simpler view of electromagnetic radiation is that the far-field is generally that part of the electromagnetic field that has traveled sufficient distance from the source, that it has become completely disconnected from any feedback to the charges and currents that were originally responsible for it. Independent of the

source charges, the electromagnetic field, as it moves farther away, is dependent only upon the accelerations of the charges that produced it.

Also known as the radiation-zone field, the far-field carries a relatively uniform wave pattern. The radiation zone is important because far-fields in general fall off in amplitude by 1/r. This means that the total energy per unit area at a distance r is proportional to $1/r^2$. The area of the sphere is proportional to r^2, so the total energy passing through the sphere is constant. This means that most of the far-field energy escapes to infinite distance [36]. Although much like the classic two-dimensional example of ripple rings expanding out over the surface of a pond, three dimensional waves require going one step farther. Instead of expanding rings, we can imagine expanding "spheres" spreading out from the source as the wave travels from the center disturbance. The wave energy is spread out over larger and larger areas as the radius increases, thus resulting in less energy per unit area and decreased strength. Because the surface area of a sphere is 4 π, the area of a sphere increases in proportion to r^2, and energy which is equally spread out over the surface is inversely proportional to r^2. This is known as the inverse-square law.

The electrostatic and reactive near-field refers to regions such as near conductors and inside atmosphere, or polarized media, where the propagation of electromagnetic waves is interfered with. The interaction with the medium can cause energy to deflect back to the source, as occurs in the reactive near-field. Or the interaction with the medium can fail to return energy back to the source but cause a distortion in the electromagnetic wave that deviates significantly from that found in a perfect vacuum, and this indicates the radiative near-field region, which is somewhat further away [37].

The reactive field region is where planets in our solar system are thought to operate when the Sun is considered the source or transmitter. The far-field would be applicable to the interaction between other suns or solar systems. Another intermediate region, called the transition zone, is the boundary between the two regions and is only vaguely defined. It depends on the dominant wavelength (λ) emitted by the source and the size of the radiating element.

For antennas shorter than half of the wavelength of the radiation they emit, the far and near regional boundaries are measured in terms of a simple ratio of the distance r from the radiating source to the wavelength λ of the radiation (**Figure 6**). For such an antenna, the near-field is the region within a radius ($r \ll \lambda$), while the far-field is the region for which $r \gg 2\lambda$. The transition zone is the region between $r = \lambda$ and $r = 2\lambda$ [38]. When the Earth is viewed as the source, or transmitter, it is considered a short antenna.

The transition zone between these near and far-field regions, extend over a distance from one to two wavelengths from the antenna. It is the intermediate region in which both near-field and far-field effects are important. In this region, near-field behavior dies out and ceases to be important, leaving far-field effects as dominant interactions. The boundaries for these regions are fluid, as there are

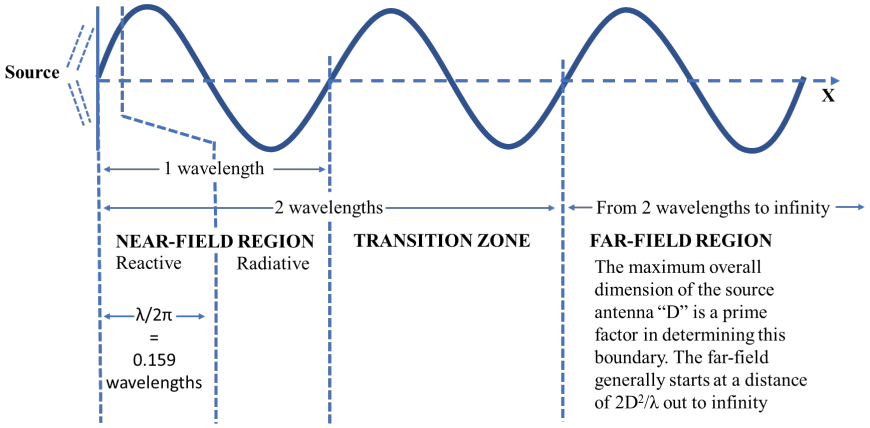

Figure 6. Short antenna wavelength.

no precise borders between them and behavioral changes with distance.

The near-field itself is further divided into the reactive near-field and the radiative near-field. The reactive and radiative near-field areas are also a function of wavelength or distance. However, these boundary regions are a fraction of one wavelength within the near-field. The outer boundary of the reactive near-field region is commonly considered to be a distance of $0.159 \times \lambda$ from the antenna surface. The reactive near-field is also called the inductive near-field. The radiative near-field, referred to as the Fresnel region, covers the remainder of the near-field region.

In the reactive region, not only is an electromagnetic wave being radiated outward into far space but there is a reactive component to the electromagnetic field, meaning that the nature of the field around the antenna is sensitive to electromagnetic absorption in this region, and reacts to it. In contrast, this is not true for absorption far from the antenna, which has no effect on the transmitter or antenna near-field. This dipole pattern below shows a magnetic B in orange (**Figure 7**). The potential energy momentarily stored in this magnetic field is indicative of the reactive near-field of a sun or planet.

Very close to the antenna, in the reactive region, energy of a certain amount, if not absorbed by a receiver, is held back and is stored very near the antenna surface. This energy is carried back and forth from the antenna to the reactive near-field by electromagnetic radiation of the type that slowly changes the electrostatic and magnetostatics effects. For example, current flowing in the antenna creates a purely magnetic component in the near-field, which then collapses as the antenna current begins to reverse, causing transfer of the field's magnetic energy back to electrons in the antenna as the changing magnetic field causes a self-inductive effect on the antenna that generated it. This returns energy to the antenna in a regenerative way, so that it is not lost. A similar process happens as electric charge builds up in one section of the antenna under the pressure of the signal voltage and causes a local electric field around that section of the antenna, due to the antenna's self-capacitance. When the signal reverses so that charge can flow away from this region again, the built-up electric field assists in pushing

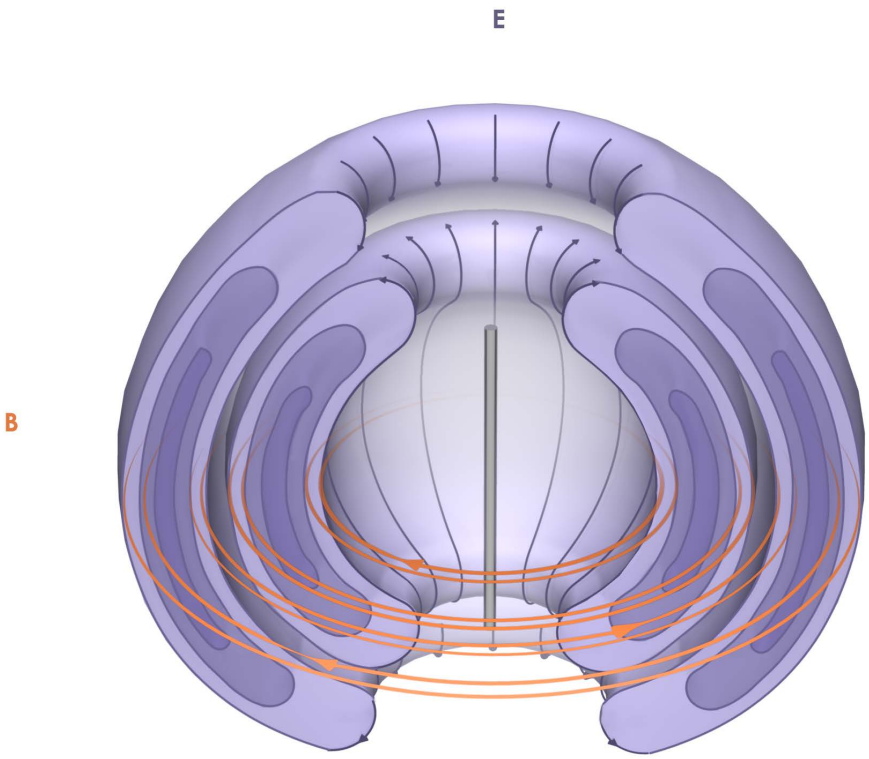

Figure 7. Near-field dipole pattern.

electrons back in the new direction of their flow, as with the discharge of any unipolar capacitor. This again transfers energy back to the antenna [39].

We note that the near-field reactive complex operation is an electrical analog to the self-excited dynamo theory of the Earth and Sun put forth by Sir Larmor, though described within the context of wireless power transfer. This description of a magnetic reactive region of the Earth's near-field becomes more tenable when considering the Faraday Disc model put forth by Dr. Elsasser.

Because of this energy storage and return effect, if either of the inductive or electrostatic effects in the reactive near-field transfer any field energy to electrons in a nearby body or conductor, then this energy is lost to the primary antenna. When this happens, an extra drain is seen on the transmitter, resulting from the reactive near-field energy that is not returned. This effect shows up as a different impedance in the antenna, as seen by the transmitter. The planets are seen as a nearby body or conductor and energy is drawn from the Sun and transferred to the planets.

The radiative near-field, called the Fresnel region, does not contain reactive field components from the source antenna, since it is far enough from the antenna that back-coupling of the fields becomes out of phase with the antenna signal, and thus cannot efficiently return inductive or capacitive energy from antenna currents or charges. The energy in the radiative near-field is thus all radiant energy, although its mixture of magnetic and electric components is still different from the far-field.

The near-field is remarkable for reproducing classical electromagnetic induction and electric charge effects on the electromagnetic field, which effects *die-out* with increasing distance from the antenna. The electrostatic field strength is proportional to the inverse-cube of the distance $1/r^3$ and magnetic field strength proportional to inverse-square of distance $1/r^2$ [40].

More distant near-field effects also involve energy transfer effects that couple directly to receivers near the antenna, affecting the power output of the transmitter if they do couple, but not otherwise. In a sense, the near-field offers energy that is available to a receiver only if the energy is tapped, and this is sensed by the transmitter by means of responding to electromagnetic near-fields emanating from the receiver. Again, this is the same principle that applies in induction coupled devices, such as a transformer, which draws more power at the primary circuit if power is drawn from the secondary circuit (**Figure 8**). This is different with the far-field, which constantly draws the same energy from the transmitter, whether it is immediately received, or not.

The amplitude of other non-radiative/non-dipole components of the electromagnetic field close to the antenna may be quite powerful, but, because of more rapid fall-off with distance they do not radiate energy to infinite distances. Instead, their energies remain trapped in the region near the antenna, not drawing power from the transmitter unless they excite a receiver in the area close to the antenna. Thus, the near-fields only transfer energy to very nearby receivers, and, when they do, the result is felt as an extra power draw in the transmitter. As an example of such an effect, power is transferred across space in a common transformer by means of near-field inductive coupling, resulting in a short range of one wavelength of the signal. Our solar system performs wireless power transfer in the exact same manner using near-field inductive coupling, but on a much larger physical and wattage scale.

5. Classical Electromagnetic Modelling

When modeling the solar system antennas, the fields of a source in a homogeneous isotropic medium can be written as a multipole expansion. The terms in this expansion are spherical harmonics which give the angular dependence

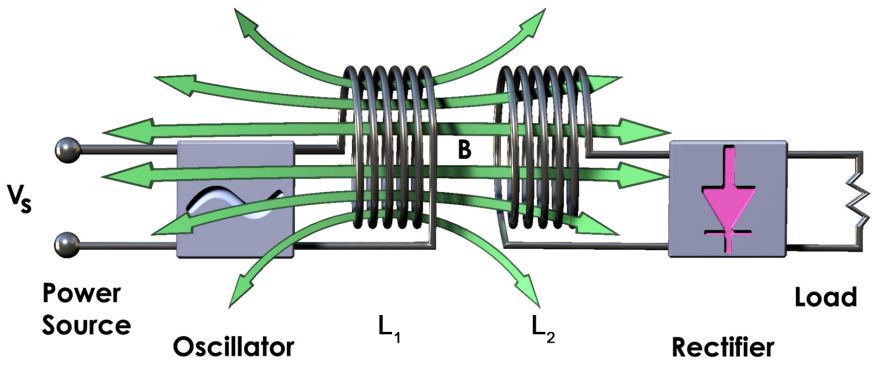

Figure 8. Inductive coupling.

multiplied by spherical Bessel functions which give the radial dependence. As one gets closer and closer to the source, approaching the near-field, other powers of r become significant [41].

The near-field term that becomes dominant is proportional to $1/r^2$ and is sometimes called the induction term [42]. It can be thought of as the primarily magnetic energy stored in the field, and returned to the antenna in every half-cycle, through self-induction. For even smaller r, terms proportional to $1/r^3$ become dominant; this is sometimes called the electrostatic field term and can be thought of as stemming from the electrical charge in the antenna element. For the Earth, this is considered to be a very low elevation phenomenon.

Extremely close to the surface of the planet, the multipole expansion is not applicable as there are too many terms needed for detailed description of the fields. In the extreme near-field, it is sometimes useful to express the contributions as a sum of radiating fields combined with evanescent fields. An evanescent field is an oscillating electromagnetic field that does not propagate as an electromagnetic wave but whose energy is spatially concentrated near the surface. Since the net flow of electromagnetic energy is given by the average Poynting vector, that means that the Poynting vector in these regions, as averaged over a complete oscillation cycle, is zero. A characteristic of an evanescent field is that there is no net energy flow in that region. In the planet itself, or as soon as one enters a region of inhomogeneous materials, the multipole expansion is no longer valid.

Solving Maxwell's equations for the electric and magnetic fields for a localized oscillating source, such as a planet, surrounded by a homogeneous material, yields fields that, far away, decay in proportion to $1/r$ where r is the distance from the source. These are the radiating fields, and the region where wavelength exceeds r is large enough for these fields to dominate the far-field. For large r, the spherical Bessel functions decay as $1/r$, giving the radiated field above. It is thought that the far-field or radiating field is what dominates past the wavelength or r; the field moving past the planet. There is comparatively little effective energy associated with the far-field. It is the field that travels through empty space into infinity.

6. Wave Impedance & Time Wave Theory

The electromagnetic field in the far-field region of an antenna is independent of the details of the near-field and the nature of the antenna. The wave impedance is the ratio of the strength of the electric and magnetic fields, which in the far-field are in phase with each other. The wave impedance of an electromagnetic wave is the ratio of the transverse components of the electric and magnetic fields. The transverse components being those at right angles to the direction of propagation. For a transverse-electric-magnetic (TEM) plane wave traveling through a homogeneous medium, the wave impedance is everywhere equal to the intrinsic impedance of the medium. Thus, the far-field "impedance of free

space" is resistive and is given by:

$$Z_0 \stackrel{\text{def}}{=} \mu_0 c_0 = \sqrt{\frac{\mu_0}{\epsilon_0}} = \frac{1}{\epsilon_0 c_0}$$

With the usual approximation for the speed of light in free space $c_0 \approx 3.00 \times 10^8$ m/s, this gives the frequently used expression [43]:

$$Z_0 = 119.92\pi\ \Omega \approx 120\pi \approx 377\ \Omega$$

The electromagnetic field in the near-field region of a spherical coil antenna is predominantly magnetic. For small values of r/λ the impedance of a magnetic loop is low and inductive, at short range being asymptotic to:

$$|Z_W| \approx 240\pi^2 \frac{r}{\lambda} \approx 2370 \frac{r}{\lambda}$$

The electromagnetic field in the near-field region of a rod antenna is predominantly electrostatic. For small values of r/λ the impedance is high and capacitive, at short range being asymptotic to:

$$|Z_W| \approx 60 \frac{\lambda}{r}$$

In both the magnetic and electrostatic cases, the wave impedance converges on that of free space as the range approaches the far-field.

If we assume for a moment the rotor of the Earth as a rod antenna, and the wavelength and distance are equal based on the distance from the Sun, we obtain an impedance of 60 Ω. Using the same approach, we obtain a constant of 60 Ω for all planets using their relative distance and wavelength from the Sun. 60 Ω is thus a near-field constant for all planets in the solar system. Recalling my first paper [44] the near field electrostatic field, which is closest to the surface of the Earth, was postulated to act as a dynamic break for the Earth. It was theorized that force, or *g*, is intended to speed regulate the Earth at a near constant 465 m/s.

Since absolute units of charge and current are expressed as combinations of units of mass, length, and time, dimensional analysis of the relations between potential, current, and resistance show that resistance is expressed in units of length per time—velocity. The absolute-units system related magnetic and electrostatic quantities to metric base units of mass, time, and length. These units had the great advantage of simplifying the equations used in the solution of electromagnetic problems and eliminated conversion factors in calculations about electrical quantities. However, the centimeter-gram-second, CGS, units turned out to have impractical sizes for practical measurements. Some early definitions of a unit of resistance, for example, defined a unit resistance as one quadrant of the Earth per second. Whereby a quadrant is defined as a fourth of the planet's circumference. It is concluded that the wave impedance is what determines time at one quadrant of the Earth per second.

To calculate minutes from the nearest electrostatic field,

$$60 \text{ ohm} = 60 \text{ quadrants}/60 \text{ s}$$

$$60 \text{ s} = 60 \text{ quadrants}/60 \text{ ohms}$$

$$1 \text{ minute} = 1 \text{ quadrant}/\text{ohm}$$

It is postulated that seconds and minutes of our concept of Time are speed regulated by the electrostatic near-field which by electrostatic force creates a dynamic brake on the Earth. Increasing the force of the brake slows the speed of the Earth and decreasing the force increases the speed of the Earth. Seconds and minutes are thus regulated by planetary speed.

For the near magnetic sphere, we note that $2370 = 240\pi^2 = 60 \times 4\pi^2$, which immediately recalls Kepler's third law [45]. Kepler's law of periods is an approximation that serves well for the orbits of the planets because the Sun's mass is so dominant. If we insert 1 minute for 60 seconds in the magnetic spherical antenna we have an equation that matches Kepler's simplified equation,

$$G = 4\pi^2$$

Reinserting 60 seconds and solving for G in absolute values of electromagnetic units (EMU), where $1\,\Omega = 1E \times 10^{-9} ab\Omega$

$$G = 2.47 \times 10^{-6}$$

It is thought that 2.47×10^{-6} may represent the average motor speed constant ks for the eight planets in the solar system. Using Kepler's law, we find that the average time period for all eight planets in our system approximates 60 years. It is postulated that years in our concept of Time are a function of speed regulation by the eight planets synchronous elliptical orbits. It is speculated that the eight plants repeat a certain orbit or position every 60 years establishing a point of synchronicity, thus years are a constant marker in time.

The number 60 can historically be traced to early astronomers who recorded epicycles, an ancient geometric model used to explain the variations in speed and direction of the apparent motion of the Moon, Sun, and planets. Primarily the epicycle explained the apparent retrograde motion of the five planets known at the time. The highest number appeared in a discussion of King Alfonso X of Castile's who had an interest in astronomy during the 13th century, and is credited with the Alfonsine tables, which formed the basis of Copernicus heliocentric model of the solar system. By this time each planet had been provided with from 40 to 60 epicycles to represent its complex movement among the stars [46]. Epicyclical motion is used in the Antikythera mechanism, an ancient Greek astronomical device for compensating for the elliptical orbit of the Moon, moving faster at perigee and slower at apogee than circular orbits would, using four gears, two of them engaged in an eccentric way that quite closely approximates Kepler's second law.

The Law of Periods

According to Kepler's Law of Periods "*the square of the period of any planet is proportional to the cube of the semimajor axis of its orbit.*"

$$T^2 = \frac{4\pi^2}{GM} a^3$$

This law arises from the law of gravitation. Newton first formulated the law of gravitation from Kepler's third law. Figure 9 plots the values obtained for the various planets for Kepler's Law of Periods (Table 1).

In the above formula, if,

T = *Earth Years*

a = *Astronomical units* AU ($a = 1AU$ *for Earth*)

M = *Solar masses* $M_\odot$

Then,

$$\frac{4\pi^2}{GM} = 1$$

There the above formula of the Law of Periods can simply be expressed as:

$$T^2 = a^3$$

Kepler's Law of Periods in the above form is an approximation that serves well for the orbits of the planets because the Sun's mass is so dominant. But more precisely the law should be written as:

$$T^2 = \frac{4\pi^2}{G(M_1 + M_2)} a^3$$

Data from Kepler's Law of Periods, as shown in Table 1, comes from measurements of the motion of the planets. The quantity T^2/a^3 depends upon the sum of the masses of the Sun and the planet, but since the mass of the Sun is so great, adding the mass of the planet makes very little difference.

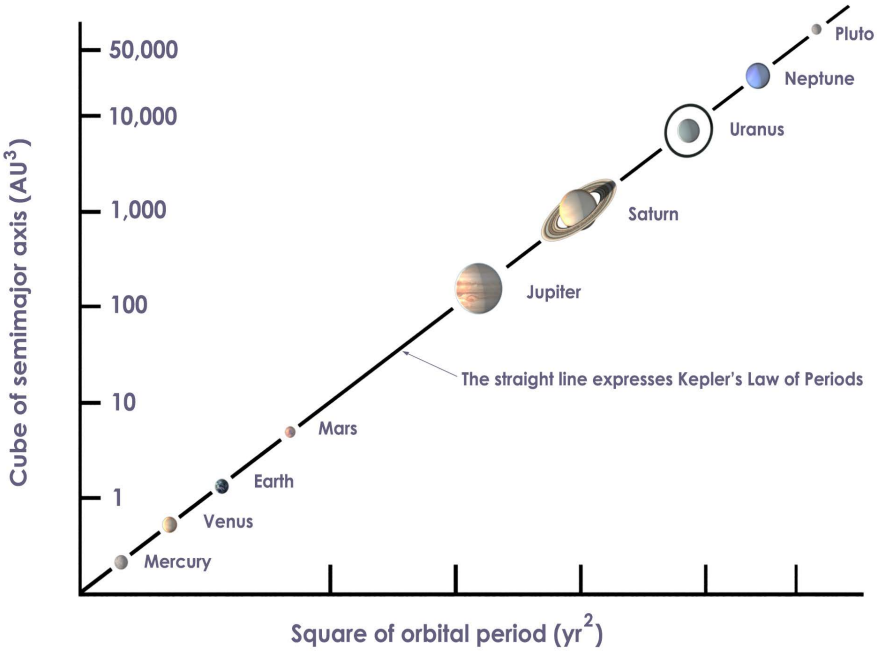

Figure 9. Kepler's law of periods.

Table 1. Data from Kepler's law of periods (Halliday, Resnick, Walker, Fundamentals of Physics 4th Ed).

Planet	Semimajor Axis (10^{10} m)	Period T (y)	T^2/a^3 (10^{-34} y^2/m^3)
Mercury	5.79	0.241	2.99
Venus	10.8	0.615	3.00
Earth	15.0	1	2.96
Mars	22.8	1.88	2.98
Jupiter	77.8	11.9	3.01
Saturn	143	29.5	2.98
Uranus	287	84	2.98
Neptune	450	165	2.99

It is also postulated that the "impedance of free space" defines the number of days in a year. The Julian calendar was introduced in 45 BC by Julius Caesar after consultation with the Alexandrian astronomer Sosigenes. The ordinary year in the previous Roman calendar consisted of 12 months, for a total of 355 days. In addition, a 27-day intercalary month, the *Mensis Intercalaris*, was sometimes inserted between February and March. This intercalary month was formed by inserting 22 days after the first 23 or 24 days of February, the last five days of February becoming the last five days of *Intercalaris*. The net effect was to add 22 days to the year, forming an intercalary year of 377 days [47].

It is noted that $T^2/a^3 = 3.0 \times 10^{-34}$ y^2/m^3 and that the Sun's rotational speed is 3.0×10^{-6} rad/s. We propose to investigate an algebraic explanation that will align these two numbers and explain synchronicity of the planets with the Sun in our solar system. An analogy would be the synchronizing of eight back-up generators to the grid of a power system. A new equation for solar system synchronization is conceived and presented:

$$\frac{v \times c^2}{60} = \frac{a^3}{T^2}$$

where,

$$v = 3.0 \times 10^{-6} \text{ rad/s} = 2088 \text{ m/s}$$

$$a^3/T^2 = 3.33 \times 10^{33} \text{ m}^3/\text{y}^2 \times \text{y}^2/(377 \text{ days} \times 24 \text{ hr} \times 3600 \text{ s})^2 = 3.13 \times 10^{18} \text{ m}^3/\text{s}^2$$

$$a^3/T^2 = 3.33 \times 10^{33} \text{ m}^3/\text{y}^2 \times \text{y}^2/1.0 \times 10^{15} \text{s}^2 = 3.13 \times 10^{18} \text{ m}^3/\text{s}^2$$

$$v \times c^2/60 = 2088 \text{ m/s} \times 9 \times 10^{16}/60 \text{ m}^2/\text{s}^2 = 3.1 \times 10^{18} \text{ m}^3/\text{s}^2$$

This proves the Sun's rotation is synchronized to the planets' orbital periods by the following equation,

$$\frac{v \times c^2}{60} = \frac{a^3}{T^2} = \frac{G(M_1 + M_2)}{4\pi^2}$$

This proof also verifies that 377, a Julian calendar day, is an instrument of planetary synchronicity and time, and the solar system's 60 second oscillations.

All of which depend on synchronization of the Sun and the eight planets at 3.13 $\times 10^{18}$ m^3/s^2. It is proposed that the new equation $vc^2/60 = a^3/T^2$ is complementary to Kepler's law of planetary motion. The speed of light was not known with any degree of accuracy until 1704. In his book *Opticks* [48], Isaac Newton reported Rømer's calculations of the finite speed of light and gave a value of "seven or eight minutes" for the time taken for light to travel from the Sun to the Earth (the modern value is 8 minutes 19 seconds). A tine period which corresponds to flux transfer events. Kepler, not having the background of c^2, would have thus never surmised a way to reconcile the speed of rotation of the Sun with his third law. The new equation presented appears to be the missing fourth equation that explains synchronism of the planets and the Sun. Four hundred years have come and gone since Johannes Kepler created the laws of planetary motion. This is an extraordinary discovery in classical physics of scientific and historical significance. Synchronicity of the Sun and eight planets is the foundation, and initial proof, of time wave theory. The time wave theory states that time is a derivative of wave impedance.

It is surmised that wave impedance of the near and far-field is what gives us our concept of time. From our previous work we deduced that the magnetic and electrostatic fields meet above the Earth and particles transition when the E/B fields are equivalent [44]. We now think that electrostatic and magnetic field are synchronized together in time. In a similar fashion, it is thought that 60 seconds, or 1 minute, is a solar system reference point, or the time dimension for the E/B field interaction. This concept of an electromagnetic time wave theory is consistent with Einstein's statement "Time is not absolute".

Using the three known equations for wave impedance we can computer model a cosmic timewave controller using PID loop control theory. A simple block diagram (**Figure 10**) of the cosmic timewave controller using three tier system architecture is presented in **Figure 10**.

One cannot help but ponder the possibilities. If by building an exact replica of the cosmic timewave machine, might we then proceed to tune our model to resonate with sufficient energy and force, such that man can influence the oscillations of time. All three equations tell us that time has frequency, wavelength, and amplitude. Time in our solar system is a time wave, plotted against the clock of the universe. The nodes and anti-nodes of vibration associated with resonance in things like strings and electromagnetic waves have characteristic patterns called standing waves. These standing wave modes arise from the combination of reflection and interference such that the reflected waves interfere constructively with the incident timewave. It is the reflected timewave that is the curiosity, for it is traveling backwards against time as we know it. Might this be the way to time travel or travel back to the future using a computer algorithm inserted into vibratory machine set to resonate and create standing timewaves. With a reflected timewave there would be a 180-degree change in phase flipping the wave over, so it constructively interferes. Production of a standing time wave involves

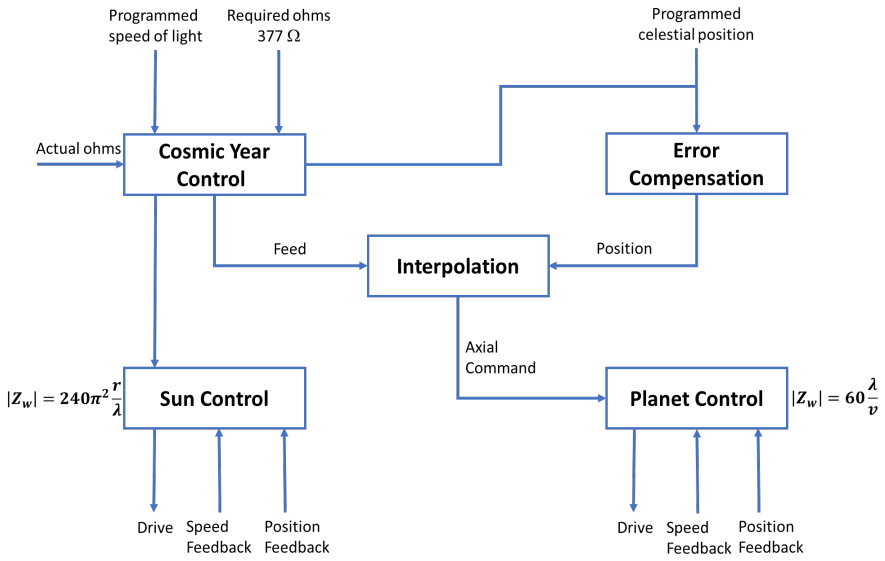

Figure 10. PID cosmic time wave controller.

reflection from both the open and closed ends of space. Barriers such as planets, asteroids and other bodies will reflect the time wave. The time wave theory suggests that historical time travel requires an understanding of the mechanism of time, i.e. wave impedance, resonant frequency, wavelength and the medium, or plenum, through which waves travel. Conversely futuristic time travel may be a function of acceleration of the wave velocity of a forward traveling time wave. Changing tension and mass during a resonant condition might catapult a standing time wave far into the future. It is conceivable that harmonic time waves and reflected waves are riding atop the fundamental wave of time as we know it. *Déjà vu* is the feeling that the situation currently being experienced has already been experienced in the past. There may be a scientific basis in faint reflected time waves for *Déjà vu* that most all humans experience in their lives on a periodic basis. Timewave theory suggests any moment in time has happened before, during and after, or will happen in the future. The resonance is created by the occasional constructive interference of two timewaves which travel in opposite directions in space, but the effect, and rarely noticed *Déjà vu* is that of an entire system of time wave is moving in simple harmonic motion.

Dark matter, or *plenum*, and dark energy is the doorway to time travel it seems. Building a cosmic time wave machine that models real time is a complex electrical engineering task, but certainly PID control theory is proven and can be readily accomplished. Time travel is not inconceivable but a collaborative effort between theoretical physicists and electrical engineers is needed to overcome the obstacles. Time wave theory could be an entirely new field or curriculum. Time waves certainly fit within the context of string theory and the theory of everything. Nothing in the universe is truly static including time. Time is another dimension of space, but with its own undulation or wavelike motion.

7. Law of Cosmic Efficiency

From our new equation $vc^2 = a^3/T^2$ it is implicit that the units (m^3/s^2) are standard SI units for Volume Acceleration or Q. The symbol is often used to refer to Volume Acceleration. Volume Acceleration, or Q, can be thought of as the equivalent of an acoustic force. It has units of m^3/s^2. For a mechanical system, Newton's Second Law of motion is $F = ma$. F is the force input into the system, a is the acceleration response output, and m is the mass. For an acoustic system, the Volume Acceleration (Q) is equivalent to the vibratory force in a mechanical system, and sound pressure (P) is the equivalent to the vibratory acceleration output response. From what is known about sound systems we can deduce the following new law of cosmic efficiency for our solar system [49]:

$$\frac{P}{F} = \frac{A}{Q}$$

as shown below:

P = Sound Pressure in Pascals (Pa)

F = Vibratory Force in Newtons (N)

A = Vibratory Acceleration (m/s^2)

Q = Volume Acceleration (m^3/s^2)

Both P/F and A/Q reduce to the same units of $1/m^2$, making them equivalent. Fuel efficiency units are measured in $1/m^2$, but it can also be referred to as energy efficiency measured in Joules and would aptly be called the energy efficiency of the solar system.

The new law of cosmic efficiency lends credence to my earlier work on cosmic string theory [50] and the ensemble of vibratory mechanical strings. It may be coincidental that the eight planets and two dwarf planets make up ten dimensions, which matches the superstring theory number. What cannot be coincidental is the relationship of Q and inflation theory. Near- and far-fields of acoustics parallel those of electromagnetics. Our solar system is an orchestra of cosmic sounds. To achieve orbital tone, and maintain time at 60s, 377 days and 60 years the acoustic system maintains a constant 3.1×10^{18} Q expansion rate. A new field of solar system acoustics merged with cosmic superstring theory is advanced. One of the big four numbers Q of the law of cosmic efficiency has been determined. Three more quantities have yet to be discovered.

8. Velocity-Energy Equivalence

The new equation for the Sun of $vc^2/60$ has a familiar look to $E = mc^2$ and giving consideration to the Sun as a nuclear device, it is thought that we may have a new set of equivalence to Einstein's equation. Equating energy to velocity postulates a new law of the Sun,

$$E = \frac{vc^2}{60}$$

If we take the average orbital speed of the eight planets,

$$E = \frac{19666\ \text{m/s} \times 9 \times 10^{16}\ \text{m}^2/\text{s}^2}{60}$$

$$E = 2.95 \times 10^{19}\ \text{J}$$

Divide the total joules by the eight planets to obtain the average energy of each planet, 3.68×10^{18} J. This number is close to the 3.13×10^{18} J we calculated previously. If we were to include the two dwarf planets, Pluto and Eris, it is expected that this average energy draw would be closer to 3.13×10^{18}. We cannot include them at this time as the orbital speeds for dwarf planets are not known.

Using the mass-energy equivalence and assuming a relatively small amount of material leaving the Sun of mass of $m = 327$ grams

$$E = mc^2$$

$$E = 327\ \text{g} \times 9 \times 10^{16}\ \text{m}^2/\text{s}^2$$

$$E = 2.95 \times 10^{19}\ \text{J}$$

This equates to the energy requirements of the Sun to electrically power the planets.

Calculation for the tons of particles per year required:

$$327\ \text{g} \times 3600\ \text{s} \times 24\ \text{hr} \times 1\ \text{kg}/1000\ \text{g} \times 2.2\ \text{lbs/kg} \times 1\ \text{Ton}/2000\ \text{lb} = 34\ \text{Tons per day}$$

$$30\ \text{Tons/day} \times 365 = 10857\ \text{Tons per year}$$

We can compare this with the estimated 10,000,000 Tons per year that the Sun loses in mass [51]. This suggests that less than 0.001% of the Sun's energized particles reach the eight planets in the form of electrical energy. The Sun is a very inefficient transmitter of electrical energy, but it has more than ample power to motor the electromagnetic planets. Assuming the Sun is entirely hydrogen, and helium a byproduct of fusion, we can use the Ideal Gas Equation $PV = nRT$ to calculate the total mass of the Sun at 3.81E32Kg. From this we concluded that the mass-energy required to power the planets is insignificant.

As such both the mass-energy equivalence and the velocity-energy equivalence are given deference to Keppler's calculation, which have stood for 400 years. We initially inverted Keppler's finding to a^3/T^2 = 3.33E33 m^3/y^2. This number compares remarkably well to the total energy content of the planets as shown in **Table 2**.

This comparison gives a high degree of certainty that Kepler 3rd law is representative of the average total energy for the planets divided by the time conversion $(KE + PE)/1.0 \times 10^{15}$, which then equates to the mass-inverse equivalence and velocity-inverse equivalence. Therefore, it is concluded that of the particles that leave the Sun, travel through space and effectively connect with another spherical planet the energy can be represented by an average value of 3.13×10^{18} m^3/s^2.

Based on the mathematical proof above, we believe that we have uncovered a new set of equations to balance the energy dissipated from the Sun to the

Table 2. The energies of the planets.

Planet	Potential Energy	Kinetic Energy	Total Energy
Mercury	-7.5526×10^{32}	3.79059×10^{32}	-3.76201×10^{32}
Venus	-5.98571×10^{33}	2.9749×10^{33}	-3.01081×10^{33}
Earth	-5.59201×10^{33}	2.66762×10^{33}	-2.62439×10^{33}
Mars	-373775×10^{32}	1.86979×10^{32}	-1.86796×10^{32}
Jupiter	-3.24179×10^{35}	1.62046×10^{35}	-1.62133×10^{35}
Saturn	-5.28556×10^{34}	2.65372×10^{34}	-2.63184×10^{34}
Uranus	-4.01788×10^{33}	2.00961×10^{33}	-2.00827×10^{33}
Neptune	-3.02974×10^{33}	1.5216×10^{33}	-1.50814×10^{33}

electromagnetic energy transport system to meet the needs of the mechanical orbital system. This equation set presented is for the electromagnetic transfer of energy from the Sun; to be dispersed to the solar system:

$$E_{Sun} = mc^2 = \frac{vc^2}{60} = \frac{a^3}{T^2} = \frac{G\left(M_1 + M_2\right)}{4\pi^2} = \frac{KE + PE}{1.0 \times 10^{15}} = Q = \frac{FA}{P}$$

Velocity-Energy Equation,

$$E_{Sun} = \frac{vc^2}{60}$$

In the case of the Sun we find that $vc^2/60 = Q$ is equal m^3/s^2. Performing unit substitution, we obtain the following:

$$\frac{P}{F} = \frac{A}{Q}$$

$$Q = F \times \frac{A}{P}$$

$$Q = \text{Newtons} \times \text{m}/\text{s}^2/\text{Pa}$$

Substituting we obtain the following average Energy or Power Transfer value for each planet.

$$E = 3.13 \times 10^{18}\ \text{m}^3/\text{s}^2$$

$$E = 3.13 \times 10^{18}\ \text{N} \cdot \text{m}/\text{s}^2/\text{Pa}$$

$$E = 3.13 \times 10^{18}\ \text{J}/\text{s}^2/\text{Pa}$$

$$E = 3.13 \times 10^{18}\ \text{W}/\text{s}/\text{Pa}$$

Substituting Erg for Watts and Atmosphere for Pascal we obtain,

$$E = 3.14 \times 10^{30}\ \text{Erg}/\text{Atm}$$

It should not be lost that this energy number starts with Archimedes Constant or Pi, a number synonymous with a circle or a sphere. We conclude that we have a new Velocity-Energy Equivalence that equates to the Mass-Energy Equivalence. Since the Sun is nuclear fusion it is speculated that the velocity-energy

equation of $E = v \times c^2/60$ is an energy conversion formula that takes nuclear power, or fusion, and turns it into electromagnetic energy to transmit throughout the solar system. The works in this paper assert that Energy can be transformed into mass (nuclear), velocity (electromagnetic) or orbital (kinetic) energy.

The velocity-energy equivalence states that a body having velocity (electromagnetic) has an equivalent amount of energy and vice versa, with these fundamental quantities directly relating to the equation:

$$E = \frac{vc^2}{60}$$

This new formula states that the equivalent energy (E) can be calculated as the velocity (v) multiplied by the speed of light (c = about 3×10^8 m/s) squared. Similarly, anything having energy exhibits a corresponding velocity (v) given by its energy E divided by the speed of light squared c^2 and multiplied by 60, the origin of time. Because the speed of light is a very large number in everyday units, the formula implies that even an everyday object at rest with an electron/particle velocity has a very large amount of energy internally. Nuclear energy transformations, such as the Sun causes the solar system to lose some of its energy content, and thus some corresponding velocity, releasing it as electromagnetic power and the radiant energy of light or as thermal energy. Given our new understanding of the wireless cosmic power transfer system it is reasonable to assume that other suns or stars are interconnected to our own Sun acting as an electrical power grid of interconnected generators. The stars are synchronized at $1/60^{th}$ of a second and share planetary loads working to keep the cosmos power system stable and reliable. The cosmic wireless power system provides uninterruptible power, other than the occasional pole flip.

Mass-energy equivalence arose originally from special relativity as a paradox described by Henri Poincaré. Einstein proposed it on 21 November 1905, in the paper *Does the inertia of a body depend upon its energy-content?* [52]—one of his *Annus Mirabilis* (Miraculous Year) papers. Einstein was the first to propose that the equivalence of mass and energy is a general principle and a consequence of the symmetries of space and time. Similarly, the equivalence of velocity and energy are a general principle and a consequence of the symmetry of space and time.

The new Sun law, $E = vc^2/60$, is a mathematical description that tells us how the Sun converts nuclear fusion energy into rotational electromagnetic energy. This electromagnetic energy is then used to inductively couple the planets to synchronize their orbits with the Sun by way of energy equivalence with Kepler's laws. The planets keep time with the Sun by the three laws of wave impedance. We have three laws of energy, three laws of planetary motion and three laws of time. Tesla was obsessed with the number three for good reason. God may not play with dice, but he likes the number 3, which is very nearly Archimedes Constant, or π. It is believed that the sun law applies to all stars, therefore these nine

laws are universal laws for the universe. The universe is gigantic synchronized electrical power grid with an atomic 1 second clock.

9. Quantum Near- and Far-Field Theory

In the quantum view of electromagnetic interactions, near-field effects are due to a mixture of real and virtual photons, whereas far-field effects are manifestations of real photons. Virtual photons composing near-field fluctuations and signals have effects that are of far shorter range than those of real photons. In physics, a virtual particle is a transient fluctuation that exhibits some of the characteristics of an ordinary particle, but whose existence is limited by the uncertainty principle. In quantum field theory, even classical forces—such as the electromagnetic repulsion or attraction between two charges—can be thought of as due to the exchange of many virtual photons between the charges. The Coulomb force, static electric force between electric charges is caused by the exchange of virtual photons. In symmetric 3-dimensional space this exchange results in the inverse square law for electric force. Since the photon has no mass, the Coulomb potential has an infinite range. The magnetic force between magnetic dipoles is also thought to be caused by the exchange of virtual photons. In symmetric 3-dimensional space, this exchange results in the inverse square law for magnetic force. Electromagnetic induction, this phenomenon transfers energy to and from a magnetic coil via a changing electromagnetic field using virtual photons. Virtual photons are also thought to affect the impedance of free space, which defines the ratio between the electric field strength $|E|$ and the magnetic field strength $|H|$: $Z_0 = |E|/|H|$ [53].

For electromagnetic forces, the zero rest-mass of the associated boson particle permits long-range forces to be mediated by virtual particles. However, in the case of photons, power and information transfer by virtual particles is a relatively short-range phenomenon existing only within a few wavelengths of the field-disturbance, as for example seen in the characteristically short range of inductive and capacitive effects in the near-field zone of coils and antennas. The near-field of antennas is where the magnetic and electrostatic effects of the changing current in the antenna wire and the charge effects of the wire's capacitive charge are important contributors to the total electromagnetic field close to the source. The magnetic and electrostatic effects are dipole effects that decay with increasing distance from the antenna much more quickly than do the influence of conventional electromagnetic waves that are far from the source. The far-field waves, for which E is in the limit of long distance equal to $c \times B$, are composed of actual photons. Actual and virtual photons are mixed near an antenna, with the virtual photons responsible only for the extra magnetic-inductive and transient electric-dipole effects, which cause any imbalance between E and $c \times B$. As distance from the antenna grows, the near-field effects as dipole fields die out more quickly, and only the radiative effects that are due to actual photons remain as important effects. Although virtual effects extend to infinity, they

drop off in field strength as $1/r^2$ rather than the field of electromagnetic waves composed of actual photons, which drop $1/r$.

Planck's equation, which was proposed by Max Planck to describe how energy is transferred in quanta or packets is given below:

$$E = h\nu$$

where

E = energy

h = Planck's constant = 6.626×10^{-34} J·s

ν = frequency

The second equation is the wave equation, which describes the speed of light in terms of wavelength and frequency:

$$c = \lambda\nu$$

where

c = speed of light = 3×10^8 m/sec

λ = wavelength

ν = frequency

Rearrange the equation to solve for frequency:

$$\nu = c/\lambda$$

Next, replace frequency in the first equation with c/λ to get a formula you can use:

$$E = h\nu$$

$$E = \frac{hc}{\lambda}$$

All that remains is to plug in the values and get the answer:

$$E = \frac{6.626\times10^{-34}\,\mathrm{J\cdot s}\times3\times10^{8}\,\mathrm{m/sec}}{633\,\mathrm{nm}\times10^{-9}\,\mathrm{m/1\,nm}}$$

$$E = \frac{1.988\times10^{-25}\,\mathrm{J\cdot m}}{6.33\times10^{-7}\,\mathrm{m}}$$

$$E = 3.14\times10^{-19}\ \mathrm{J}$$

If we then invert the value of energy of a photon we obtain,

$$E = 3.18\times10^{18}/\mathrm{J}$$

A curious coincident, or an unlikely, yet fortuitous addition to our wonderous equation that now connects quantum electrodynamics to macrophysics. It would seem that the energy of the Sun is the creator of wavelength, speed of light and Plank's constant. The quantization of light and matter are derived from solar energy. Assuming new (SI) units for our invert constant can be developed, we have a new addition to the equation.

$$E = mc^2 = \frac{vc^2}{60} = \frac{a^3}{T^2} = \frac{G\left(M_1 + M_2\right)}{4\pi^2} = \frac{KE + PE}{1.0\times10^{15}} = Q = \frac{PA}{F} = \frac{\lambda}{hc}$$

The elementary charge, usually denoted as q, is the electric charge carried by a single proton, or a single electron, which has charge—e. This elementary charge is a fundamental physical constant. To avoid confusion over its sign, e is sometimes called the elementary positive charge. This charge has $1.602176634 \times 10^{-19}$ C. If we perform the same inverse function and divide by 2 we obtain:

$$E = 1/2\,q$$

$$E = 1/2 \times 1.602176634 \times 10^{-19}\ \text{C}$$

$$E = 3.12 \times 10^{18}$$

This again implies that the electron charge is derived from the Sun's electromagnetic energy, and our equation continues to grow:

$$E = mc^2 = \frac{vc^2}{60} = \frac{a^3}{T^2} = \frac{G\left(M_1 + M_2\right)}{4\pi^2} = \frac{KE + PE}{1.0 \times 10^{15}} = Q = \frac{PA}{F} = \frac{\lambda}{hc} = \frac{1}{2q}$$

10. Near-Field and Gravity Waves

The study of how electromagnetic waves move in free space and over the surface of the Earth, is important in understanding the cosmic wireless power transfer system. Electromagnetic waves passing through different types of matter experience reflection, refraction, polarization, diffraction, and absorption [54]. At lower frequencies in the longwave bands, due to diffraction, vertically polarized radio waves can bend over hills and mountains, and propagate beyond the horizon, traveling as surface waves, which follow the contour of the Earth. As the frequency drops, the losses decrease and the achievable range increases. Tremendously Low Frequency (TLF) can radiate over all of the Earth.

The near-field close to the Earth antenna, is a portion of the changing electromagnetic field, but is not considered part of electromagnetic radiation. The interaction with the Earth capacitance will cause energy to deflect back to the Earth, as occurs in the reactive near-field. The interaction with the near-field medium can fail to return energy back to the Earth source thus causing a distortion in the electromagnetic wave and this indicates the radiative (Fresnel) near-field region, which is somewhat further away.

The electromagnetic near-field does not transport a conserved amount of energy over distances, but instead fades with distance, with its energy rapidly returning to the planet. This return circuit is yet another affirmation that electrons circumnavigate the globe at a fixed speed thus generating a centripetal force towards the center of the Earth (**Figure 11**). It is the near-field electromagnetic wave traveling at 7900 m/s that gives gravity its inward centripetal acceleration of 9.8 m/s^2, or (g). Nickola Tesla described (g) in terms of "dynamic gravity", and people have pondered its meaning for a century. It only makes sense that Nickola Tesla the master of electric motors who invented "dynamic braking" would have described the Earth's mechanical brake as "dynamic gravity". Tesla would have known the Earth was a rotating machine with a near-field propagating electrons. The author surmises that the near-field is responsible for

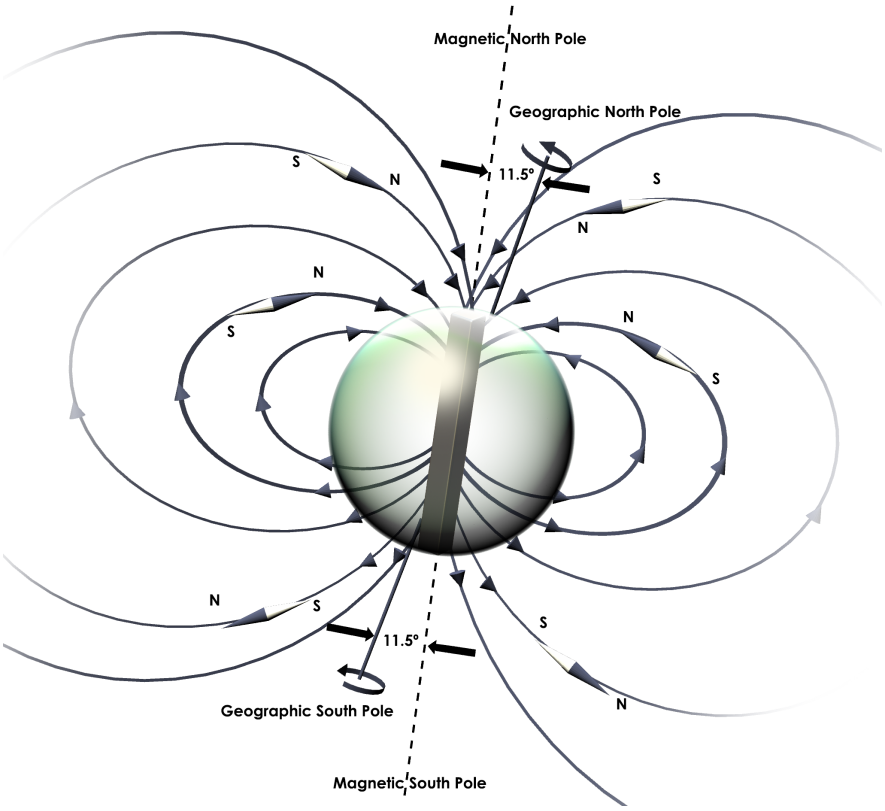

Figure 11. Earth near-field.

planetary gravity and has provided the rationale that confirms Tesla's assertion of a "dynamic gravity".

The Fresnel pattern refers to the positional dependence of the electromagnetic field in the near-field, or distorted radiative region of the source. The near-field pattern is most commonly defined over a plane placed in front of the source, or over a spherical surface enclosing it. The near-fields do not propagate freely out into space, but rather oscillate, returning their energy to the transmitter if it is not received by a receiver [55]. Currents in the Earth directly produce a magnetic field, but it is of a magnetic dipole type that dies out according to an inverse cube power law. The rapid drop in power contained in the near-field ensures that effects due to the near-field essentially vanish. In a similar manner, moving charges pushed apart in a conductor by a changing electrical potential of the antenna produce an electric dipole-type electrical field, but this also declines with distance. These fields make up the near-field nearest the electromagnetic planets.

The force in Figure 12 points in the opposite direction of the E and B wave and travels alone with both of them. Planets operate at Tremendously Low Frequency (TLF) and require very high current to power their rotation. In previous work, we calculated the current of the Earth to be 1.7 billion Amp in order to generate a magnetic field of 0.6 G at its poles using the Biot-Savart law [44]. Therefore, there is a mechanical force traveling with the electromagnetic wave. This force can be depicted using Lorentz law.

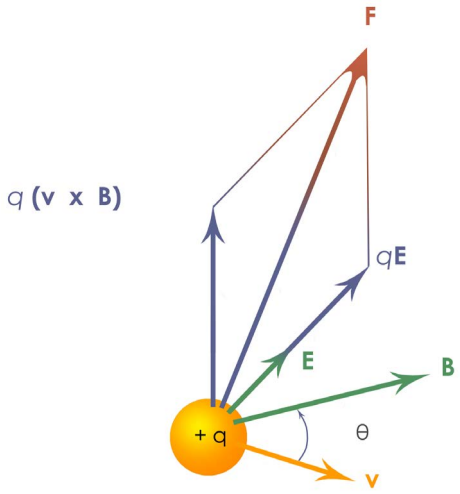

Figure 12. Lorentz vectors.

Based on cosmic string theory it is thought that electrons are a string of electrons that can be thought of as a rope. The rope oscillates at tremendously low frequency. It has an up and down motion, nonetheless. This gives the electron a centripetal force as well as a gravitational potential energy. It is this gravitational potential energy that physicists call a gravity wave. There is very little gravity or g in space, but there is always some, and the electron has mass. The gravitational potential energy is equal to the electrostatic force and both are very small, but a part of the equation nonetheless. The mechanical portion of the wave can be shown or represented as follows (**Figure 13**):

$$\text{Required centripetal force} = \frac{mv^2}{r}$$

At the top the minimum speed to maintain a circle is the speed which gives a downward centripetal acceleration a = g. So, the minimum speed at the top is given by

$$v_{\text{top}}\left(\text{minimum}\right) = \sqrt{gr}$$

Conservation of energy relates the velocities at the top and bottom of the circle:

$$\frac{1}{2}mv_{\text{top}}^2 + mg2r = \frac{1}{2}mv_{\text{bottom}}^2$$

Substitutions give the relationship between the tensions at the top and bottom.

$$T_{\text{bottom}} = T_{\text{top}} + 6mg$$

This finding will require a change to the Lorentz equation from $F = qE + qvB$ to the following:

$$F_g + F_c = qE + qvB$$

This is a significant finding because it also redefines the radio wave and the

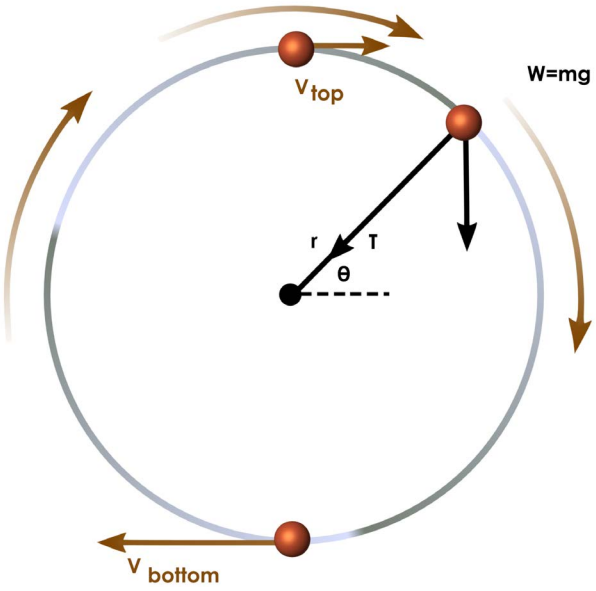

Figure 13. Centripetal and gravitational force.

power wave. The implication is that all electromagnetic waves are electrically and mechanically balanced. Observations of high current arc furnace transformers confirm this finding by way of the physical movement of the primary leads connecting the transformer. Arc furnace transformers operate effectively as short circuit and currents of tens of thousands of amps are not uncommon. Bolted short circuit faults are also known to have violent physical movements that are attributed to the Lorentz force. Given that the Earth requires over a billion amps for its normal operation, it is not a stretch of the imagination to visualize giant electromagnetic waves emanating from the Sun as plasma like conductors oscillating mechanically, as well as electrically. These are magnificent power waves propagating through space at the speed of light transferring much needed life sustaining energy to the planet's antenna. Planets are thus the most powerful of antennas, which convert electromagnetic energy to a billion amps of electric current which causes rotation and generate the planets own electromagnetic field. The receiver then becomes the transmitter. The solar system, and the universe, is envisioned as a vast network operating as a tremendously low frequency power system network. The size and immensity of the interconnected network of stars in the universe make it extremely stable and predictable.

We know that there is an electromagnetic wave that is E and B, and opposite that is a mechanical wave, which would be F centripetal and F gravitational. The wave is thus four dimensional and F can be shown to be two components, F_c and F_g, which correlate proportionally to E and B (Figure 14).

Another way to view Lorentz force is to view it on a particle basis in an electromagnetic field with a rotational force.

In the case where the charged particle q moves in both electric field E and magnetic field B, that is an electromagnetic field (Figure 15), the combined

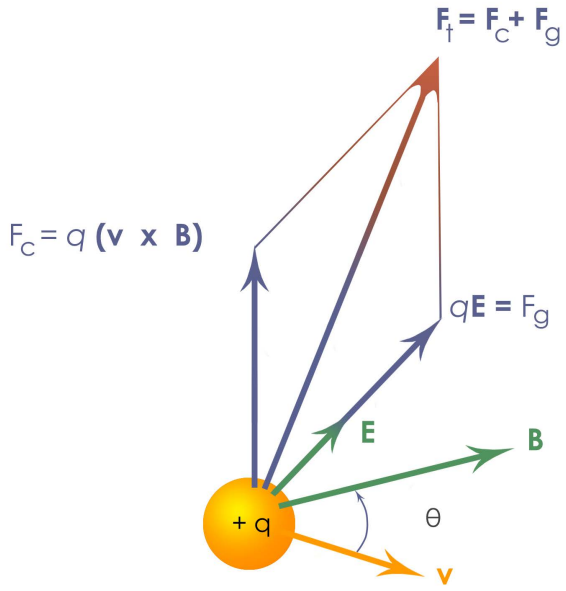

Figure 14. Lorentz force vectors.

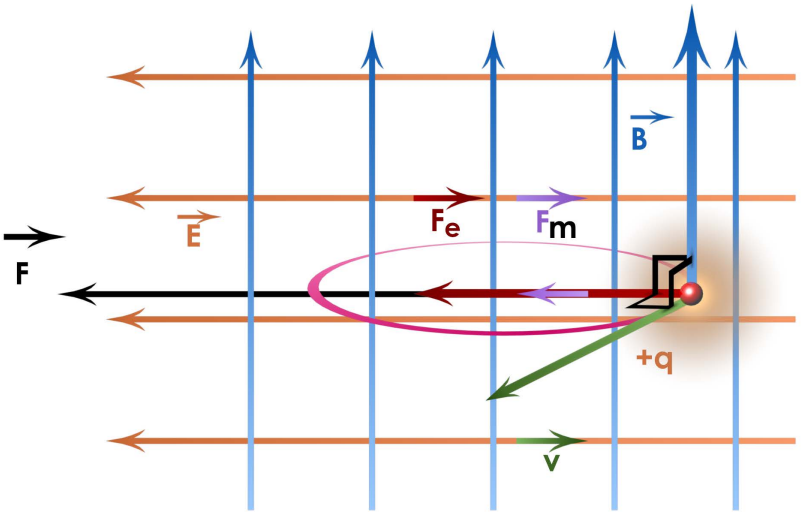

Figure 15. Lorentz electromagnetic force vectors.

force F that acts on the particle becomes the electromagnetic force that is the vectoral sum of F_e and F_m:

$$F = F_e + F_m = qE + qv \times B$$

11. Ground Waves

Ground wave propagation uses the area between the surface of the Earth and the ionosphere for transmission. The ground wave can propagate a considerable distance over the Earth's surface particularly in the tremendously low frequency. Typically, a ground wave signal is made up of a number of reflected waves. Since the Sun and the Earth are in the line of sight, there will be a direct wave as well

as a reflected signal. There will be a number of reflected signals as the transmission will be reflected by a number of objects including the Earth's surface and any hills, or large objects or buildings that may be present. In addition to this there is a surface wave. This tends to follow the curvature of the Earth and enables coverage beyond the horizon. It is the sum of all these components that is known as the ground wave. Beyond the horizon the direct and reflected waves are blocked by the curvature of the Earth, and the signal is purely made up of the diffracted surface wave. It is for this reason that the surface wave is commonly called ground wave propagation. The surface wave is also very dependent upon the nature of the ground over which the signal travels. Ground conductivity, terrain roughness or roughness of the sea, and the dielectric constant all affect the signal attenuation. In addition to this the ground penetration varies, becoming greater at lower frequencies, and this means that it is not just the surface conductivity that is of interest. At lower frequencies penetration means that ground strata down to hundreds of meters may have an effect. The tremendously low frequency gives us an idea of how deep the currents of the Earth are from the surface [56].

Despite all these variables, it is not surprising that the terrain with good conductivity gives the best result. Current prefers the least path of resistance. Thus, soil type and the moisture content are of importance. Salty sea water is the best, and rich agricultural, or Marshy land is also good. Dry sandy terrain and city centers are by far the worst. This means sea paths are optimum, although even these are subject to variations due to the roughness of the sea, resulting in path losses being slightly dependent upon the weather. It should also be noted that in view of the fact that signal penetration has an effect, the oceans seawater table may have an effect dependent upon the frequency [57].

12. Cosmic String Theory and Maxwell's Equations

Maxwell's equations are a set of equations that, together with the Lorentz force law, form the bedrock of classical electromagnetism and optics. The famous equations describe how electric and magnetic fields are generated by charges, currents, and changes of each other. One important consequence of the equations is that they demonstrate how fluctuating electric and magnetic fields propagate at the speed of light. Electromagnetic waves in vacuum travel at the speed of light according to Maxwell. When passing through a material medium, they slow down according to that object's permeability and permittivity. Dark matter is thin enough that in space waves travel very close to the speed of light. The wavelength is the distance from one peak of the wave's electric field to the next and is inversely proportional to the frequency of the wave. The distance an electromagnetic wave travels in one second, in vacuum, is 299,792,458 meters.

The electromagnetic waves that compose electromagnetic radiation can be imagined as a self-propagating transverse oscillating wave of electric and magnetic fields. **Figure 16** shows a plane linearly polarized electromagnetic radiation

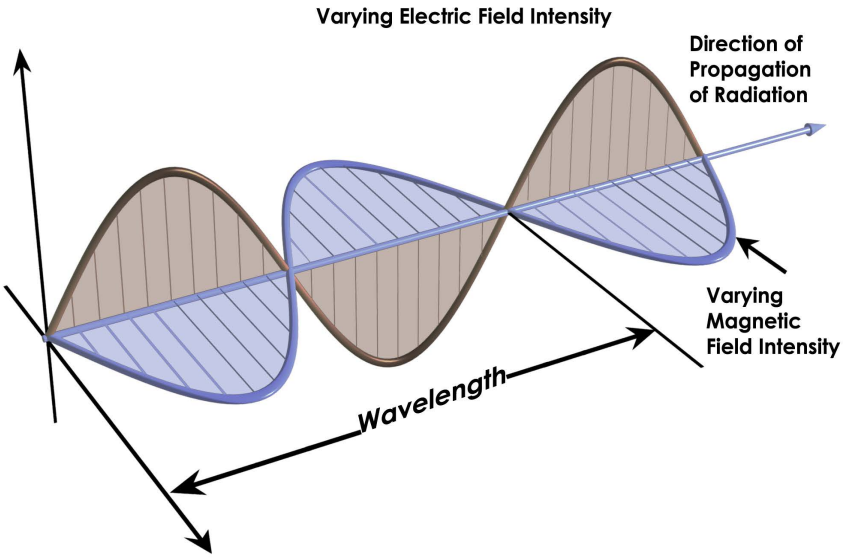

Figure 16. Electromagnetic wave.

wave propagating from left to right (X-axis). The electric field is in a vertical plane (Z-axis) and the magnetic field in a horizontal plane (Y-axis). The electric and magnetic fields in electromagnetic radiation waves are always in phase and at 90 degrees to each other.

Maxwell's equations have two major variants. The microscopic Maxwell equations have universal applicability but are unwieldy for common calculations. They relate the electric and magnetic fields to total charge and total current, including the complicated charges and currents in materials at the atomic scale. The macroscopic Maxwell equations define two new auxiliary fields that describe the large-scale behavior of matter without having to consider atomic scale details. However, their use requires experimental determined parameters for a useful description of the electromagnetic response of materials.

When considering cosmic electromagnetic waves macroscopic dominates the conversation, but even macroscopic is not sufficient to comprehend the size and immensity of cosmic waves. Maxwell, when formulating his equations in the 1800's would have never considered electromagnetic wavelengths billions of meters long and tremendously low frequency (TLF). There is no indication in the writings of Maxwell or JJ Thompson that they or anyone else of the time period used the Biot Savart law to calculate the current draw of the Earth at 1.7 billion A. It is doubtful that in the early stages of the development of these fundamental equations that the ampacity of lightning was understood. Today we know that lightning can range from several thousand amps up to 200,000 A.

Lightning is perhaps the best example we have of the grandeur of cosmic electromagnetic waves emanating from the Sun to power planets. Lightning as we know is a short circuit to ground whereas cosmic waves are traveling through space not connected to anything. But the size and power are similar and give us a clue as to the characteristics of cosmic electromagnetic waves. It is the charac-

teristics of lightning that leads one to percolate thoughts on the possible expansion of Maxwell's equations. For we know that lightning is not just an electromagnetic wave. The phenomena of lightning include much more than just propagating waves of magnetic and electric fields. Lightning is accompanied with thunderous sound waves, intense light waves, explosive pressure waves and high energy convective radiant heat waves. Combined with the Lorentz forces of centripetal and gravitational waves we begin to see that on the grand scale of lightning, or even on the scale of an arc flash we have a wave that it is multi-dimensional. When we add up all the dimensions—magnetic, electric, centripetal, gravitation, sound, light, pressure, convective and radiant heat—we have nine dimensions plus wave time.

It is postulated that lightning waves may be cosmic superstrings with ten dimensions. To extend this theory, we then begin to consider that cosmic waves are also ten dimensional super strings traveling through space. At over a billion amps and billions of miles long it is visualized that these cosmic super strings are moving through time and space as gigantic twisting bending snakes of energy. Since the cosmic waves are unground and unconnected, the current flow in the super string itself is contained when compared to when it reaches its planetary destination. Many of the dimensions of the snake are suppressed or stored like a coiled spring. The electrical and mechanical dimensions are propagating and vibrating through space waiting to connect and spring. The mechanical movement of the string produces a low frequency sound and gives space its normalized pressure and warms the space as well. Very little light is generated by the superstring in space as little change of state is occurring.

When we expand the electromagnetic wave to a cosmic scale the wave looks different than what we imagine emanating from our 20-amp wall outlet. But, then the question becomes, what is the nature of the electromagnetic wave when it is scaled down from the cosmos? We know that at a commercial or industrial service 5000 and 6000 A are not uncommon. Even at this magnitude, we have mechanical bracing to counteract the mechanical forces, and we hear the hum of vibration in the switchyard along with the smell of ozone due to pressure. When walking gingerly through a 345,000 V high voltage substation there is a sense of foreboding that should something go amiss, there are more dimensions to Maxwell's equations than just the magnetic and electric fields. One feels that beneath the surface of the electromagnetic wave are the other dimensions traveling with the electromagnetic weave. Just as voltage and current are stepped up and stepped down by transformers, it is theorized that sound, pressure, heat and light can be stepped up or stepped down based on the energy and demands of the wave. Arc flashes resemble lightning strikes and give us an example where sound, pressure, heat and light are instantly stepped up, and voltage and current stepped down. In a sense electromagnetic waves have their own built-in transformer action where nine of the dimension can be stepped up or down based on their relations and interactions with one another. It may even be possible that

the timewave stands still, speeds up or slows down, when a catastrophic event such as an arc flash occurs.

Since its beginnings superstring theory has developed into a broad and varied subject with connections to quantum gravity, particle and condensed matter physics, cosmology, and pure mathematics. Superstring theory is shorthand for supersymmetric string theory. Superstring theory is an attempt to explain all of the particles and fundamental forces of nature in one theory by modeling them as vibrations of micro supersymmetric strings. It is thought that cosmic waves in the form of electrical, mechanical, pressure, sound, heat, etc. can be used to expand the theory to the macro physics world. It is hypothesized that at low energy levels and low frequency, such as 60 Hz, normal running condition of a power system, the electromagnetic vibrations dominate the spectrum and the other dimensions of the waveform—heat, pressure, sound, and light all lay dormant or suppressed. As the energy levels increase due to increase in current and voltage the other dimensions start to become noticeable. At high currents of 5000 or 6000 A or high voltage of 345,000 V these other dimensions become even more noticeable. At fault levels, or arc flash, or even lightning, there is a significant change in energy levels, and the frequency is raised substantially. This change in frequency and energy causes the dormant dimension of heat, pressure, sound and light to increase in amplitude and strength such that they become the dominant forces involved and the electromagnetic wave becomes negligible. Effectively a change in energy and frequency changes the characteristic of the waveform from an electromagnetic and mechanical force to waveform of heat, pressure, sound and light force. This concept or theory of waveform shape shifting due to frequency would be consistent with ten-dimensional super string theory.

Maxwell himself stated to the Royal Society that he dropped the mechanical portion of his equations due to the complexity of integrating mechanical forces with the electromagnetic and electrostatic equations. This complexity grows even greater when nine or ten dimensions are considered to be part of Maxwell's equations. But it might be that Maxwell's equations represent only a small portion of the ten-dimensional superstring we call an electromagnetic wave. Adding the seven other dimensions to make it a nine-dimension wave (**Figure 17**) with time as the tenth wave form would meet the super string theory for asymmetry.

13. Pattern of a Spherical Antenna

It is a property of antennas that the transmitting pattern of an antenna when used for transmitting is identical to the radiation pattern of the antenna when used for receiving. This is a function of the reciprocity theorem of electromagnetics. Therefore, in relation to planetary spherical patterns the antenna can be viewed as either receiving or transmitting, whether it is the Sun, the Earth or another of the planets. The spherical antenna is thus generalized for all large bodies in our solar system.

The far-field radiation pattern of a planet may be represented graphically as a

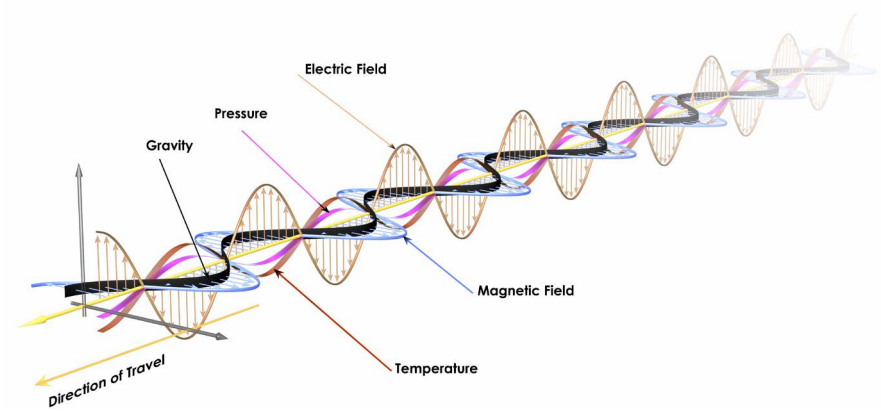

Figure 17. Artist depiction of nine-dimensional wave with time wave.

plot of one of several related variables, including; the field strength at a large radius, amplitude pattern or field pattern, the power output pattern and the directive gain. The plotted quantity for the total gain is typically plotted in dB. The plot is typically represented as a three-dimensional graph (as at right), or as separate graphs in the vertical plane and horizontal plane. This is often known as a polar diagram. A radiation pattern defines the variation of the power radiated by an antenna as a function of the direction away from the antenna. This power variation as a function of the arrival angle is observed in the antenna's far-field. As an example, consider the 3-dimensional radiation pattern in **Figure 18**, plotted in decibels (dB) [58].

Figure 19 is an example of a spherical radiation pattern that may represent a sun or planet. In this case, along the z-axis, which would correspond to the radiation directly overhead the antenna, there is very little power transmitted. In the X-Y plane (perpendicular to the Z-axis), the radiation is maximum. These plots are useful for visualizing which directions the antenna radiates. Typically, because it is simpler, the radiation patterns are plotted in 2-d. In this case, the patterns are given as "slices" through the 3D plane. The same pattern in **Figure 19** (left) is plotted in **Figure 19** (right). Standard spherical coordinates are used, where θ is the angle measured off the Z-axis, and ϕ is the angle measured counterclockwise off the X-axis [59] [60].

The radiation pattern on the left in **Figure 19** is a typical elevation pattern, which represents the plot of the radiation pattern as a function of the angle measured off the Z-axis. Observing **Figure 19**, we see that the radiation pattern is minimum at 0 and 180 degrees and becomes maximum broadside to the antenna 90 degrees off the Z-axis. This corresponds to the plot on the left in **Figure 19**. The radiation pattern on the right in **Figure 19** is the azimuthal plot. It is a function of the azimuthal angle for fixed polar angle 90 degrees off the z-axis in this case. Since the radiation pattern is symmetrical around the Z-axis, this plot appears as a constant. A pattern is isotropic if the radiation pattern is the same in all directions. Antennas with isotropic radiation patterns are thought not to exist, and it is probable that planet poles are no different in this regard.

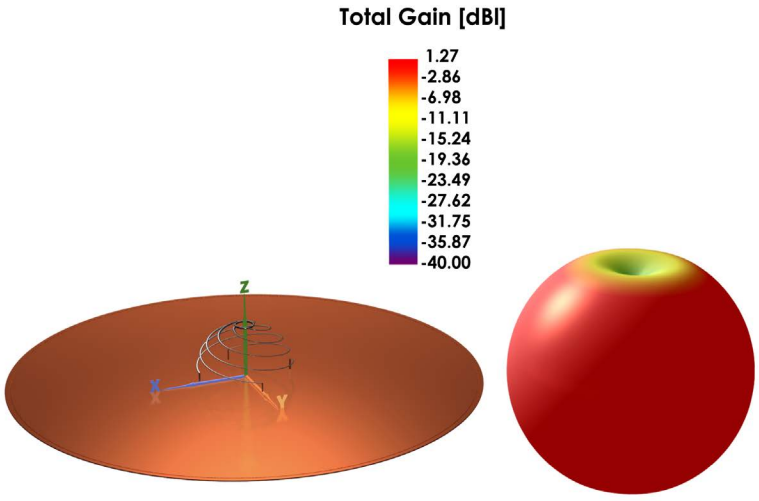

Figure 18. Spherical radiation pattern.

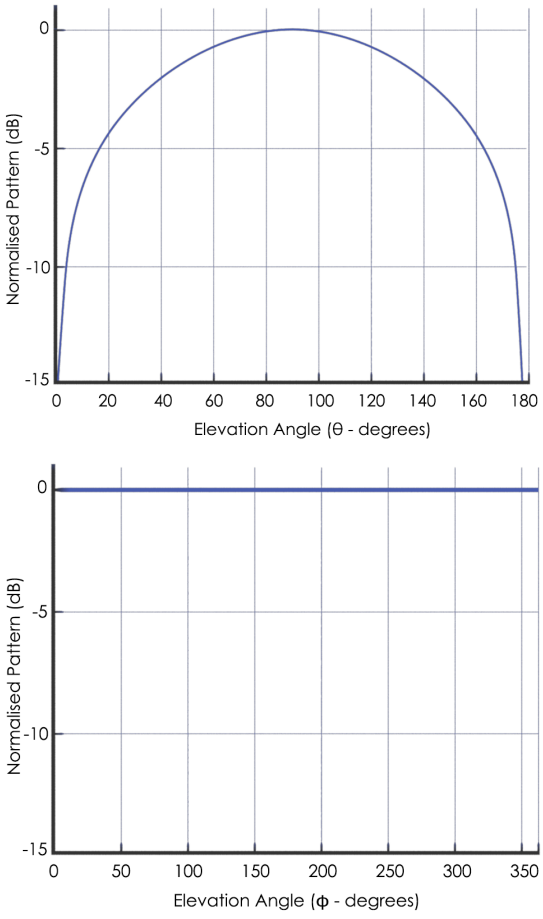

Figure 19. Two-dimensional radiation pattern.

14. Reflection Coefficient

In electrical engineering, the reflection coefficient is a parameter that describes how much of an electromagnetic wave is reflected by an impedance discontinui-

ty in the transmission medium. Since dark matter is an evolving science it is theoretical conjecture that reflected waves are present in the solar system. It does seem probable from what we know about transmission systems and wave theory. In the case of planets, the Sun is delivering electrical power to the Earth and other planets though a near vacuum transmission line. If the impedance of the stellar line does not match the impedance of the planets, a reflection will take place and some of the power is reflected to the Sun. When both a forward and a reflected wave travel simultaneously in opposite directions on a transmission line, the resulting wave, being the superposition of the two, is called a standing wave. A low amplitude standing wave on a transmission line is not unusual, but transmitters usually do not receive back part of the power they deliver, and so they reflect it back to the receiver or planet.

The reflection coefficient is equal to the ratio of the amplitude of the reflected wave to the fundamental wave; expressed as phasors. It is common in electrical engineering to calculate how much of the electromagnetic wave is reflected by an impedance. The reflection coefficient is closely related to the transmission line coefficient [61]. Typical reflection coefficient versus frequency is shown in **Figure 20**.

15. Extremely Low Frequency (ELF) Waves

Extremely low frequency (ELF) in atmospheric science is usually given, from 3 Hz to 3 kHz. In the related magnetosphere science oscillations 0~3 Hz are considered to lie in the tremendously low frequency range (TLF).

Naturally occurring ELF waves are present on Earth, resonating in the region between ionosphere and surface seen in lightning strikes that make electrons in

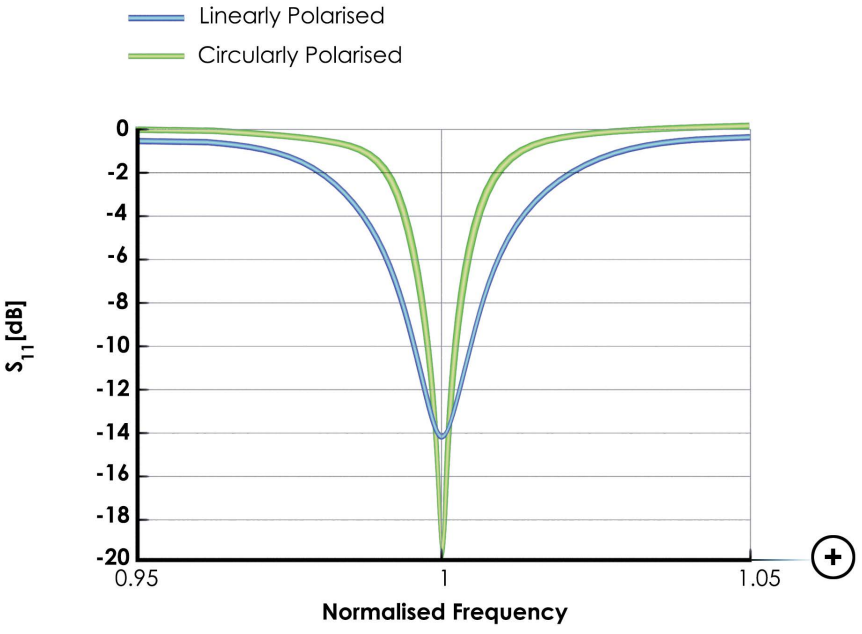

Figure 20. Reflection coefficient vs. frequency.

the atmosphere oscillate. The fundamental mode of the Earth-ionosphere cavity has a wavelength equal to the circumference of the Earth, which gives a resonance frequency of 7.8 Hz. This frequency, and higher resonance modes of 14, 20, 26 and 32 Hz appear as peaks in the ELF spectrum and are called Schumann resonance (**Figure 21**). Lightning strikes cause the cavity to resonate, causing peaks in the noise spectrum. The sharp peak at 50 Hz is caused by radiation from global electric power grids [62] [63]. The rise of the amplitude at low frequencies, shown on the left side, is the tremendously low frequency (TLF) waves caused by slow processes in the Earth's magnetosphere and Flux Transfer Events.

Due to their extremely long wavelengths, ELF waves can diffract around large obstacles, and are not blocked by mountain ranges or the horizon and can travel around the curve of the Earth. ELF waves propagate long distances by an Earth-ionosphere waveguide mechanism. The Earth is surrounded by a layer of charged particles in the atmosphere at an altitude of about 60 km at the bottom of the ionosphere, called the D layer which reflects ELF waves. The space between the conductive Earth's surface and the conductive D layer acts as a parallel-plate waveguide which confines ELF waves, allowing them to propagate long distances without escaping into space [64].

ELF and TLF waves can travel considerable distances through high impedance media like Earth and seawater, which would absorb or reflect higher frequency radio waves. The attenuation of ELF waves is so low that they can travel completely around the Earth several times before decaying to negligible amplitude, and thus waves radiated from a source in opposite directions circumnavigating the Earth on a great circular path interfere with each other. At certain frequencies these oppositely directed waves are in phase and reinforce, causing standing waves. In other words, the closed spherical Earth-ionosphere cavity acts as a huge cavity resonator, enhancing ELF radiation at its resonant frequencies.

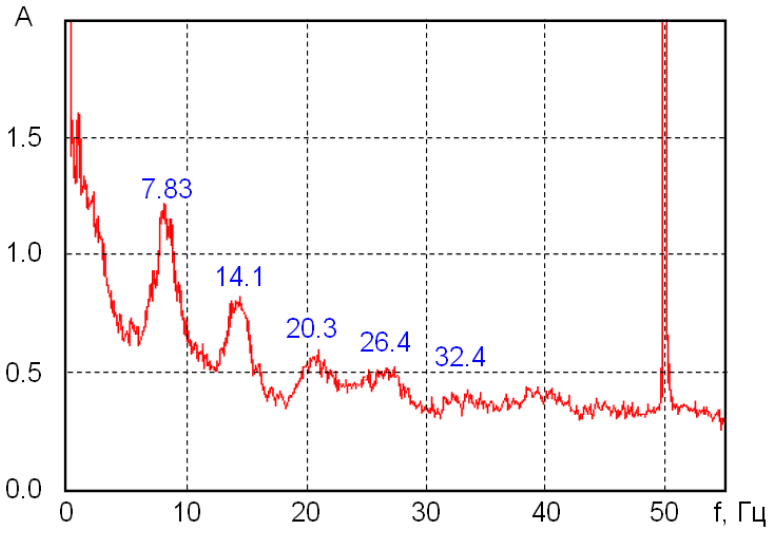

Figure 21. Schumann resonance spectrum.

16. Calculate the Period of Electromagnetic Waves

In free space, the propagation speed of cosmic electromagnetic waves is the same as that of light, at approximately 300,000 km (Figure 22), so they would arrive there in about 1.3 seconds. The speed falls slightly when passing through a conductor such as an antenna or cable. The wave length λ (lambda) of radio waves is as follows: If the frequency of the radio wave is f, and the speed of the radio wave in a vacuum is c, then:

$$\lambda[\mathrm{m}]=\frac{C[\mathrm{m}]}{f[\mathrm{Hz}]}$$

Using the distance between Earth and Moon as the wavelength (Figure 20),

$$\text{Frequency of Moon} = 300000000/390000000 = 0.769 \text{ Hz}$$

$$\text{Period of Moon} = \frac{1}{f} = 1.3 \text{ s}$$

Table 3 shows the flux transfer periods of planets calculated using the distance between the Sun and planets.

We point out that the electromagnetic period for the earth is the same as that reported by Satellite data [26], yet half of what was calculated in my earlier Cosmic String Theory paper, which was 16.6 minutes [65]. This is not unexpected and is consistent with cosmic string whereby changes of state or being is frequency dependent. Further research should show that in the cosmic wave there

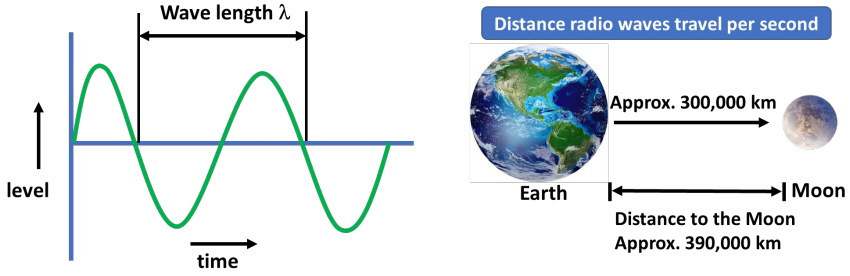

Figure 22. Earth and moon wavelength.

Table 3. Flux transfer periods of planets.

Planet	Wavelength	Frequency	Period
Mercury	58 BM	0.0052 Hz	3 min
Venus	108 BM	0.0028 Hz	6 min
Earth	150 BM	0.0020 Hz	8.3 min
Mars	228 BM	0.0013 Hz	12 min
Jupiter	778 BM	0.00039 Hz	43 min
Saturn	1427 BM	0.00021 Hz	79 min
Uranus	2871 BM	0.00010 Hz	160 min
Neptune	44,497 BM	0.000067 Hz	250 min

is also pressure, sound, heat and light all operating at different frequencies yet traveling from the Sun to the planets. The cosmic wave is thought to be a multi-faceted wave with harmonic frequency corresponding to each change of state. The fundamental is the electromagnetic frequency of 0.002 Hz. Underneath it all is the time wave counting off seconds, minutes, days and years.

17. Cosmic Resonant Circuit

In such an astronomical application as the Sun and the Earth, electrical engineers are interested in effects where the distance from the Sun to the Earth is less than the dimension of the transmitting antenna of the Sun (**Figure 23**). The equations describing the fields created about the antenna can be simplified by realizing a large separation between planets and dropping all terms that provide only minor contributions to the final field. These simplified distributions have been termed the near-field and usually have the property that the angular distribution of energy change with distance, is according to the inverse square law. The angular energy distribution is known as the antenna pattern. When viewed to scale we see that the Sun acts as an electrical dynamo and as a gigantic inductive coupler transmitting electrical power to the planets which act dually as receivers and motors at the same time. Once powered the planets also act as self-excited dynamos and produce their own electromagnetic field.

Thomas Edison was the first to grasp the tremendous potential energy of planetary electromagnetism and notes in his diary on July 1885, that man should "***harness the rotational power of the Earth***" for the benefit of mankind [66]. A decade later Tesla would attempt to make Edison's passing thoughts a reality. Tesla was at heart a Maxwellian and leaned heavily on the writings of Maxwell, Thomson, Lorentz, Laromar and even Hertz, though the two had their disagreements. Nickola Tesla's patent for the Wardenclyffe system references integers of 7 Hz; written fifty years before Schumann Resonance was discovered. An earlier patent discusses low frequency and wavelengths of nearly 200 miles [67], which equate to approximately 300,000 meters or 1 Hz. It is not coincidental that

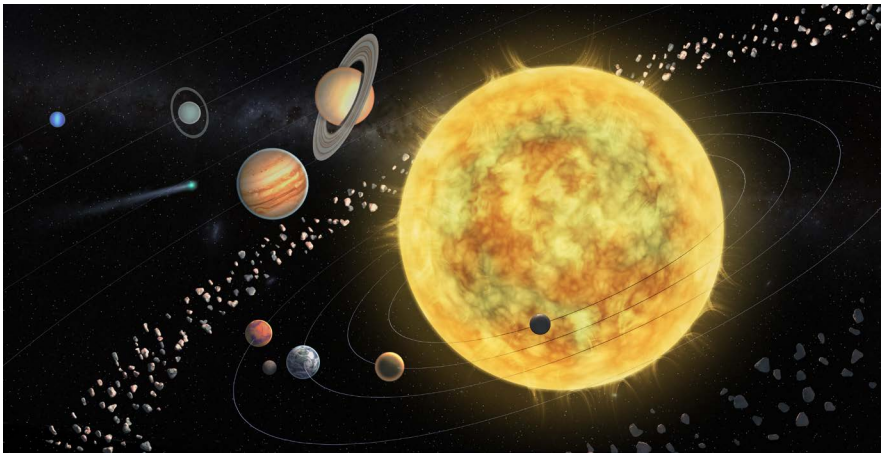

Figure 23. Cosmic antenna's to scale.

the LIGO detectors are spaced a mere 3000 meters apart. Tesla's patent filings and experimental work in Colorado Springs give credence to his claims of millions of available horsepower to transfer wirelessly. Tesla's calculation is 1/1000 of my calculation suggesting that cosmic power can be tapped from the universe at higher resonant frequencies of the fundamental tremendously low frequency (TLF).

Absorption of electromagnetic power in the reactive near-field region by another planet has effects that feedback to the Sun, increasing the load on the Sun that feeds the planet by decreasing the impedance that the Sun sees. Thus, the Sun can sense when power is being absorbed in the magnetic near-field zone by another planet and is forced to supply extra power to its own antenna circuit, and to draw extra power from its own nuclear power supply. Conversely if no additional power is being absorbed by a planet the transmitter does not have to supply extra power. The solar system acts as a power grid with a closed loop power sensing circuit that mimics antenna theory.

It is thus theorized that the Sun and Earth use primarily resonant inductive coupling to transfer power wirelessly across space. Resonant inductive coupling is also called magnetic phase synchronous coupling. The Sun and planets are conceptualized as resonant spherical Tesla coils harmonized for efficient power transfer with minimal losses. Electrostatic coupling and far-field radiation also contribute to the power transfer equation, but it is thought, to a lesser degree.

Resonance, such as resonant inductive coupling of a Tesla coil, can increase the coupling between the transmitter and receiver greatly, allowing efficient transmission at somewhat greater distances, although the fields still decrease exponentially. Resonant transfer works by making a coil *ring like a bell* with an oscillating current. This creates an oscillating magnetic field. Because the coil is highly resonant, any energy placed in the coil dies away relatively slowly over very many cycles; but if a second coil is brought near it, the coil can pick up most of the energy before it is lost. The energy will transfer back and forth between the magnetic field in the inductor and the electric field across the capacitor at the resonant frequency. Each winding has a capacitance across it and functions as an LC circuit, storing oscillating electrical energy.

When the voltage across the capacitor reaches the breakdown voltage of the spark gap a spark starts ionizing the air and lowering the spark gap resistance. This completes the primary circuit and current from the capacitor flows to the primary coil. The current flows rapidly back and forth between the plates of the capacitor through the coil, generating radio frequency oscillating current in the primary circuit at the circuit's resonant frequency. It is theorized that lightning is a form of spark gap oscillating at Schumann Resonance to charge the capacitor around the Earth and discharge into the Earth's spherical inductive coil.

This oscillation will die away at a rate determined by the gain-bandwidth, mainly due to resistive and radiative losses. Because the gain can be very high, even when low power is fed into the transmitter coil, a relatively intense field

builds up over multiple cycles, which increases the power that can be received. At resonance, far more power is in the oscillating field than is being fed into the coil, and the receiver coil receives a percentage of that. However, provided the secondary coil cuts enough of the field, such that it absorbs more energy than is lost in each cycle of the primary, then most of the energy can still be transferred. The loose coupling slows the exchange of energy between the primary and secondary coils, which allows the oscillating energy to stay in the secondary circuit longer before it returns to the primary and begins dissipating in the spark. The secondary receiver coils are similar designs to the primary sending coils. Running the secondary at the same resonant frequency as the primary ensures that the secondary has a low impedance at the transmitter's frequency and that the energy is optimally absorbed [67]. The range of resonant capacitive or inductive coupling using solenoid design for practical transfer of power is 10 times the antenna diameter. If we multiply the Sun's diameter by 10, we obtain high efficient power transfer at a distance of 14×10^9 m. The Earth would also have a similar multiplying effect based on its diameter.

Since the two planets are separate the resonant frequencies of the two circuits, f_1 and f_2 would be determined by the inductance and capacitance in each circuit [68]:

$$f_1 = \frac{1}{2\pi}\sqrt{\frac{1}{L_1 C_1}}$$

$$f_2 = \frac{1}{2\pi}\sqrt{\frac{1}{L_2 C_2}}$$

It is expected that $f_2 = 7.83$ Hz. The capacitance of the Earth is an often calculated and quoted value of 710 microfarads. The capacitance of a sphere is its "self-capacitance", which references itself against an imaginary infinite sphere. The radius of the Earth and dielectric constant of vacuum have been used to calculate the Earth's capacitance. The capacitance of the Earth is a critical value in our analysis and deserves future scrutiny in regard to relative permeability. Based on what is known. We are assuming that 710 microfarads are the correct value for the Earth. Solving for L_2, the Inductance of the Earth:

$$L_2 = \frac{1}{4\pi^2 C_2 (f_2)^2}$$

$$L_2 = \frac{1}{4\pi^2 (7.83)^2 \left(710 \times 10^{-6}\right)}$$

$$L_2 = 0.582 \text{ Henry}$$

However, because the Sun and planets are coupled together, the frequency at which the planet resonates is affected by the Sun's electrical circuit and the coupling coefficient k and occurs at its anti-resonant frequency while the original resonant frequency acts as a resonant frequency. The frequency at which the planet's spherical coil has to be driven is the resonant frequency.

$$f_2' = \frac{1}{2\pi}\sqrt{\frac{1}{\left(1-k^2\right)L_2C_2}} \quad [68]$$

Our Sun to Earth calculations indicate that $f_2' = 0.002$ Hz. Therefore, we can solve *k*, the coupling coefficient:

$$k = \sqrt{\frac{1}{4\pi^2 L_2 C_2 f_2'^2} - 1}$$

$$k = \sqrt{\frac{1}{4\pi^2 (0.582)\left(710\times10^{-6}\right)(0.002)^2} - 1}$$

$$k = \sqrt{\frac{1}{1.0001487447} - 1}$$

$$k = 0.000255$$

The condition for planetary resonance can also be expressed as [68],

$$L_1C_1 = \left(1-k^2\right)L_2C_2$$

Calculating the Sun's value of L_1C_1:

$$L_1C_1 = \left(1-0.000255^2\right)(0.586)\left(710\times10^{-6}\right)$$

$$L_1C_1 = 0.000413$$

The capacitance of the Sun is approximately 73,000 microfarads [67]. The inductance of the Sun is approximately:

$$L_1 = \frac{0.000413}{73{,}000\times10^{-6}}$$

$$L_1 = 0.00565 \text{ H}$$

Inserting this value back into the frequency equation we calculate the equivalent Schumann Resonant, or resonant frequency of the Sun (f_1) [68]:

$$f_1 = \frac{1}{2\pi}\sqrt{\frac{1}{L_1C_1}}$$

$$f_2 = \frac{1}{2\pi}\sqrt{\frac{1}{L_2C_2}}$$

$$f_1 = \frac{1}{2\pi}\sqrt{\frac{1}{0.000413}}$$

$$f_1 = 7.83 \text{ Hz}$$

The Sun has an identical resonant frequency, or Schumann Frequency, as the Earth. The Tesla transformer is very loosely coupled, and the coupling is extremely small. Hence, the factor $\sqrt{1-k^2}$ is close to unity, while the two resonant frequencies differ by 2%, at most. Therefore, the transformer is resonant when the resonant frequencies of primary and secondary are equal. This implies that the Sun and all eight planets operate at the same Schumann Resonance of 7.83 Hz. Calculating the characteristics of all the planets is simply a matter of repeat-

ing the same calculations for each planet.

In a resonant planet coil, the high voltage is produced by resonance. The output voltage can be calculated approximately from conservation of energy. At the beginning of the cycle all the energy in the primary circuit, W_1, is stored in the Sun's capacitor. If C_1 is the capacitance and V_1 is the voltage at which the voltage gap breaks down, which is thought to be the peak output voltage of the Sun, this energy is [68]:

$$W_1 = \frac{1}{2} C_1 V_1^2$$

The total energy of a flux transfer events from the Sun to Earth is expected to be 3×10^{18} J, which equates to 3×10^{18} W. The voltage of the Sun is calculated [68] [69] [70]:

$$V_1 = \sqrt{\frac{2 \times W_1}{C_1}}$$

$$V_1 = \sqrt{\frac{2 \times 3 \times 10^{18}}{73000 \times 10^{-6}}}$$

$$V_1 = 9 \times 10^9 \text{ V}$$

During the "ring up" this energy is transferred to the planet. At the peak V_2 of the secondary sinusoidal voltage waveform, all the energy in the secondary W_2 is stored in the spherical capacitance C_2 between the poles of the planet [68]:

$$W_2 = \frac{1}{2} C_2 V_2^2$$

Solving the equation for voltage of the Earth we obtain,

$$V_2 = \sqrt{\frac{2 \times W_2}{C_2}}$$

$$V_2 = \sqrt{\frac{2 \times 3 \times 10^{18}}{710 \times 10^{-6}}}$$

$$V_2 = 92 \times 10^9 \text{ V}$$

Assuming resonance and no energy losses, the peak voltage of the Sun and the planets can be calculated using the following equation [68]:

$$V_2 = V_1 \sqrt{\frac{C_1}{C_2}} = V_1 \sqrt{\frac{L_2}{L_1}}$$

Confirming our results, we obtain,

$$V_2 = V_1 \times 10$$

The value of N compares favorably with my calculation of $N = 9.8$ in previous work [44]. Indications are that the transformer turns ratio, N, for the wireless power system from the Sun to the Earth is equal to 9.8 or 10. Previously the Earth's current had been calculated to be 1,730,000,000 A. The Sun therefore has a current of 17,300,000,000 A, or approximately 17 Billion A. Given the eight planetary loads the Sun is powering, a turn ratio of 9.8 to 10 appears realistic, as

does the high reactive current.

I am concerned about the accuracy of the calculated voltages due to the small capacitance values used for the Sun and the Earth. As an alternative we can use the equation for energy for an inductor. We can solve for L using our solar energy source of 3.13×10^{18},

$$W_2 = \frac{1}{2} \times LI^2$$

$$L_2 = \frac{2W_2}{I^2}$$

$$L_2 = \frac{2 \times 3.13 \times 10^{18}}{\left(1.73 \times 10^9\right)^2}$$

$$L_2 = 2.0 \text{ H}$$

Solving for C_2 we obtain,

$$C_2 = \frac{1}{4\pi^2 L_2 \left(f_2\right)^2}$$

$$C_2 = 0.000206 \text{ F}$$

Inserting the values of capacitance and inductance, and assuming $R = 100\ \Omega$ for the Earth, we calculate the operating flux transfer frequency of 0.002 Hz and Schumann Resonant frequency. This confirms our model of the Earth.

Defining the parallel resonant frequency as the frequency at which the voltage and current are in phase, unity power factor, gives the following expression for the resonant frequency:

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

The above resonant frequency expression is obtained by taking the impedance expression for the parallel RLC circuit (**Figure 24**) and setting the expression for X_{eq} equal to zero to force the phase to zero.

$$C = 206\ \mu\text{F}$$

$$L = 2 \text{ H}$$

$$f = 0.002 \text{ Hz} \left(\text{solar system frequency}\right)$$

$$R_C = 100\ \Omega$$

$$R_L = 100\ \Omega$$

$$Z = 100\ \Omega$$

$$\text{Phase Angle} = 0.05 \text{ degree}$$

The Resonant Condition of the Earth is calculated to be 7.84 Hz.

Solving for V_1 and V_2 a second time we obtain,

$$V_2 = \sqrt{\frac{2W_2}{C_2}}$$

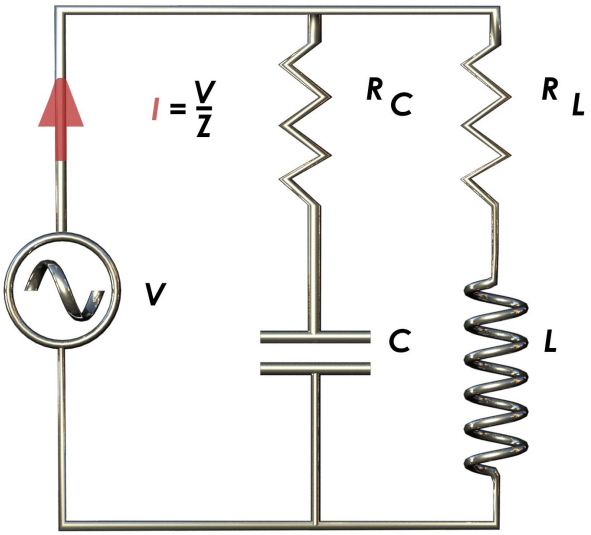

Figure 24. Parallel RLC circuit of Earth.

$$V_2 = 170.6 \times 10^9 \text{ V}$$

$$V_1 = 17 \times 10^9 \text{ V}$$

Solving for C_1 and L_1 we now have,

$$L_1 C_1 = L_2 C_2$$

$$L_1 C_1 = 0.000412$$

Solving for C_1 using voltages,

$$C_1 = \left(\frac{V_2}{V_1}\right)^2 C_2$$

$$C_1 = 0.02 \text{ F}$$

$$L_1 = \frac{L_2}{\left(\frac{V_2}{V_1}\right)^2}$$

$$L_1 = 0.02 \text{ H}$$

Inserting the capacitance and inductance into our RLC model, and assuming $R = 100\ \Omega$ for the Sun, we again calculate the operating flux transfer frequency at 0.002 Hz and the Sun at Schuman Resonance. This confirms our model of the Sun (Figure 25).

$$C = 0.02 \text{ F}$$

$$L = 0.02 \text{ H}$$

$$f = 0.002 \text{ Hz} \left(\text{Solar System Frequency}\right)$$

$$R_C = 100\ \Omega$$

$$R_L = 100\ \Omega$$

$$Z = 100\ \Omega$$

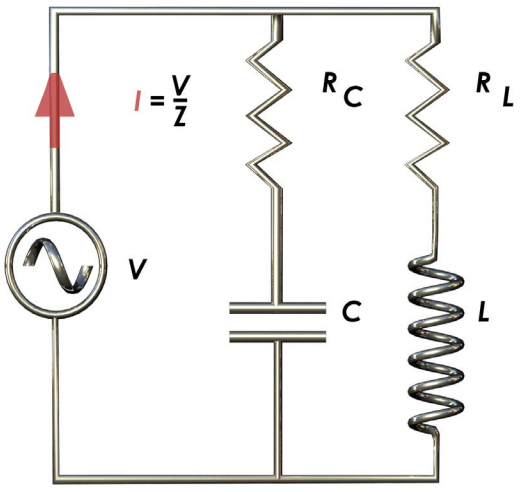

Figure 25. Parallel RLC circuit of Sun.

The resonant condition of the Sun is calculated to be

$$f = 7.95 \text{ Hz}$$

These Inductance and Capacitance values for the Sun are asymmetrical at 0.02 F and 0.02 H. The current and voltage for the Sun are also symmetrical at 17 Billion A and 17 Billion V, respectively. The power of the Sun is 2.89×10^{20}. The Earth's values differ due to the turns ratio of 10 but are tuned to match the same frequency as the Sun and the resonant frequency as well. The power of the Earth is 2.89×10^{17} W. Using another version for power, $P = I^2R$, the ideal resistance of the Earth is approximately 1.0 Ω. It is concluded that these are the most accurate values for the Sun and Earth to date. My previous paper stands corrected based on what is presented in this manuscript [44]. We now have an electrical model for the Sun and Earth based on resonant tuning. Using the same approach, we can calculate all the values for the other 7 planets and model the entire solar system as electrical one-line diagram fairly easily.

Modeling the Earth as an RLC Series Impedance to determine the spark value of the Earth, we insert our calculated voltage of 170 Billion V/10 turns = 17 Billion V, and a surface resistance of R = 6.7 MΩ. The average lightning strike is then calculated to be 25,000 A. A value with the range of 10,000 to 50,000 A often cited. **Figure 26** shows an RLC series circuit.

$$X_c = \frac{1}{\omega C}$$

$$X_L = \frac{1}{\omega L}$$

$$Z = \sqrt{R^2 + \left(X_L - X_C\right)^2}$$

$$\text{Phase} = \phi = \tan^{-1}\left[\frac{X_L - X_C}{R}\right]$$

At series resonance:

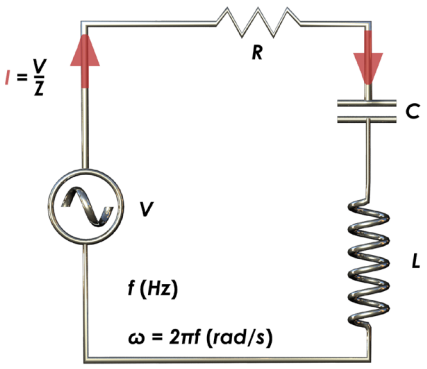

Figure 26. RLC series impedance.

$$Z = R$$

$$X_C = X_L$$

$$\omega = \frac{1}{\sqrt{LC}}$$

$$\text{Phase} = \phi = 0$$

For,

$$C = 206 \times 10^{-6} \text{ F}$$

$$L = 2 \text{ H}$$

At angular frequency

$$\omega = 49 \text{ rad/s}$$

$$\text{Frequency} = 7.82 \text{ Hz}$$

$$\text{Resistance}(R) = 6.7 \text{ M}\Omega$$

$$Z = 6.7 \text{ M}\Omega$$

$$\text{at Phase } \phi = 0.0016 \text{ degrees}$$

The resonant condition is

$$\text{Angular frequency } \omega = 0.493 \times 10^2 \text{ rad/s}$$

$$\text{Frequency}(f) = 7.84 \text{ Hz}$$

$$Z = R = 6.7 \text{ M}\Omega$$

$$\text{Phase } \phi = -0.0$$

For an applied RMS voltage

$$V = 170 \times 10^9 \text{ V}$$

the RMS current will be

$$I = 25000 \text{ A} \quad [63]$$

The component voltages can be obtained by multiplying the current times the component impedances (**Figure 27**).

$$\text{Capacitor}: V_c = IX_c = 123170 \text{ V}$$

$$\text{Inductance}: V_L = IX_L = 50746266 \text{ V}$$

$$\text{Resistor}: V_R = IR = 169 \times 10^9 \text{ V}$$

Since we use 3×10^{18} as our source of energy in our electrical equations, the Equation for Everything is now extended for Power, Energy in an Inductor and Energy in a Capacitor.

$$E = mc^2 = \frac{vc^2}{60} = \frac{a^3}{T^2} = \frac{G(M_1 + M_2)}{4\pi^2} = \frac{KE + PE}{1.0 \times 10^{15}} = Q$$
$$= \frac{PA}{F} = \frac{\lambda}{hc} = \frac{1}{2q} = VI = \frac{1}{2}LI^2 = \frac{1}{2}CV^2 = I^2R = \cdots$$

18. Lightning and Current Path of Earth

By modelling the planets as Tesla coils, we have gained a new understanding of how lightning around the Earth acts as a spark gap. Energy is stored in the Earth's atmosphere, which is a capacitor until the voltage level is crested at which time a spark, or lightning occurs from Earth to the sky. The bolts range anywhere from 10,000 A to 200,000 A. These strikes hit the Earth at a rate of 100 per second. This gives us a total current range of 1,000,000 to 200,000,000 A per second. Research by NASA shows that they emanate in one hemisphere, and then land in the other hemisphere thus creating a path through the Earth and then up into the high altitude to complete the path back around to the Earth [68]. We also know that lightning concentrates around the equator and travels around the globe. With this new discovery of the spark gap and our analogy to lightning we revisit the Toroid and update our model to get a visual of how current is discharged from the capacitive atmosphere to the Earth's inductor.

In our Earth toroid model, we are using 10 turns, which based on NI gives us an I of 173,000,000 A. The relative permeability near the surface of the Earth is 1.

Finding the magnetic field inside a toroid is a good example of the power of Ampere's law. In **Figure 28**, the current enclosed by the blue line is just the number of loops times the current in each loop. Ampere's law then gives the magnetic field by

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

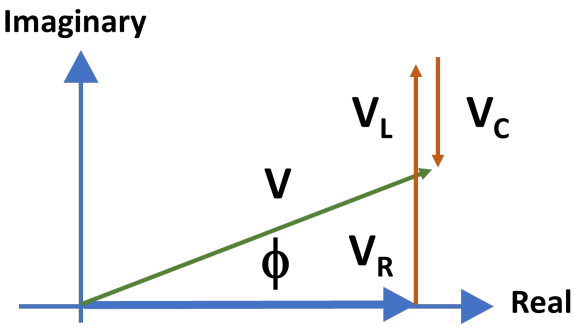

Figure 27. Phasor diagram.

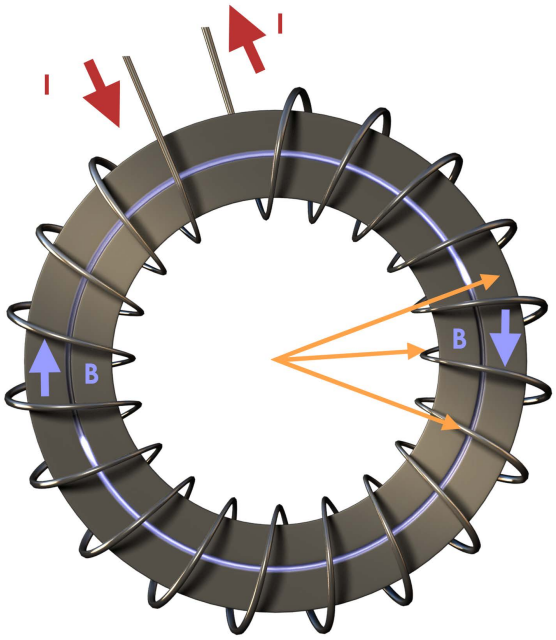

Figure 28. Magnetic field of a toroid.

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

The toroid is a useful device used in everything from tape heads to tokamaks.

$$\text{Magnetic field} = \text{permeability} \times \text{turn density} \times \text{current}$$

For a solenoid of radius

$$r = 6.38 \times 10^6 \text{ m}$$

With

$$N = 10 \text{ turns}$$

The turn density is

$$n = \frac{N}{2\pi r} = 2.5 \text{ turns/m}$$

If the current in the solenoid is

$$I = 1.73 \times 10^8 \text{ A}$$

And the relative permeability of the core is

$$k = 1$$

Then the magnetic field at the center of the solenoid is

$$B = 0.542G$$

The Earth's magnetic field is about half a gauss.

The inductance can be calculated in a manner similar to that for any coil of wire. The application of Faraday's law to calculate the voltage induced in the toroid is of the form:

$$Emf = -N\frac{\Delta\Phi}{\Delta t} = -NA\frac{\Delta B}{\Delta t}$$

This can be used with the magnetic field express above to obtain an expression for the inductance.

$$L \approx \frac{\mu N^2 A}{2\pi r}$$

where A = cross-sectional area;

r = toroid radius to center line.

Toroidal radius

$$r = 6.38\times10^6 \text{ cm} \quad \text{with } N = 10 \text{ turns}$$

$$\text{Coil radius} = 4.51\times10^6 \text{ cm gives area } A = 6.38\times10^9 \text{ cm}$$

Relative permeability of the core

$$k = 1$$

Then the inductance of the toroid is approximately

$$L = 2 \text{ H}$$

The radius of the toroid coil radius is calculated using an inductance of L = 2 H. The coil radius is approximately 45,000 meters, of which we surmise roughly half travels through the Earth and the other half travel through the air, which has known relative permeability of 1. Heights of 15 to 20 km for lightning strikes are not unusual, so the model seems reasonable. The cross-sectional area of the toroid is approximately 6378 × 10^9 m^2—another coincidental, yet curious number in view of the radius of the Earth being so similar.

We can also calculate the frequency of the toroid using the circumference of the Earth as the wavelength, 40,075,000 meters.

$$f = 3E8/40075000 = 7.48 \text{ Hz}$$

If we assume a speed of light slightly faster than c = 3 × 10^9; yet proportional by 1 × 10^{10} with our constant of the solar system, we obtain the desired frequency.

$$f = \frac{3.14\times10^8}{40075000} = 7.83 \text{ Hz}$$

Our work raises the question regarding the current reference standard for the speed of light. We also note that 7.83 Hz is equivalent to a period of 0.1277 seconds, a coincidental number matching 0.1277 Ωm·h^2, a cosmological parameter pertaining to dark matter and dark energy, inflation and the structure of the universe [71]. It is postulated that all stars and planets operate at a frequency of 7.83 Hz determined by a universal constant of 0.1277 Ωm·h^2. It is thought the universal frequency of the cosmos is 7.83 Hz. Just as the power grid operates at 50 Hz in Europe or 60 Hz in the US, it is thought the galactic grid operates at 7.83 Hz. It should be stressed however that dark matter and dark energy problems are not the thrust of this paper and they can be, in principle, solved thru

extended theories of gravity [72].

19. Updated Model of the Earth

The new discovery of the spark gap or lightning circuit has given us fresh information to provide a more accurate view of the Earth's electrical current paths (Figure 29). Like any electrical motor the Earth has two windings, a stator and an armature circuit. Our current thinking is that the stator winding is a ten-turn toroid Tesla coil, and the spherical coil is the Earth's armature circuit. To make a transformer analogy the toroid is the primary of the transformer, and the armature spherical coil is the secondary of the transformer. The ratio of the Sun to toroid is 10, the ratio of the toroid to the armature is 1. It is thought that telomeric currents which flow on the outside of the Earth are represented by the spherical coil. J.J. Thompson's original calculations for an earthly spherical coil will be consulted in the future with this new understanding of our planet. Below is our updated drawing showing how the Earth is wired with a primary resonant LC toroid coil acting as a motor stator. Planets are the most complex and peculiar of electrical machines imaginable.

However, it is important to note that the Sun is 150 billion meters away. It is so far away that the Sun does not "see" a tesla toroid coil or a spherical coil. The wiring diagram or motoring effect of planets is immaterial to the transmitter. To

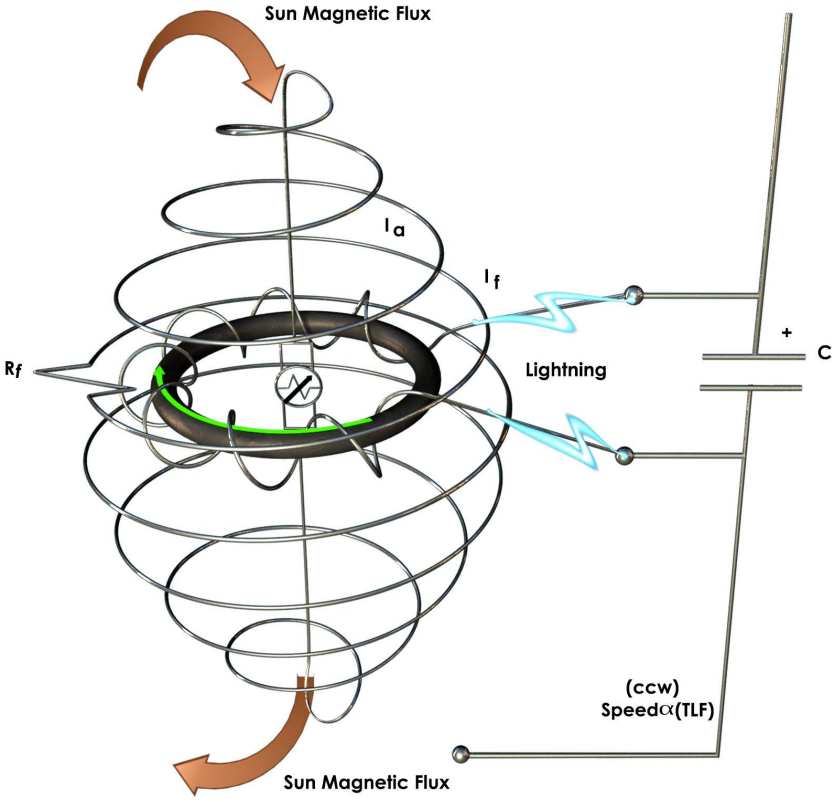

Figure 29. Updated model of the Earth.

the Sun it is just an inductive load that can be lumped into one current sink. What the Sun or transmitter "sees", or how it is modelled based on antenna theory, is a simple dipole antenna that receives energy. Therefore, our earlier calculation of frequency, or Schumann Resonance, of the Earth is deemed to be correct.

20. Conclusions

In the context of cosmic wireless power, energy harvesting or power harvesting, it is the conversion of energy from the electromagnetic field to electric power. The ambient electromagnetic energy may come from the Earth or the Sun's electromagnetic field. Although the power gathering techniques are theoretical, and efficiency of conversion is yet to be determined, it is believed that one day cosmic wireless power transfer will be sufficient to power man's needs, and the source of energy as limitless as the Sun itself. New technology such as piezoelectric and resonant Tesla coils tuned to comic frequencies, should be developed to eliminate the need for batteries in cars, allowing them to operate completely autonomously. Tapping the inexhaustible supply of cosmic power would put an end to world dependence on fossil fuels and nuclear energy. Greenhouse gases and nuclear waste will make these power plants obsolete. Solar and wind will have its place in the future, but it will be inefficient and costly when compared to a resonant electrical coil tuned to the cosmic power frequency. Other than the initial cost of the electrical coil, the energy will be free and simple to operate.

During research, the solar system's atomic time clock has been discovered. Three equations of wave impedance have been related to seconds, minutes, days and years. Due to the nature of the equations it is concluded that time is also a wave and thus expected to have standing and reflect waves. Reflected waves may be the mechanism for understanding the concept of time moving forward or backwards. It may also be the doorway to time travel and teleportation. This discovery is a radical breakthrough in physics. Further investigation into the theory of timewaves and how best to model an analogous cosmic time machine using control theory is recommended. Time and time travel is one of the great contemplations of science and the wave impedance equations identified might be used to solve one of the great paradoxes in physics.

A new law of the Sun has been discovered 400 years after Kepler's laws of motion were introduced. The new equation has been equated to the inverse of Kepler's third law with the accuracy of a time piece. The solar system for the first time has been described as an acoustic system with the ratio of vibratory acceleration divided by volume acceleration then equated to pressure divided by force. The acoustic analogy fits well with my previous paper on Cosmic String Theory: Tension and Gravity, whereby the Sun and Earth were modeled as a violin in space [50]. A second law of cosmic efficiency is proposed that incorporates acceleration and volume expansion of the solar system. Two new measures of energy efficiency can now be considered for our solar system.

In addition, a velocity-energy equivalence equation has been developed and equated to mass-energy equivalence. $E = vc^2/60$ is believed to be the missing law of electromagnetism that ties the nuclear world with the Newtonian/Kepler world. It sets the time clock of the solar system, synchronizes the Sun with the planets, and transmits the power of the nuclear fusion Sun to the solar system. The law applies to macro physics as we have seen but like Einstein's mass-energy equivalence applies to quantum physics as well. By viewing the solar system as a wireless electrical power system and solving the problem of how the Sun is synchronized to the planets the author has uncovered a treasure trove of equations and new concepts about the solar system and the universe. Fusion, free electromagnetic energy, anti-gravity and time travel all seem theoretically and realistically achievable with this new insight. If a scientist could paint the heaven by the numbers, then the equation of everything will start with colorful symbols and letters that look something like this:

$$E = mc^2 = \frac{vc^2}{60} = \frac{a^3}{T^2} = \frac{G\left(M_1 + M_2\right)}{4\pi^2} = \frac{KE + PE}{1.0 \times 10^{15}} = Q$$
$$= \frac{PA}{F} = \frac{\lambda}{hc} = \frac{1}{2q} = VI = \frac{1}{2}LI^2 = \frac{1}{2}CV^2 = I^2R = \cdots$$

The Earth's energy constant is 3.13×10^{18} J. This is the energy that can be received by the capacitance and inductance of the Earth, which is a physical limitation based on the size of the Earth. The limitation is the rate at which the Sun rotates and transmits energy, and the capacity of the Earth to absorb energy. The rate of transmission is based on the velocity of the Sun. The size of the Earth's capacitor is the capacity. The Sun and Earth work in conjunction to deliver and receive a constant amount of energy during fixed periodic flux transfer events. This energy constant becomes the fundamental constant by which all other constants and equations are set. The limitation to energy is how much can be transmitted and received via the planetary antennas. And, how much is being used up by the Earth. Once the Earth receives the energy it is divided up and used to perform a litany of tasks all of which can be modeled by laws and equations. The equation of everything states that everything is energy and energy is everything. If eternal life is rooted in the conservation of energy, might the story of the resurrection be a demonstration in the physics of transformation?

Ancient philosophers as far back as Thales of Miletus c. 550 BCE had inklings of the conservation of some underlying substance of which everything is made. Conservation of energy states that the total energy of an isolated system remains constant, it is said to be conserved over time. This law means that energy can neither be created nor destroyed; rather, it can only be transformed from one form to another. Special relativity showed that mass could be converted to energy and vice versa by $E = mc^2$, and science now takes the view that mass-energy is conserved. Scientifically speaking, conservation of energy can be rigorously proven by the Noether theorem because of continuous time translation symmetry; that is, from the fact that the laws of physics do not change over time. Since

our equation has a time translation symmetry it is possible to define conservation of energy for the solar system. A perpetual motion machine of the first kind cannot exist; no system without an external energy supply can deliver an unlimited amount of energy to its surroundings. The Sun and stars have an abundant yet finite amount of nuclear energy.

The equation starts with nuclear energy of the Sun, which equates to wireless electrical power which equates to orbital energy of the planets, which equates to cosmic string theory, and so on. Additional equations will be added on the right-hand side as we define cosmic string theory for vibratory pressure, acceleration and force. The equation begins with the macroscopic on the left side and, overtime, will end with the microscopic on the rights side. This equation tells us that energy, not only can be exchanged with mass, it can take many different forms and shape itself to whatever needs the universe requires. Energy is the inverse of the electron and the proton, a most provocative of discoveries. The theory of everything will be realized through a progression of Euclidean equations that will be solved by equating to 3×10^{18} J. New units and constants will be required. The theory of everything now has form and function. The theory of everything is no longer a theory; it is an equation for everything. We have only scratched the surface with the first handful of laws.

It is believed that over time all equations and all constants will find their way into the equation of everything. The equation will be the longest equation in existence when completed. The equation of everything will describe the relationship between all things and make sense of the entire cosmos. All the electromagnetic constants will be redefined in terms of the equation, as well as atomic and nuclear constants. The equation will even extend to chemical constants eventually.

The Sun and the Earth have been modeled with resonant Tesla coils with interesting results. Using Schumann Resonance, the period of flux transfer events of the Earth and energy consumption of the Earth, we have been able to calculate exact values of inductance, capacitance, frequency, voltage and currents for the Earth and the Sun. Our understanding of how the solar system works electrically has been significantly enhanced by modeling the system as a wireless power transfer system tuned for resonance. It is now possible to model the Sun and all eight planets using the techniques presented. The modeling of the planets as resonating coils and values of inductance, capacitance and voltages in this manuscript are valid and considered a correction over my first paper [44]. Our understanding and ability to calculate lightning strikes is greatly enhanced through electrical modeling.

In its simplest form, the Earth can be viewed as a rotating current transformer (**Figure 30**) connected to a resonant capacitor with a dipole antenna acting as a conductor. Using the frequency of the Earth and a slower 1/3 speed of light due to media, we can calculate the wavelength of the Earth dipole antenna $\lambda = (1 \times 10^8)/7.83$ Hz $= 12.77 \times 10^6$, or approximately the diameter of the Earth. By

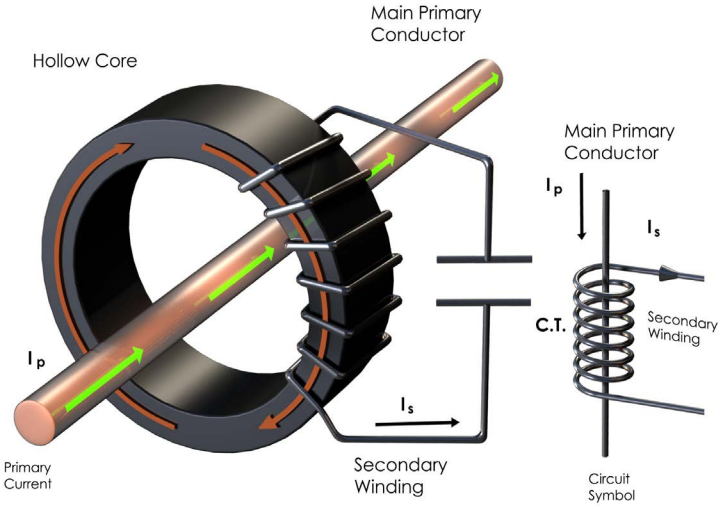

Figure 30. The current transformer—current transformers produce an output in proportion to the current flowing through the primary winding as a result of a constant potential on the primary conductor.

building replica Earth like devices to small scale and using known techniques for energy harvesting of resonant current transformers [65], the potential for unlimited renewable energy from electromagnetism is a distinct possibility. We may be able to realize Thomas Edison's vision of harnessing the electromotive power of the Earth using Tesla like know how.

The biggest electrical machines in the solar system are being conquered one calculation at a time. We have modeled the Earth's stator winding as a toroid Tesla coil, or a loosely wound current transformer, and the armature as a spherical coil. One day we will map the universe and electrically model the entire galactic grid. Stars will be seen as sources of electrical energy to be harnessed and controlled by man using equations and constants. Man will learn to reshape the universe by transforming energy to suit his needs.

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