A Nonlinear Electromagnetic Device and Potential Explanations

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Abstract—**The Energy Box represents an unusual nonlinear revolutionary derivative based upon both the Searl and a modified Searl device implemented by the Russians Godin and Roschin. The Energy Box uses Russian device by using a mechanical cage to align laminated rollers per Searl and a unique main ring incorporating a ferromagnetic fluid to enhance electrical and magnetic properties as well as using Hymu-80 material. This approach represents a game-changing technology. The Russians made several serious claims where their device-generated self-acceleration, provided a weight loss when spun in one direction and gain when spun in the opposite direction producing discrete magnetic walls. Unexpectedly the Energy Box is a 190-pound electromagnetic device which reduced its weight by 7% during steady-state situations and as much as 20% during transient.**

The device established similar phenomenon regarding discrete magnetic walls, with weight gain and loss, although at lower magnitudes than the Russian claims. Unfortunately, no self-acceleration was achieved. Previous investigations identified several plausible explanations from the conversion of angular momentum into linear momentum, Gravito-Electro-Magnetism (GEM) effects- a notion using a Poynting vector force induction based upon the roller design. This produced a Poynting Conservation law as well as another field believed to be a localized gravitation field. Retarded Potentials where the ring component acts as a reflection plane for the roller electric and magnetic fields and if the time is retarded, was examined as a possible means to create self-acceleration. Emerging Theories are mentioned to include Gravitational-wave generation, Co-gravitation (Jefimenko) DeBroglie matter waves and an N-Dimensional Axis. Unfortunately, because of this nonlinear device, no clear-cut theory provided any reasonable explanation of these events. This obviously warrants continued investigation.

Keywords—*Gravitation, electric fields, magnetic fields, levitation, spin.*

I. INTRODUCTION

Several unusual and controversial mechanisms warrant consideration especially if they have space propulsion implications. Some of these devices are discounted because they might defy expected physics behavior. In some cases, the theoretical determinations are unclear with these similar devices; however, they demonstrate some unusual physical and experimental behavior that warrants investigation. Some of these controversial devices regard efforts of Searl[1,3], and by Godin & Roschin[4-6] with significant claims about a phenomenon that have either produced unusual electromagnetic fields or the gain or loss of weight. If successful and if real, such devices may implicate new forms of 'Green Energy' or some advanced propulsion capabilities to include spacecraft[7,8]. The problem is to investigate these claims with a sane rational approach thereby identifying a potential significant game-changing technology that may create advanced propulsion or energy. The Energy Box clearly falls within this domain and warrants continued investigation.

II. DISCUSSION

A. Searl Device

The idea proposed by John Searl[1-3] has created significant controversy. The basic idea of his device is that cylindrical magnets will interact with a ferromagnetic bar of material. These magnets will diametrically approach a certain displacement from the bar. Searl's contribution bends the bar into a contiguous ring so that the individual magnets 'hunt' and 'peck' in a circular arrangement with an equal azimuthal increment concerning the ring. The rollers stay above but do not contact the ring surface. His notion suggests that all of the magnets have either all south or all north polarity. The other contribution by Searl is that the rollers and rings are laminated with specific materials. For the roller, they consist of a central core that includes an intense strong magnet. These are inserted in a copper sleeve followed by a dielectric material externally concentric by an aluminum sleeve. The dielectric provides a gate for electrons; other roller materials also provide electrons. The ring has a similar laminated arrangement where the magnet is on the exterior portion of the ring and aluminum within the interior ring. Other elements to include iron can also be used. Searl identifies the law of squares or the *magic*

squares[2] but we found there is basically no real science to validate this concept.

Rings will achieve a magnetic/mechanical resonance that produces a rotation rate as the rollers move quickly about the ring. Some felt that the roller rotation rate motion is the same as the surface motion on the ring whereas another view implies the roller rotation rate moves faster by a factor of six. That means the rollers rotate faster than the motion expects around the ring. To generate electricity,

Figure 1. The rollers operate around the ring with parity of the pole magnets.
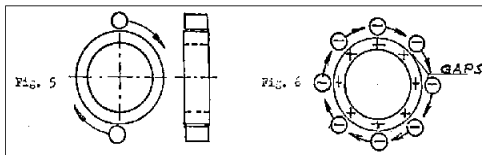
Considerable information claims that Searl may have generated some devices that lifted to high altitudes. Nevertheless, these comments did not provide real evidence for these claims and are a principal source of controversy especially why one would want to lose such a complex device in the first place.

B. The Brown Device

Before his demise, Dr. Paul Brown[4] created a Searl device supposedly the size of a telephone book. Rollers were in even pairs and had a specific radius of the roller radius to the diameter with the ring. Test results suggested the device was unstable and created about a megawatt of electricity. Wires started to glow and magnets were so overheated that the magnets caught fire before the system was destroyed. Not much information is available about this machine. However, if the magnets became hot, they would exceed the Curie temperature and the magnets should have lost their magnetism. Consequently, device rotation should have ceased.

*C. The Russian Godin & Roschin Device*

Roschin provided an initial device that resembled a Searl system to demonstrate feasibility. Godin and Roschin[5-7] are Russian scientists that created a comparable electromagnetic technology. They made a similar ring with several hundreds of pounds of magnets using Selenium. Rollers were not concentric but cylinder slabs for each of these materials. Rollers were also constrained to a mechanical carousel or armature that oriented the location of the rollers as well as the spacing from the surface of the ring. Other variations by the Russians are that the rollers had used radial magnets meshed between the rollers and the ring. If this worked successfully, rollers would

passing rollers move through a transformer capture device that generates electricity by cutting the roller lines of its magnetic field. In a different variation from the theme, these sections could be charged to create an electric signal that allows induction for the roller's rotation. Very little evidence has identified the amount of current generated by this device. Finally, Searl suggests that the device may have three concentric sets of rings and rollers[3] but no evidence has ever shown any working apparatus with more than a single ring.

rotate per the linear spacing of the ring where the magnets meshed like gear teeth.

This device, reported[6] at an AIAA Meeting in 2001, claimed the device self-accelerated, that it rotated by itself. A 7 KW generator was used to generate electricity. The device was charged on the exterior of the rollers to 20,000 volts. It is not clear how this voltage was applied. When the device rotated at 600 rpm, the approximate weight of the 375 kg armature lost 35% of its weight. They claimed at this time, the temperature decreased. When rotated in the opposite direction, the device gained 35% of weight at 560 rpm. Moreover, the system produced magnetic discrete walls that were at several distances away from the device. Finally, the system also had a smell of Ozone.

Figure 2. The rotating MEC supposedly generated self-acceleration as well as very significant phenomena.
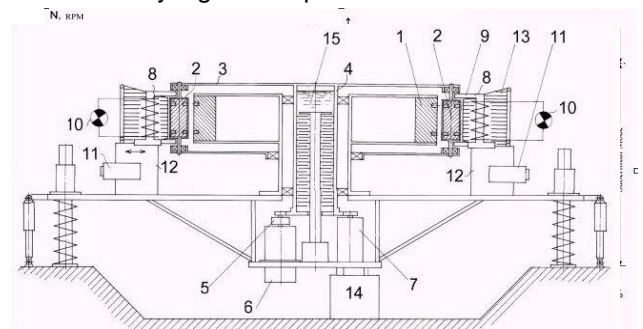

Unfortunately, the authors stated that in 1993, the device was torn apart supposedly to obtain money for support funds. For example, the magnets were very costly. This was a crucial time during the economic collapse of the Soviet Union. For this reason, when the findings were presented, there was not much of any encouraging response from the participants of the meeting proceedings.

They were able to create a second heavily modified device. Unfortunately, this second device was not successful. A third attempt was produced but has not provided any new or additional information about the Godin and Roschin device. At face value, the primary issue is that if the temperature decreased with the weight loss, this would constitute an Unruh-like effect. However, their oral report does not

mention temperature increases commensurate with weight increases per the technical paper.

The Russians had several different theoretical views regarding how their device worked. The main idea is that angular momentum can convert linear momentum. This may sound trivial; however, it works in terms of a wheel in a bicycle, a car or a locomotive. The notion[8-10] here is that a von Karman vortex street provides this effect. Unfortunately, the problem in this particular situation is not obvious. Each odd vortex would rotate in one-spin rotation while even vortices rotate in the opposite spin. Moreover, the length of these vortices may not be of even lengths for specific conditions. The results are shown in the following figure.

Figure 3. A vortex street has specific fluid geometry. The Russian notion may be promisingon this basis for certain pairs of vortices that act on the ring and
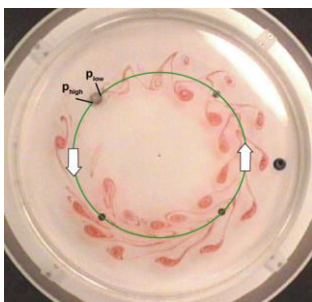
the opposite vortices in the rollers.

D. The Energy Box

The name *"Energy Box"* is a misnomer. The original purpose of the device was to originally create a magnetic motion drive. Unfortunately, this did not occur when experiments revealed that the device could alter its weight. This was unexpected. The unusual operation of this device is that the rollers move within a three-dimensional magnetic field in a circular kinematic trajectory that differs from an axisymmetric electrical motor because of the electromagnetic field trajectory.

This revolutionary variant is based upon at least three possible theoretical principles. These possibilities are:

- *Angular momentum-* The idea is to change Mother Nature by transferring angular

momentum into linear momentum possibly similar to the Russian motives.

- *Gravito-Electro-Magnetism (GEM[11])-* This notion uses a Poynting vector force induction based upon the roller design that acts like magnetic dipoles, and
- *Retarded Potentials-* The ring acts as a roller reflection plane on the ring. If the time is retarded or through magnetic hysteresis, the image and subsequent forces from one roller may attract the adjacent roller to create self-acceleration.

The first approach would allow an angular motion to induce linear motion using interactions with magnetic and electric fields. The second approach initially looks at a magnetic roller/capacitor around the ring in Figure 4. When roller motion is started, an electric field is created by Maxwell-Heaviside'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
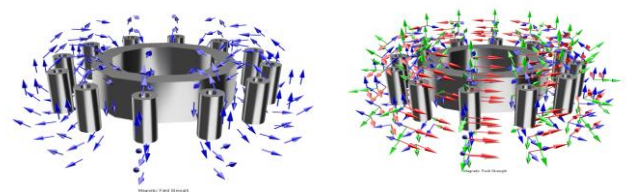
to induce motion. John Searl's use of dielectrics tends to act like a capacitor, thus it is obvious that the Searl roller creates such a Poynting vector effect. Additionally, we have found a derivation for the Poynting field conservation that offers additional effects dependent upon separate magnetic and electric fields. The Poynting field[12] looks very promising but requires further investigations.

Figure 4. The left figure is with no rotation and the right uses rotation. Blue arrows are the magnetic field, green is the electric field and the red is the Poynting field with motion.

The Poynting field is:

$$\bar{S} = \frac{1}{\mu_o}\left(\bar{E} \times \bar{B}\right). \qquad (1)$$

And the conservation equation is:

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

$$(2)$$

Where **S** is the Poynting field[13], **E** is the electric field, **B** is the magnetic field, **J** represents currents, **ρ** is a source term with subscripts are for **e** with electric and **m** for magnetic fields. This also provides insights into gravitational forces in a recent publication[12].

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

that aligns the rollers, the images may drag the next roller to cause linear momentum and self-acceleration. It is conceivable that the revolutionary performance of the Energy Box may use new theories, combinations of each or all of these theories. This will be addressed in the result section.

E. Description of the Energy Box

The device operates with rollers similar to Searl's design and the design of a ring, while a cage is used as a carousel similar to the Russian device. The ring in this figure is a laminated device with different rings to enhance the electric and magnetic properties and how this will interact with the rollers. Moreover, in place of using magnets within the ring, HyMu-80 material in the ring contains a copper reservoir for a ferromagnetic fluid. Besides, rollers have a passageway to allow air movement to cool the magnets and hopefully prevent the magnet fire problem seen by Brown. HyMu-80 material is also used as the magnetic core of the rollers and the core is placed in concentric angular Neodymium magnets. This is generally followed by a copper sleeve and an insolated aluminum sleeve. Thus, the Energy Box has similar components with these effects, which includes the use of the most favorable characteristics gathered from several serious investigations. Components for these elements are seen in Figure 5.

Figure 5. The laminated ring graphically shows with the actual ring and spindle to drive the carousel. Hardware for the carousel also includes the motor and support drive.

The system used to determine information includes various components. Measurement Specialties Inc. manufactures the six load cells with part number FC2231-0000-0100-L. The load cell is capable of 0-100 lbf with outputs from .5 to 4.5 volts. These load cells were placed on the bottom of the cabinet to minimize any magnetic effects from the rollers. Moreover, cables were used to minimize magnetic effects from distorting electrical signals during the operation. AlphaLab Inc. provides a magnetometer using part number DC Gaussmeter M1ST with a range of 0 to 20,000 gauss; this was increased using a modification by the developer to 30,000 gausses. The Motenergy (formerly Mars Electric Inc.) motor is a 48 V brushless DC motor

capable of 5-10 kW or a maximum of about 6.7 HP with a rotation rate of 0 to 5,000 rpm. Compact Instruments Tachoprobe A2108 provides a laser tachometer to determine rotation levels capable of 80 to 6,000 rpm. The National Instruments SCXI 1600 data acquisition system was used for all measurements. The configuration contained 32 channels of analog to digital conversion that was additionally fitted with an SCXI 1102 32-Channel Thermocouple/Voltage Input Module as well as an SCXI-1102C 32-Channel Amplifier Module. Also, to overcome noise in the data, a relaxation filter was also used. The assumed actual weight is approximated by.025 times the new experimental measured weight added to 0.975 multiplied by the weight at the previous time step to decrease frequencies higher than the Nyquist frequency sampling rate. This provides a reasonable weight distribution as a function of steady-state and rotation rate changes.

Four different types of rollers were manufactured. The interaction of these rollers depends upon the strength of the magnets as well as performance. The ability of the rollers to hunt along the ring is also crucial. Some of these concepts were found unworkable based upon how they would be anchored to the carousel. In general, these rollers used a core that consisted of Hymu-80. The green color represents a copper sleeve and a gray aluminum sleeve that does not have electrical contact with the other components within the roller by the yellow separate sleeve. Magnets in the central core were small segments because it was difficult to obtain magnets within the roller geometry. The purple objects are larger magnets that enhanced the magnetic pole of the roller. These magnets generally were strong enough to generate a pull of 69 pounds per magnet. This created quite a bit of difficulty in terms of handling these rollers that are shown in Figure 7.

In a phone conversation with Devon Tassen[14], the recommendation was made to enhance the poles of the rollers. This advice was correct. The successful roller used larger magnets at the poles compared to the rollers that used smaller magnets. The final selection for the roller design used a turbine-like arrangement that replaced the plastic sleeve. This would allow an air passageway between the copper and aluminum sleeves. If the magnets were too hot, this air would provide a modicum of cooling and prevent problems. In the experiments, a question was raised if these turbines could generate aerodynamic lift. We used to tape over these accesses to block any air passage and there was no change in performance. If this were an important conclusion, the lift would go in one direction to decrease weight and probably add weight in the opposite direction. No clear-cut demarcation occurred. If there were weight loses or gains, they

occurred at specific situations based upon rotation rates or different voltages.

Ivan Kruglak provided significant insights on these devices and the performance of the Godin and Roschin device. Kruglak[15] stressed that they used a planetary gear relationship to enhance roller rotation. One approach used by the Russian device was that small magnets were drilled and physically meshed within both the rollers and the ring. This was to generate a gear-like tooth mesh action to ensure that roller motion about the spin of the rollers. Some collars used on the roller were altered to allow for the creation of small-embedded magnets in a radial direction. This was in addition to the larger magnets. No small magnets were incorporated in the ring. After tests, there was no great difference in results with these modifications. If anything, the small magnets would be ejected from the roller due to the strong centrifugal force acting away from the center of the carousel. To our surprise, the small magnets were not ejected radially but were found located on the ring considering that the rollers move about 100 g's of acceleration. This surprisingly suggests that the magnetic attraction of the ring with its Hymu-80 material and ferromagnetic fluid acted far stronger than the centrifugal motion.
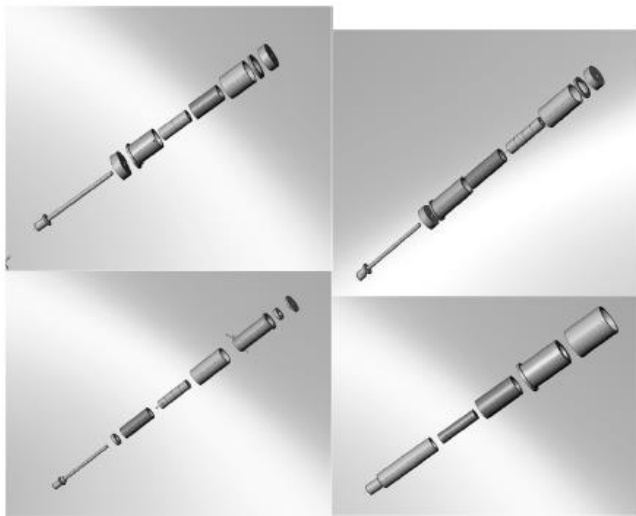

Figure 6. Four different roller configurations were initially fabricated to test capabilities.

The last detail is a capacitor that is embedded within the plastic turbine. This, in turn, is connected to the large bottom magnet to the aluminum sleeve. The connection through this magnet allows electrical continuity throughout the entire roller and the aluminum acts similar to capacitance to create an electric charge to induce a Poynting force.

There are several basic options for tests that exist. Rollers can be either 12 or 24 in the carousel, four different versions of rollers were examined and the device may rotate clockwise or counterclockwise. There are several different voltages usually from 0,

60, 120, 180 and 1,000 voltages with plus or minus charges and the amount of ferromagnetic fluid can be at 0, .50, to 1.00 levels. This easily results in a spectrum of at least 120 test variations.
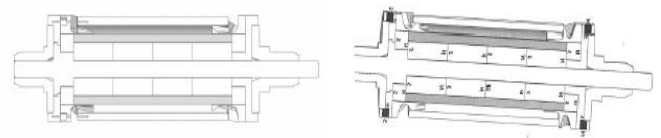

Figure 7. The selected roller design with and without using small radial magnets at the collars of each roller ends are seen with no basic difference in performance.
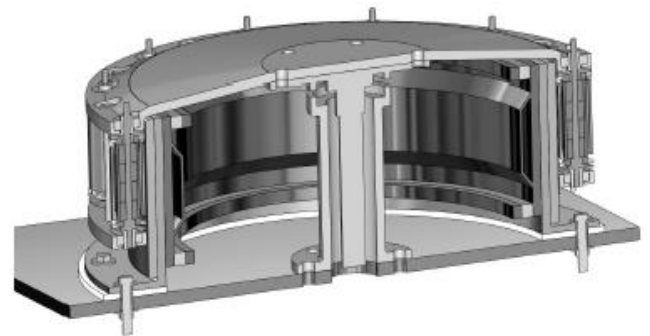

Figure 8. This is the integrated assembly that resides on a base support plate.

III. RESULTS

A. The behavior of the Energy Box

Based on the rationale for a device to generate electricity, self-acceleration is the highest desirable phenomenon. To date, we have not observed this phenomenon with any certainty. However, several unusual effects were observed and documented under controlled laboratory conditions. Results demonstrate that this is a very nonlinear device.

The first investigation was to examine the magnetic field from the device. Results are a function of rotation rate and radial distance. The maximum field strength is located at 9.5 inches for the rollers' position in the carousel. If the roller magnets were set at alternating poles, the strength of the magnetic field was significantly reduced. Reverse polarity of the alternating rollers, in effect cancel or compete with adjacent rollers. On this basis, the rollers were used in the same polarity to maximize field strength.

In general, there was no obvious increase in the magnetic field as a function of rotation rate. However, some disturbances showed a considerable radial distance from the device. Later, it was apparent that the magnetic field would move radially outward at a greater distance to increase carousel velocity, these 'moving' magnetic walls may be radial shells. Here, some sudden increases for magnetic walls show discrete changes in the field. This is unusual in that

one would normally expect the field to be continuous and not discontinuous in the magnetic field. This is similar to some of the effects observed by the Russians.
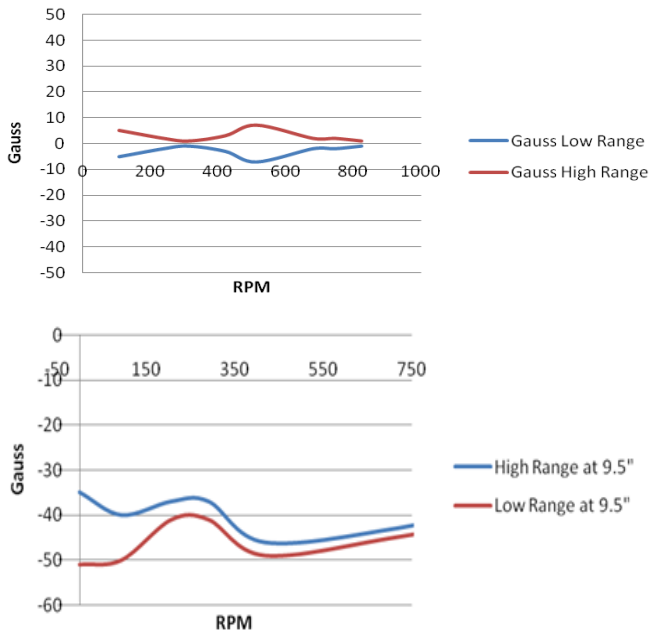

Figure 9. The magnetic field response shows the polarity of the rollers.

Because of the limited laboratory spacing, we could only measure two or three walls from the device. Also, there are several other metal objects in the cramped test lab, which may supply the magnetic fields. Moreover, the magnetic walls appear like shells that increase radially as the rotation rate increases.

Using magnetometers, the walls are not linear barriers as the Russians imply. Here, the walls follow a parabolic curve similar to expected trajectories from the magnetic lines of force. The difference is that the Russian device could have had a significantly stronger magnetic field than in this device. The reason these walls are important is that the magnetic field movement could be used to harvest electrical energy away from the machine.

When the device was originally examined with two thermocouples to give a measure of temperature, there were very unusual responses that varied at different rotation rates. However, some of the instrumentation was incorrect and when grounded, the thermocouples did not show significant temperature variations together with weight increase or decrease. Thermal energy is driven by the driveshaft and a significant amount of electrical power from the motor generates conduction heat transfer. This creates a background noise affect compared to defining an Unruh effect so no particular relationship was identifiable for temperature decreases with weight losses or gains. Godin later

mentioned that there was no real trend to support Unruh-like relations.

Regarding weight, bathroom scales initially estimated that there was a change in the device's weight. Some resulting judgments looked at weight changes based upon considerable vibrations that moved during rotation changes. Six load cells were used to determine weight responses. These generated weights that in some situations lost or increased by as much as 20 to 40 pounds. The device, minus the cabinet and instrumentation, would weigh about 190 pounds. The results would be examined where weight was measured against the rotation rate. This strongly depended upon varying conditions. However, these results showed specific regions where the rotation rate occurred during a resonance.
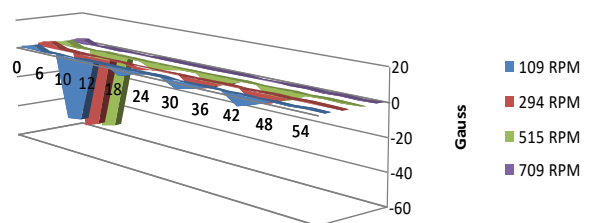

Figure 10. The walls showed some radially displaced locations from the mechanism. These walls would increase with increases in rotation rate.

Results in Figure 11 show the rotation rate as a function of time. In this graph, rpm shows a staircase step history. Besides, a smell of Ozone was detected when the carousel was removed from the drive mechanism.

Results from the first three series validated some of the ideas about the Russian device; we saw unusual results that showed increases or decreases in weight but at a smaller magnitude compared to the Russian claims. A fourth test series of the Energy Box was performed approximately two months later after these tests. The new test objective was to modify the rollers to use capacitors capable of holding 1500 volts compared to the original capacitors that only held 100 volts. This would be used to validate the Poynting vector approach to increase the force of the rollers by at least a factor of ten.

Real-world tests usually provide unexpected situations. These tests had clearly defined reasonable objectives. One co-author established that the capacitor for the lower voltage was not required during the first three series. This was debated because voltage differences in the rollers could not be sustained; hence, the capacitance was

required. At higher voltages, several rollers lost their charge because of the space between the rollers and the ring formed by an electric arc resulting in a short circuit. This limitation only allowed the device to reach an upper voltage of, say 325 volts before the roller voltage would discharge. In other words, if the device was to achieve a charge of 1,000 volts, the spacing between the insolated rollers and the ring should be increased. This raises questions of how a Searl device could operate and sustain a voltage difference or how the Russians used 20,000 volts? In other words, short circuits may become routine regarding conserving voltage.

Figure 11. A typical weight reduction case occurred with resonances at 480 and 810 rpm.
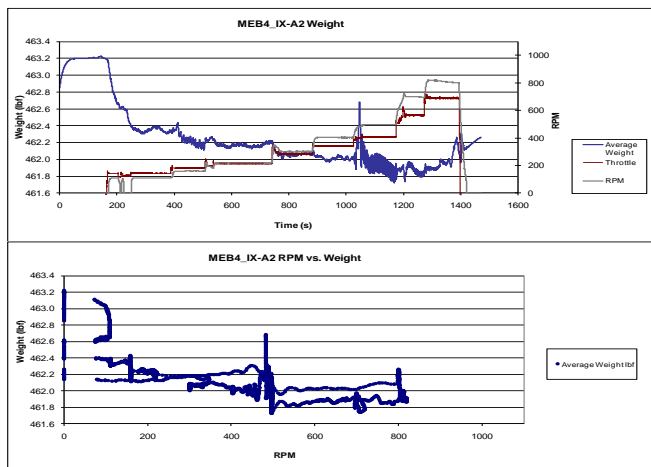
In many postulated theories, the retarded potential was considered as a low probability. Unfortunately, the device was fully assembled and dormant for several months. In the past, the carousel and rollers were disassembled from the ring. Here, the carousel and rollers did not move. This induced magnetic imprints within the ring despite that the Hymu-80 material was not supposed to maintain a sustained magnetic field. Moreover, Searl indicated that the ring should use imprinting magnets within the ring. By residing in this position for several months, this imprint naturally occurred and this created unexpected events compared with the other series. When spun by hand, the carousel coasted in a relatively smooth fashion. However, after it moved in a particular direction, the carousel would stop and move a small amount in the opposite direction before stopping again. This was unexpected. The rotation was about 10 degrees in azimuth regardless of clockwise or counter-clockwise direction. This effect of ring imprinting tends to support the idea about the hypothesis for a retarded potential.

One of the investigators suggested the device would overcome the strange magnetic effects by rotations above 300 rpm. This effect would persist regardless of the rotation rate. When the voltage was increased, the device would act like a normal device. This meant that rotation was smoother than the previous test series where only a very small weight

change was observed in either direction. This was disappointing because this demonstrated that we could not duplicate behavior seen during the other three series. These new trials established experimental uncertainty that reached about .1 or .2 pounds of weight. In a majority of runs, the device would lose or increase weight by about 2 pounds. These weight changes were within 1% considering the 190 pounds of the device without the weight of the cabinet, battery, and charging power supplies. Results were therefore ignored as not being considered as notable.

In addition to the change in the capacitors, the brake drive was also removed for decelerating the electric motor. When 1,000 rpm was reached and power was withdrawn, the carousel coasted for 37 to 39 seconds before stopping though it only took 20 seconds during the prior three-test series with the brake. As previously mentioned, the carousel always stopped and reversed direction before finally coming to a rest. When the weight versus rpm data was examined, departures that were once seen at resonance locations in previous tests were found considerably diminished because of the ring imprinting. Data showed some resonance locations but the amplitude was not as prevalent. If power was removed at 1,000 rpm, the weight history as a function of the decreasing rpm showed a sinusoidal response that peaked at different locations for different voltages or rotation directions as shown in Figure 11. This did not seem to show any disparity when the rpm reached resonance thresholds. Such behavior was not observed for the other three-test series. Moreover, the change in weight was very low at some of these conditions to record what you would assume would occur for a normal device that did not produce weight changes.

At this point, there was some disappointment about results, and obviously, the imprinting had made the device operate in a more nonlinear fashion than in the past. Moreover, the earlier results could not be repeated since this device now acted like a different system. Runs were made at higher voltages as high as 325 volts with no notable consequences worth reporting.

A reference trial was performed where there was no voltage at the rollers and the carousel moved first in one direction and decelerated to a stationary state. The device was restarted in the opposite direction and was eventually decreased to cease operations. The results were unexpected as follows.

The initial weight includes the device, cabinet, and supporting equipment. The weight shown in Figure 12 first dropped from 447 pounds to 433 pounds, and held constant with resonance spikes at 220 and 400 rpm. A weight spike at about 2180 seconds dropped to 425 pounds. The weight returned to the initial weight and then, in a different

direction, dropped a minimum of 431 pounds. A maximum weight loss occurred at 22 pounds at about 12%, and an average loss in direction was 14 pounds at 7.3%. The initial objective of this run was designed to establish resonances but the results changed weight right away. Moreover, one may argue that less weight may occur at one direction over the other but this would have been reasonable only if the rotation rate history was identical. Unfortunately for this run, the different directions went to a higher rotation rate, and results at different directions were apples versus oranges.
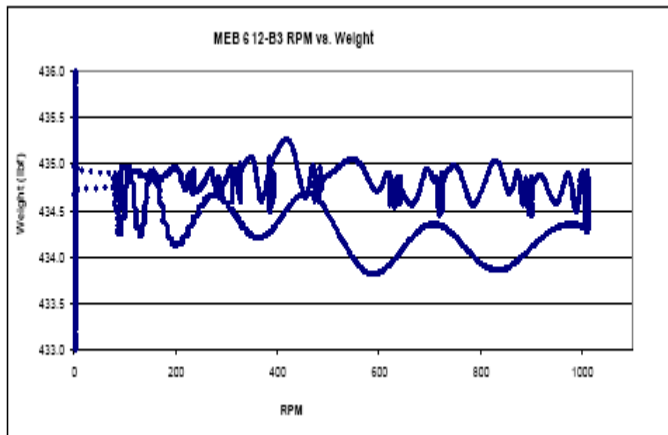

Figure 12. The behavior demonstrated a typical response with fewer resonance effects and the sinusoidal signal when electric power was removed. The rollers were charged at 325 volts.

Compared to the other test series, there was no behavior where the weight changed for a considerable time of period and higher result magnitudes occurred only at transient situations. The weight loss of 7.3% would easily be assumed as greater than experimental error at .1 or .2 pounds.
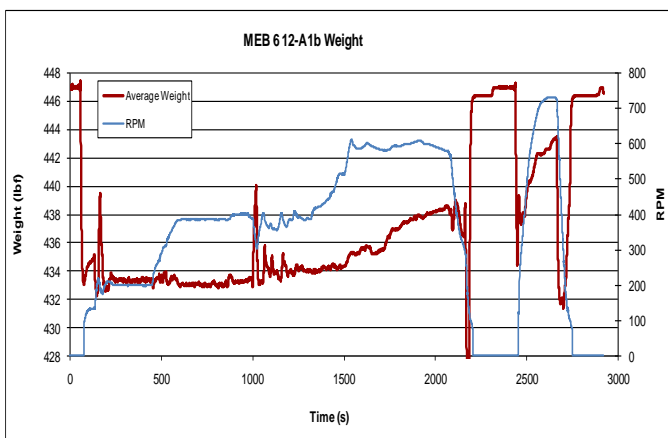

Figure 13. This unusual weight history resulted in no roller electrical charge at both directions.

The success of these runs encourages us to pursue and complete the manufacture of a tapered

ring system. After these different tests and results, a variant device would explore these ideas for further changes in weight reduction situations. The increase in the angle of the ring is designed to extend the electric and magnetic fields of the rollers that should alter weight. In other words, using the current configuration, the charge on the roller is limited by the spacing between the roller and the ring. By using this geometry, spacers could be used to extend the carousel and increase the spacing between the rollers and the ring thereby allowing for larger voltages of the order of 1,500 volts.
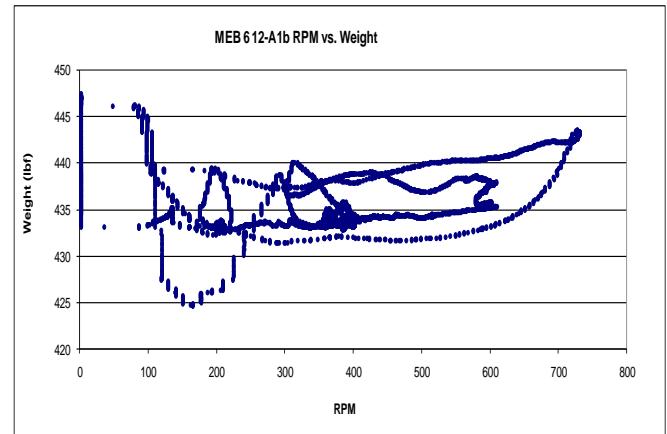
Figure 14. The unusual behavior demonstrated events as a function of acceleration versus deceleration. Resonance was not as expected at 200 and 400 RPMs. The lowest value occurred when the first portion of the run was decelerated or stopped running at about 2180 seconds.
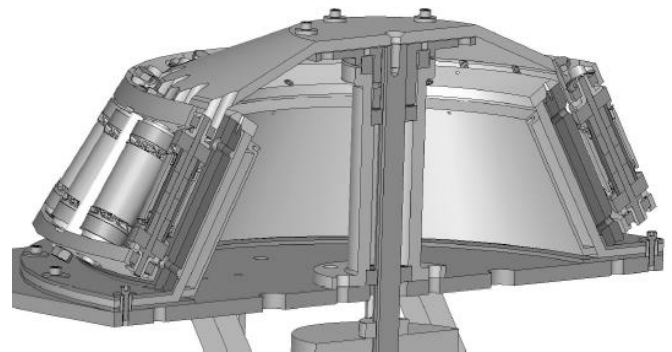
Figure 15. The Tapered Ring Device- A future reality that could use more weight.

B-1 Angular Momentum

Is there a reasonable postulate or theory to explain these results? One idea is to change Mother Nature by transferring angular momentum into linear momentum. This would allow an angular motion to induce linear motion using interactions with magnetic and electric fields.

This may sound unusual but several dynamic situations 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, 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 the 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 are involved in 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 the inertia matrix.

Regarding the 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 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.

One of the theories we examined included the notion that angular momentum can be transferred into linear momentum. This obviously sounds foolish, but this is how a car, bicycle, or train operate. In prior research of 6 degree-of-freedom computer simulations of foreign missiles, the force equation includes acceleration as well as motion due to rotation or for a Cartesian coordinate system:

$$\left| \begin{aligned} F_x &= m\left(\dot{V}_x + V_z\omega_y - V_y\omega_z\right) \\ F_y &= m\left(\dot{V}_y + V_x\omega_z - V_z\omega_x\right) \\ F_z &= m\left(\dot{V}_z + V_y\omega_x - V_x\omega_y\right) \end{aligned} \right. \tag{3}$$

However, this Energy Box is in a cylindrical coordinate system where the curl is:

$$\bar{\omega} \times \bar{r} = \left| \begin{matrix} \hat{i} & \hat{j} & \hat{k} \\ \omega_r & \omega_\theta & \omega_z \\ r & r\theta & z \end{matrix} \right| = (z\omega_\theta - r\theta\,\omega_z)\hat{i} + (r\omega_z - z\,\omega_r)\hat{j} + (r\theta\omega_r - r\omega_\theta)\hat{k} \tag{4}$$

This assumes that all rotations are constant. Moreover, eliminating all components in the z direction and only looking at the force in the z direction yields:

$$\boxed{F_z = \left(r\dot{\theta}\omega_r - \dot{r}\omega_\theta\right)} \tag{5}$$

Now the problem is not this simple. One would have to look at the distance and rotation based upon the surface of the roller. Here, r is equal to the radius of the large ring r_{ring} plus a component depending upon the surface of the roller r_{roller} which would be a sinusoidal term. Likewise, rotation is basically the rotation of the roller plus an increment that becomes plus or minus rotation due to the roller.

Let us approximate such that:

$$\begin{aligned} F_z = \Big(&\left(r_{ring} + r_{roller}\cos\theta_{roller}\right)\left(\omega_{ring} + \omega_{roller}\cos\theta_{roller}\right)\omega_{ring} \\ &- r_{roller}\omega_{roller}\left(\omega_{ring} + \omega_{roller}\cos\theta_{roller}\right)\Big) \end{aligned} \tag{6}$$

After much consideration about the rotation rates of the roller compared to rotation of the ring and the differences in the sizes of the rollers and the ring, the final forces becomes:

$$F_z = 6\,r_{roller}\,\omega_{ring}^2 \sum_{1}^{24} \left(1 + 6\cos\theta_{roller}\right)\left(1 + \cos\theta_{roller}\right) \tag{7}$$

The series term is for each of the rollers in the carousel. Needless to say, the force is dependent upon the rotation rate. However, the answer does not seem sensitive to this parameter based upon the experimental data.

B-2 Gravito-Electro-Magnetism (GEM)

This notion uses a Poynting vector force induction based upon the roller design. The second approach initially 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 that tends to act like a capacitor creates such a Poynting vector motivator.

Briefly, the Poynting field is:

$$\bar{S} = \frac{1}{\mu_o}\left(\bar{E} \times \bar{B}\right). \tag{8}$$

And the conservation equation that is derived is:

$$\mu_o \left[\frac{1}{c^2} \frac{\partial^2 \bar{S}}{\partial t^2} - \nabla^2 \bar{S} \right] = \mu_o \nabla \times \nabla \times \bar{S} - 2\nabla \times \bar{B} \times \nabla \times \bar{E} -$$
$$\overline{-4\pi \left[-\frac{1}{c} \frac{\partial}{\partial t}(\rho_e \bar{E} + \rho_m \bar{B}) + \frac{1}{c} \frac{\partial}{\partial t}(\bar{J}_e \times \bar{B} + \bar{E} \times \bar{J}_m) - \nabla(\bar{J}_e \cdot \bar{E} + \bar{J}_m \cdot \bar{B}) \right]} \qquad (9)$$

Where s is the Poynting field, e is the electric field, b is the magnetic field, *j* represents currents, ρ is a source term with subscripts are for e with electric and m for magnetic fields. This also provides insights into gravitational forces in a 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 additional field then 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:

$$\left[\frac{1}{c^2} \frac{\partial^2 \bar{V}}{\partial t^2} - \nabla^2 \bar{V} \right] = -4\pi \nabla \cdot [(\rho_e \bar{E} + \rho_m \bar{B}) - (\bar{J}_e \times \bar{B} + \bar{E} \times \bar{J}_m)]$$
$$\overline{-\frac{1}{c} \frac{\partial}{\partial t} \left[\int_0^r [-\mu_o \nabla \times \nabla \times \bar{S} + 2\nabla \times \bar{B} \times \nabla \times \bar{E}] \cdot d\bar{r} - 4\pi(\bar{J}_e \cdot \bar{E} + \bar{J}_m \cdot \bar{B}) \right]} \qquad (10)$$

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 Gertenshtein 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 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, the mass would repel against each other and such an expression may be an interesting alternative to generate a future vehicle to produce a vehicle exercising in long-range spaceflight.

B-3 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 on the ring. If the time is retarded in the image within the ring due to electromagnetic properties such as hysteresis, 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 magnet 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 counterclockwise 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 and that used 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.

B-4 Generation of Gravitational Waves

This 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[16]. 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.

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. 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 technology. Moreover, several interesting ideas exist 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. 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.

B-5 Cogravitational Waves

Jefimenko[17-19] claimed that gravity could be modified to deal with two separate fields to create gravity and cogravity field the force was based upon a Lorentzian type of relationship that derives Maxwell's equations:

$$\overline{F} = q(\overline{E} + \overline{v} \times \overline{B}) + m(\overline{g} + \overline{v} \times \overline{K}) \qquad (11)$$

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

$$\nabla \times \overline{g} = - \frac{\partial \overline{K}}{\partial t} \; ; \quad \nabla \cdot \overline{g} = - 4 \pi G \rho \; ; \quad \nabla \cdot \overline{K} = 0.$$

$$and: \; \nabla \times \overline{K} = - \frac{4 \pi G}{c^2} \overline{J}_g + \frac{1}{c^2} \frac{\partial \overline{g}}{\partial t}. \qquad (12)$$

These equations are adjusted to create wave equations such that:

$$\frac{1}{c^2} \frac{\partial^2 \overline{g}}{\partial t^2} - \nabla^2 \overline{g} = 4 \pi G \left[\nabla \cdot \rho_g + \frac{1}{c_g^2} \frac{\partial \overline{J}_g}{\partial t} - \frac{\nabla \times \overline{J}_c}{c} \right],$$

$$\frac{1}{c^2} \frac{\partial^2 \overline{K}}{\partial t^2} - \nabla^2 \overline{K} = 4 \pi G \left[\frac{\nabla \cdot \rho_g}{c^2} - \frac{1}{c^3} \frac{\partial \overline{J}_c}{\partial t} - \frac{\nabla \times \overline{J}_g}{c^2} \right]. \qquad (13)$$

Moreover, 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 of 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:

$$\overline{g} = - \frac{G}{r^3} \frac{m}{\left(1 - \overline{r} \cdot \overline{v}/r c\right)^3} \left[\left(\overline{r} - \frac{r \overline{v}}{c} \right) \left(1 - \frac{v^2}{c^2} \right) + \overline{r} \times \left[\left(\overline{r} - \frac{r \overline{v}}{c} \right) \times \frac{\dot{v}}{c^2} \right] \right] \approx - G \frac{m}{r^3} \left[\left(1 - \frac{v^2}{2c^2} \right) \overline{r}_o - \frac{2 r v^2}{3 c^3} \overline{v}_o \right]. \qquad (14)$$

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 essentially dynamically operate in the same rotation direction. This tends to confirm some of Jefimenko's conjectures. Finally, the need for cogravitation is to allow the effects of gravity due to responding for 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 from Maxwell's equation type of relation. 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[i].the point is that this cogravity field may be active under the influence of the energy box and that this is creating the 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. Additional effort is warranted to examine if cogravity exists and if so, what would be the consequences that may impact the energy box.

B-6 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 like a particle under other conditions. Finally, a middle ground was determined in the particle vs. Wave debate of light propagation. Louis de Broglie became intrigued and came up with a very interesting idea[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?

$$\Psi = Ae^{i(px - \omega t)}$$

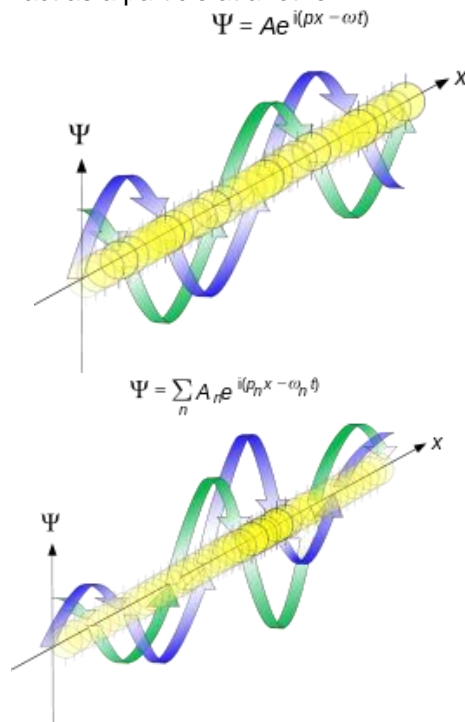$$\Psi = \sum_n A_n e^{i(p_n x - \omega_n t)}$$

Figure 15. The propagation of de Broglie waves in one-dimension–the real part of the complex amplitude is blue, the 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 to decrease again, and vice versa - the result is an alternating amplitude or a wave.

Using the relativistic momentum formula from special relativity:

$$p = \gamma m_0 v$$

(15)

Allows this equation to be written as:

$$\lambda = \frac{h}{\gamma m_0 v} = \frac{h}{m_0 v}\sqrt{1 - \frac{v^2}{c^2}}$$

$$f = \frac{\gamma m_0 c^2}{h} = \frac{m_0 c^2}{h\sqrt{1 - \frac{v^2}{c^2}}}$$

(16)

Using the four-momentum p = (e/c, p) and the four-wave vector k = (ω/c, k), the de Broglie relations form a single equation:

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

(17)

Which is frame-independent. This relates the wavelength of a particle to its momentum creating the basis for wave-particle duality, which is used in the time-dependent Schrödinger equation *(single non-relativistic particle).*

$$i\hbar\frac{\partial}{\partial t}\Psi(\mathbf{r}, t) = \left[\frac{-\hbar^2}{2m}\nabla^2 + V(\mathbf{r}, t)\right]\Psi(\mathbf{r}, t)$$

(18)

This idea is rather simple: the generation of an electromagnetic vortex is based upon the Poynting Conservation equation[ii]. 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 slowing down or stopping.

There is a far simpler understanding. If de Broglie said that $E = m c^2$, then matter waves may be defined as $m = E/c^2$. What is suggested is that the energy 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 stops.

In summary, this conceptualization of temporary non-local mass displacement can result from a local space time perturbation. When you mention Heisenberg's uncertainty principle, it isn't a violation, but because of this, it might be possibility. The premise here is that the singularity of the eigen-state for location of any given particle of the particle ensemble may consists of the device and become uncertain. This uncertainty may persist for the duration of the perturbation depending on coherence or frequency,

B-7 Dimensional Axis Transport

This hypothetical approach is based upon the conjecture that the perturbation associated with the device was able to impact the space-time manifold of the local area to the point where the charged particles would be able to access a D-dimensional axis that would allow for transport to a point in space-time that was less perturbed. If this D-dimension exists, it would overlay the primary dimensions of space-time and due to the perturbation of the device allow for a window into how particles fundamentally interact.

Initially, this idea came from the observation that mass was being lost or gained by the device. The thought that mass was phasing 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.

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 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.

C. Basic Considerations

The basic issue is that most of these ideas are worth investigating. Unfortunately, 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 eventual 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 instead 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.

IV. 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 space-time 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.

Basically from these results, the Energy Box validated some of the interesting phenomena discussed by the Russians. This includes weight increases, decreases, magnetic walls, and the presence of Ozone. Weight measurement spikes of

the Energy Box indicate a higher weight loss fraction than the 35% suggested by the Russians during transient motion.

There are at least three interesting alternative theories for this nonlinear machine. This includes several options theorizing about converting angular rotation to linear momentum, a Poynting field force effect, or using retarded potentials where the ring acts as a reflection ground plane against the electric and magnetic fields of the roller's images. Clearly, this Energy Box is a nonlinear mechanism by virtue of the unusual magnetic and electrical fields. All of these notions require further clarification with additional tests as well as the possibility of inducing gravitational fields. Rollers could represent electromagnetic dipoles that repulse gravitational fields, which are also among other possibilities. Additional variants of the Energy Box should be fabricated and tested to identify and understand the physics….

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