

Applying Faraday's Law of Induction to Explain How the Sun's Core Reverses  
Polarity and Oscillates

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**Abstract**

This is an introduction to the most logical approach in understanding how the sun reverses its magnetic poles while simultaneously maintaining its continuity. Based upon a novel patent-pending magnetic confinement method that was designed to emulate how confined plasma at the sun's core rotates about a single relative center point (SRCP); this theory of sun polarity reversal was developed to provide supplementary validity that this novel magnetic confinement method for fusion has similar properties to how the sun operates. By logically applying Michael Faraday's law of induction in analyzing the generated oscillating currents within the confines of this sun-like confinement device; one is able to simply explain how magnetic pole reversals observed by NASA's magnetic field detectors occur without the sun's core physically flipping or reversing in direction.

**Key words:** Helioseismology, Pole Reversal, Geomagnetic, Sun, Faraday, Pole Flip, induction

**Introduction**

The Nuclear Electromagnetic Shaping Accelerator Reactor (NESAR) [1] is meant to be a logical approach to sustainable fusion by being the first reactor that oscillates plasma similarly to the sun by creating a true SRCP; which is a common location where the magnetic confinement and the confined rotating plasma have the same relative location of interaction. In an effort to express the validity of this method of confinement for fusion, it seemed logical to develop a simple and straightforward way to explain how the sun reverses its magnetic poles based upon how the NESAR confines charged particles. Using Faraday's law of induction allowed for a rational reason why NASA's magnetic field detectors observe pole reversals in the sun's core.

This paper will review the general current flow generated within the NESAR. The induced effects of this generated current flow will then be analyzed against how it influences the magnetic field detectors used by NASA

in assessing the magnetic fields of stellar bodies. What will be finally reviewed will be how the sun produces observations of magnetic pole reversals and perpetuates through its cycles without the sun's core physically altering its configuration.

**How Plasma Oscillates Within the Confines of the NESAR**

The most important feature of the NESAR confinement method is that every confinement coil, besides the vertical axis, is directed relatively off-center to promote a collective directional rotation to the confined charged particles relative to an SRCP within the confinement apparatus. Angling the magnetic confinement fields to spherically rotate charged particles relative to a single location at the SRCP allows the NESAR to quickly perform what took the sun thousands and maybe millions of years to do naturally through sheer size and induction from an increasing well potential at the center of its confinement. Being able to spherically rotate charged particles with coil confinement is vital to the NESAR in having the capability to effectively confine and perpetuate without catastrophic magnetic reconnections and loss of charged particles at the magnetic cusps that would greatly reduce the capability of the confinement. In Figure 1, the left is a cross-section top view of how the confinement coils are collectively angled to promote a rotation to the confined plasma, and on the right is a cross-section side view of how the confinement coils are collectively angled to promote a rotation to the confined plasma.

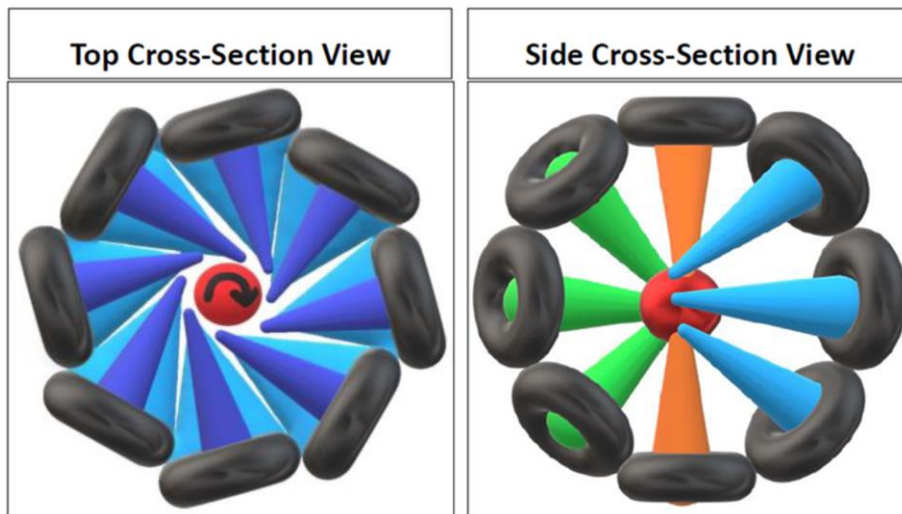


Figure 1.

From Figure 1, one can observe the toroidal magnetic coils that are slightly directed off-center to push a rotational pattern upon the confined charged particles. On the left angled toroidal magnetic coil fields on this plane are depicted in blue. In Figure 1 on the right is a cross-section view from an upright perspective of NESAR confinement apparatus. The angled toroidal magnetic coil fields directed to the background are green; while the toroidal magnetic coil fields directed to the foreground are blue. In addition, the toroidal magnetic coil fields on the vertical axis directed to the center of the confinement apparatus are orange.

Magnetic fields will not cross each other, they merely push against one another. This means that the angled toroidal magnetic fields will layer upon each other while pushing the rotation of confined charged particles spherically. This increases the confinement's capability in trapping charged particles while at the same time driving charged particles to rotate collectively to create a dominant magnetic field within the NESAR confinement apparatus. In remembering that an electromagnet is only charged particles moving as a collective in a rotational direction, the confined charged particles within the NESAR will collectively exhibit similar electromagnetic properties as charged particles flowing through a coil. Thus, creating an observable primary magnetic field for the system just like the sun. Figure 2 is a general depiction of the plasma flow generated within the confines of the NESAR.

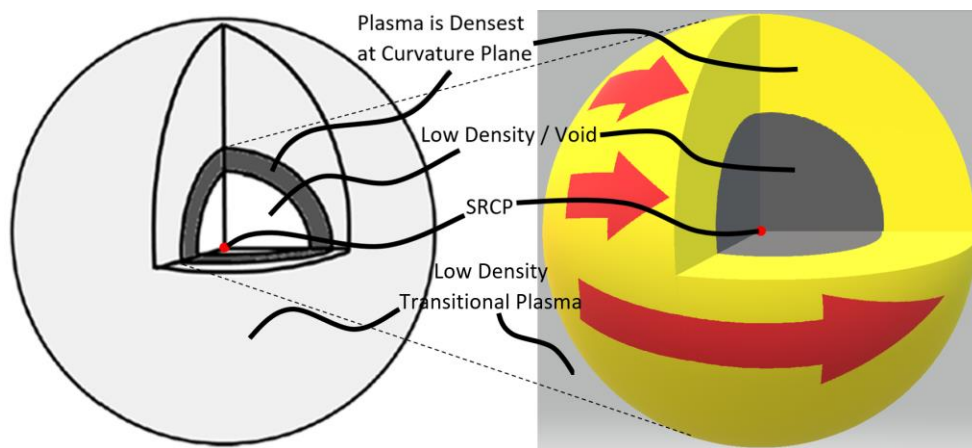


Figure 2.

Figure 2 displays three defined plasma layers that should be generated about the SRCP within a NESAR confinement. The most outward layer should be the largest in volume but should obtain a low density of plasma as this is a

transitional layer for charged particles to move towards the curvature plane. The curvature plane is the layer where the confinement of plasma is the densest. The curvature plane is where the majority of fusion interactions occur and is the layer that generates the dominant magnetic field for the system. The layer closest to the SRCP is another low-density region.

### **Proving that the NESAR Confines Like the Sun by Explaining How the Sun Reverses Its Magnetic Field**

The NESAR was developed in an attempt to reverse engineer the sun. So, the collective flow of charged particles within the NESAR confines should provide some type of understanding in how the sun operates. Currently, no other physicist or cosmologist who studies helioseismology has come up with a logical explanation that fully embodies how the sun reverses its magnetic poles while progressing through its solar cycles. This section of the paper will cover what is being observed as magnetic pole reversals from the sun, how observed magnetic pole reversals are being recorded with NASA's equipment, and how the sun is able to endlessly perpetuate through its solar cycles. Being able to provide a logical explanation for these questions should add validity in the NESAR method of confinement as being a process of fusion that is truly similar to the sun.

There are many layers to the sun that have a multitude of different features, but the sun's magnetic pole reversals must originate from a solitary system as a single dominating magnetic field is observed relative to countless surrounding contiguous fields. The sun is a continually changing environment, so it should be assumed that its core is doing the same. If this is true, then the effects of inductance should be observed from the core. Due to these few but simple observable facts, it seems most logical to apply Michael Faraday's law of induction to approach a better understanding of how the sun operates. Figure 3 is a simple depiction of how the sun's core resembles how plasma oscillates within the confines of the NESAR.

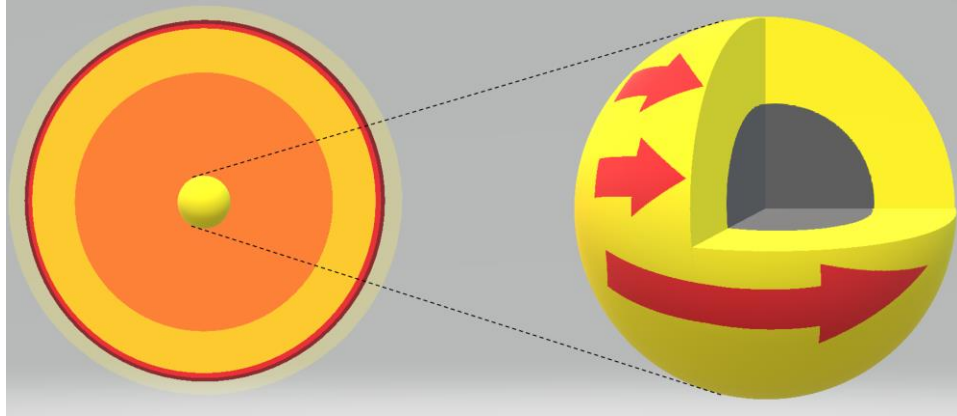


Figure 3.

In studying Faraday's experiments [2], inductance is dependent upon the rate of changing magnitude of a magnetic field. To apply Faraday's law of induction to how the NESAR and sun may reverse its direction in inductance, one cannot simply envision how Faraday conducted his experiments by moving a bar magnet in and out of a coil since the NESAR spherically circulates charged particles for constant utilization. In applying Faraday's law to better understand how the NESAR and sun-like confinements may reverse their magnetic poles, one must imagine a ring-shaped magnet rotating at variable speeds within a coil. Figure 4 is a depiction of this ring-shaped magnet rotating within a coil.

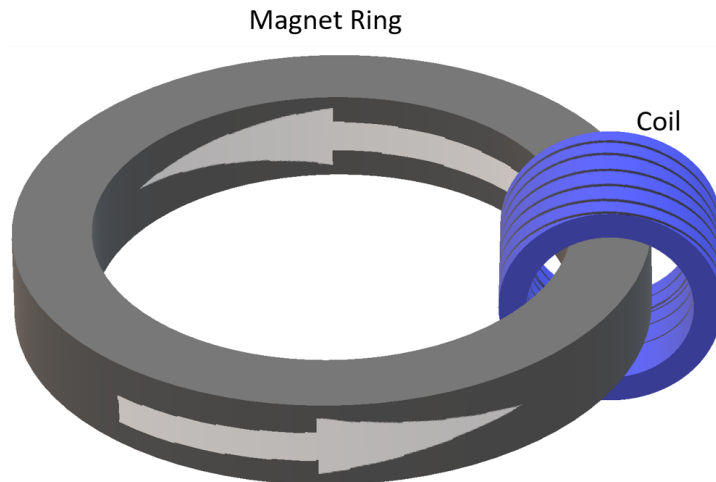


Figure 4.

In analyzing the above rotating magnetic ring from a Faradayan perspective, the equation in Figure 5 must be used to understand the generated electromotive force (EMF). Even though the coils have a certain

amount of turns, this factor is not important to get a general understanding how EMF,  $\mathcal{E}$ , will be affected by a variable rotating magnetic ring. The most important factor to focus on is how the inverse rate of magnetic flux,  $\Phi$ , is changing.

$$\mathcal{E} = -\frac{d\Phi_B}{dt}$$

Figure 5.

In applying the equation from Figure 5 to the rotating magnetic ring, understand that EMF is purely based upon the rate of a changing magnetic flux. So, if the magnetic ring is rotating at a stable rotational speed; there will be little to no change in the magnetic flux, so EMF will be zero. If the rotating magnetic ring increases in rotational speed, an opposing EMF will be created because the law of conservation of energy dictates that an effort must be made to maintain the system's previous lower energy state. If the rotating magnetic ring decreases in rotational speed, a supporting EMF will be created because the law of conservation of energy dictates that an effort must be made to maintain the system's previous higher energy state. Figure 6 is a graph of the EMF of a magnetic ring as the ring increases its rotational speed from a speed of 1 to a speed of 2, and as it reduces its rotational speed from a speed of 2 to a speed of 1. The rotational speed is depicted by a black line, and the EMF is depicted by a red and green line.

Rotational Speed	EMF
Constant Rotational Speed 1	None
Increase in Rotational Speed 1 to Speed 2	EMF in Opposite Direction of Main Field
Constant Rotational Speed at Higher 2	None
Decrease in Rotational Speed 2 to Speed 1	EMF in Supporting Direction of Main Field
Resume Constant Rotational Speed 1	None

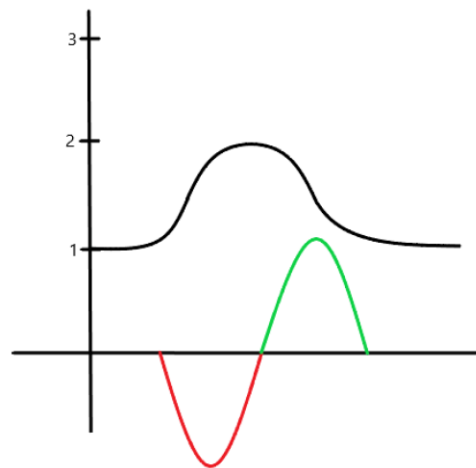


Figure 6.

The only way that magnetic flux could change in the NESAR confinement, and possibly the sun's core, without reversing the direction of the system's rotation is by altering the rotational speeds of the confined charged particles. Altering the rotational speeds of a stable confinement of charged particles will cause the magnetic flux to change, which then results in an alternating EMF as shown in Figure 6.

To get a better idea of this concept, Figure 7 depicts a created magnetic field from a NESAR or sun-like confinement. As the rotational speeds of the confined charged particles increase; the more charged particles will pass through the imaginary blue plane over time. This increase in rotational speed results in the NESAR or sun's core increasing in current; causing in the system to increase in magnetic flux, which results in generating an opposing EMF and conversely when a decrease occurs in its rotational speed.

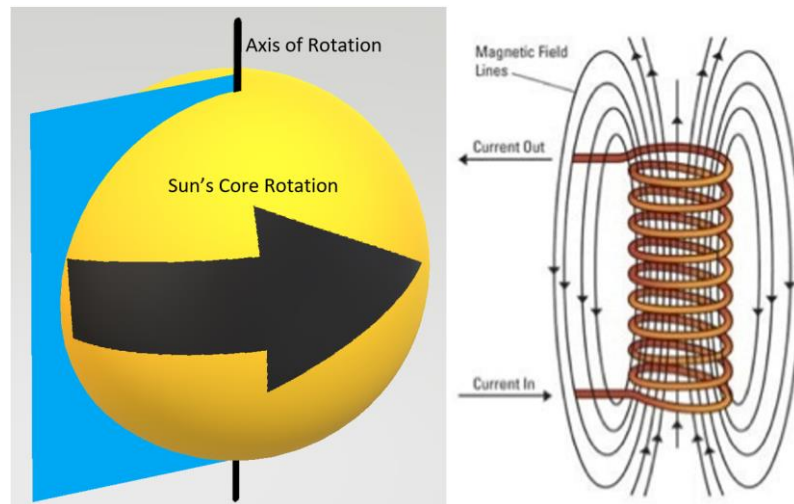


Figure 7.

Since the NESAR and sun's core are a rotating ball of plasma; it is logical to relate how the induced currents generated within the ring-shaped tokamaks may be similar to how it may occur within the sun's core. Even though tokamaks are extremely unsuccessful due to magnetic reconnection failure; experts know how the reconnection occurs. The reconnection failure in tokamaks is called a sawtooth reconnection. This reconnection occurs when the opposing induced current's field from the main confinement of charged particles is pinched and severed by the field of the main current of confined charged particles. This happens because the tokamak's poloidal field currents run parallel to the main current of confined charged particles. So, as a tokamak increases in its confinement of charged particles; the induced

current's field gets pinched between the field of the main current of charged particles being pulled towards the fields of the poloidal currents that are affixed to the outside of the confinement apparatus. This pinching of the induced field causes an explosive surge of kinetic and thermal energy that causes massive disruptions in the tokamak confinement. The main thing to take away from observing sawtooth failures in tokamaks is that in plasma currents, inductance directly influences the main current flow of plasma. Figure 8 depict this sawtooth failure [3]. Notice how the opposing induced current is created in Figure 8(A), in yellow. In Figure 8(B), the main current's field, in orange, is being pulled towards the parallel running poloidal currents, in green; pinching the induced current's field.

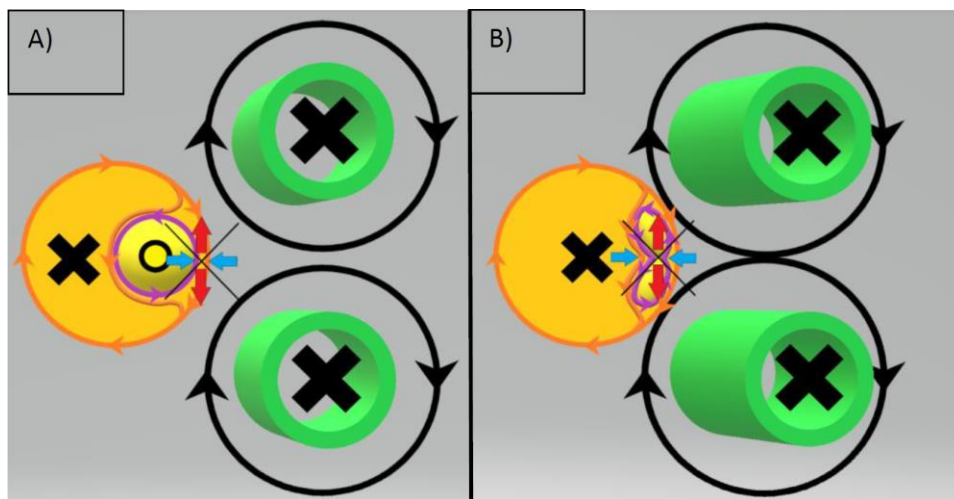


Figure 8.

The main reason that the NESAR confinement method is an improvement upon the tokamak is because catastrophic magnetic reconnection failures are eliminated due to the removal of parallel running confinement magnets to the current of plasma. The main reason that the tokamak sawtooth failure is being brought up at this time in the paper is to provide a depiction of the type of induced current that is more than likely occurring in the sun's plasma core. This induced current plays an extremely important role in the perpetuation process of the sun by driving the system to maintain a certain energy level depended upon the law of energy conservation. Due to a sun-like system's effort in maintaining a certain energy level, continual shifts in magnetic flux must be performed to preserve a certain level of energy.

Since the magnetic flux of the sun's core is constantly changing then there must be the presence of inductance within and about the sun's plasma



core. In Faraday's experiments, inductance occurs in the coil around the source of the changing magnetic flux; but what is also known from countless research on tokamaks is that it also occurs within plasmas with changing currents. What this means is that the sun's core should consist of two separate dependent magnetic fields; a primary field from the main current of plasma varying in rotational speed, generating a secondary field from inductance within the main current. Figure 9 depicts the region where a weaker induced field would reside within the confines of a sun-like core, which is depicted in blue.

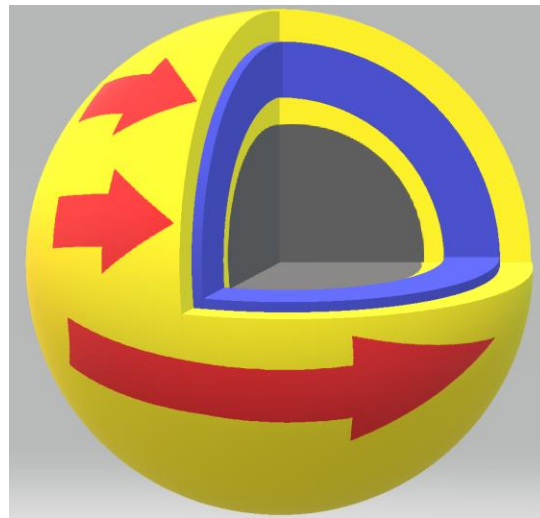


Figure 9.

While revisiting Faraday's experiments, where inductance occurs in the surrounding coil, about a source changing its magnetic flux; the question of what is NASA's magnetic field detectors actually observing presented itself. Because of this uncertainty of what NASA is actually recording as the sun's magnetic field, researching the equipment used to record the sun's magnetic field was the next phase. NASA uses Search Coil Magnetometers (SCM) [4] to observe the sun's magnetic field. SCMs are basically copper coils wound around a high magnetic permeability core. This magnetic core concentrates magnetic field lines, and the magnetic fluctuations they carry inside the coils. The fluctuations induce currents and electric voltage drops inside the core that can be measured and recorded by the instrument's electronics circuits. In general, these coils are recording the inductance given off by the sun's core. Their SCMs not only observe one direction, they record the magnitude of the induced electromotive force (EMF) on the X,Y, and Z axes. Figure 10 obtains pictures of the two types of search coil magnetometers used

to observe the sun's magnetic field. In these pictures, these three axes of wounded coils are visible.

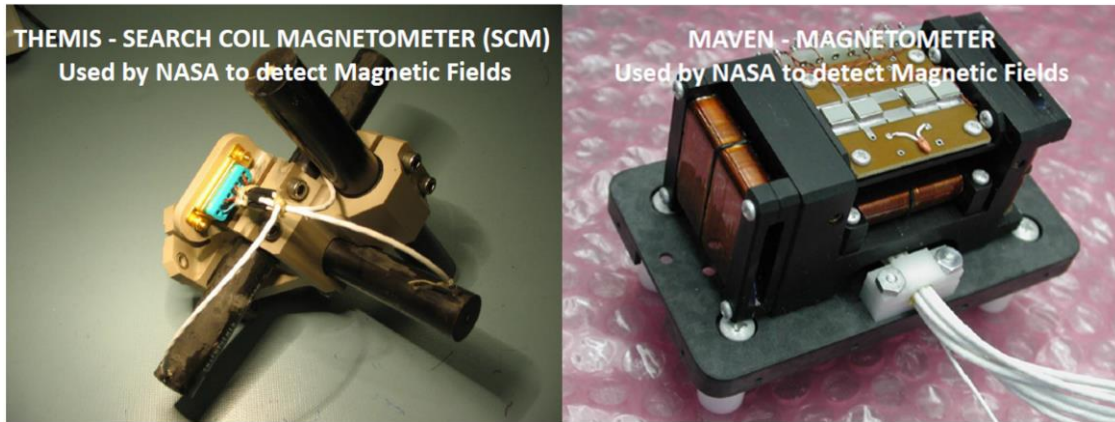


Figure 10.

In researching NASA's SCMs, it was surprising that these recordings were not commonly presented as inductance readings instead of the actual magnetic field of the sun's core. Faraday discovered and conveyed how inductance occurs in conductive coils almost over 200 years ago, and if the sun's pole reversal were presented as a shift in measured inductance, those who intently study helioseismology may have been more equipped in understanding that there is a high probability that the sun's core may not physically be flipping at all.

After researching the NESAR's generated plasma current and understanding what NASA's SCMs are actually observing from a Faradayan perspective; a Nikola Teslan approach was needed to understand how the sun's core is driven to perpetuate. So, if NASA's equipment is actually observing the sun's inductance, then the recordings that are being captured by NASA's SCMs are actually the sun's electromotive force (EMF) from the main current.

In the study of electric motors, stators induce an EMF current upon the rotors to drive a rotation upon the motor's rotor. Any change in the magnetic environment of a coil of wire will cause a voltage (EMF) to be "induced" in the rotor coil. Within plasmas with a varying dominant current, this generated EMF is also observed. Somewhat related to how EMF is the driver for rotors to rotate in an electric motor; the sun's core's induced current within the main current is the driver in the sun's core's ability to perpetuate.

Figure 11 was developed to simplify how an induced field within the main current can either assist in increasing or decreasing the main current's rotational speed. The main current rotation of the sun's core is in yellow. The blue toroid is the induced current. There is a red and green arrow on this blue toroid to indicate that an induced field can work to either increase or decrease the rotational speed of the system, as the system attempts to maintain its initial maximum rate of change where the induced current was at its greatest strength. In general, the sun's perpetuation is due to the law of conservation of energy; where the sun is attempting to maintain its maximum induced current by varying its rotational speed. To clarify, the sun's recorded EMF is being driven by the changing rotational speeds of the core's plasma in yellow. The sun's oscillation is driven by the induced current in blue. This induced current, in blue, is not what NASA's detection instruments are recording, because the main current's magnitude, in yellow, supersedes the induced current in blue.

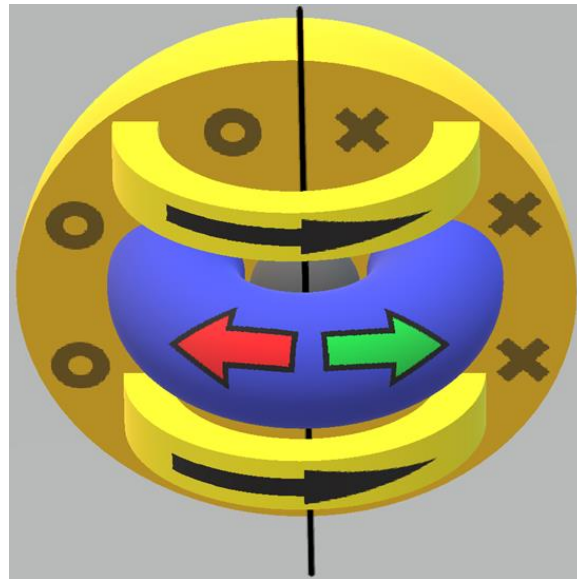


Figure 11.

In order to graph the relationship between the sun's core main current and EMF; Faraday's fundamentals serve as a succinct summary of the ways a voltage (or EMF) may be generated by a changing magnetic environment. The induced EMF in a coil is equal to the negative rate of change of magnetic flux times the number of turns in the coil. To graph how the sun's core cycles, a focus is placed on the sun's EMF. As mentioned before this EMF is

the negative rate of the sun's core changing in magnetic flux; which would be the negative rate of change of the system's rotational speed.

Figure 12 was developed to show how this relationship between how the rotational speed of the system is directly tied to its induced fields. Dependent upon the system's rotational speed, the black line, the generated EMF oscillates about the X-Axis. The reason that EMF is on the X-Axis is that it is the negative rate of change of the rotational speed of the system that emits magnetic flux. The EMF will shift from an aiding or opposing current towards the system's rotational speed. Again, this shifting in EMF is due to the system trying to maintain its greatest initial rate of change, EMF; but the most important thing to take notice of is when the EMF is zero, which is when the sun's magnetic pole reversals are observed with NASA SCMs. Notice that the green indicates that the induced current is working to increase the rotational speed; while the red is opposing the direction of cores rotation, slowing the system's rotation. The induced current's direction is depicted at the top of the graph in red or green. The EMF curve on the graph is color-coated red and green as well to indicate when induced currents are working to increase or decrease the system's rotational speed. Finally, it is important to notice that the solar maximums and minimums occur when the rotational speed of the sun's core is at its greatest rates of change.

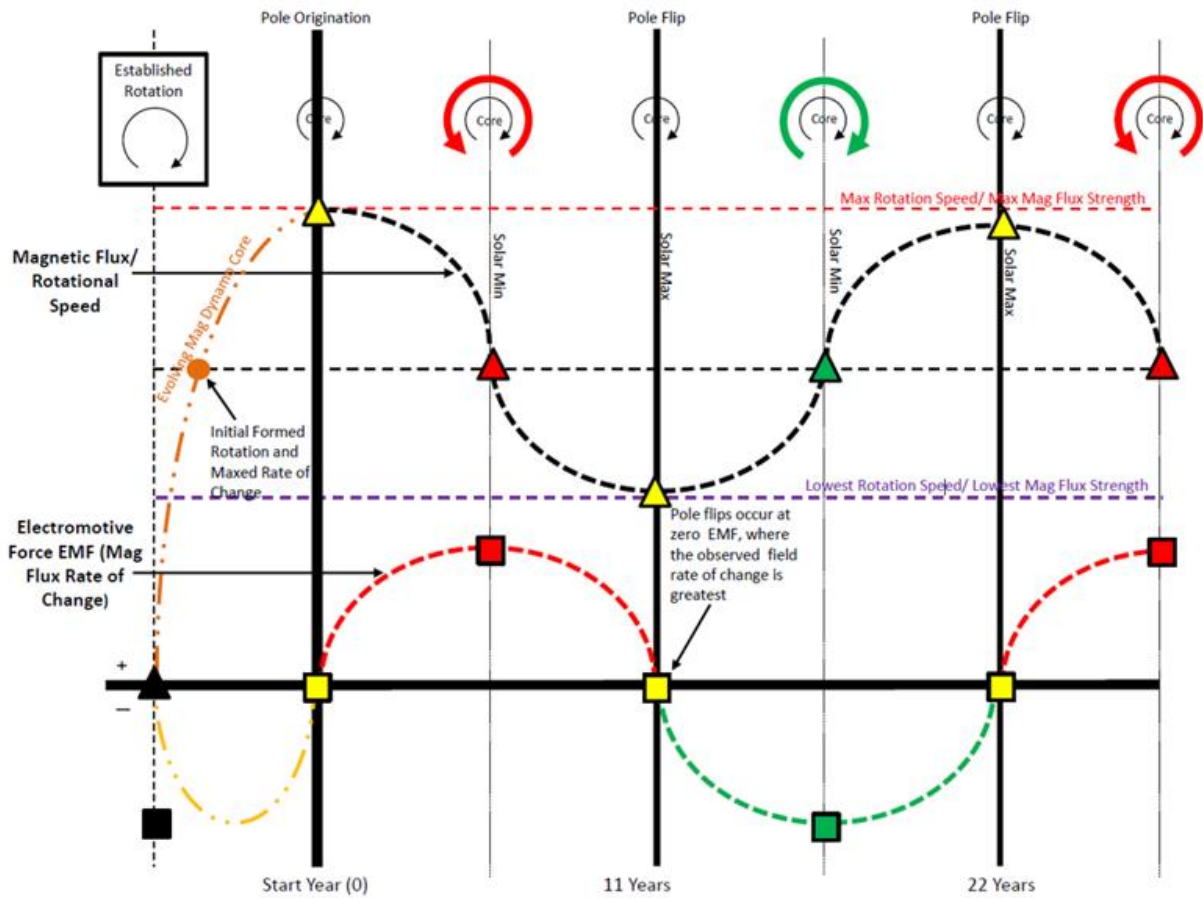
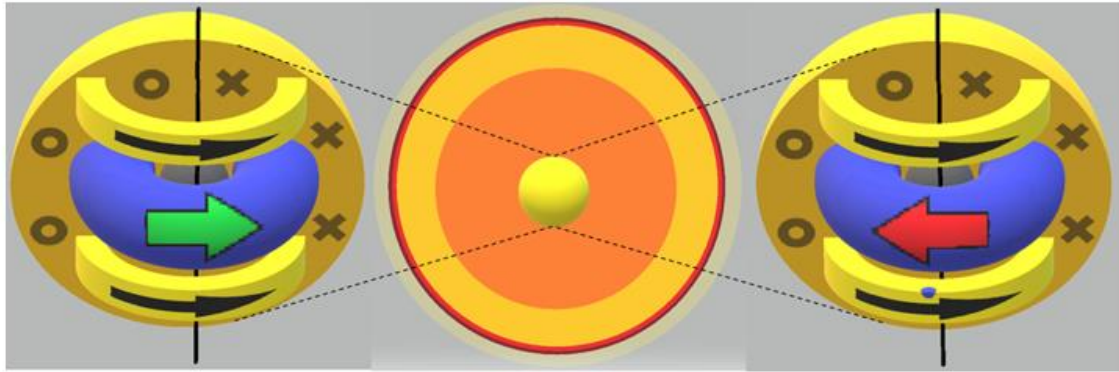


Figure 12.

An important thing to notice from Figure 12 is that the sun's rotational speed, magnetic flux, is initially a dotted orange line. The initial rotational speed is dotted orange because the sun's core initial rapid increase in rotational speed would not mirror the latter established oscillating pattern. So, to be congruent to this initial rotational speed; the opposing induced current, EMF, is also depicted with a dotted yellow line. The most important takeaway from the initiation of the sun's core, the

dotted area of the graph, is that this is the region where the magnitude of EMF is established; which is a major factor in the time of the system's cycle periods and the speed at which the system's core will rotate to generate a dominant magnetic field.

If this magnetic pole reversal theory is correct about the sun, it may also be applied in better understanding Earth's much smaller and less active core. If the Earth's core operates similar to the sun's, then the reason why the Earth's poles drift is simply due to its core varying in rotational speed as well. As Earth's core slows in rotation, like a top, it starts to wobble; but once induced current works towards aiding its rotational speed to increase in magnetic flux, it should become more stable.

Above all, this theory of magnetic pole reversal provides a simple explanation for recorded observations that are founded on Faraday's law of induction; which allows for a pathway in explaining how the sun's core can maintain a rotational direction without physically reversing in position while simultaneously influencing observations to insist that the sun's core reverses in polarity. In addition, this theory logically ties observations of the sun's solar cycles to the laws of conservation of energy by explaining how the sun's core generates induced efforts to sustain a given energy level.

### **Possible Beginnings of a Provable Quantum Theory of Gravity**

The main concern some may have in reviewing this paper to this point is that previously it was stated that this theory of solar pole reversal is based upon a novel confinement method for fusion that is supposed to mimic how the sun perpetuates fusion; which may be initially off-putting for some because everyone knows that gravity is the main driver for the fusion within the sun. Developing a logical theory on how magnetic pole reversal occurs within the sun based upon how the NESAR spherically rotates charged particles about an SRCP meant that there was some probability that the force of gravity may be tied to the manner of how charged particles are confined. After months of researching how the particles within the NESAR spherically rotate charged particles; a quantum theory of gravity founded on charged particles electrostatically interacting under Relative Accelerated Energy (RAE) from curvature deviation was developed. This theory is founded on the idea if the core's of stars are rotating spheres of plasma with a curvature plane about an SRCP, then there is a probability that charged particles upon this plane may experience slight relative perpendicular acceleration from curvature

deviation. This added dimension from curvature deviation has the potential to drive the electromagnetic field from a three-dimensional spatial field to a fourth; allowing for spacetime manipulation. To not detract from the main subject of this paper, this gravitational theory will vaguely be reviewed in this paper but will be fully presented in full detail in the following paper.

At the quantum level, gravity may be no more than a product of relative acceleration. Figure 13 is a general depiction of how RAE is generated from a NESAR or starlike confinement and is then converted to a gravitational force carrier. As these charged particles spherically rotate about an SRCP, they will undergo deviation from obtaining a curved trajectory. This deviation allows for the charged particles to generate extra accelerated energy amongst the confined charged particles that are electrostatically interacting. As these charged particles electrostatically interact under curvature deviations, the RAE is converted into a boson that is the force carrier for gravity. This process is similar to how the energy of a photon is transferred through an electron during the Compton Scattering process, but instead of a recoiled electron emitting a scattered photon; a scattered boson that embodies the RAE is expelled between relatively electrostatically interacting electrons recoiling from the extra energy from curvature acceleration. The magnitude of this scattered boson is very subtle due to its magnitude being generated from discreet RAE. Acceleration being transferred into energy in this manner would provide some clarity on why the gravitational force is so weak. In addition, this novel concept may also provide a deeper understanding of why Newton's law of universal gravitation is so similar to Coulomb's law of electric force amongst charged objects.

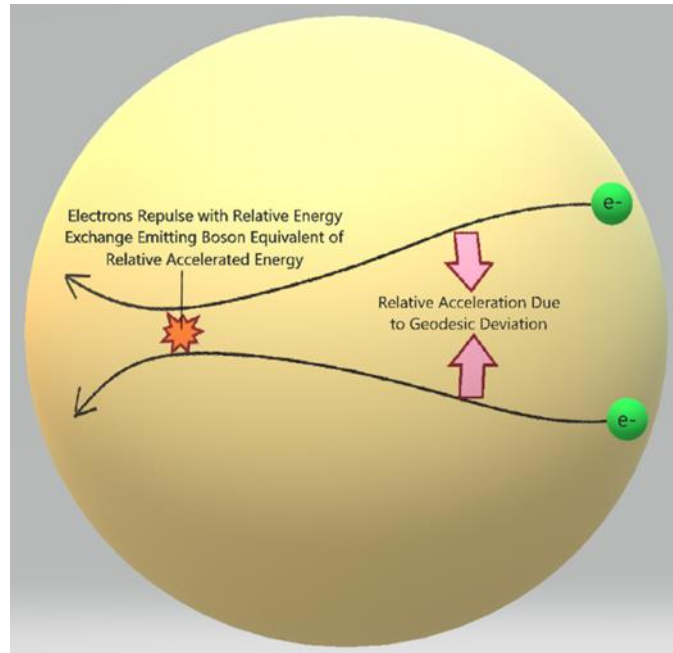


Figure 13.

If the force of gravity is generated in this manner, one must consider that almost all observations of the known universe are based upon photons that originate from atomic interactions that strictly follow a charged particle composition ratio, electron to proton ratio, that is one. Closed systems, like atoms, that require baryonic matter to stay intact may be limited in their energy due to this standard composition ratio that could be generating universal limitations for light speed. This means that all of man's analysis of stellar observations are based upon the incorporation of baryonic matter, protons and neutrons. If stars are a closed system that is similar to the NESAR, they have the capability to operate with an exponentially higher composition ratio. Having a high composition ratio allows for stronger gravitational forces to be generated at much lower masses because the confinement would mainly consist of the much less massive electron. Most importantly, having a high composition ratio may allow for baryonic limitations to be exceeded. If a black hole is a starlike confinement composed mainly of electrons, it would be much less luminous due to reduced fusion interactions while simultaneously obtaining a much stronger gravitational force in comparison to its luminosity; falling in line with what is possibly observed as dark matter.

For some, including Einstein, it is extremely hard to logically separate electromagnetism from gravity. RAE drives an extra dimension into



the electromagnetic field that can possibly generate gravity and influence time. To date man has only developed methods to relatively drive charged particles into two spatial dimensions, linear (one dimension) and loop (two dimensions); resulting in generating a magnetic field with a maximum of three spatial dimensions. In general, the spatial dimension of the generated magnetic field is one dimension higher than the spatial trajectory dimension of the charged particle. Since the highest relative accelerated dimension charged particles have been driven into is two, there has not been a method to truly generate or influence time and gravity. Figure 14 is chart of the spatial dimensions generated from the charged particle trajectories in comparison to the corresponding magnetic field generated. On the far right of this chart, highlighted in yellow, the additional accelerated dimension is emphasized. The NESAR has the capability to allow for charged particles to deviate from curved trajectories; driving charged particles to accelerate to a subtle third dimension. This subtle acceleration has the potential to allow for the generated magnetic field to influence a higher dimension.



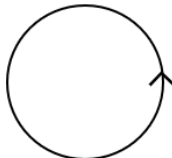
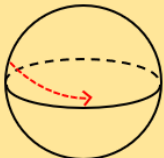
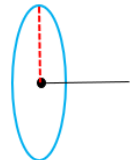
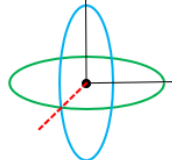
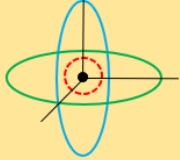
	Stationary Charged Particle	Wire/Linear Current	Loop/Coil Current	NESAR Current
Charged Particle Trajectory				
Spatial Dimension of Charged Particle Trajectory	N/A	1D	2D	3D, Additional Dimension From Curvature Divation
Magnetic Field Magnitude	N/A, Electric Field			
Spatial Dimension of Magnetic Field	N/A, Electric Field	2D	3D	Possible 4D Influence of Time and Gravity

Figure 14.

In all stellar observations of major gravitational phenomena, an electromagnetic property is always present. This type of simultaneity displays the critical role electromagnetism has in understanding gravity at the quantum scale. If gravity is a product of RAE amongst charged particles driving another dimension into the electromagnetic field, then a probability exists that this concept could be applied to better understand quark interactions within protons and neutrons to enhance comprehension of the remaining weak and strong forces. The probability does exist that all known forces may be a product of relative acceleration at the atomic level.

### **Conclusion**

All things considered, this is a straightforward theory of how the sun perpetuates; that requires little to almost no postulation to fully define this phenomenon. This Faraday law-based theory of solar magnetic pole reversal seamlessly ties a congruent relationship between the separate forces that drives the sun's perpetuation and magnetic pole reversals. Most importantly this theory provides clarity on what NASA's SCMs are actually recording from the sun's core. After researching countless theories on the sun's magnetic pole reversals, this explanation makes the most sense with the current recorded knowledge obtained on the sun's core.

In developing a method of fusion that truly functions as the sun operates, addressing the solar characteristics of magnetic pole reversal and quantum gravity are unavoidable. Since the physics community is separated into a myriad of highly specialized fields, most physicists are extremely hesitant to review concepts that do not perfectly fall in line with their specific focus. Due to this circumstance, it seemed most logical to release three separate papers to properly express the NESAR concept coherently with the most possible visibility. The reason that the initial paper on the NESAR confinement method is focusing on the magnetic pole reversal theory of the sun's core is that little to no postulation is needed in this theory. In addition, a theory purely based upon Faraday's law of induction would yield the least resistance in acceptance while adding possible validity to the claim that the NESAR confinement method may obtain similar properties as the sun. If this magnetic pole reversal seems plausible to those who review it; additional credibility would be tied to the following quantum gravity and fusion papers by indicating that the sun's core may be a dense rotating sphere of charged particles.

The main takeaway from this paper is that the observed pole reversals from the sun's core are shifts in EMF, which means that the sun's pole flips don't have to be dependent upon physically flipping a magnetic pole as so many believe. The observed pole flips in the sun's core are due to rotational speed changes in the densest confined plasmas. The universe is driven by the universal laws of energy conservation, and these laws are the driver of why the sun's core oscillates. So, every time the rotational speeds of the sun's core maximizes or minimizes, observations record a pole reversal as alternating EMF; which seems as if the sun's magnetic poles are flipping.

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