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Exploring the Role of Photons in Gravity and Mass: A Theoretical Mathematical Model

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ABSTRACT

This paper provides a mathematical proof that the fundamental particle of gravity and mass is the photon, and that initial gravity is caused by the electrostatic force of interacting photon pairs. Here a true value for the energy of a single quanta is given in accordance to the criteria set forward by Planck and Einstein. It is discussed in length that the Millikan's style derivation using the root-mean squared value of an electron is an improper definition for quanta. Using the proper value of quanta the conditions in which photons make mass and cause gravity were found. The mathematical proof then goes on to explain how moving particles of like frequency appear to act as a wave and particle due to the centrifugal forces that tie them together, the parallel forces that is created by their symmetry of motion that acts as a bounding condition, and effects caused by General and Special relativity. The predictions set forth in these equations were then correlated by experiments conducted by the author and others.

INTRODUCTION

Energy Quanta Value

Maxwell Planck had theorized that everything in the known Universe was comprised of discrete quanta of energy. The formula for a single quantum of energy was given by Planck to be energy multiplied by time or:

$$E = \frac{1}{2}mv^2$$

Or

$$h = E * T$$

Planck lacked the tools to provide an exact measurement of the constant of energy. At the time of its conception the photon had yet to be defined, but the electron had. Armed with the knowledge available to him, Robert Millikan set out to derive a constant value for the energy of quanta which today is known as Planck's Constant.

Planck Constant

Planck constant **h** represents energy of a single electron and is meant to be the value of quanta of energy that makes up all matter. The value of h was determined using root-mean squared (RMS) calculations and is by definition not exact. RMS comes from the Pythagorean Theorem where the square of the hypotenuse is equal to the sum of the square of the other two sides. For a continuous wave, which we now know electrons and photons are, the RMS value is "the peak value, multiplied by the square root of .5." (Cemer, 2019) RMS is often simplified to .707.

Millikan created the first measured value of h in 1912. In the experiment Millikan passed white light through colored filters into a vacuum chamber to measure the electrons emitted. He accounted for any free electrons and then measured the resulting voltage. Millikan did not measure the exact energy per time, but instead manipulated the formula into the electro-magnetic equivalent of energy:

$$eV = hf - W$$

"Here e is the electric charge on an electron and V is the voltage of the corresponding electrical field" (MpowerUK, n.d.) Millikan's measurement makes the electron the quanta of energy that makes up all mass and energy in the Universe but doesn't relate directly to photons as photons do not have magnetic properties. Millikan would manipulate the formula further by solving for the voltage alone:

$$V = f\frac{h}{e} - \frac{W}{e}$$

Or

$$Slope = \frac{h}{e}$$

He charted the resulting frequency and voltage on a graph with the slope representing T. He then calculated the slope by choosing points along the line and solving using the Pythagorean theorem or RMS value. The value of the electron was also determined by Millikan in his now famous "oil drop" experiment. Using the slope as time and his discovered value of e as the energy Millikan determined the Planck constant to be "6.57 x 10^{-34} joule-second which is about .8% of its currently accepted value today." (MpowerUK, n.d.) The accuracy of the first determination of the value of h to today's value are closely related which makes sense because the value of h is still calculated in the same method; comparing the voltage and frequency and taking the slope. Meaning even to this day h is in terms of RMS and not exact.

Millikan was later awarded the Nobel Prize in 1923 for two experiments that contradict each other in a subtle way. The Nobel Prize was awarded "for his work on the elementary charge of electricity [described above] and the photoelectric effect." (The Nobel Prize in Physics 1923, 2020) Millikan defined quanta of energy as an electron however the second experiment proved Einstein's theory that photons exist and are made of two quanta. It is well proven that photons are not made up of two electrons which eliminates the possibility of the electron being the value of h. The findings were not meant to be contradictory. In fact, Millikan's intent was to disprove Einstein's photoelectric effect and the manipulation of Planck's formula was expected to do just that. Instead Millikan proved the photoelectric effect and the divide began between the single theory of physics. The article from IEEE written by John Vardalas and published in June of 2016 titled "Robert A. Millikan: Measuring the Controversies of an Electron's Charge" perfectly outlines the issues with Millikan's value of h and the methods in which it is still obtained. In summary:

Einstein theorized that "electrons were freed from the surface of the metal by the energy of the incoming electromagnetic quanta." The formula to describe the Kinetic Energy is hv or Plancks Constant times the frequency of the radiation. Millikan derived that if Einstein was correct then by plotting the electron's kinetic energy and comparing it with the radiation frequency which produced it one should get a "straight line whose slope is Planck's constant."

Nearly a decade later, Millikan in his 1916 paper admitted that Einstein's photo-electric effect theory was correct but refused to acknowledge light-quanta exists. Today we know that light-quanta does exist and is a smaller form factor than the electron. The Physicist Felix Ehrenhaft's brought this discrepancy to Millikan's attention shortly after Millikan's paper was first published. Ehrenhaft had performed the same experiment as Millikan and noted that he found a smaller charge than the electron that would mean the electron was not the fundamental particle of energy. In response Millikan sought to reprove the electron as the smallest quanta of energy and eventually used those findings in his 1913 paper that would yield him the Nobel Prize. It is noted however, that Millikan published *some* of the results from his experiment. Experts who examine Millikan's notebook all agree that data is omitted but disagree on the impact the missing data would have. Millikan stated that the missing data was omitted for not being conclusive enough. The extent of Millikan's deceptive practices, his need to take all credit, and possible attribution of his actions to "the desire for professional recognition amongst their peers." Is well explored in the article by Vardalas and is worth a read.

Dirac introduced the reduced Planck Constant $\hbar$ to describe the angular momentum of an electron. The reduced Plack Constant is:

$$\hbar = \frac{\mathrm{h}}{2\pi}$$

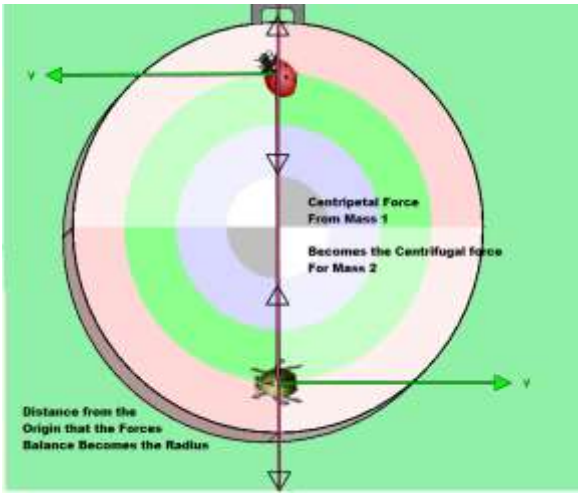
If the value of h is found in terms of RMS then the value of $\hbar$ will be as well. If the value of h and $\hbar$ are not exact than the Planck length, mass, time, and gravity are all an estimation as well that contain a percentage of uncertainty, which they admittedly do. The uncertainty of h and $\hbar$ was exposed in Heisenberg's Uncertainty Principle. Instead of reevaluating the accuracy of value given for Planck Constant the uncertainty principle and the notion that position and momentum of a particle cannot be known at the same time became a rule. It is important to stop here and see how far away from the elegant formula put forth by Planck, Millikan's measurement has become. It is reflective of the complicated formulas that are used in Quantum theory today that likewise do not yield an exact result and instead contain an uncertainty percentage.

Quanta energy, photons, and relativity

Photons are the smallest known particle and are made up of pairs of quanta rotating around each other over a given period of time. The period of 2π represents one complete cycle. How fast a single quantum completes the cycle is the Energy of that quantum.

$$E(q) = \frac{C}{2\pi}$$

The single quantum of energy is never found alone but in pairs. The individual quanta are paired in photons due to a balance of forces exactly how depends on the position of the observer. In a perfectly balanced photon the two quanta are 180 degrees(π) from each other and have equal momentum in the same direction(velocity). As they begin to rotate around the common origin an accelerating force is generated towards the origin. When rotating at an angular frequency of 2pi(n) the accelerating force will extend to the parallel quanta of energy creating a balanced force that holds them together as shown in the below figure 1.



The above figure was created using phET Simulation: Ladybug Revolution an interactive simulator where the results can be easily recreated. Like parallel forces exert force in the same direction they are traveling. This tangent force provides a boundary for the quanta pair and to the inertial observer the pair appears to be traveling along the tangent line in the direction of its velocity.

Photons travel in a quad-quanta arrangement of vertical and horizontal pairs. Two photon pair, of the same frequency, and 90 degrees out of phase will spin around the same origin. They will create their own centrifugal Force tying them all to the origin. When the movement is parallel to each other in the same direction such as at the point of inflection a strong force will be created parallel to the photons giving the pair a bounded limit. When the parallel photon pair are moving in different directions opposing forces push in on the photon pair until the quanta is squeezed at the origin.

The quanta starts to spin away from the center, reaches the point of inflection, a tangent plane of force is created which pushes the quanta back towards the center or origin, there the force from the parallel quanta pushes the energy away from the center, until the quanta of energy hit the point of inflection and the bounding force acts upon the quanta again. The pulsing from the origin to the outer radius causes the photon to act like a wave. The below figure 2 shows the external forces acting around the pair as they rotate.

Fig 2.

*The angle is sloped to the right to simulate the movement over time.

The tangent force will appear when the rotating particles are the same value.

$$\mathbf{tan}(\boldsymbol{x}) = \frac{\mathbf{sin}(\boldsymbol{x})}{\mathbf{cos}(\boldsymbol{x})}$$

$$\mathbf{tan}(\boldsymbol{x}) = \frac{\mathbf{0}}{\mathbf{0}}$$

Or

$$\mathbf{tan}(\boldsymbol{x}) = \pm\frac{\mathbf{1}}{\mathbf{1}}$$

$$\mathbf{tan}(\boldsymbol{x}) = \mathbf{1}$$

A single photon is made of two quanta giving the photon the energy value of:

$$E(p) = \frac{C^2}{2\pi}$$

Proof:

Starting with $E = mC^2$

Rearranging the formula to solve for mass:

$$m(p) = \frac{E(p)}{C^2}$$

Substituting in the value of E(p):

$$m = \frac{{C_1}^2}{2\pi} * \frac{1}{{C_2}^2}$$

*Where C_1 is the incoming Energy or Photons and C_2 is the speed of light through the medium

If the speed of the incoming photons matches the speed of light through the medium:

$$m = \frac{\cancel{C_1^2}}{2\pi} \cdot \frac{1}{\cancel{C_2^2}}$$

$$m = \frac{1}{2\pi}$$

Substituting the proton's mass back into $E=mc^2$ we get the energy value of:

$$E(p) = \frac{1}{2\pi} * C^2$$

$$E(p) = \frac{C^2}{2\pi}$$

Here the assertion that protons are massless is proved in the case which the speed of the incoming photons is equal to the speed of light through the medium, in the case of a single photon or when the system is in equilibrium; strong bond. That changes when the value of the C_1 is different from C_2:

If $C_1 < C_2$ then the mass will be spread out over a larger area than the ideal 2π and will be unstable resulting in a weak bond:
Example:

$$m = \frac{{C_1}^2}{2\pi} * \frac{1}{{C_2}^2}$$

Let $C_1 = 3$ and $C_2 = 4$

$$m = \frac{3}{2\pi} * \frac{1}{4}$$

$$m = \frac{3}{8\pi}$$

A single quanta has the radius of 2 π meaning that the mass in the above equation would be an energy of three spread over four particles. The above example is over simplified for easy understanding.

If $C_1 > C_2$ then the mass will have a value of $m \geq 1$:
Example:

$$m = \frac{{C_1}^2}{2\pi} * \frac{1}{{C_2}^2}$$

Let $C_1 = 9$ and $C_2 = 3$

$$m = \frac{9}{2\pi} * \frac{1}{3}$$

Using cross multiplication, we arrive at the answer from the position of an outside observer who would see the mass as a whole:

$$m = \frac{3}{2\pi}$$

Relativity

Time is relative to the viewer and flows in rings. These rings unfold in the manner of Euler's number (e). Where the observer is in relation to the center of the event determines the time period. These rings are the unfolding of matter where time is in terms of pi and the movement is in terms of degrees:

Power	Time	Movement	Object
$\frac{1}{0!}$	0, 2π	0◦	Quantum
$\frac{1}{1!}$	2π	360◦	Photon
$\frac{1}{2!}$	$\frac{2\pi}{2}$	180◦	Photon Pair – 1D
$\frac{1}{3!}$	$\frac{2\pi}{6}$	60◦	Element/Atoms – 2D Add electron and positron
$\frac{1}{4!}$	$\frac{2\pi}{24}$	15◦	Molecules – 3D
$\frac{1}{5!}$	$\frac{2\pi}{120}$	3◦	Matter – 4D over space and time
$\frac{1}{6!}$	$\frac{2\pi}{720}$	1◦	Complete System 3D – Mass and Gravity
$\frac{1}{7!}$	$\frac{2\pi}{5040}$	1/7◦	Complete system 4D - space and time

From the position of the quantum time stands still because there is no rotation until it becomes a pair. Then the quantum pairs with another to form a photon and the time that it takes for the quanta to do a clycle of 360° is 2π.

$\frac{1}{0!}$	0, 2π	0◦	Quantum
$\frac{1}{1!}$	2π	360◦	Photon

The photon grabs its rotating pair and time is now spread out over a sphere. The photon Pair only completes half of its cycle and rotates 180° in relation to the quanta's rotation.

$\frac{1}{2!}$	$\frac{2\pi}{2}$	180◦	Photon Pair – 1D

The basic element/atom has the core rotation and adds the electron and positron pair. The time is now spread out over entire atom. The electron and positron only complete 1/6 of their cycle and rotate 60° in relation to the quanta's rotation.

$\frac{1}{3!}$	$\frac{2\pi}{6}$	60◦	Element/Atoms – 2D Add electron and positron

Molecules are made of two or more atoms. Time is spread out over all four quadrants in Euclidian space. One pole only completes 1/24 of their cycle and rotate 15◦ in relation to the quanta's rotation.

$\frac{1}{4!}$	$\frac{2\pi}{24}$	15◦	Molecules – 3D

Matter is the collection of molecules over space and time. Space and time or λ^5 as found in blackbody radiation equations. Time is spread out over the entire radiating body. One pole only completes 1/120 of their cycle and rotates only 3◦ in relation to the quanta's rotation.

$\frac{1}{5!}$	$\frac{2\pi}{120}$	3◦	Matter – 4D over space and time

Alive matter, humans and animals, are at the next level of time. Our concept of time is based on the movement of our system over 720◦. We start all of our measurements of movement after the entire container, box, or sphere has moved. Our view of time in relation to the quanta is 1/720 or just one degree movement in relation to the quanta's rotation.

$\frac{1}{6!}$	$\frac{2\pi}{720}$	1◦	Complete System 3D – Mass and Gravity

Time including ourselves and the "heavens" would be the container as it moves over time and space or 1/5040. To the individual quanta it would take seven cycles to make 1 degree of movement in relation to the quanta's rotation.

$\frac{1}{7!}$	$\frac{2\pi}{5040}$	1/7◦	Complete system 4D - space and time

"The one becomes two, two becomes three, and from the three the fourth is born."

It is not a surprise then that we find Euler's number, sum of the infinite series, in the expediential growth of systems.

Assuming that everything is opaque the outside viewer will only see the movement of the system at the same speed as themselves. This is what Einstein proposed in this theory of relativity that a person falling in an elevator will see the elevator moving at the same speed as them and everything around them will look like it is moving. From our vantage point as living beings we can only see matter over space and time and we register it as a solid system. This is why we need to slow down electrons, molecules, and atoms, in order to see them as a solid. However to the quanta we are spinning quanta moving together as an impossibly slow blob moving at a momentum of 1 degree per time period. The relativity effect exists over distance as well and for the same reasons. This effect is well observed over the ages and formalized by Einstein.

PHOTONS MAKE MASS PROOF

The current outbreak of COVID-19 has brought attention to the ability of Far-UVC to inactivate the virus. There have been counterclaims and uncertainty as to what frequencies in the Far-UVC range are safe and which create harmful ozone. Oxygen is an element that exists in bonded pairs of two or three oxygens; O_2 is commonly known as oxygen and O_3 is Ozone and is considered hazardous to humans. Ozone is produced when a double bonded Oxygen molecule is hit with an energy source equal to its bond enthalpy. The errant Oxygen molecule then must be hit again by an energy source equal to the triple bond

enthalpies of formation. (H. Zhu, 2019) The bond enthalpy formula is the Energy needed to break a bond and is doubled in cases of double bonds and tripled in the case of triple bonds etc.
The bond enthalpy for O2 is the following:
Work: $8.27x10^{-19}$ J
Frequency: 1248.1004 THz
Wavelength 240nm

The above is the minimum energy needed to break up the O2 bond. After the bond is broken the Oxygens will become free and will reform according to the enthalpies of formation. Three times the bond enthalpy of oxygen would break the existing Oxygen pairs and reform them into Ozone, two strong Oxygen bonds with one weak oxygen bond. Applying to the formulas and assumptions above:

If the speed of the incoming photons matches the speed of light through the medium:

$$m = \frac{{C_1}^2}{2\pi} * \frac{1}{{C_2}^2}$$

$$\Delta m = \frac{240nm}{240nm}$$

$$\Delta m = 1$$

Mass stays the same still O2

Prediction:
If $C_1 < C_2$ then the mass will be spread out over a larger area than the ideal 2π and will be unstable resulting in a weak bond:

$$m = \frac{{C_1}^2}{2\pi} * \frac{1}{{C_2}^2}$$

$$\Delta m = \frac{240nm}{360nm} * \frac{1}{2\pi}$$

$$\frac{m}{2\pi} = \frac{2}{3}$$

Result: Two times the original now spread over 3 particles with the 3rd particle resulting in a weak bond or O3. This is exactly what is seen when 360nm is applied to O2.

Prediction:
If $C_1 > C_2$ then the mass will have a value of $m \geq 1$:
Example:

$$m = \frac{{C_1}^2}{2\pi} * \frac{1}{{C_2}^2}$$

$$\Delta m = \frac{240nm}{480nm} * \frac{1}{2\pi}$$

$$\frac{m}{2\pi} = 2$$

Result: The original now spread over four particles with two strong bonds results in two double bonded oxygens. The experiment of making matter out of light has been carried out at the Large Hadron Collider (Atlas Collaboration, 2020), by the Stanford Linear Accelerator (Ehrenstein, 1997), and UC San Diego (Ham, 2020) to name a few.

PHOTONS MAKE GRAVITY

ANALYSIS AND PROOF

The writer begins by analyzing Einstein's constant of gravity as it is the most accurate and complete. Starting with the numerator.
Pi(π) is used to describe rotation in space with 2π being a full rotation over all four quadrants or dimensions. Einstein's Zurich notebook (which is now available online with special thanks to John D. Norton and University of Pittsburgh) shows Einstein labeled the four dimensions as x, y, z, and ICT. The manifold representing the whole, split into four parts or quanta (V_u, V_d, H_u, H_d)[1], over four dimensions (2π), gives us the first unit in Einstein's gravitational constant:

4*2π = 8π

"C" in the denominator describes the speed of light and by raising "C" to the 4th power or dimension we are stating the distance travelled by each of the energy quanta with respect to time. The denominator represents the Scalar quantity.
8π in the numerator in the formula for electrostatic forces is represented by KE, kinetic energy in space. C^4 can be represented by PE; Potential energy or energy over distance where distance equals

rate*time. Rewriting Einstein's gravity constant with the substitutive values we get:

$$k = \frac{KE}{PE} * \frac{G}{1}$$

Setting k equal to 1 and solving for G we arrive at:

$$\frac{PE}{KE} = G$$

PE and KE must maintain a ratio of 1:1 to satisfy the laws of conservation.

Using the same process as above to investigate Planck's gravity constant:

$$G = \frac{\mathrm{lp}^3}{m_p t_p^2}$$

Where Planck describes Gravity using l_p or plank's length to the 3rd power/dimension. L_p in the numerator is the potential energy (PE); energy over distance with respect to time. And held in ratio with Planck mass * Planck time squared in the denominator. The denominator is the kinetic energy (KE) and is in three dimensions; two dimensions of time for one of mass. The ratio is 1:1 resulting in G = 1. (Ball, Two Constants to Rule Us All, 2007)

Lastly when performing the same analysis on Newtons 2-D gravitational constant:

$$G = \frac{r^2}{m1 * m2}$$

Where r is equal to the distance between mass1 and mass2. The numerator again represents the potential energy and is held in ratio to the mass of object 1 * the mass of object 2. All three formulas result in $\frac{PE}{KE}$ therefore the following is true:

$$\frac{C^4}{8\pi} = \frac{l_p^3}{m_p t_p^2} = \frac{r^2}{m1m2}$$

$$\frac{PE}{KE} \equiv G_p \equiv G$$

The next step is to apply the previously discussed properties of photons to solve the three equations of gravity. Solving for the two dimensional Newtonian numerator PE, at the point of intersection between the pairs, the distance r = 0. Photons have a mass of zero, m1 = 0 and m2 = 0, therefore the denominator is 0^2. Photons as the fundamental particle of gravity satisfies the identity:

$$G = \frac{0^2}{0^2}$$

Graphing the above does not result in an "undetermined" as traditional thinking suggest. Rather graphing the above results in what Einstein predicted for special relativity. In the below fig 3 green represents the gravitational field on the z axis. and the shaded grey region represents the photon pairs or light. From the position of the observer, gravity can be seen traveling in opposing directions and at a 45 degree angle away from the observer's position as predicted in special relativity. (Dilts, 2017) The angle shows the event in flat spacetime. This would be the event from the perspective of the origin in which the photons rotate through.

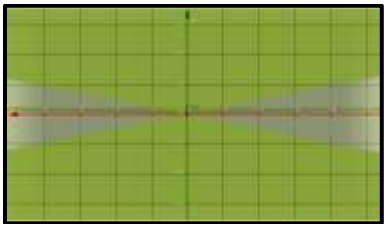


Fig 3

Perhaps more exciting is fig 4 which shows the event from the position of the observer in three dimensions. If the assertions in this paper are correct then this is what a gravity field would look like at the moment it is produced.

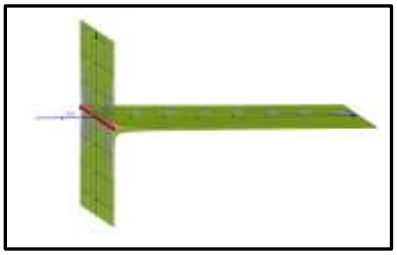


Fig 4

The above figure is the result of graphing the solution using x,y,z where x and y are equal to 0: $z = \frac{x^2}{y^2}$

THE "SPECIAL" CASE OF $\frac{0}{0}$ = 1

The general thinking of 0/0 being undetermined has been a subject of great debate in the community and in the process of getting this paper peer reviewed. As

such the Writer felt it necessary to address 0/0 or the point of independence in better detail. Einstein called the condition where all points begin at the origin independence, stating that it is the point in which the system acts independently of any other system. A paper titled, "Zero Divided by Zero Equals One," describes the Law of Independence in length. (Barukčić, 2018).

Historically the Babylonians and Sumerians in the estimated time period of 3000BCE had created a system of numbers and mathematics using base 60. Their mathematics were very sophisticated and included the earliest recorded examples of multiplication and division. Division was accomplished by multiplying using reciprocals. The Babylonian formula for division is:

$$\frac{a}{b} = a * \frac{1}{b}$$

Letting C = $\frac{a}{b}$

Where a = 0 and b = 0, the result will be:

$$C = 0 * \frac{1}{0}$$

Simplifying by cross-cancellation we get:

$$C = 1 * 1$$

$$C = 1$$

Substituting the values into C = $\frac{a}{b}$

$$1 = \frac{0}{0}$$

Outside of multiplying by reciprocals the writer was able to find two cases of 0/0 = 1 that relate to photons creating gravity. The first case explains the conditions in which the intersection of the two photons will result in a tangent plane through the origin.

Case 1:

It is an established that:

$$\mathbf{tan}(\boldsymbol{x}) = \frac{\mathbf{sin}(\boldsymbol{x})}{\mathbf{cos}(\boldsymbol{x})}$$

Further, that tan(x) = 1 when sin(x) and cos(x) have the same value.

If sin(x) = 0 and cos(x) = 0 then:

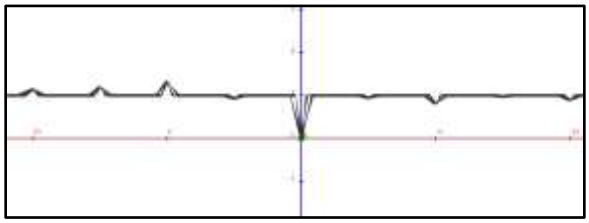
$$\mathbf{tan}(\boldsymbol{x}) = \frac{\mathbf{0}}{\mathbf{0}}$$

$$\mathbf{tan}(\boldsymbol{x}) = \mathbf{1}$$

Substituting the values:

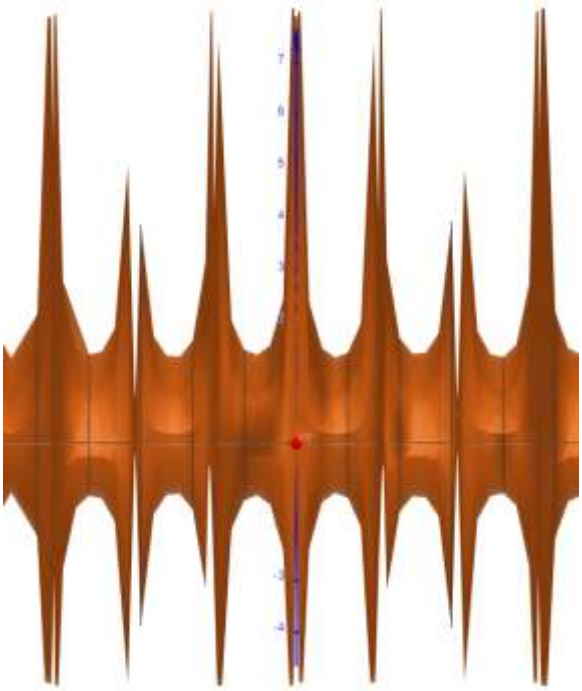
$$1 = \frac{0}{0}$$

Figure 3 below is the graph of the solution on a 2-D plane. The cosine wave has been shifted to align the zeros.

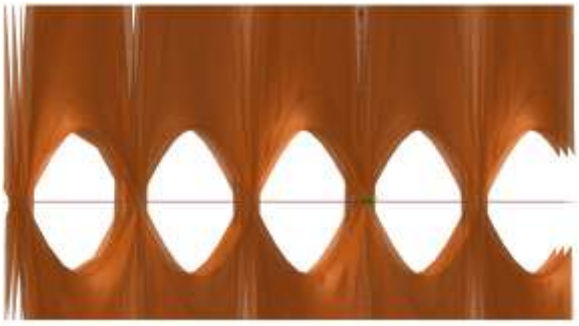


In the 2D graph it is noticed that at the 0 there is no value for z. This is the point in which the two photons are starting in motion. Once they reach 2π completing one full spin their accelerating forces are pushing against each other as described in the section Quanta, energy, and photons above. The photons are moving in parallel with each other and maintain a force equal to 1 as they rotate. When the photon pair finish each cycle at 2π there is a spike in forces either up or down depending on which direction the photons are rotating.

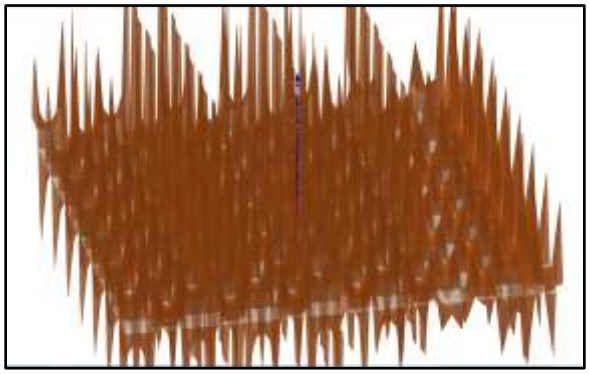
When graphed on a 3D graph:
From the position of the observer directly down the x-axis.



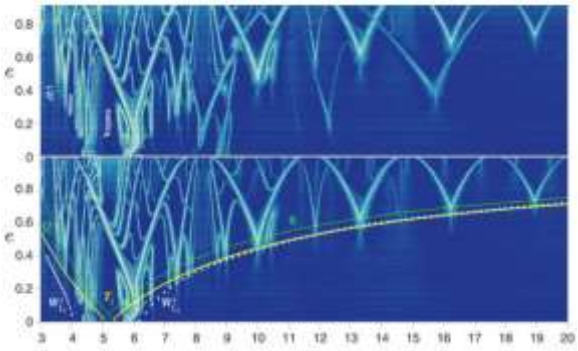
From the position of the observer directly down the y-axis.



From the position of the observer overlooking the field:



The findings in this paper were first published on zenodo.org October 8, 2020, making the prediction of what gravity fields would look like and how they would be created. On December 9. 2020 phys.org published the below figure of gravity fields found in the solar system. Phys.org called them “arches of chaos,” however other outlets are calling them gravity superhighways.



(Jeewandara, 2020)

Gravitational waves, caused by the rotating energies of perfectly balanced systems, and spread out over a sphere.

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