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Further investigations of the operation of a Poynting vector motive device

Abstract

The Morningstar device, which initially weighs 190 pounds, was able to reduce its weight by 7% during a steady-state situation and as much as 20% during transient operation. In our original paper, three or four approaches were identified to possibly explain this phenomenon including: conversion of angular momentum into linear momentum; Gravito-Electro-Magnetism (GEM) effects- a Poynting vector force induction based upon the roller design, and retarded potentials. In the latter, the ring component acts as a reflection plane for the roller electric and magnetic fields and if the time is retarded, it is possible that the image from one roller may attract the adjacent roller to create self-acceleration. Additional possible explanations were identified in the operation of this nonlinear device. This spectrum of additional feasibilities warrants further investigation to determine the physical motivation that can induce the observed weight changes. There is caution regarding these and additional explanations which should fall within supportable technical evidence. These additional efforts include: cogravitational, matter waves, gravitational wave effects and a conjecture about spacetime perturbation.

Keywords

Poynting vector; Angular momentum; Cogravitational; Gravitation waves; deBroglie matter waves; D-Dimensional.

INTRODUCTION

The name "Energy Box" is a misnomer. The original purpose of the device was to create a magnetic motion drive. Instead the device^[1] demonstrated changes in its weight gain and loss during its operation. This was carefully investigated. Basically this device is a variant of a Searle device and Godin and Roschin's concept with modifications. What the energy box consists of is a laminated ring that does not include a magnet but instead uses a ferromagnetic fluid and two copper rings that are electrically insulated from the main ring. The laminated rollers are consistent with Searle's suggestion but a carousel is included similar to Godin and Roschin's notion to use a cage that mechanically contains and aligns the rollers with respect to the ring. Generally, the device generates a non-symmetric or three-dimensional magnetic field that allows the magnets in the roller to move around the stationary ring. In our original paper^[2], the device weighed approxi-

mately 190 pounds. With additional support equipment for instrumentation and batteries, this with the device and a supporting cabinet weighed about 460 pounds. The cabinet was placed above six load cells to determine the weight distribution when the device was rotated. We found that the system weight would either have a loss or gain of weight as a function of conditions based upon rotation direction, voltage levels, and ring status. Moreover, the response of the system indicated an apparent resonance. There was some reproducibility with the results, under these conditions.

During the initial test series, the objective was to assume that the device would operate as a magnetic motor based upon previously mentioned claims. The device did not perform specifically as either Searle or the Russians had claimed. Searle mentioned using a dielectric material in the rollers and rings to separate copper from aluminum. This was an important issue because this included using a capacitance and that the

subsequent electric field would act radially with respect to either the ring or the rollers. This would act perpendicular to the magnetic field which should produce a Poynting vector force. As a result of this hypothesis, we developed a conservation law for the Poynting field and to much surprise, the Poynting field was found to be related to a gravitational or torsion field. This finding was very promising.

The first test series also gave inklings that using bathroom scales, to value weight, despite the extensive vibrations, appeared to measure weight change on a time-average basis. With more accurate digital load cells, some weight would change by increasing or decreasing depending upon the rotation rate of the carousel. These results were considerably small and could have easily reflected experimental error. These results appeared on the second and third test series.

One claim made by Searle was to magnetically imprint the ring with a strong magnetic source. This was not initially performed and results indicated that the device would only lose or gain a small difference in weight. While investigating the results, the rollers and carousel were intentionally positioned for several months with the main ring. These are considerably strong magnets and they imprinted the ring. During the tests prior to this, the results showed resonances that appeared as a function of revolution at about 200, 450 and 750 rpms. However, after imprinting, this resonance disappeared and this generated the large weight reductions previously mentioned. What was important was that the device was truly a nonlinear device. In other words, the possibility of reproducing the conditions at a former test may not be reproducible because of the strength of imprinting or the diminishing of magnetic field strength as a function of time. This goes against the common sense approach required for any scientific principle or experiment regarding reproducibility.

The imprinted ring resulted in a different set of circumstances and the device behaved in a very nonlinear manner. For example, the resonance disappeared as a function of rpm. Moreover, the 190 pound weight of the basic device was found to lose 7% weight during steady-state operations and as much as 20% during transient operations. These values are considerably higher than what one would expect with 1% weight loss normally allow for experimental differences.

Basically this performance is enigmatic and three or four technical approaches were identified to explain the device's actions. These existing alternative approaches suggest caution to investigate approaches regarding any explanation that falls within the supportable experimental evidence in the investigation.

DISCUSSION

The device is rather unusual with Hymu materials that include 80% nickel. Copper and aluminum as well as Hymu material are used for the laminated structure of the ring and rollers. The rollers include strong Neodymium magnets that support a Hymu core that are attached to ball bearings on the top and bottom to spin freely with the carousel. The device is shown in Figure 1.

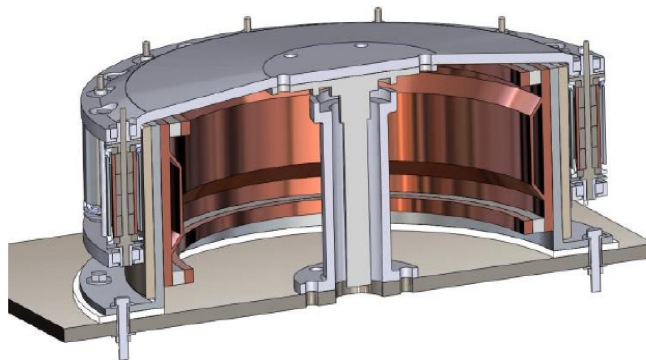


Figure 1 : The shaft drives the carousel which acts as a cage to constrain the rollers that move around the ring. Both rollers and the ring consist of a laminated structure. The reservoir with ferromagnetic fluid is in the interior of the ring.

The purpose of this effort is to cover a spectrum of imagination that allows us to open the door and possibly understand this scientific enigma. The possibilities that were initially selected include the following:

- Conversion of angular momentum to linear momentum,
- Delayed mirror image of the magnetic/electric field, and
- Poynting vector force/gravito-electro-magnetism (GEM) interaction.

Since that time, additional theories were included in this list:

- Generation of gravitational waves,
- Cogravitation per Jefimenko,
- Matter wave per de Broglie, and
- D-dimensional transport

These individual points will be addressed.

ANALYSIS

When the energy box was originally designed, its purpose was to generate a magnetic motor. The desire was to generate self-acceleration. However, the change in weight created a change in direction that required re-examining the purpose of the device. The direction about the revolutionary variant looked at four possible theoretical principles. These initial and additional possibilities will be discussed.

Angular momentum

The idea is to change Mother Nature by transferring angular momentum into linear momentum. This would allow angular motion to induce linear motion using interactions with magnetic and electric fields.

This may sound unusual but there are several dynamic situations that exist where there is a transfer of momentum from one coordinate direction to another. For example if one is to consider the six degrees of freedom of a body, say an airplane or a missile, there are specific situations that may not occur. This would involve a geometric body that has a body of inertia matrix that only has elements in the main diagonal. Here, motion in a specific linear or rotational momentum, is kept separate in a specifically defined direction. However, if the body is not symmetric and elements appear off of the diagonal elements in the moment of inertia matrix, there is an unexpected transfer from one direction into another. In other words, pitch rotation can induce yaw or roll orientation. Other examples also occur for the trajectory of a missile system in these situations. This can induce sudden yaw motion which will induce roll and pitch rotations. The subsequent performance of the aircraft results in what is familiar as ‘Dutch roll’.

The final example which is more direct is the situation of a bicycle or any automotive device. Here the wheels involve rotation but the vehicle changes this rotational momentum into linear momentum deriving forward motion.

In these examples, it is feasible to include the impact of large electrical or magnetic fields inherent in the energy box. These fields might alter such a change as an off-diagonal element in such a mathematical entity as the moment of inertia matrix.

Regarding the Morningstar Energy Box, the main carousel rotates and each roller is allowed to separately rotate within the carousel. The complications exist further in that each roller has its own electromagnetic fields and the ring on the energy box also may generate its own magnetic and electric fields. The roller fields will induce a three-dimensional field during the rotation around the carousel and the ring as well as the individual rotation at the axis of each roller. Clearly it is feasible that these fields can induce the linear and angular momentum effects seen by the rollers traveling around the ring and that these could allow the carousel to initially rotate by its own capability. The impact of these fields may induce weight reduction in some as of yet to be determined effect.

Gravito-electro-magnetism (GEM)

This notion uses a Poynting vector force induction

based upon the roller design. The approach looks at a magnetic roller/capacitor around the ring. When roller motion is started, an electric field is created by Maxwell’s equations. If the magnet is longitudinal and the electric field in the roller is radially oriented, the Poynting vector, which is the cross product between the electric and magnetic fields, would create a force to induce motion. John Searl’s use of dielectrics acts like a capacitor obviously creating a Poynting vector motivator.

Briefly the Poynting field is:

$$\bar{S} = \frac{1}{\mu_0} (\bar{E} \times \bar{B}) \tag{1}$$

And the conservation equation that is derived^[3] is:

$$\mu_0 \left[\frac{1}{c^2} \frac{\partial^2 \bar{S}}{\partial t^2} - \nabla^2 \bar{S} \right] = -4\pi \left[\rho_m \nabla \times \bar{E} - \rho_e \nabla \times \bar{B} + \frac{1}{c^2} \frac{\partial}{\partial t} (\bar{J}_e \times \bar{B} + \bar{E} \times \bar{J}_m) \right] + \mu_0 \nabla \times \nabla \times \bar{S} \tag{2}$$

Where S is the Poynting field^[4], e is the electric field, B is the magnetic field, J represents currents, ρ is a source term with subscripts that are for e with electric and M for magnetic fields. This also provides insights into gravitational forces in the future publication.

At this junction, it is speculated that the curl of the Poynting vector could have induced an effect that created losses and gains to weight because of the interaction. Additionally, we have found a derivation for the Poynting field conservation that offers an additional field than only by using separate magnetic and electric fields. This use of the Poynting field looks very promising. During these efforts, the ancillary field looks like:

$$\frac{1}{c^2} \frac{\partial^2 \bar{V}}{\partial t^2} - \nabla^2 \bar{V} = \frac{\partial}{\partial t} \int_0^r \left[4\pi \left[\rho_m \nabla \times \bar{E} - \rho_e \nabla \times \bar{B} \right] - \mu_0 \nabla \times \nabla \times \bar{S} \right] \cdot d\mathbf{r} + 4\pi \nabla \cdot \left[\bar{J}_e \times \bar{B} + \bar{E} \times \bar{J}_m \right] \tag{3}$$

This expression includes magnetic sources and currents for completion with symmetry between the electric and magnetic fields derived as a byproduct from the Poynting conservation equation. It represents another field that may be either a torsion field or possibly a gravitational field. It is most likely that this is a gravitational field that would cause these effects. This is far more detailed than what is available from either Gertsenshtein or Forward’s efforts that imply that an electromagnetic field can be used to induce gravitation.

The importance of this equation is that you can see components that are related to the items that create the Poynting vector. However, the crucial component

is the curl of the Poynting vector. The rotation of the separate rollers within the Morningstar energy box could have created some of these components; however, the rotation of all of the rollers would generate a larger term for the curl expression that would produce a significant effect.

There is another point worth noting. No restrictions are made on whether this field is positive or negative. If this is a gravitational field in the conventional sense, it could be positive to generate an attractive force acting near different masses of a body. However, with these different terms, it is possible that the field could be negative thereby generating a repulsive gravitational effect. In other words, mass would actually repel against each other and such an expression may be an interesting alternative to generate a future vehicle exercise in long-range spaceflight. Finally, additional work will soon be updated on these equations.

Retarded potentials

As the rollers interact while moving around the ring, they will create an image directly opposite to the field on the ring created by the roller. As these virtual images exist, there are some interrelationships between the ring and the individual rollers. Thus, the ring acts as a roller reflection plane. If the time is retarded in the image within the ring due to electromagnetic properties such as hysteresis, it is possible that the image from one roller may be delayed such that it will attract the adjacent roller to create self-acceleration. The retarded potential looks at the electric and magnetic field images in the ring created by the roller. If these images in the surface plane could be delayed, say due to high rotation about the carousel, the images may drag the next roller to cause linear momentum and self-acceleration.

What is of interest is that during the last series of tests of the energy box, a stronger level of magnetic imprinting occurred and the carousel acted differently. When power was reduced, the carousel rotated longer than in the past as a function of time. However, when the carousel stopped in a specific direction, it would rotate in the opposite direction for about 10 degrees in azimuth before finally stopping. This occurred in either clockwise or counter-clockwise motion when the stopping appeared acting in the opposite direction. This may have represented an experimental rationale for validating the idea about retarded potentials.

It is conceivable that the performance of the energy box may use combinations of each or all of these theories. It should be mentioned that the Russians also have

a theory that was a magnetic von Karman street. Each of the vortices in the street would operate at the location of the roller in a circular path following the ring. This would lead to self-acceleration. We did not fully assess this capability but would like to suggest that it represents a possible solution set as well.

Generation of gravitational waves

The approach is rather different. In the case of 1913+16, a binary pulsar, the precession rate is significantly high. This implies that the neutron star is losing weight significantly and the view is that this is predominantly due to the creation of gravity waves^[5]. The issue about binary pulsars is not trivial by any stretch of the imagination. The neutron star rotates at a significantly high rotation rate. According to speculation from some investigators, it is conceivable that this rotation rate affects the gravitational field of the neutron star. Moreover, there is a careful balance between the weights of the neutron star, the companion star as well as the type of trajectories with these stars and the neutron star rotation rate. These interactions may exist somewhat like these relations in a binary pulsar.

Obviously, Einstein claimed the existence of gravitational waves but since Newtonian gravitation does not include time effects, gravitational waves will either occur instantaneously or do not exist at all. On this basis, Einstein developed a wave equation relationship for gravity to allow the inclusion of gravity waves. However, the problem is that the technology to either create gravity waves or detect gravity waves may be currently outside of the realm of contemporary technology. Moreover, several interesting ideas become relevant if gravity waves would exist. Giorgio Fontana addressed an interesting idea about using gravity wave generators that were focused in front of a spacecraft. When these beams of gravity waves intersected, they would create a singularity in the space-time continuum. This would induce a pseudo-gravitational field that would literally pull instead of push the craft's motion due to an attraction toward the singularity.

Although speculative, the idea here is that if weight is reduced, gravity waves are emitted away from the device due to creating a vortex. When the rotation stops and the weight returns, the device would attract gravitational waves. The processes to create or absorb gravity waves are created by the unusual electromagnetic field induced by the rollers interacting with the ring. If this is the case, then creating or destroying gravity waves might be far easier than initially considered and this warrants additional concern.

Cogravitational waves

Jefimenko claimed that gravity could be modified to deal with two separate fields to create a gravity and cogravity field^[6-8]. The force was based upon a Lorentzian type of relationship that derives Maxwell's equations:

$$\bar{\mathbf{F}} = \mathbf{m}[\bar{\mathbf{g}} + \bar{\mathbf{u}} \times \bar{\mathbf{K}}] \tag{4}$$

The relationships for the gravitational field and the cogravity field have to obey the following relationship:

$$\begin{aligned} \nabla \times \bar{\mathbf{g}} &= -\frac{\partial \bar{\mathbf{K}}}{\partial t}; \quad \nabla \cdot \bar{\mathbf{g}} = -4\pi G \rho; \quad \nabla \cdot \bar{\mathbf{K}} = 0. \\ \text{and: } \nabla \times \bar{\mathbf{K}} &= -\frac{4\pi G}{c^2} \bar{\mathbf{J}}_g + \frac{1}{c^2} \frac{\partial \bar{\mathbf{g}}}{\partial t}. \end{aligned} \tag{5}$$

These equations are adjusted to create wave equations such that:

$$\begin{aligned} \frac{1}{c^2} \frac{\partial^2 \bar{\mathbf{g}}}{\partial t^2} - \nabla^2 \bar{\mathbf{g}} &= 4\pi G \left[\nabla \cdot \bar{\rho}_g + \frac{1}{c^2} \frac{\partial \bar{\mathbf{J}}_g}{\partial t} - \frac{\nabla \times \bar{\mathbf{J}}_c}{c} \right], \\ \frac{1}{c^2} \frac{\partial^2 \bar{\mathbf{K}}}{\partial t^2} - \nabla^2 \bar{\mathbf{K}} &= 4\pi G \left[\frac{\nabla \cdot \bar{\rho}_g}{c^2} - \frac{1}{c^3} \frac{\partial \bar{\mathbf{J}}_c}{\partial t} - \frac{\nabla \times \bar{\mathbf{J}}_g}{c^2} \right]. \end{aligned} \tag{6}$$

The reason for the additional field was that gravity would not only bring forth an attractive force but would also create angular motion. The reason was to provide an explanation why the moon of the earth only looked at the same side. This notion is somewhat similar to the ideas previously mentioned about angular and linear momentum transfer.

The final expression for the gravitational vector is:

$$\begin{aligned} \bar{\mathbf{g}} &= -\frac{G}{r^3} \frac{m}{(1 - \bar{\mathbf{r}} \cdot \bar{\mathbf{v}}/rc)^3} \left[\left(\bar{\mathbf{r}} - \frac{\mathbf{r} \bar{\mathbf{v}}}{c} \right) \left(1 - \frac{v^2}{c^2} \right) + \bar{\mathbf{r}} \right. \\ &\times \left. \left[\left(\bar{\mathbf{r}} - \frac{\mathbf{r} \bar{\mathbf{v}}}{c} \right) \times \frac{\dot{\mathbf{v}}}{c^2} \right] \right] \approx -G \frac{m}{r^3} \left[\left(1 - \frac{v^2}{2c^2} \right) \bar{\mathbf{r}}_o - \frac{2r\mathbf{v}^2}{3c^3} \bar{\mathbf{v}}_o \right]. \end{aligned} \tag{7}$$

The Newtonian would accept this behavior of the moon based upon an offset in the weight or center of gravity of the moon. However, investigations revealed that all of the major planets with moons also had similar behavior. Moreover, all of the planets and moons in our solar system dynamically operate in the same rotation direction. This tends to confirm some of Jefimenko's conjectures. Finally, the need for cogravitational allows the effects of gravity due to treatment of motion at or near the speed of light.

Jefimenko makes, as mentioned, an analogy between gravity and cogravity with electricity and magnetism. This is derived with a Maxwell's equation type of relationship. Several variations of these gravity laws were modified to treat with gravity and cogravity currents. These

currents are not well defined except with analytical representations. In other words, if these currents were dependent upon electrical and magnetic currents within the energy box, there would be a logical conclusion that a relationship exists for explaining the weight losses and gains^[1]. The point is that this cogravity field may be active under the influence of the energy box and that this is creating the weight gains or losses. From the wave equation relationships, there is no pretext to define a positive or negative value although the relationship is clearer for this with the definition of the gravity term. Further gravitational laws based upon Jefimenko, have also formed a similar relationship but with an expansion to include additional magnetic current and source terms. This warrants additional effort to examine if cogravity exists and if so, what would be the consequences that may impact the energy box.

deBroglie matter waves

The turn of the 20th century brought about some amazing thought provoking ideas. Einstein presented the idea of a photon. A small packet of light that acts as a wave under certain conditions and then acts like a particle under other conditions. Basically a middle ground was determined in the particle vs. wave debate of light propagation where Louis deBroglie was intrigued and came up with a very interesting notion^[9]. What if other particles had wave like properties to them? Could all matter act as a wave at some point and then act as a particle at another? These notions extended to consider that if mass can be converted to energy, energy may similarly be converted to particles as well.

Using the relativistic momentum formula from special relativity:

$$\mathbf{p} = \gamma m_0 \mathbf{v} \tag{8}$$

Allows this equation to be written for the wavelength and frequency as:

$$\begin{aligned} \lambda &= \frac{h}{\gamma m_0 \mathbf{v}} = \frac{h}{m_0 \mathbf{v}} \sqrt{1 - \frac{v^2}{c^2}} \\ f &= \frac{\gamma m_0 c^2}{h} = \frac{m_0 c^2}{h \sqrt{1 - \frac{v^2}{c^2}}} \end{aligned} \tag{9}$$

Using the four-momentum $\mathbf{p} = (e/c, \mathbf{p})$ and the four-wave vector $\mathbf{K} = (\omega/c, \mathbf{k})$, the deBroglie relations form a single equation that relates wave-like characteristics with mass:

$$\mathbf{P} = \hbar \mathbf{K} \tag{10}$$

Which is frame-independent.

This relates the wavelength of a particle to its momen-

tum creating the basis for wave-particle duality, which is used in the Klein-Gordon equation.

$$\frac{1}{c^2} \frac{\partial^2}{\partial t^2} \Psi - \Delta^2 \Psi + \frac{m^2 c^2}{\hbar^2} \Psi = 0 \tag{11}$$

This idea is rather simple. The generation of an electromagnetic vortex generated by the energy box is based upon the Poynting Conservation equation^[2]. This also implies a vortex that contains some level of energy. What we are suggesting is that this vortex contains a conduit that allows converting mass into energy during the rotation of the energy box and likewise, converting this energy back into mass when the device is either slowing down or stopping.

There is a far simpler understanding. If de Broglie said that $E = m c^2$, then it is possible that matter waves are defined as $m = E/c^2$. What is suggested is that the en-

ergy is changing due to the electromagnetic interactions between the rollers and the ring, that matter waves are produced while weight is lost during rotation. The weight is regained by matter waves when the device slows down or stops.

D-Dimensional axis transport

This hypothetical approach is based upon the conjecture that the perturbation associated with the device was able to impact the spacetime manifold in the local region. This may occur at the point where charged particles would be able to access a D-dimensional axis that allows for transport to a point in the spacetime continuum that was less perturbed^[10]. If this D-dimension exists, it would overlay the primary dimensions of spacetime and due to the perturbation of the device

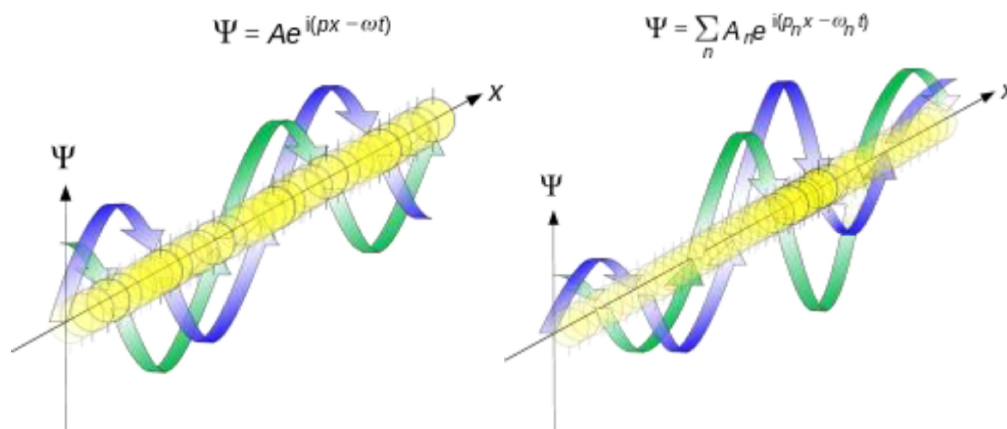


Figure 2 : Propagation of de Broglie waves in one-dimension—the real part of the complex amplitude is blue, imaginary part is green. The probability for finding the particle at a given point x is spread out like a waveform, there is no definite position of the particle. As the amplitude increases above zero the curvature reverses sign, so the amplitude begins decrease again, and vice versa - the result is an alternating amplitude or a wave.

allow for a window into how particles fundamentally interact.

Initially, this idea was motivated from the observation that mass was being lost or gained by the device. The thought that mass was paltered in a particular phase and returning at the end of the experiment is a difficult concept to understand, much less accept, since it implies that the laws of conservation of energy and mass are being violated. When this occurs, engineering conservation becomes problematic. However, when conservation is violated, Einstein’s field equations suggest that this results in either a change in the curvature in the spacetime continuum or the change in the gravity tensor. The latter would explain the weight changes. Further explanation of this possible transport was investigated that assumed information of the particle experiencing the perturbation of the device would be transported along this to be determined axis through quantum mechanical interactions thus violating Heisenberg’s uncertainty principle. This explanation

somewhat utilizes the GEM theory relationship associated with the application of the Poynting vector, the retarded potential created during rotation of the device and the wave-particle duality exhibited by deBroglie matter waves as mechanisms that require a further investigation using Einstein’s field equations.

RESULTS

The basic issue is that most of these ideas are worth investigating. The original objective of this examination was to scrutinize additional alternatives from the ideas initially discussed and this was somewhat achieved. It is unfortunate that there was no clear-cut decision one way or another when an additional test series was performed. Moreover, the effort to fully identify and provide an adequate understanding would require serious considerations for defining each of these separate possibilities in the form of creating unique experiments. Furthermore, there is a tacit view that the even-

tual phenomenon may not be a consequence of a single approach but rather as a consequence that includes several of these ideas simultaneously.

To perform this, experiments would have to be carefully designed to exploit each of these approaches as well as coupling several of these alternatives simultaneously. This is currently outside of the realm of technology in some of these notions where measurement may affect the observation of the device. As mentioned, for example, no technology currently exists to identify gravitational waves in terms of a transmitter and a receiver. The notion about isolating cogravity is also something that would require detailed investigations as well as discovering and quantifying the torsion or gravitational field based upon the conservation law for the Poynting field. Possibly, the solution may exist in a quiescent environment such as in outer space or in orbit around the Earth.

A more down-to-Earth possibility can be discussed but only with some portion of the problem as a means to examine small pieces in lieu of the 'whole' process. The examination of environmental conditions would need to be monitored during the operation of the device to understand how the system affected its environment. Time could be observed using a laser-detector array passing through the area of field interaction to observe how the evolution of the system occurred. A cubic grid of magnetometer probes could be placed around the device at 2" increments with a real time feed to an on-line acquisition system to attempt to better map the changes in the magnetic fields to infer the changes in gravity. A change of symmetry of the carousel could be used to create a stronger alignment of fields. Certainly the employment of new materials, such as graphene as a capacitance element may be useful as well.

NOMENCLATURE

E	- electric field
B	- Magnetic field
S	- Poynting Vector field
G	- gravitational constant
K	- Cogravitational field
P	- Momentum
J	- Current density
c	- Speed of light

Greek Symbols

ρ	- density
ψ	- probability
μ	- permeability

CONCLUSIONS

The experimentation involved with the Energy Box has proven to be a non-linear roller coaster. In an attempt to explain how the device works, a group of plausible explanations has emerged. What can be taken away from these explanations is that the device in motion causes a system that due to symmetry and dynamic force production yields an environment where the fundamental interconnection between mass and force can begin to be explored. Through mathematical analysis gained by the GEM approach, the interdependence of the dynamic fields begins to take shape through how the device reacts to subtle changes in energy. The retarded potential or lagging field image created can imply a state of causality entrained in the operation of the system. Each of these cases explains the system as it is, a nonlinear reaction of interdependent forces. To gain a greater understanding of which theory is present and how it works will need greater experimentation.

The Energy Box and how it implements dynamic forces creates a window into how our reality is affected due to spacetime perturbation. The fundamentals of how mass is seen and how its energy is converted in these dynamic fields could lead to a greater understanding of our terrestrial environment, which in turn could allow for a greater understanding of our extraterrestrial environment.

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REFERENCES

- [1] Paul A.Murad, Morgan J.Boardman, John E.Brandenburg; The Morningstar energy box- Part redux, Journal of Space Exploration - STAIF II - published via Elsevier, (2012).
- [2] Paul A.Murad, Morgan J.Boardman, John Brandenburg, Jonathan McCabe, Wayne Mitzen; The Morningstar energy box, AIAA Paper No. 4-920 AIAA Meeting in the 50th Aerospace Sciences Meeting in Nashville, Tennessee on January, (2012).
- [3] P.A.Murad, J.E.Brandenburg; A Poynting vector/Field conservation equation and gravity- The Murad-Brandenburg equation, presented in STAIF II, Albuquerque, New Mexico, (2012).
- [4] Lorentz et al.; (1952).

-
- [5] Paul A.Murad; Replicating pulsar behavior to create a future space propulsor, International Journal of Astronomy, **1(5)**, 81-86 (**2012**).
- [6] O.D.Jefimenko; Gravitation and Cogravitation, Electret Scientific Company Star City, ISBN 0-917406-15-X, (**2006**).
- [7] O.D.Jefimenko; Electromagnetic Retardation and Theory of Relativity, Electret Scientific Company, Star City, West Virginia, (**1997**).
- [8] O.D.Jefimenko; Causality Electromagnetic Induction and Gravitation, Electret Scientific Company, Star City, West Virginia, (**1992**).
- [9] L.deBroglie; Recherchez sur la theorie des quanta, Researches on the quantum theory. Thesis (Paris). 1924: L.deBroglie, Ann.Phys.(Paris), 3.22 (**1925**).
- [10] Morgan J.Boardman, John E.Brandenburg, Garrett E.Volk; Space-time perturbation effect upon rotating bodies on laminate layer branes, presented in STAIF II, Albuquerque, New Mexico, (**2013**).