
Superposition & Signaling Considerations for Impermeable Plasma Barriers (IPBs) & associated Space Propulsion & Survival Technologies

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Brief Description:

This paper is meant as a primer for understanding and creating Impermeable Plasma Barriers, Hyper-accelerated Tubular Linear Induction Motors & associated technologies for peaceful, next-generation computers, space propulsion and space survival.

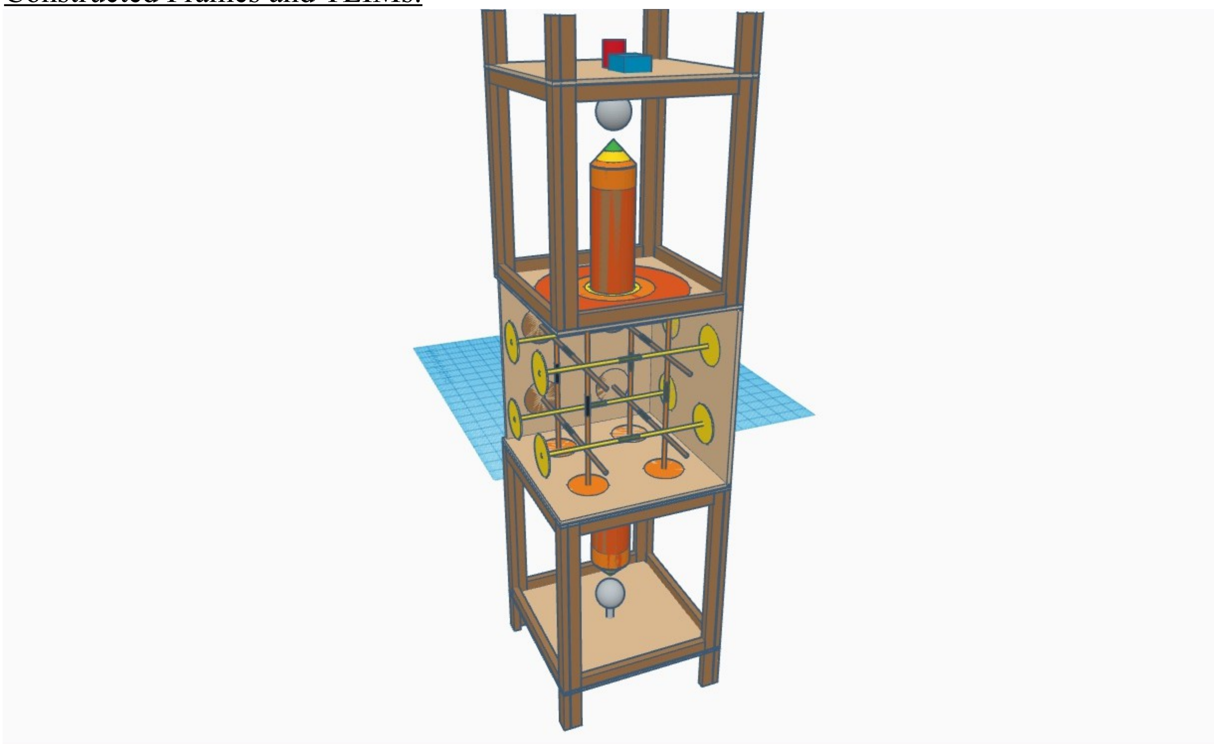
A short introduction to the needed Radio principles is included. It is there to understand how superpositioned EM emissions can meet the energy requirements of Impermeable Plasma Barriers (IPBs)

Impermeable Plasma Barriers & Hyper-accelerated Tubular Linear Induction Motors (IPBs & HATLIMs) use super-positioned signaling to function. Super-positioned EM emissions are created by combining 2 (or more) convoluted, superimposed AC signals, relatively low voltage electronics, a capable microcontroller (to generate signaling, duty & phasing), a series of interleaved wire wrappings (for both primary & secondary coil structures), and spinning spheres (to modulate the path and relative speed of energized plasma filaments). Stacked LC tank circuits are included - to store the relative energy levels of separate frequencies.

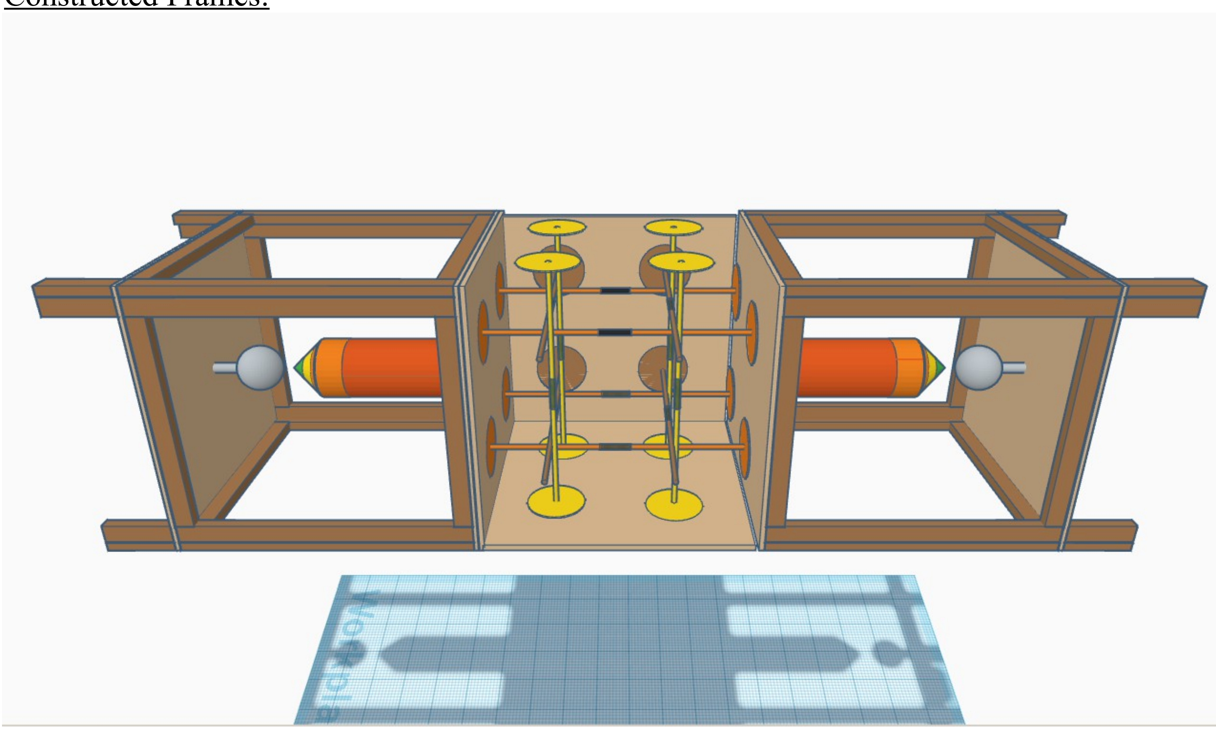
This is the theoretical path of energized plasma around an IPB Generator (3 layers).

A generalized Impermeable Plasma Barrier (IPB) design is shown below (several diagrams).

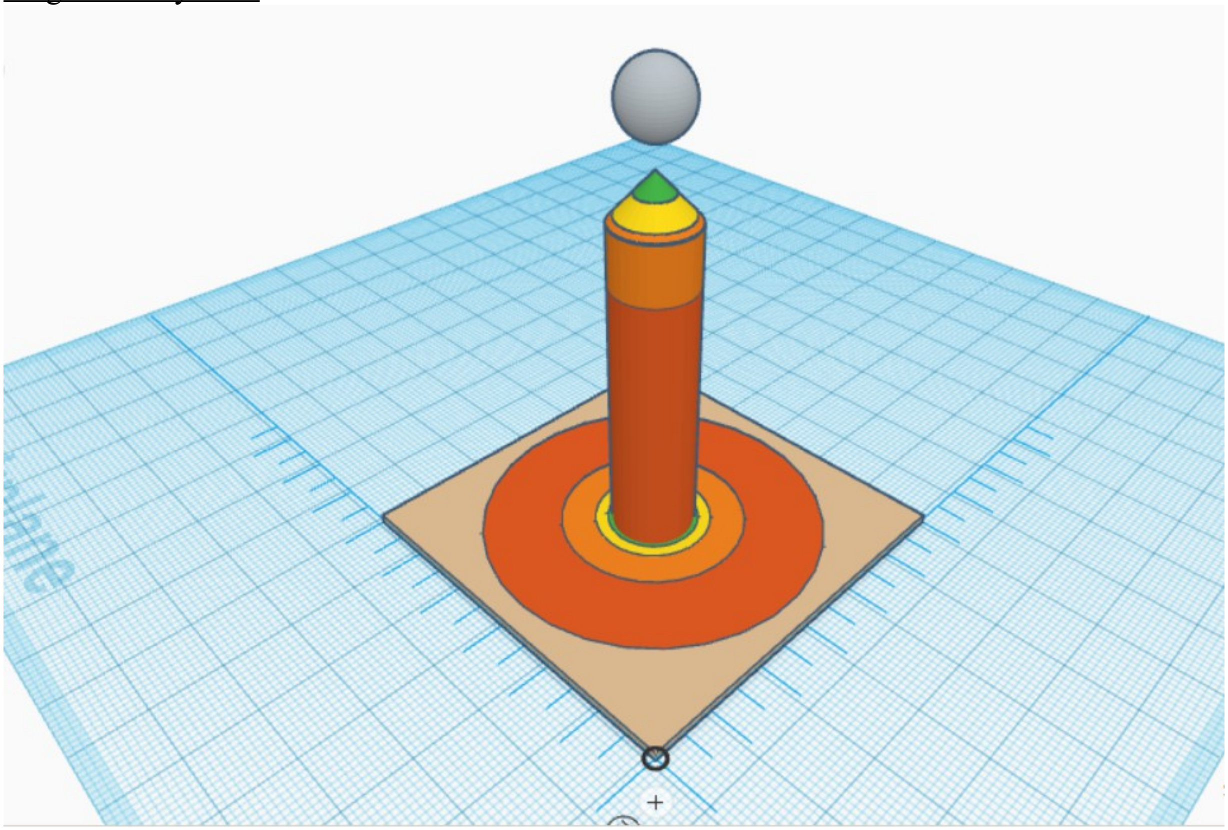
Constructed Frames and TLIMs:



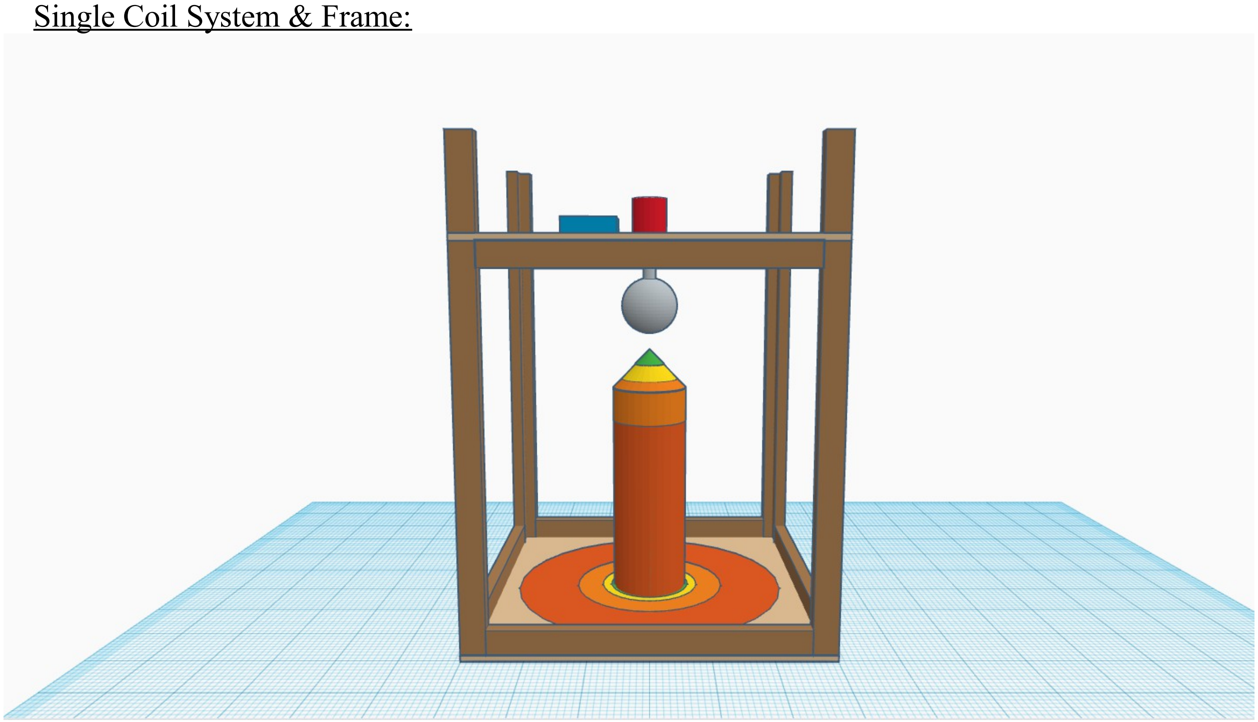
Constructed Frames:



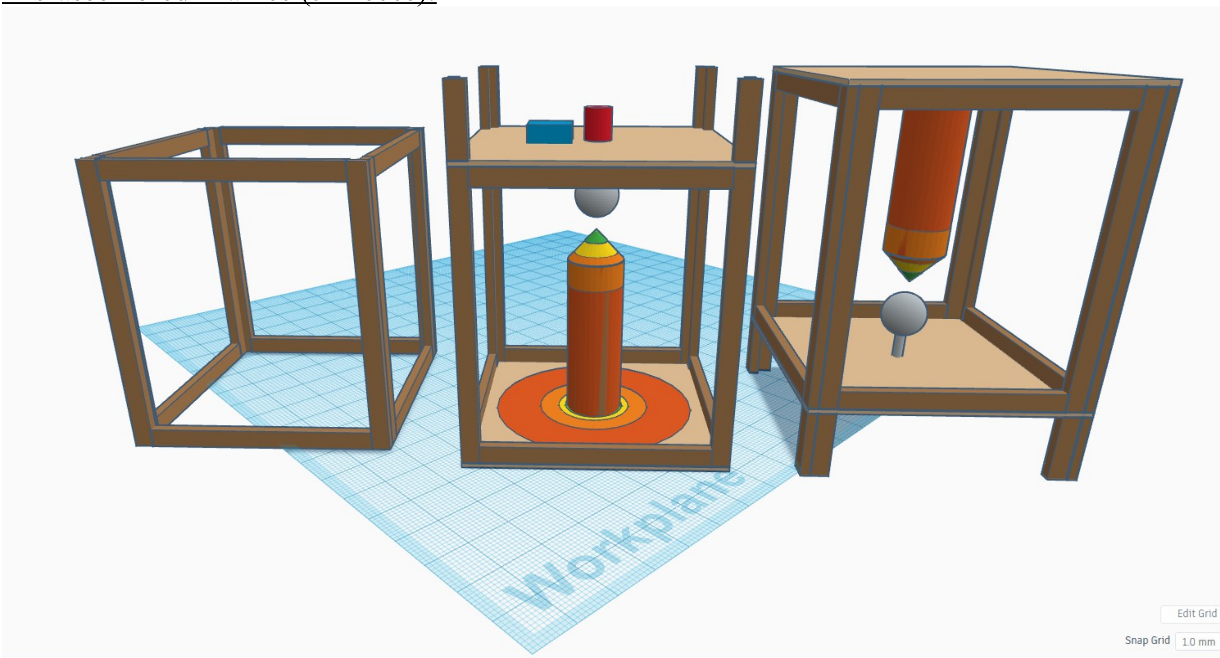
Single Coil System:



Single Coil System & Frame:



Dis-assembled Frames (3 Pieces):



1. Common Conversions & Constants

1 meter	=	**39.37007874 inches**
Degrees per rad = 360/(2π)	=	**57.29577951308**
Rad per Degree = (2π)/360	=	**0.01745329251**
Helical Radius (rh) =		**6.286620" in.** (based on measured circumference of 39.5" in.)
30 AWG bare wire diameter =		**.01" in.**
Insulation thickness =		**2 x .0008" in. = .0016"**
Total wire diameter =		**c1 = .0116 in.**
Resistance of 30 AWG wire =		**338.6 milliohms per meter (.3386 ohms)**
		103.2 milliohms per foot (.1032 ohms)
1 Hertz (Hz)	**=**	**60 rpms (cycles or revolutions per minute**

The number of wraps per inch of 30 AWG wire (with insulation) is 1 / c1.

= 86.206897 wraps per inch (wpi)[1]

2. Initial Example for Superpositioning of Frequencies

a. A Sine Wave Summation Sequence is used to describe Super-positioned frequencies & wire lengths to create the natural rectification of signals. It can be used to create the IPB, or drive a HATLIM

A simplified conditional summation of sine waves is below. Phasing & DC bias will cause a constructive interference of the convoluted EM waves across stacked primary coils.

$$f(x) = 3 + \sum_{n=1}^{n=3} (\sin(4^{n} * x + 3/2\, \pi)$$

1 The number of wraps was confirmed by wrapping 86 wraps to fill a 1 in. gap.

This simple function spans across 1 cycle & shows relative constructive interference along the top of the curve (compared to the bottom of the curve) through phasing of sine waves. It uses n=1 to 3 for visual simplicity.

b. The constant 3 in the summation equation represents 3 volts of DC bias (1 volt for each frequency). This bias causes the rectification. The bias voltage is meant to set a reference level.

c. The sequence of sine waves represents the convolution & superposition of 3 generated digital frequencies (by a microcontroller).

d. The phase is accomplished by programming the microcontroller to shift each subsequent frequency by 3/2 * π radians (or 270 degrees).

Superposition of 3 frequencies

e. Real-life considerations - regarding capabilities, availability, and price are considered. Cylinder-shaped, helical coil templates have maximum sizes based on price & wire availability. Maximum lengths of the coil systems (that will fit in a workspace or construction area) are calculated below.

f. The realistic maximum resonant frequency that the Propeller Board can manipulate (through coded Phasing & Duty Cycle) is approximately 1.0 – 1.5 Mhz. The minimum frequency of the Board is not limited – however the price & length of the coil system, limits the value of n to 7 or 8. Higher frequencies can be achieved with these boards, but will need external phasing electronics. The Intel Galileo Microcontroller uses 5x the clock speed as the Propeller, so at least 1 higher frequency should be achievable.

g. To find lengths of the wires & coil systems (based on n=7), changes to the equation need to be made. To build a realistic (workable device) - an increase in n, and a shift in the n-values of the summation function is needed:

$$f(x) = 3 + \sum_{n=7}^{n=13} (\sin(4^n + 3/2\ \pi)$$

3. Preliminary Frequency, Wire lengths & Resistance Calculations

a. Frequency calculations

The maximum resonant frequency (f_R) should equal a particular value of 4^n. To keep the overall size of the cylinders manageable & prices realistic – super-frequencies can then be added. The set of frequencies is listed:

f_R @ 4^13 = **67,108,864 Hz** (highest oscillator frequency from Propeller Board)
f_R @ 4^12 = **16,777,216 Hz**
f_R @ 4^11 = **4,194,304 Hz**
f_R @ 4^10 = **1,048,576 Hz** (highest phase-modulated freq. for Propeller Board).
f_R @ 4^9 = **262,144 Hz**
f_R @ 4^8 = **65,536 Hz**
f_R @ 4^7 = **16,384 Hz (tallest realistic coil size that can be built – 4 feet)**

b. The ¼-wave resonant-condition & resistance calculations

Resonant frequencies & wire lengths are calculated for each layer of the coil-sets. They use a range of powers used to calculate the Resonant Frequencies. The workable subset of n = {13,12,11,10,9,8,7}. 30 AWG wire is assumed for resistances.[2]

$$\text{Length of wire (for n = 13 through 7)} = \frac{300{,}000{,}000}{(4 * \text{Resonant Frequency})}$$

f_R = 67,108,864 Hz (for n=13): **2 x wire length = 1.1175871 m** (43.999492 in.)
Resistance **= 0.378396 ohms**
f_R = 16,777,216 Hz (for n=12): **2 x wire length = 4.4703483 m** (175.997964 in.)
Resistance **= 1.513582 ohms**
f_R = 4,194,304 Hz (for n=11): **2 x wire length = 17.881393 m** (703.991850 in.)
Resistance **= 6.05433 ohms**
f_R = 1,048,576 Hz (for n=10): **2 x wire length = 71.5255737 m** (2815.967468 in.)
Resistance **= 24.217320 ohms**
f_R = 262,144 Hz (for n=9): **2 x wire length = 286.1022949 m** (11263.869877 in.)
Resistance **= 96.869281 ohms**
f_R = 65,536 Hz (for n=8): **2 x wire length = 1,144.4091797 m** (45055.479516 in.)
Resistance **= 387.477124 ohms**
f_R = 16,384 Hz (for n=7): **2 x wire length = 4,577.6367187 m** (180221.918059 in.)
Resistance **= 1549.987793 ohms**

2 Confirmation of the wire length - relies on measured resistance, capacitance and inductance.

4. PRIMARY Pancake Coil Calculations

The formula for the length of a spiral is:

Spiral Pancake Wire Length = (π * ((b^2) - (a^2))) / c1

a = inner radius of primary coil (inches)
b = outer radius of primary coil (inches)
c1 = diameter of wire = .0116 (inches)

The outer radius of each pancake coil can then be calculated with this formulation:

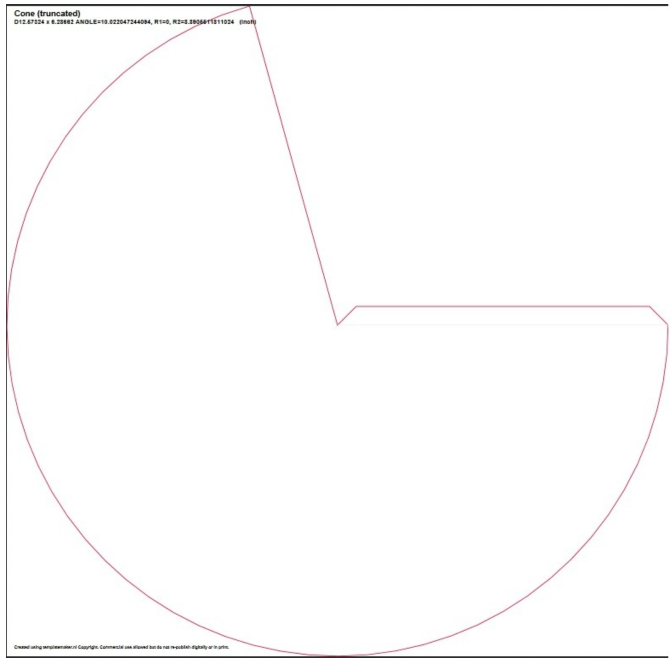
b = SQRT((a^2) + ((wire length * c1) / π))

f_R = 67,108,864 Hz (n = 10): 2 x wire length = **1.1175871 m** (43.999492 in.)
outer radius = b = 6.299528" inches
inner radius = a = 6.286620" inches
f_R = 16,777,216 Hz (n = 9): 2 x wire length = **4.4703483 m** (175.997964 in.)
outer radius = b =6.338095" inches
inner radius = a = 6.286620" inches
f_R = 4,194,304 Hz (n = 8): 2 x wire length = **17.881393 m** (703.991850 in.)
outer radius = b =6.49007" inches
inner radius = a = 6.286620" inches
f_R = 1,048,576 Hz (n = 10): 2 x wire length = **71.5255737 m** (2815.967468 in.)
outer radius = b =7.065356" inches
inner radius = a = 6.286620" inches
f_R = 262,144 Hz (n = 9): 2 x wire length = **286.1022949 m** (11263.869877 in.)
outer radius = b =9.006234" inches
inner radius = a = 6.286620" inches
f_R = 65,536 Hz (n = 8): 2 x wire length = **1,144.4091797 m** (45055.4795157 in.)
outer radius = b =14.348666" inches
inner radius = a = 6.286620" inches
f_R = 16,384 Hz (n = 7): 2 x wire length = **4,577.6367187 m** (180221.918059 in.)
outer radius = b =26.551310" inches
inner radius = a = 6.286620" inches

5. SECONDARY Cone & Helical Coil Calculations

The SECONDARY coil is split up into 2 shapes – a helical portion & a cone portion (that sits on top of the helical portion.) The structures should be positioned close enough that the interleaved wire is seamless between the helical portion & the cone portion. A cotton cloth is potentially helpful in covering the seam.

a. Create a cone template based on the radius of the helical coil. The following template was created using an online cone calculator. The template also needs to be split up into scoured sections – for cardboard to bend into a cone.



b. Formulate a **<u>cone wire length formula</u>** – from the Surface Area formula.

By choosing 45 degree cone designs – this simplifies the cone height & cone radius calculations & assembly. By finding the Surface Area (SA) of a cone (minus the end) – we can find the cone wire length:

SA of cone = π*rc*SQRT(hc^2 + rc^2)

Assuming 45 degrees allows replacement of hc with rc:

Cone wire length = π*rc* SQRT(2) * hc / c1

<u>Cone wire length = (SQRT(2) * π * rc * rc) / c1</u>

c. Formulate a **<u>cylinder wire length formula</u>** – from the Surface Area formula.
By finding the surface area (SA) of a cylinder (minus the ends) – we can find the cylinder wire length.
The Surface Area (SA) of the functional cylinder is:

2π * rh * hh

The length of the cylinder wire becomes:

<u>2π * rh * hh / c1</u>[3]

d. Formulate a **<u>Total Secondary wire length formula.</u>**
It is described by the following equation:

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3 **<u>NOTE:</u>** If the maximum cone wire-length is longer than the <u>¼-wave resonant-condition wire length,</u> then all wire should go towards making a cone tip (for that coil layer/frequency) - and a helical portion will be zero length.

<u>Helical portion</u> <u>45 degree Cone Portion</u>

Secondary wire length (in) = ((2π * rh * hh) / c1) + (SQRT(2) * π * rc * rc) / c1

Secondary wire length (in) = <u>((2π * rh * hh) / c1) + (SQRT(2) * π * rc ^2) / c1</u>

If the helical wire length is known & NOT zero, then:
hh = (Helical wire length * c1) / (2π * rh)

If the helical wire length is not known, then height (hh) of the helical coil becomes:
<u>hh = [(Secondary Wire length * c1) / (π * rh) – (rh * SQRT(2))] / 2</u>

This works if hh < 0, then hh = 0

Where,
rh = radius of helical coil (inches)
c1 = diameter of wire = .0116 (inches)

e. Calculate the 2 Portions of the Secondary Coil:
The length of the cone wires (WITHOUT a <u>helical portion)</u> = ¼ wave resonant wavelength. The cone radius is assumed less than the helical radius, so:

<u>rc = SQRT((1/4 Wave Resonant Wirelength * c1) / (SQRT(2) * π))</u>[4]

Cone wire length = ¼ Wave Resonant Wire length = 1.1175871 m **(43.999492 in.)**
f_R = 67,108,864 Hz (n = 13): rc= SQRT((43.999492 in.) / (SQRT(2) * π / c1))
Helical radius = **None:** Helical wire length = Helical coil height = **0**
Cone Resistance = 0.3783956312 ohms
Cone hc & rc = **0.338938" in.:** Slant height = SQRT(2) * 0.338938"= **0.479331"**

Cone wire length = ¼ Wave Resonant Wire length = 4.4703483 m **(175.997964 in.)**
f_R = 16,777,216 Hz (n = 12): rc= SQRT((175.997964 in.) / (SQRT(2) * π / c1))
Helical radius = **None:** Helical wire length = Helical coil height = **0**
Cone Resistance = **1.5135824904 ohms**
Cone hc & rc = **0.677876" in.":** Slant height = SQRT(2) * 0.677876"= **0.958662"**

Cone wire length = ¼ Wave Resonant Wire length = 17.881393 m **(703.991850 in.)**
f_R = 4,194,304 Hz (n = 11): rc= SQRT((703.991850 in.) / (SQRT(2) * π / c1))
Helical radius = **None:** Helical wire length = Helical coil height = **0**
Cone Resistance = **6.05433 ohms**
Cone hc & rc = **1.355752" in.:** Slant height = SQRT(2) * 1.355752"= **1.917323"**

Cone wire length = ¼ Wave Resonant Wire length = 71.525574 m **(2815.967468 in.)**
f_R = 1,048,576 Hz (n = 10): rc = SQRT((2815.967468 in.) / (SQRT(2) * π / c1))
Helical radius = **None:** Helical wire length = Helical coil height = **0**
Cone Resistance = **24.217320 ohms**
Cone hc & rc = **2.711505" in.:** Slant height = SQRT(2) * 2.711505" = **3.834647"**

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4 **NOTE:** The narrow end of the cone should be the starting point of the wrap.

Cone wire length= ¼ Wave Resonant Wire length=286.102295 m **(11263.869877 in.)**
f_R = 262,144 Hz (n = 9): rc= SQRT((11263.869877) / (SQRT(2) * π / c1))
Helical radius = **None:** Helical wire length = Helical coil height = 0
Cone Resistance = **96.869281 ohms**
Cone hc & rc = **5.42301" in.:** Slant height = SQRT(2) * 5.42301" = **7.669294"**

The cone radius of the remaining coils (HAVING a helical portion) is measured rh. From above, the length of the cone wires - having a helical portion - calculate to: **SQRT(2) * π * rh ^2 / c1.**

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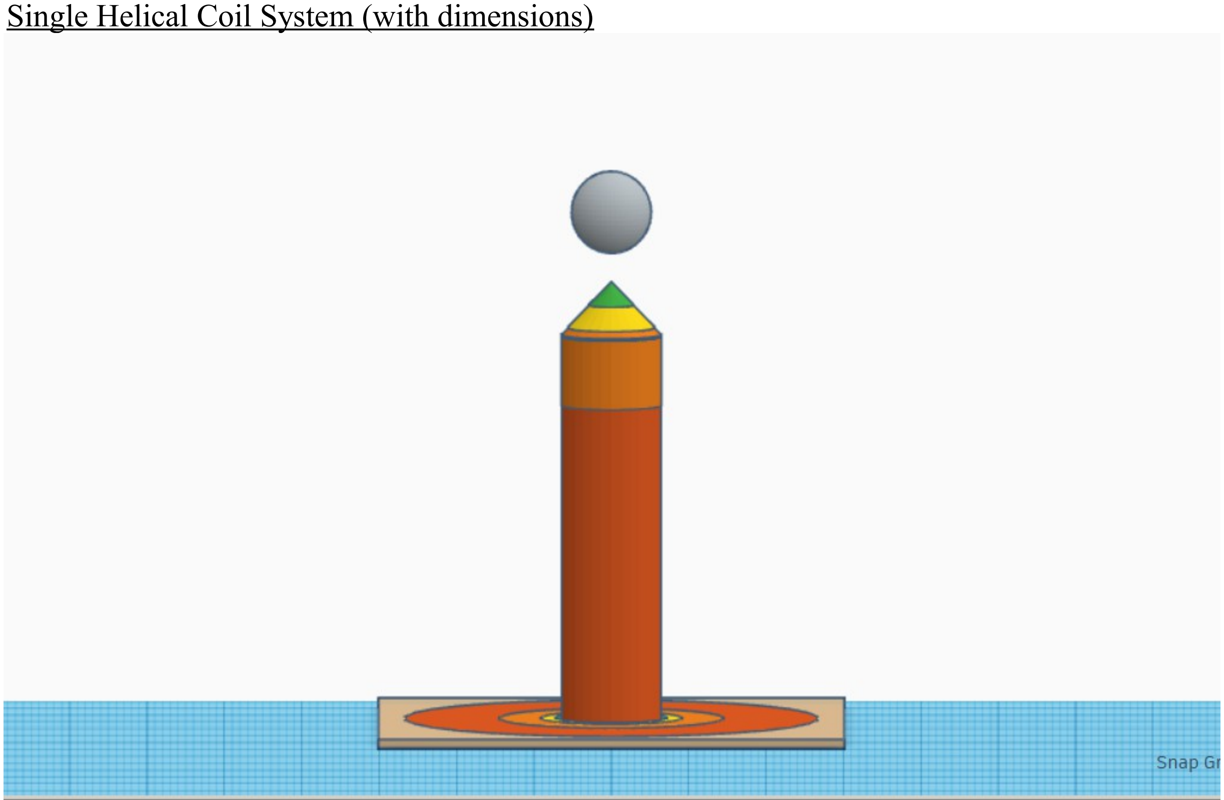
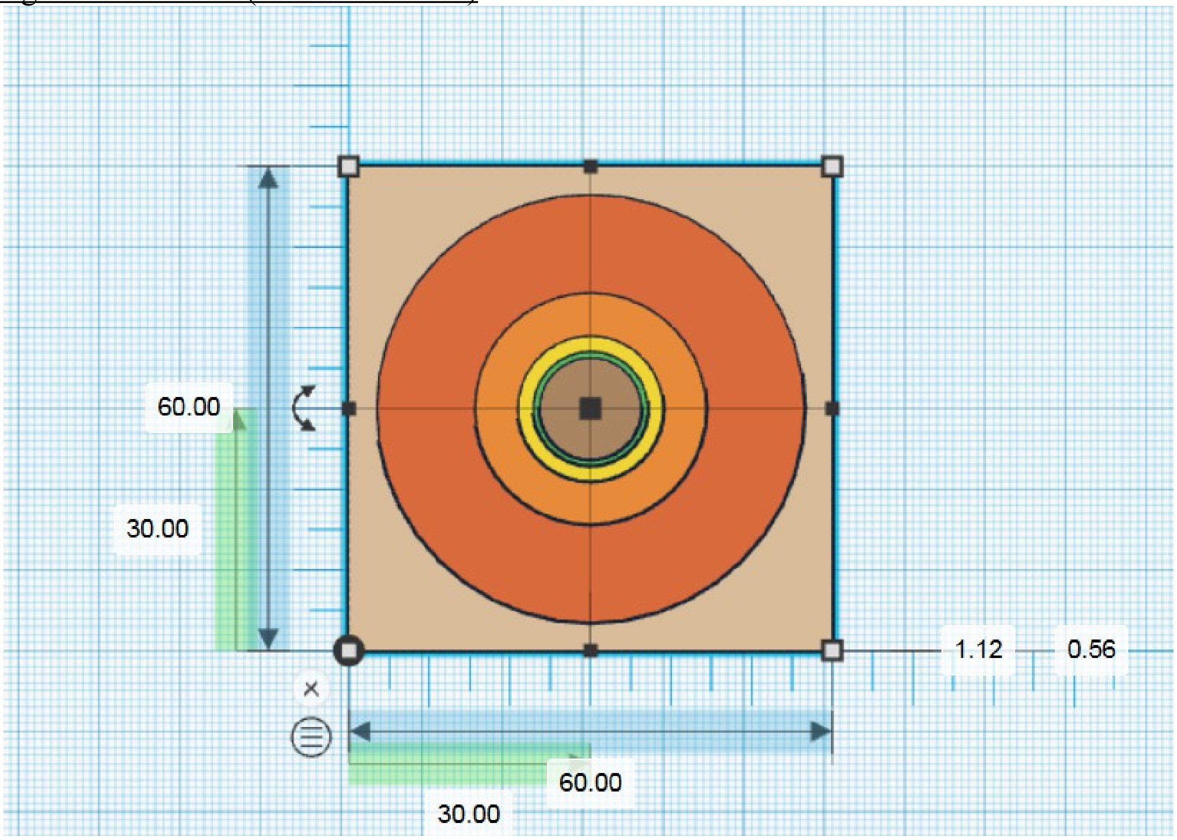
f_R = 65,536 Hz (n = 8): Res. length = 1,144.40918 m (45055.479516 in.)
Cone wire length = 385.901309 m (**15192.964906** in.)
Helical wire length = 1144.4091797 m – 385.901309 m (**15192.964906** in.)
= 758.507871 m **(29862.51461 in.)**
Helical Resistance = **256.817625646 ohms:** Cone Resistance = **130.659498 ohms**
Helical radius = **6.29822" in.:** Helical coil height = **8.753599" in.**
Cone hc & rc = **6.29822" in.:** Slant height = SQRT(2) * 6.29822" = **8.907028"**

f_R = 16,384 Hz (n = 7): Res. length = 4,577.6367187 m (180221.918059 in.)
Cone wire length = 384.481119 m **(15137.051935 in.)**
Helical wire length = 4577.6367187 m – 384.481119 m **(15137.051935 in.)** = 4193.1556 m **(165084.86613 in.)**
Helical Resistance = **1419.729849 ohms:** Cone Resistance = **130.178647 ohms**
Helical radius = **6.286620" in.:** Helical coil height = **48.480621" in**
Cone hc & rc = **6.286620" in.:** Slant height = SQRT(2) * 6.286620" = **8.890623"**

Single Helical Coil System (with dimensions)



Single Pancake Coil (with dimensions)



f. The Skin Effect

Below is a table which may be helpful in combating any issues with the skin effect. Whether or not the skin effect is prevalent on interleaved coils – is unknown. This speculation is due to the coil system's internal capacitance & auto-resonant behavior, which may offset the skin effect.

The "Skin Effect" is the tendency of an alternating electric current (AC) to distribute itself within a conductor so that the current density near the surface of the conductor is greater than that at its core. The electric current tends to flow at the "skin" of the conductor. The skin effect causes the effective resistance of the conductor to increase with the frequency of the current. The maximum frequency show is for 100% skin depth (ie. no skin effects).

AWG	Diameter [inches]	Diameter [mm]	Area [mm^2]	Resistance [Ohms / 1000 ft]	Resistance [Ohms / km]	Max Current [Amperes]	Max Frequency for 100% skin depth
28	0.0126	0.32004	0.081	64.9	212.872	0.226	170 kHz
29	0.0113	0.28702	0.0642	81.83	268.4024	0.182	210 kHz
30	0.01	0.254	0.0509	103.2	338.496	0.142	270 kHz
31	0.0089	0.22606	0.0404	130.1	426.728	0.113	340 kHz
32	0.008	0.2032	0.032	164.1	538.248	0.091	430 kHz
33	0.0071	0.18034	0.0254	206.9	678.632	0.072	540 kHz
34	0.0063	0.16002	0.0201	260.9	855.752	0.056	690 kHz
35	0.0056	0.14224	0.016	329	1079.12	0.044	870 kHz
36	0.005	0.127	0.0127	414.8	1360	0.035	1100 kHz
37	0.0045	0.1143	0.01	523.1	1715	0.0289	1350 kHz
38	0.004	0.1016	0.00797	659.6	2163	0.0228	1750 kHz
39	0.0035	0.0889	0.00632	831.8	2728	0.0175	2250 kHz
40	0.0031	0.07874	0.00501	1049	3440	0.0137	2900 kHz

6. Pricing & Durability Considerations of Parts

g. When calculating prices, wire lengths need to be doubled for adding primaries.
Wire lengths need to be doubled - again - for the 2nd coil system.
30 AWG copper wire is sturdy enough to wrap by hand without breaking.
Therefore, 24,328 meters of 30 AWG copper wire are needed for 4 coil interleaved layers (and frequencies), over 2 coil systems.

30 AWG copper wire cost is $60 per 5 lb. spool. (4773 meters each).[5]
6 spools are $360 on Amazon.com.

h. Two cardboard tubes are needed as helical templates. Large, durable cardboard tubes 12" inches diameter x 49" inches long are available at Cement Distribution Outlets (cement form tubes). These are needed to hold the longest wire lengths of 4558 meters.
The tubes are sturdy since they are .3" inches thick.
These are $3.50 dollars per foot. So, $35 for qty. 2 - 5 ft. cardboard tubes.[6]

i. Quantity 4 – 5’ x 5’ x ¾” plywood pieces. The largest pancake coils have an outer radius of 26.551310” inches, or a diameter of 53.10262” in. (over 4 feet). Two 8’ x 4’ x ¾” plywood boards are not enough. 3 pieces of 8' x 4' x ¾” plywood are available at Home Depot for $35.00 to support the cork board & mount the Variable Frequency Drives & their motors.
The third piece of 8’ x 4’ x ¾” plywood is needed to adjust the size of the 4 platforms to 60” x 60” inches. Total is $105 at Home Depot.

5 **NOTE:** Each 10 lb. spool is 3 times as expensive as 5 lb. spools.

6 Theoretically, for n=6, cardboard tubes need to be 192 inches long (4 x 48”). These can be custom cut by certain cement distributors. Also, a quantity of 2 - 10 lb. spools of wire are needed for each of the 4 longest coils (total of 80 lbs. of wire).

j. 2” x 4”x 8’ foot long boards are needed to build the cage surrounding the coil systems. 12 for each end, and 12 for the middle section are needed. Qty 36 – 2” x 4” x 8’ boards are $3.57 each at Home Depot (Total $128.52).

k. Two Parallax Propeller microcontrollers are needed ($35 each) add up to $70.

l. Two Variable Frequency Drive Packages (1/2 HP Controllers & 1/4 HP motors) at 1800 rpm ($160 each) are $320. They can be purchased at Dealers Industrial Equipment.

m. Two aluminum spheres have already been purchased from King Architectural Metal for $70 each ($140 total), along with 10 diodes, 10 Zener diodes & 10 transistors.

n. Four (dual-sided) power supplies for powering 4 frequencies (and DC Bias) on each end ($150 each) is $600. These are on Amazon.

o. A 4-channel oscilloscope for $350 from Rigol.com.

p. Home Depot sells a corded drill (and screwdriver) for $60. Model 110K

q. Home Depot sells a corded Circular saw for $120

r. A box of 3 ½ inch wood screws (qty. 247) is $26 at Home Depot.

s. Two boxes of 1250 staples is $3.50 (total $7.00) at Home Depot.

Cost of parts = $1533
Cost of test equipment = $1130
Total cost of experiment = $2663 plus tax.

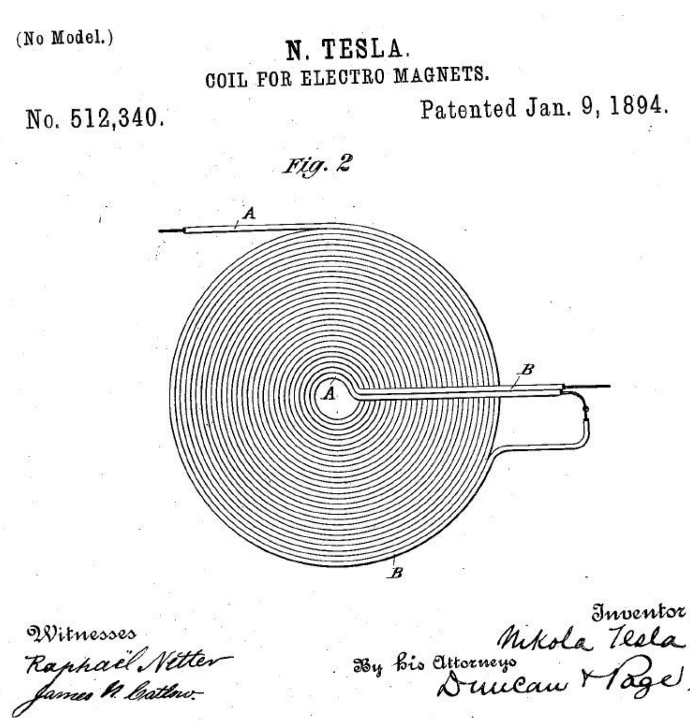
7. Patents, Experimental Practices & Theories Considered

a. The first factor is a patent by Nikola Tesla from January 1894 – and was released to the public (republished) in 1995 – exactly 101 years after its inception. This is patent #512,340. It describes an interleaved coil system (2 wires wound next to each other).

   This coil system is unique in the sense that it creates both induction & capacitance (between the two adjacent wires) at the same time (causing a self-resonant LC “tank” circuit without the use of external capacitors). Interleaving adds the benefit of storing 250,000 times the energy of a single wire coil.

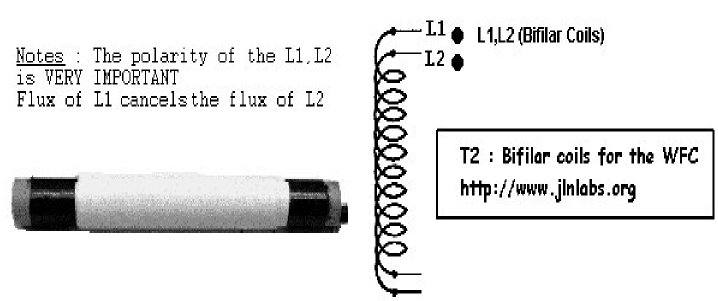
   Use of this patent is required – to achieve super-positioning of multiple frequencies - and is a way to eliminate external capacitors - to achieve multiple resonant conditions.

   The first diagram is a primary interleaved spiral (pancake) coil. Multiple coils need to be stacked (similar to pancakes) & positioned under their multi-layered secondary windings (described next) – one set for each frequency used. The coil patent is nicknamed a flow capacitor – or “flux capacitor”.



The next diagram is a secondary, multi-layer, <u>interleaved helical</u> coil (also considered patent #512,340).
Two spools of wire (of the same diameter) need to be used to create this coil, and the 2 wires need to be wrapped side-by-side, along the entire length of the coil. No skips, overlaps, or twists are allowed between the 2 wires – if it is to work correctly. The 2 adjacent wires creates a capacitance, and again, holds 250,000 times more energy <u>than single-wire helical coil.</u> There will be 4 wire connections (2 on each end) when completed – 2 of which will be coupled.

Multiple wrappings are made on a tube of cardboard (preferable) - one coil layer for each frequency used.



L1,L2 <u>BIFILAR COILS</u> (interweaved)
2x190 turns of 5/10 mm magnet wire #24
on a 20 mm cardboard tube (length 190 mm)

b. The second factor is a patent showing how to improve the magnetic field of the entire primary/secondary coil system – by finding the resonant frequency of each primary coil (and matching it to the secondary). Matching the wire lengths of all primary & secondary coils - allows all resonant frequencies to be the same. This results in matched inductance & internal capacitance – allowing a dual-resonant condition.

Dual resonant conditions are achieved by matching the LC resonant frequency of all interleaved coil pairs, with their ¼ wave resonant frequency (requiring the same length of wires in each primary/secondary pair). It is patent #US7973296-B2

The patent advises to match these equations - by setting them equal:

¼ wave resonant frequency equation = 300,000,000 / (4 * Length of wire)
LC resonant frequency equation = 1 / (2 *pi * sqrt(LC)

Therefore,

Length of wire = 150,000,000 * pi *sqrt(LC)
LC = (Length of wire / (150,000,000 * pi))^2

Equations for the capacitance & inductance of interleaved, multilayer coils are difficult to derive, but are potentially not needed to finish the design. As long as the wires are kept to the same size & same length, patent #512,340 potentially will give the same inductance & capacitance – regardless if helical or pancake shaped. (Research this).

c. The third factor is finding the relative coil size dimensions - after matching the length of the spiral primary coil (pancake shaped) with the helical secondary coil (rod shaped). Again, this is to maintain 1/4 wave & LC resonances – at the same frequency. Calculations have been made above.

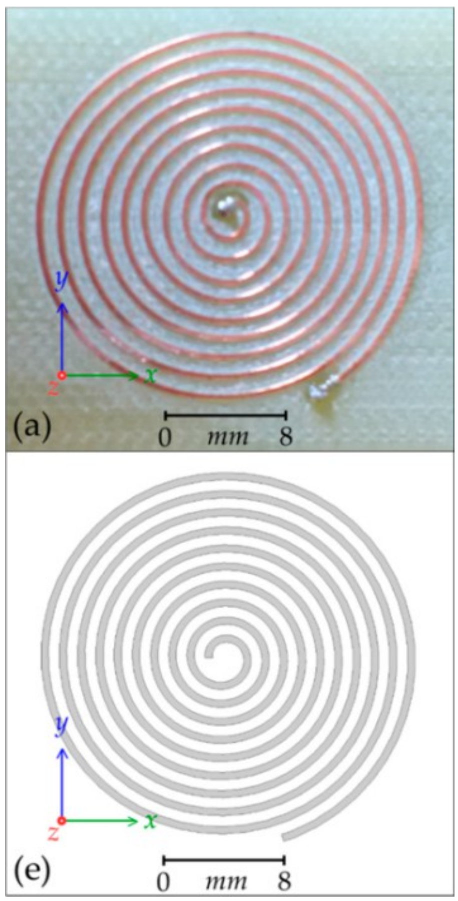
Different length & gauge (AWG) wire should be avoided. This situation makes achieving resonance difficult, since different sized wires having different L & C values – and creates the need for a balancing act to reach resonance. Also, multi-layer, interleaved inductance increases geometrically (instead of arithmetically), so induction measurements are not possible past 6 layers (with traditional inductance meters) – and require microcontrollers & oscilloscopes to find the inductance.

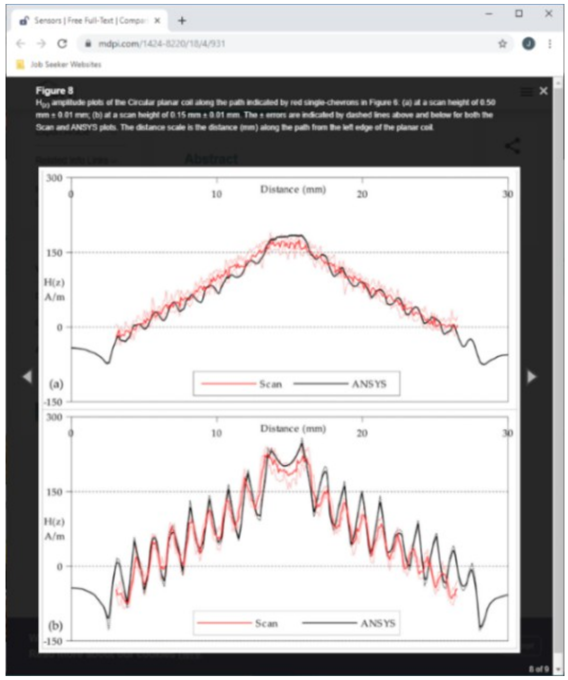
Furthermore, capacitance measurements can become negative (depending on configuration) when measuring interleaved coils, which can be problematic. The best course of action is to keep all primary/secondary pairs the same length, and same gauge – and measure their L & C values individually. If same length primaries & secondaries have different L & C values, then external capacitors might be useful at this point. External “tuning” capacitor values are the difference between the primary & secondary coils’ C values. External “tuning” inductors can be calculated and added the same way.

d. The fourth factor is building, wrapping, and placement of the cone-shaped “concentrator coils” at the ends of the large helical coils. These cone-shaped coils are interleaved, and should be considered an extension of the helical coil when making wire length calculations. The entire helical & cone coil structure represents the coil-length when calculating ¼ wave resonance (not just the length of the helical coil). Their wire-length is the length of similar-sized pancake coil, but then multiplied by the Square root of 2 – or sqrt(2).

e. The fifth factor is <u>placement & relative proximity of the primary (pancake) & secondary (helical) coils.</u> A third-party simulation & measurement of EM fields was done in 2018 – showing the EM field emissions of a spiral coil.
The first picture shows the size of the spiral coil that the measurements were based on.

The second picture shows the EM field distribution of a mini-spiral coil of 25 mm outer diameter & 2.5 mm inner diameter. It can then be deduced that the helical coil radius should be slightly smaller (and fit inside) than the inner radius of the primary coil.





Source: Gibbs, R.; Moreton, G.; Meydan, T.; Williams, P. "***Comparison between Modelled and Measured Magnetic Field Scans of Different Planar Coil Topologies for Stress Sensor Applications"***. *Sensors* **2018**, *18*, 931.

f. The sixth factor is the Gravitational Magnus Effect - which can be used to extend the path of plasma around a spinning, conductive sphere – allowing slowing & modulation of the plasma propagation in a functional direction.
A published paper regarding the Magnus Gravitation Effect was released in July of 2018, giving a Newtonian explanation for Gravity which uses Magnus Effect equations - instead of the equation for Universal Gravitation – but calculates to the same results.

Magnus Effect mechanics, potentially replace 2 difficult scientific concepts with 2 simpler ones (an example of fixing Occam's Razor) - by using Newtonian Pilot Wave Theory (De Broglie - Bohm Theory) & standing waves to explain deterministic outcomes (instead of the non-deterministic Copenhagen Interpretation of Quantum Theory) & the bending of Plasma instead of spacetime (Plasma Cosmology instead of Big Bang Cosmology).

Source: ***"Gravitational Magnus Effect",*** L.Filipe O. Costa, Rita Franco, Vitor Cardoso, published on May 3rd, 2018, revised & republished on July 25, 2018.

g. The seventh factor needed is the use of Zener Diodes for super-positioning of signals. Zener diodes are used to separate the LC tank circuits – and allow a natural separation of signal frequencies to occur.

h. The eighth factor needed is use of the proper phase angle for super-position - of $(3/2 * \pi)$ between all frequencies. Other phases don't properly create constructive interference.

i. The ninth factor is to add a DC bias – to finish rectifying the super-positioned signal. This can be done by adding an extra pancake coil - and applying only a DC source without signaling.

j. The tenth factor is to add electric variable frequency drives (1 VFD for each sphere) – to spin both conductive spheres - and slow the speed of flowing plasma along the N-S axis by extending & twisting its path along a perpendicular axis. These electric drives should have a maximum rotational speed of at least +/- 30 Hz (+/-1800 rpm). The horsepower should be based on the size & weight of the spheres, but a 1/4 HP motor is potentially sufficient for all spheres under 2 kg.

   The rotational speed was estimated by researching “slow”, “stopped” and “fast” light experiments at Glasgow University & their use of a +/- 1-30 Hz (60 – 1800 rpm) Variable Frequency Drive – used to spin a ruby window – thus slowing observed light by twisting & extending the path of light taken.

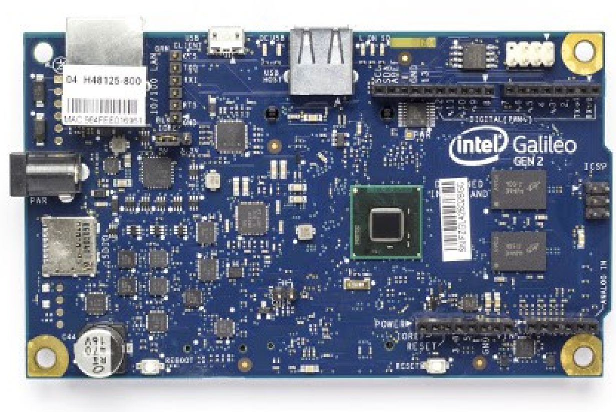
   Source: Wisniewski-Barker, Emma (2015) “***Slow light in ruby: a study in spatial and temporal domains”***. PhD thesis.

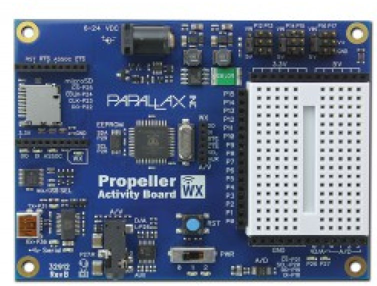
8. Micro-controllers

t. Digital Signaling & Phasing of multiple frequencies cannot be accomplished with college-standardized Arduino microcontrollers. A newer, competing microcontroller from Parallax was released in 2008 – called the Propeller Board.

u. The Propeller board can produce up to 32 frequencies at the same time, and can be programmed in C, assembly language, or proprietary SPIN code to control the number of frequencies, duty cycles & phasing necessary for superposition. Extensive open-source code is available for the Propeller Board. It is enough information to achieve a Pulse Width & Phase Modulator – to operate a 4 frequency IPB or HATLIM. Quickstart & Activity versions are shown below.

v. Other boards under consideration are Intel Galileo Boards (400 Mhz) and the Cyclone 4 FPGA board. Propeller Boards can be written in C & Spin-Assembly.





9. Phasing Considerations

If the resonant frequency is too high for the microcontroller to phase, then external phasing electronics need to be added. The formulas below describe the phase angle, with respect to external Resistance (R), Capacitance (C), and X_c (capacitive reactance).

Because of the higher frequencies needed for the TLIM, the Propeller Board can only be used to generate a frequency – but not be able to make phase changes. A variable RC circuit (and potentially just a variable resistor) is necessary for the needed phase changes.[7]

$$X_C = \frac{1}{2\pi f C} \qquad R = R,$$

$$Z = \sqrt{R^2 + (X_C)^2}$$

$$\therefore \quad \phi = \tan^{-1} \frac{X_C}{R}$$

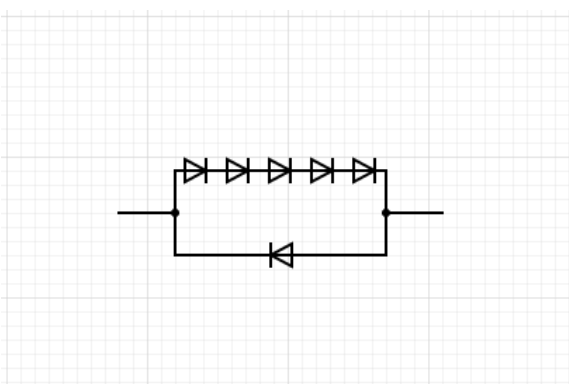
More completely,

$$|Z| = SQRT(R^2 + (X_L - X_C)^2)$$

$$\tan \theta = (X_L - X_C)/R$$

10. Zener structures.

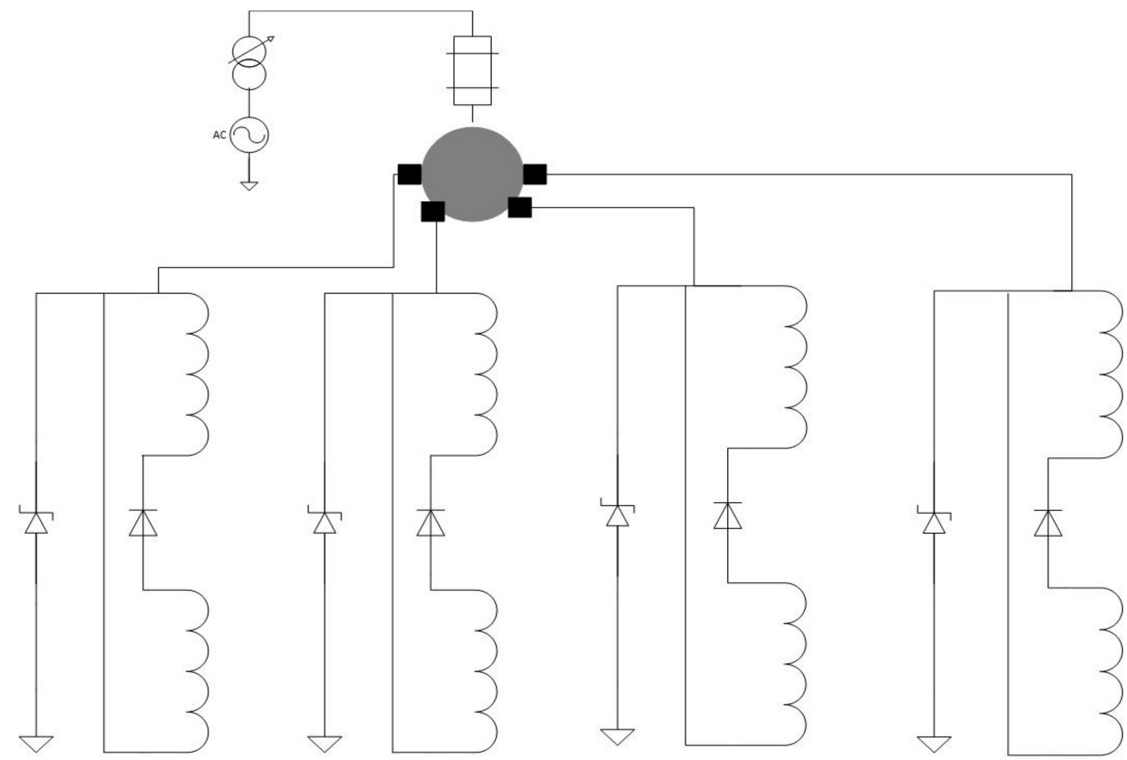
a. Zener diodes can be built using regular diodes – instead of buying Zener diodes. The following diagram is the equivelent of a Zener diode with a reverse voltage of 3 volts.
b. The number of diodes used in the reverse direction will depend on the maximum voltage swings created.

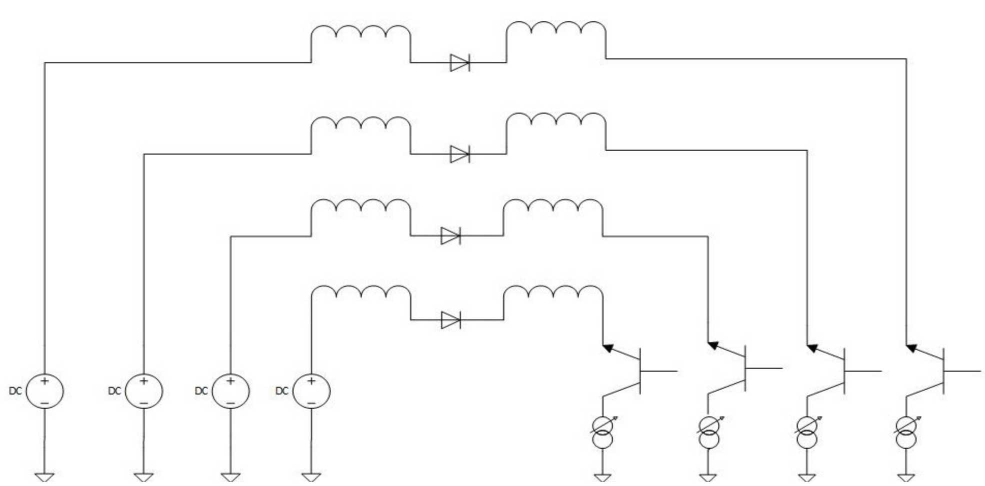


7 The Wein Bridge Oscillator is 1 example of a circuit that uses a resonant frequency for operation.

11. Impermeable Plasma Barrier (IPB) diagram

Below is the circuit layout of the primary coil system (bottom - pancake) & secondary coil system (top - helical) transformer circuits (3 frequencies shown).



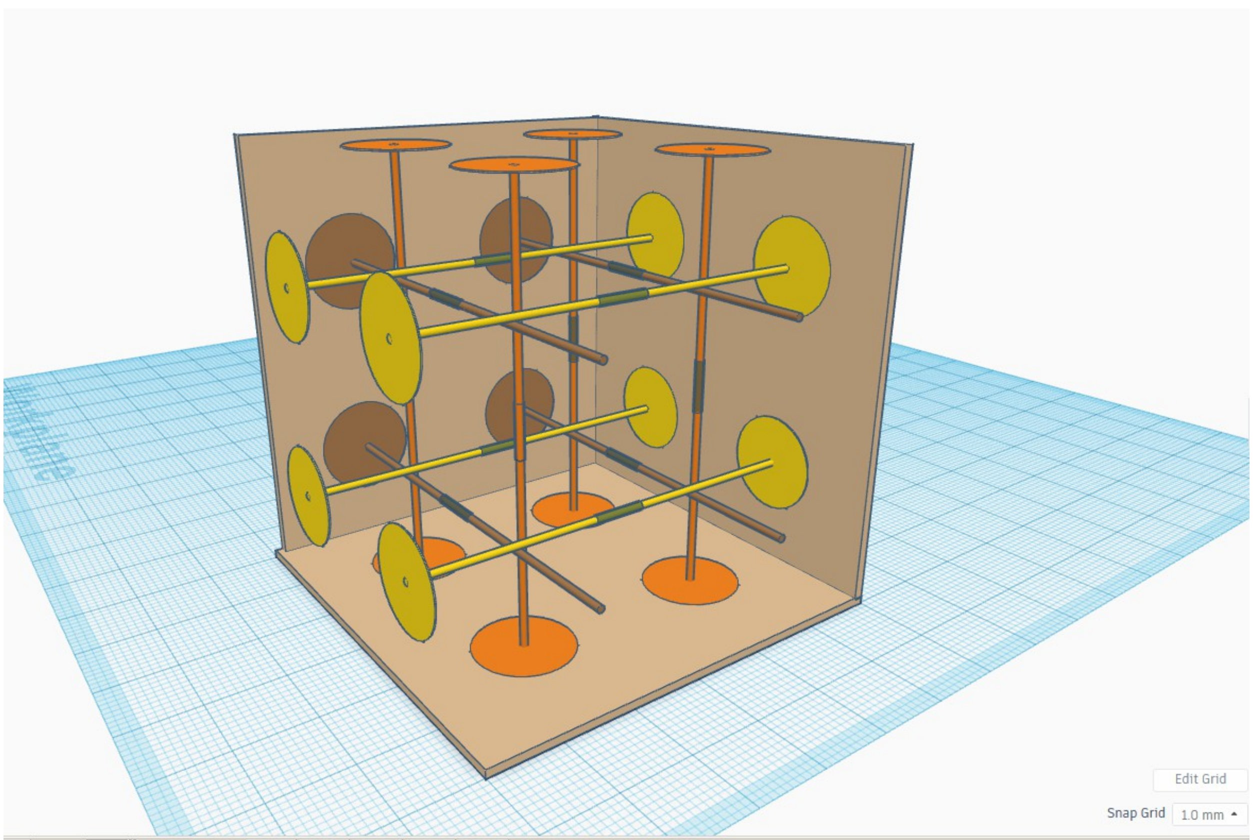


12. Tubular Linear Induction Motor (TLIM)

a. The cutaway diagram below shows a 3-axis Tubular Linear Induction Motor (TLIM), to be placed inside a Impermeable Plasma Barrier – which will potentially allow Hyper-accelerated propulsion in at least 6 directions. Wood tubes & connectors should be used instead of plastic, in case of any radioactive ingredients in polymers.

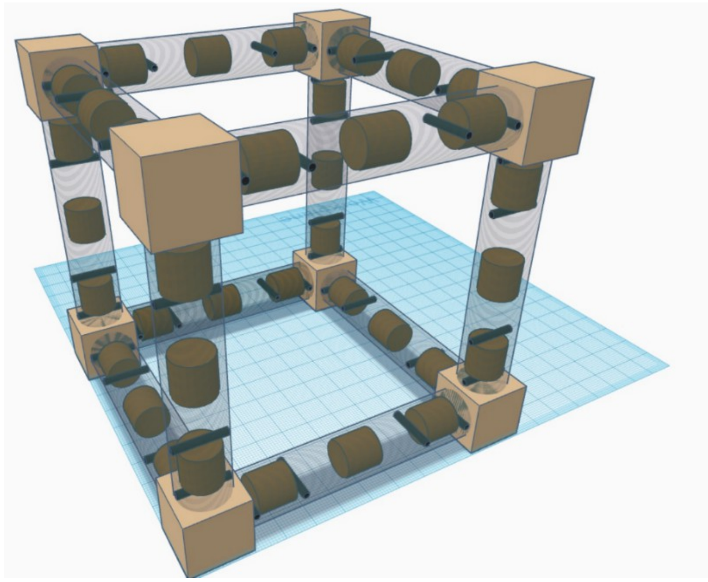
This design allows propulsion & guidance control of the entire plasma structure (when placed inside a IPB) – leading to controlled flight. Each tube contains pinned & floating magnets. The tubes are wrapped with 2 sets of multi-layer, interleaved helical coils – 1 on each end (not shown).

The black portion of each tube represents an area with 2 pinned magnets & a floating magnet in-between the 2 pinned magnets. If a IPB protects against acceleration, & superpositioned frequencies (and energy states) are used - then the TLIM can be renamed HATLIM (Hyper-Accelerated Tubular Linear Induction Motor)[8]



8 **NOTE:** A modification of the design will double the amout of magnets & wire (placing them at the far ends of the tubes.) This allows helical coils to be wrapped twice as long.

b. Below is an earlier design (not functional) due to proximity of LIMs (and inability to add coils of any useful wire lengths. However, it shows the pinned & floating magnets.



13. Peaceful, Practical Space Survival Applications

c. **Warp Drive and Unconventional Flying Objects** – This technology is written about in several 2012 PIERS proceedings, including ***"Pulsed EM Propulsion of Unconventional Flying Objects"***, A. Meessen, Institute of Physics, Catholic University of Louvain, Belgium.

   This technology is meant for safe, faster-than-light travel – by assuming a plasma-filled universe model (versus a spacetime model – or Copenhagen interpretation). Another function of Plasma-force fields (IPBs) – is to protect their contents (including HATLIMs – detailed above) from acceleration against external space plasma.

   The plasma-filled universe is a published, competing model to the Einsteinian space-time model (Copenhagen Interpretation) – and is necessary to create a Newtonian design - to propel through space at unconventional speeds.

   Source: ***"Plasma Universe"***, Hannes Alfven, April 1986, Department of Plasma Physics, S-100 44 Stockholm, Sweden. TRITA-EPP-86-03

d. **AM water electrolysis** (elemental separation of water - without recombination) – AM Water electrolysis can create pure, breathable oxygen (O2), and separate burnable Hydrogen (2H2) for gaseous fuel applications.
e. **AM water desalination & radioactive cleanup** (molecular separation & recombination). AM water electrolysis is more efficient that DC water electrolysis. It can be used with contaminated water, salinized water, or even distilled water to remove everything – including metal & radiation.

The molecules (2H2 & O2) can then be recombined to create clean, liquid water for drinking. This is done by attaching an oxy-hydrogen torch nozzle to the electrolysis machine. Burning the oxy-hydrogen recombines the gas into water.

f. **BINGO or AuqaFuel –** Oxy-hydrogen gas can also be recombined into something other than water. By using graphite during electrolysis – recombination potentially yields a burnable liquid similar to gasoline. Octane ratings would depend on the amount of graphite available for the recombination reaction.
g. **Atmospheric creation** – This technology is meant for holding breathable, oxygen-rich atmospheres. They are created by building a Impermeable Plasma Barrier which is safe for life, and large enough to fit lifeforms inside. Clean oxygen can be created & held inside the IPB. The oxygen can be produced from electrolyzed water – and hydrogen can be expelled.
h. **"Q-Bit" or "Qubit" technology** – This technology is a 3-dimensional way to store digital information (instead of 2D memory arrays) – and would have layers (like an onion). Plasma waves can be combined to create standing waves & anti-nodes along an Impermeable Plasma Barrier, which would trap & spin small, metal particles. Then, an internal laser could determine the spin direction & allocate a "0" or "1" to the direction of the spin.
i. **Faster-than-light Communications** – This technology is meant to improve the speed of AM communications, by modulating the plasma that surrounds transmitted radio waves – allowing non-traditional communication radio-wave velocities.
j. **Autonomous Hoverboard technology** – This technology uses 3-4 relatively small Impermeable Plasma Barriers - mounted underneath a board. These IPBs would be an interface with the ground, and allow for semi-frictionless transportation across the ground. The smaller coils would require higher frequencies & better microcontrollers than the current design.
k. **Low power audio speaker –** By adding an audio signal to the input waveform, the plasma can be made to move at audio frequencies of 0 - 20,000 Hz.

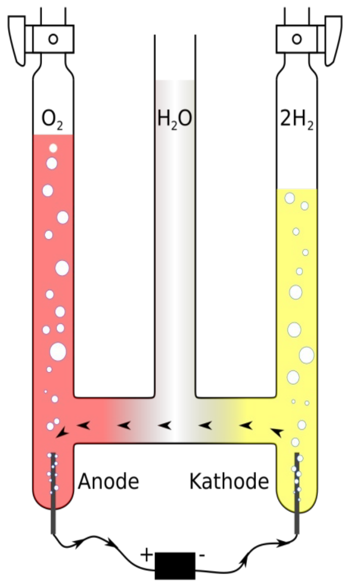
14. Atmospheric Creation - using IPBs & AM Water Electrolysis

This technology involves creating an Impermeable Plasma Barrier (IPB) large enough to contain a water tank, electrolyzing equipment & a human being.

a. Creation of pure 100% oxygen can be efficiently accomplished by electrolyzing a supply of water with AM signaling (instead of DC). Then, venting of the Hydrogen gas can occur (with a tube) & leave Oxygen for breathing.

With AM electrolysis – chemical electrolytes are not necessary (as with DC electrolysis) – keeping the inputs & outputs clean of impurities.
A Hoffman "voltameter" is a device meant to separate the Oxygen & Hydrogen gases during water electrolysis. The application of superpositioned AM signaling to the anode (instead of DC power) - is necessary to avoid using electrolytes (i.e. metal salts, sodium HCL or potassium HCL caustic bases) – and also use power efficiently.

b. To perform water electrolysis – add a power coil to collect energy from the main coil system from the IPB circuit above. Then connect the leads to the Anode & Cathode of the Hoffman voltameter and allow water to fill the middle tube.
The diagram below shows the layout & functioning of a Hoffman voltameter – and allows separation & venting of hydrogen gas - **away from oxygen gas** - after AM electrolysis takes place. An air-tight IPB would then be able to hold the oxygen.



60 ml Hoffman voltameters are available online for about $115.00

Constants, Conversions & Calculations:

Water contains a stechometric ratio of 1 mole of atomic Oxygen (O) & 2 moles of atomic Hydrogen (H).

The volume of 2 moles of liquid water can generate 1 moles of molecular, gaseous O2 & 2 Moles of molecular, gaseous H2 (3 moles of total oxy-hydrogen gas).

Therefore, O2 makes up 1/3 the volume of the separated gases.

The volume of 1 mole of liquid water (H2O) = 18 ml (.018 liters).

The volume of 2 moles of liquid water = 36 ml (.036 liters)

1 mole of any ideal gas (O2 or H2) occupies 22.4 liters of space at ambient temperature & pressure.

The volume of 1 mole of O2 plus 2 moles of H2 molecules (or 2 moles of equivalent water) = 3 moles of ideal gas (O2 + 2 H2) * 22.4 = 67.2 liters.

1 mole of water (18 ml) generates (½ * 67.2 liters) or 33.6 liters of Oxyhydrogen (O2 + 2H2) mixed ideal gases.

Furthermore, the Gaseous Expansion ratio of oxy-hydrogen gas (O2 + 2H2) from water = 33.6 / .018 = 1866.6666.

Therefore, after venting the H2 - the Gaseous Expansion ratio of just O2 from the same 1 mole of water is (1/3 * 1866.66666) = 622.22222

c. 60 ml of water in the Hoffman voltameter contain 3 1/3 moles of water.

The volume of liberated oxygen from 60 ml (.06 liters) of water is 3.333333 moles (water) x (.018 liters/mole) x 622.222222 (expansion factor) which equals 37.333333 liters (9.862428 gallons or) of mol. oxygen (O2).

The minimum size of the plasma barrier will potentially be a sphere with a diameter defined by the distance between the 2 spinning spheres. To make a 5' x 5' x 5' cube in the middle of the machine, involves a minimum separation distance of 16.6667 feet between the equator of each sphere (seperated from the cone by up to 6 inches) – or a plasma radius of 8.333333 feet.

Conversions used:

Liters per cubic foot – **28.3168**

Liters per gallon – **3.78541**

Gallons per cubic foot – **28.3168 / 3.78541 = 7.48052**

The volume of a sphere is calculated with the following formula:

Volume of sphere = $\mathbf{4/3 * \pi * radius^3}$

Therefore, the volume of the sphere is **2424.068406 cubic feet.**
The sphere will have a minimum volume of **68641.860226 liters (18133.26964 gallons).**

The voltameter will need to be filled 1839 times to fill the sphere with pure oxygen at atmospheric pressure (assuming the hydrogen is vented and no longer taking up space).

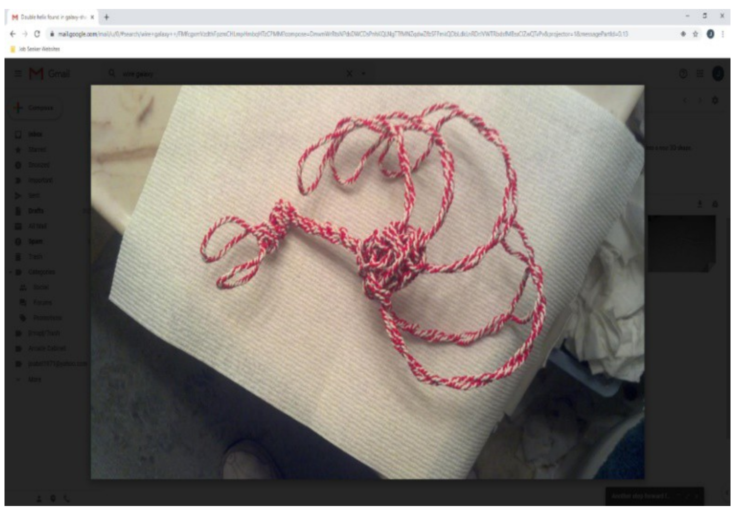
Therefore, to create a 100% oxygen environment of this volume – requires **110.317413 liters (29.142791 gallons) of water.**

NOTE:: To clean the existing air (nitrogen plus oxygen) – before adding more oxygen to the IPB, an air compressor & air conditioner are potentially needed to separate the Oxygen & Nitrogen gases, or a vacuum pump is needed to empty the space of **all** gases.

15. Coil Shaping & Re-evaluating Cosmic Structures

Patent #512,340 can be twisted & wrapped in any shape necessary - for specific applications. It leads to an understanding of coil shaping & creating true, 3-dimensional antennas. This concept (combined with superposition techniques & plasma modulation) allows for creation of cosmic structures, and better spatial understandings of existing cosmic structures (such as cosmic jets & triaxial galaxies). 3-dimensional galaxies are considered more prevalent than first thought.

The following article explains how isophosic twisting occurs in galaxies – leading to an argument against dual-axial galaxies since 1982. Source: ***"Isophote Shapes"***, by R.I. Jedrzejewski at the Mount Wilson & Las Campanas Observatories in Pasadena, CA.



Sources:

1. ***"Plasma Universe"***, Hannes Alfven, April 1986, Department of Plasma Physics, S-100 44 Stockholm, Sweden. TRITA-EPP-86-03

2. ***"Gravitational Magnus effect",*** L.Filipe O. Costa, Rita Franco, Vitor Cardoso, published on May 3rd, 2018, revised & republished on July 25, 2018.

3. Wisniewski-Barker, Emma (2015) "***Slow light in ruby: a study in spatial and temporal domains"***. PhD thesis.

4. ***"Isophote Shapes"***, by R.I. Jedrzejewski at the Mount Wilson & Las Campanas Observatories in Pasadena, CA.

5. 2012 PIERS Proceedings, ***"Pulsed EM Propulsion of Unconventional Flying Objects"***, A. Meessen, Institute of Physics, Catholic University of Louvain, Belgium.

6. Gibbs, R.; Moreton, G.; Meydan, T.; Williams, P. "***Comparison between Modelled and Measured Magnetic Field Scans of Different Planar Coil Topologies for Stress Sensor Applications"***. *Sensors* **2018**, *18*, 931.

7. US Patent #512,340 - Interleaved Coil

8. US Patent #7,973,296-B2 - Dual Resonant Condition