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The BICEP2 Experiment And The Inflationary Model:Dimensionless Quantization of Gravity. Predictive Theory of Quantum Strings.Quantum Wormholes and Nonlocality of QM.The Absence Of Dark Matter

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I thank God for showing me a tiny part of the infinite beauty of his creation. Creator of all things. And his son Jesus Christ, our Savior.

Abstract

In this paper shown; on the one hand, as the tensor-scalar polarization modes B ratio, it is derived from the initial properties of the vacuum due to the unification of gravitation and electromagnetism. This ratio suggest that it is 2/Pi ^ 2 (0.20262423673), as an upper bound.

Secondly; demonstrates that it is not necessary to introduce any inflaton scalar field or similar (ad-hoc fields); If on the other hand, is the same structure of the vacuum and the quantization of gravity which perfectly explains this initial exponential expansion of the universe. In some respects exponential vacuum emptying has certain similarities with the emission of radiation of a black hole.

This quantization of gravity and its unification with electromagnetic field, shown in previous work; It allows deriving complete accurately the exponential factor of inflation; and therefore calculate accurately the Hubble constant, mass of the universe, matter density, the value of the vacuum energy density, the GUT mass scale (bosons X,Y), the gravitino mass and more.

The method of quantize gravity used in this work; It is based on dimensionless constants that must be enforced in accordance with general relativity.

We demonstrate the existence of quantum wormholes as the basic units of space-time energy, as an inseparable system.These quantum

wormholes explain the instantaneous speed of propagation of entangled particles. Or what is the same: an infinite speed, with the condition of zero net energy.

Another consequence of the dimensionless quantization of gravity; is the existence of a constant gravitational acceleration that permeates all space. Its nature is quantum mechanical, and inseparable from the Hubble constant. This work is not mere speculation; since applying this vacuum gravitational acceleration; first allows us to explain and accurately calculate the anomaly of the orbital eccentricity of the Moon. This anomaly was detected and accurately measured with the laser ranging experiment. This same constant acceleration in vacuum (in all coordinate of space), which interacts with the masses; explains the almost constant rotation curves of galaxies and clusters of galaxies. Therefore there is no dark matter.

Current interpretation of quantum mechanics is completely erroneous. We explain that; as the de Broglie–Bohm theory, also known as the pilot-wave theory; is a much more realistic and correct interpretation of quantum mechanics. The current assumption that there is reality no defined; until the act of observation does not occur; is an aberrant, illogical assertion false and derived from the obsolete current interpretation of quantum mechanics.

The age of the universe derived from the Hubble constant is a wrong estimate; due to absolute ignorance of the true nature of this constant and its physical implications. The universe acquired its current size in the very short period of time, a unit of Planck time.We understand that this work is dense and completely revolutionary consequences. Experiments reflection of lasers; type of the laser ranging experiment; undoubtedly will confirm one of the main results: the existence of an intrinsic acceleration of vacuum of gravitational quantum mechanical nature, which explains the rotation curves of galaxies and clusters of galaxies; and which thus makes unnecessary the existence of dark matter.

"By faith understand have been constituted the universe by word of God, so that what you see, was made of what is not saw".

Hebrews 11:3

1 Introduction

All attempts to reconcile General Einstein's relativity with quantum mechanics have taken, so far, to a dead-end. Except particular partial results as, for example, the Hawking radiation of a black hole.

Without a deeper understanding of gravity, (ie: quantization of gravity), would not be logical to try to understand the conditions and initial properties of space-time - energy that gave rise to the expansion of the universe.

Therefore; make up somewhat artificially, scalar fields like the inflaton and similar; without taking into account gravity, indicates only the impotence of ignorance about the quantum properties of gravity (space-time-energy system), in our modest understanding.

To have an understanding of this work, it will be necessary to begin a fundamental result that was obtained in a previous paper ("The zeros of Riemann's Function And Its Fundamental Role In Quantum Mechanics"). Because of its importance, it should be included.

The method that is used to quantize gravity, consists mainly; in the not dimensionality (pure numbers) of the curvature of spacetime, according to Einstein's General Relativity. This curvature is given by the well-known expression for deflection of photons by gravitational fields.

Because of the fundamental importance that has to this work; the main result obtained in one of our previous articles; we need to include it in its entirety. Otherwise, you could not understand is properly which will be held in this paper.

This result is an equation absolutely exact that equals gravity with electromagnetism, through the elementary electrical charge.

("The zeros of Riemann's Function And Its Fundamental Role In Quantum Mechanics")

1.1 *The zeros of the Riemann zeta function: derivation of elementary electric charge, and mass of the electron.*

1.1.1 *The relativistic invariance of the elementary electric charge.*

As demonstrated, in this last section, the relativistic invariance of the elementary electric charge, is based on that solely depends on the canonical partition function of the imaginary parts of the non trivials zeros of the Riemann zeta function. And since the imaginary parts of the zeros of the zeta function, are pure and constant numbers; immediately relativistic invariance of electric charge is derived. Being the Planck mass other relativistic invariant, since there can be no higher mass to the Planck mass, this invariance is guaranteed.

1.1.2 *Partition function (statistical mechanics).*

Be considered, the coupling of the electromagnetic field to gravity, as represented by a bath of virtual particles, whose thermodynamic state is in equilibrium and there is no exchange of matter. Being a thermal bath whose temperature is constant, invariant, then its energy is infinite (in principle, ideally). Thermodynamic temperature canonical ensemble system can vary, but the number of particles is constant, invariant. That this theoretical approach, is exactly according to the values of the elementary electric charge, and mass of the electron, suggests that space-time-energy to last the unification scale, would behave like black holes, or even, as we shall see later, with wormholes with throat open. These wormholes, following a hyperbolic de Sitter space can explain the quantum entanglement, and the call action at a distance, or non-locality of quantum mechanics.

This partition function of the canonical ensemble, as is well known, is:

$Z = \sum_s \exp -\beta E_s$; *where the "inverse temperature",* β , *is conventionally defined as* $\beta \equiv \frac{1}{k_B T}$; *with* k_B *denoting Boltzmann's constant.Where* E_s *,is the the energy.*

Will use for the dimensionless factor; βE_s , *the change by the imaginary parts of the nontrivial zeros of the Riemann function* $\zeta(s)$

This change is justified, for the simple reason that the vacuum is neutral with respect to the electric charges, ie the value of the electric charge of the vacuum is zero. These zeros can be expressed by the Riemann function, applying the Kaluza-Klein formulation for electric charges; dependent Planck mass, and as we will show by the partition function of canonical ensemble. Thus the zeros of the vacuum to the electric charge is expressed as:

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1} m_{Pk}}{n^s \cdot \sqrt{\pm e^2/16\pi \cdot G_N}} = 0 \; ; \; s = \tfrac{1}{2} + it_k \; ; \; \zeta(s) = 0 \quad (26)$$

Equation (26), and therefore the behavior of the electric field strength with distance, depends on the value of s, because of (26) is obtained, using the conjugate of s: $\frac{(-1)^{n-1} m_{Pk}}{n^s \cdot n^{\overline{s}-\frac{1}{2}} \cdot (\pm e^2/16\pi \cdot G_N)} = \frac{m_{Pk}}{\pm\sqrt{(\pm e)^2/16\pi \cdot G_N}}$

Therefore, by using the canonical partition ensemble, making the substitution of the imaginary parts of the nontrivial zeros of the Riemann function, and taking into account the deviation of the electric charge, the equation is obtained relating the gravity with electric charge and the nontrivial zeros of the Riemann function. The calculation of the partition function has been performed with wolfram math program, version 9. For this calculation we *used the first 2000 nontrivial zeros, value more than enough for the accuracy required. Although using the first six zeros, would also be sufficient. The code of this calculation is as follows:*

$$\frac{1}{\sum_{n=1}^{2000} e^{-N[\Im(\rho_n),15]}} = \frac{1}{\sum_{n=1}^{2000} \exp -(N\,[Im\,[ZetaZero[n]]\,,15])} = 1374617.45454188\ ; \textit{Given}$$

that for values greater than 2000; $\exp -Im(\rho_n) \approx 0$; *You can write the equality as (by changing rho to s) as:* $\left(\sum_{s_n}^{\infty} \exp -Im(s_n)\right)^{-1} \approx 1374617.45454188\ (27)$

Finally, the equation that unifies the gravitational and electromagnetic field, by elementary electric charge, is: $m_{Pk} = \left(\sum_{s_n}^{\infty} \exp -Im(s_n)\right)^{-1} \cdot \sqrt{(\pm e \cdot \sigma(q))^2/G_N} = 2.176529059 \cdot 10^{-8}\, Kg\ (28)$; *The value obtained for the Planck mass is in excellent agreement. The very slight difference, surely is that the constant of gravitation has a very high uncertainty about the other universal constants. Thus, making a speculative exercise, we can give a value for the gravitational constant:*

$G_N = \left[\left(\sum_{s_n}^{\infty} \exp -Im(s_n)\right)^{-2} \cdot (\pm e \cdot \sigma(q))^2\right] \Big/ m_{Pk}^2 = 6.674841516 \cdot 10^{-11}\, N \cdot m^2/Kg^2\ (29)$

1.1.3 *Derivation of the partition function of canonical ensemble by the special and unique properties of the Riemann zeta function, for complex values s, with real part 1/2.*

The function x^r *, to a value of 1/2 , in the set of real numbers , is the only one that has the property, for which its derivative is 1/2 the inverse of this function, that is:* $d(x^{1/2}) = \frac{1}{2 \cdot x^{1/2}}$ *This function has the same property, for complex values of the exponent, such that:* $r = s = \frac{1}{2} + it$; $dx^{\overline{s}}/\overline{s} = 1/x^s$; $dx^s/s = 1/x^{\overline{s}}$ (31)

1.1.3.1 ***Commutation properties*** *From equation (31), the following four identities are derived:**1)*** $x^s dx^{\overline{s}} = \overline{s}$; 2) $x^{\overline{s}} dx^s = s$; 3) $\frac{dx^{\overline{s}}}{\overline{s}} - \frac{1}{x^s} = 0$; 4) $\frac{dx^s}{s} - \frac{1}{x^{\overline{s}}} = 0$

Of the identities (1) and (2) are derived, by commutation of the conjugates of the exponents, $s\,,\overline{s}$; *the following identities:*

1) $x^s dx^{\overline{s}} + x^{\overline{s}} dx^s = 1$ *2)* $x^s dx^{\overline{s}} - x^{\overline{s}} dx^s = -2it$ *3)* $x^{\overline{s}} dx^s - x^s dx^{\overline{s}} = 2it$ (32)

From the identities (31) and (32) immediately derives the following corollary:

Corollary 1. *Only for complex values, s, with real part 1/2, the three conmutation properties, expressed in differential equations are satisfied.*

Conditions that must meet the equation derived from the conmutators (32), and the identities (31)

1. *Must include the invariance of the sum of the quantized electric charges. This sum is equivalent to the difference between the standard deviation of the electric charges with zero arithmetic mean, and the standard deviation, which has been developed previously, that is:* $\sigma^2(q\ ,\ \mu(q) = 0) = \sum_q q^2 = \dfrac{31}{9}$ (33) ; $\sigma^2(q\ ,\ \mu(q) = 0) - \sigma_0^2(q) = 1 = \sum_q q$ (34)
2. *The neutrality of the vacuum, in relation to the electric charges, or zero value of the electric charges of the vacuum, is the sum of infinite "oscillators", whose function is the Riemann zeta function applied to the ratio of Planck mass and the mass derived , from elementary electric charge and gravitational constant; fulfilling the equation obtained by Kaluza-Klein, to unify electromagnetism and gravity, adding a fifth dimension compactified on a circle.* $\sum_{n=1}^{\infty} \frac{(-1)^{n-1} m_{pk}\sqrt{G_N}}{\pm e\cdot n^s} = \left(\frac{m_{pk}\sqrt{G_N}}{\pm e}\right)\cdot (\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^s}) = 0$ (35)
3. *The complex value s, can only be with real part 1/2, since only for s = 1/2 + it, it is possible to derive from the conmutators, both the invariance of the sum of the electric charges and the function of canonical ensemble , as will be demonstrated below.*
4. *The value of the energy is the lowest possible, with integer values.*

With these four conditions, we have: 1) $E^s dx^{\overline{s}} + E^{\overline{s}} dx^s = 1 = \sigma^2(q\ ,\ \mu(q) = 0) - \sigma_0^2(q) = \sum_q q\ ;\ E = energy$

2) $E^s dE^{\overline{s}} = \overline{s}\ ;\ E^{\overline{s}} dE^s = s\ ;$ *3)* $[(E^s dE^{\overline{s}})E - E/2]/Ei = -t_n$

4) $\sum_{n=1}^{\infty} \frac{(-1)^{n-1} m_{pk} \sqrt{G_N}}{\pm e \cdot n^s} = 0 = \sum_{E=1}^{\infty} \frac{dE^{\overline{s}}}{\overline{s}} - \frac{1}{E^s} = \sum_{E=1}^{\infty} \frac{dE^s}{s} - \frac{1}{E^{\overline{s}}}$

1.1.3.1.1 ***Derivation of partition function of canonical ensemble: ratio, elementary electric charge and kalulaza-Klein equation.***

The introduction of a fifth coordinate; allowed obtaining Theodor Kaluza, the quantization of electric charge; unifying Maxwell's equations (electromagnetism) and the RG Albert Einstein's equations.The derivation of a much higher mass, that the mass of electron, and other problems of the theory, led to dismiss it as a realistic theory, according to experimental physical data.

As we will demonstrate shortly, this theory lacked renormalization by canonical partition function of statistical mechanics (thermodynamics), derived from the imaginary parts of the zeros of the Riemann function $\zeta(s) = 0$; $s = \frac{1}{2} + it_n$

In the framework of the theory we are developing in this work, this fifth dimension corresponds to the three isomorphisms: five electric charges, five spines, five solutions of the energy equation momentum.

As a beginning assumption, assume that a thermodynamically large system is in thermal contact with the environment, with a temperature T, and both the volume of the system and the number of constituent particles are fixed. This kind of system is called a canonical ensemble. Let us label with s = 1, 2, 3, ... the exact states (microstates) that the system can occupy, and denote the total energy of the system when it is in microstate s as E_s *. Generally, these microstates can be regarded as analogous to discrete quantum states of the system.*

$$Z = \sum_s \exp\left(-\frac{E_s}{k_B T}\right)$$

The equation for the elementary electric charge, according to the initial theory of Kaluza (see bibliography) is: $q_n = m_n \cdot \sqrt{16\pi G_N}$

From equations (31), (32) and (34) with the conditions imposed, the following development is obtained, leading to accurate calculation of the elementary electric charge, as a partition function of the imaginary parts of the nontrivial zeros Riemann's function $\zeta(s)$ *. Partition function exactly equivalent to the canonical partition function of statistical mechanics (thermodynamics).*

a) $E_0/c^2 = m_0$ *b)* $dm^s/s \cdot m^s = (1/m^s) \cdot (1/m^{\overline{s}}) = 1/m_0$, $dm^{\overline{s}}/\overline{s} \cdot m^{\overline{s}} = (1/m^s) \cdot (1/m^{\overline{s}}) = 1/m_0$

c) $m_0(dm^s/m^s) = s$; $m_0(dm^{\overline{s}}/m^{\overline{s}}) = \overline{s}$; $m_0 \equiv \sigma^2(q, \mu(q) = 0) - \sigma_0^2(q) = \sum_q q = 1$; *d)* $(dm^s/im^s) - 1/2i = t_n$

f) We make the change (dm^s/im^s) , *by* (dm_1/m_1) ; *g)* $-(dm_1/m_1) + 1/2i = -t_n$; $(dm^{\overline{s}}/im^{\overline{s}}) - 1/2i = (dm_2/m_2) - 1/2i = -t_n$

h) $-(dm_1/m_1) + 1/2i \quad + (dm_2/m_2) - 1/2i = -t_n - t_n$; $-(dm_1/m_1) + (dm_2/m_2) = -t_n - t_n$

$-(dm_1/m_1) + (dm_2/m_2) = -t_n - t_n \rightarrow (dm_2/m_2) = (d - m_3/m_3) = -(dm_3/m_3) = -(dm_1/m_1)$

Having two elementary electric charges with signs -, +, because: $\pm q_n = m_n \cdot \pm\sqrt{16\pi G_N}$; *Then, the following two differential equations for the real value of the imaginary part of the nontrivials zeros Riemann's function is obtained:*

i1) $-(dm_1/m_1) = -t_n$; *i2)* $-(dm_3/m_3) = -t_n$; *j)* $\int_{m_5}^{m_4} -(dm_1/m_1) = -t_n$; $m_4 < m_5$; $\ln(m_4/m_5) = -t_n$

$\int_{m_5}^{m_4} -(dm_3/m_3) = -t_n$; $m_4 < m_5$; $\ln(m_4/m_5) = -t_n$; $(m_4/m_5) = \exp(-t_n)$

Finally, making the infinite sum nontrivial zeros Riemann's function (with the above approach; 7.2.2, with the first 2000 zeros), the two solutions (negative electric charge and positive), these are obtained, taking into account the standard deviation of the electric charge $\sigma(q) = 0.8073734276$ *:*

$\sigma(q) = 2 \cdot \sqrt{(\sigma_0^2(q)\,)/3 \cdot 5}$ *(five electric charges, three colors, and two sings +, -)*

$$(35) \sum_n^{\infty} \frac{m_{n-}}{m_0} = \sum_n^{\infty} \exp(-t_n) = \sqrt{(-e \cdot \sigma(q))^2 \cdot G_N}/m_{Pk} \; ; \; m_{Pk}/\sqrt{(-e \cdot \sigma(q))^2 \cdot G_N} = \left[\sum_n^{\infty} \exp(-t_n)\right]^{-1}$$

$$(36) \sum_n^{\infty} \frac{m_{n+}}{m_0} = \sum_n^{\infty} \exp(-t_n) = \sqrt{(e \cdot \sigma(q))^2 \cdot G_N}/m_{Pk} \; ; \; m_{Pk}/\sqrt{(e \cdot \sigma(q))^2 \cdot G_N} = \left[\sum_n^{\infty} \exp(-t_n)\right]^{-1}$$

Performing the calculation with a value of the gravitational constant, the conjectured by equation (29), it has the value of the electric charge, with excellent accuracy:

$$\left[\sum_{n}^{\infty} \exp -(t_n)\right]^{-1} \approx 1374617.45454188 = m_{Pk}/\sqrt{(e\cdot\sigma(q))^2\cdot G_N} \rightarrow ...$$

$$... \rightarrow \pm e = \sqrt{m_{Pk}^2\cdot G_N}/\Big(1374617.45454188\cdot\sigma(q)\Big)^2$$

$$\pm e = \sqrt{m_{Pk}^2\cdot G_N}/\Big(1374617.45454188\cdot\sigma(q)\Big)^2 = 1.602176565\cdot 10^{-19} C \;\textbf{\textit{(37)}}$$

1.1.4 *The mass of the electron.*

Being the electron, the mass of the vacuum lower, with electric charge and completely stable (infinite lifetime), and on the other hand, the Planck mass is the maximum possible, if indeed, the non-trivial zeros of the Riemann function represent stabilizing a deformed torus; become a wormhole, with gravitational and electromagnetic, fully matched forces, then you can set requirements to be the equation, which equals each of the zeros Riemann's function.

Conditions *These conditions would be: a) the sum of the electromagnetic and gravitational part must be zero. b) In the equation the term breaking torus must appear. c) The curvature of space-time, according to general relativity, it must be possible derive directly.*

d) The equation must contain the partition function zeros Riemann's.

The equation $2\pi^2\cdot(\pm e)\cdot[\sum_{n}^{\infty}\exp(-t_n)] - 2\cdot\sqrt{m_{Pk}\cdot m_e\cdot G_N} = 0\;;\; 2\pi^2 = \textit{volume torus}$ (39)

$$\sqrt{m_{Pk}\cdot m_e} = m_o\;;\; \int_0^{2\pi} m\cdot dm = 2\pi^2\;;\; e\cdot\exp(2\pi i n) = 1\cdot e$$

$$e\cdot\exp(2\pi i n/2) = -1\cdot e\;;\; n\in\{N\}$$

$$m_e = \pi^4(\pm e)^2[\sum_{n}^{\infty}\exp(-t_n)]^2\Big/ m_{Pk}\cdot G_N = 9.10938291\cdot 10^{-31} Kg\;;\; G_N = 6.674841516\cdot 10^{-11}\, N\cdot m^2/Kg^2\;;\; m_{Pk} = \sqrt{\tfrac{\hbar c}{6.674841516\cdot 10^{-11}}}$$

In the above equation the volume of a torus appears in three dimensions. Can also derive the angle of curvature of general relativity, because:

$$4\pi^4(\pm e)^2 \cdot [\sum_n^\infty \exp(-t_n)]^2 \Big/ m_e \cdot c^2 \cdot l_{Pk} = \frac{4 \cdot m_{Pk} \cdot G_N}{c^2 \cdot l_{Pk}} = \theta = 4 \ (40)$$

The gravitino mass. *Equation (39) requires that the gravitational force, at scales of the Planck length, is repulsive. The only possible candidate is the gravitino, which occurs naturally in both theories of supersymmetry, supergravity and string theory. Therefore, from equation (39) can be derived for the gravitino mass, taking into account the spin 3/2, the mass:*

$$m_{3/2} = \sqrt{m_{Pk} \cdot m_e \cdot (s+1)s_{=3/2}} \ (41)$$

Equation (41) is more than pure speculation;since the gravitino field is conventionally written as four-vector index. With the mass of the gravitino, according to equation (41) a mass ratio of four grade (four-vector index) is obtained. In the numerator, the four potency of gravitino mass. And in the denominator the product of the Planck mass, electron mass and equivalent mass Higgs vacuum. The result is the mass of unification, in GUT theory.

$$(m_{3/2})^4 \cdot 4^3/(m_{Pk} \cdot m_e \cdot m_{Vh}) = m_{GUT} = 4.065067121 \cdot 10^{-11} K_g$$

$$\ln(\frac{m_{GUT}}{m_Z}) \approx \frac{10\pi}{28} \cdot [\alpha^{-1}(U(1)) - \alpha^{-1}(SU(2))] \ ; \ \alpha^{-1}(U(1)) \approx 59.2 \ ; \ \alpha^{-1}(SU(2)) \approx 29.6$$

Observe, that in equation (40), the volume factor appears eight dimensions. Also, in this equation the entropy of a black hole is obtained by multiplying by π *.This last operation; implies a volume factor in ten dimensions.*

$$\Big(4\pi^4(\pm e)^2 \cdot [\sum_n^\infty \exp(-t_n)]^2 \Big/ m_e \cdot c^2 \cdot l_{Pk}\Big) \cdot \pi = 4\pi \ ; \ 4\pi^4/4 \cdot dim[SU(5)] = V_{8d} = \frac{\pi^4}{24} \ ; \ dim(l8) = 240 \ ; \ \frac{4\pi^4 \cdot \pi}{2 \cdot 240} = V_{10d} = \frac{\pi^5}{120}$$

2 Tensor - scalar ratio B modes: $2/\pi^2$

Once you have the equation that equals gravity and electromagnetism; We are able to calculate the ratio tensor - scalar B modes, due to primordial gravitational waves.

From Equation (39), derives this one: $2\pi^2 \cdot (\pm e) \cdot [\sum_n^\infty \exp(-t_n)] - 2 \cdot \sqrt{m_{Pk} \cdot m_e \cdot G_N} = 0$

1. $$(\sqrt{m_{Pk} \cdot m_e} \cdot \sqrt{G_N}) \Big/ \left\{ \lfloor -e \rfloor \cdot [\sum_n^\infty \exp(-t_n)] + \lfloor +e \rfloor \cdot [\sum_n^\infty \exp(-t_n)] \right\} = (\sqrt{m_{Pk} \cdot m_e} \cdot \sqrt{G_N}) \Big/ \left\{ 2e \cdot [\sum_n^\infty \exp(-t_n)] \right\} = \pi^2/2 \ (42)$$

The previous equation is an equality, in which the numerator is a mass multiplied by the square root of the gravitational constant; ie: have a scalar quantity (mass). The denominator is the elementary electrical charge multiplied by the function partition of the nontrivial zeros of the Riemann zeta function.

We demonstrate this denominator is a tensor quantity.On the right side of the equation, its equivalence in dimensionless constants. The numerator square the number Pi, and in the denominator number two. Later you will get this dimensionless ratio of equivalent ways.

So that the denominator of the equation (42), will be a tensor; and since that the electrical chargue is a constant relativistic invariant, necessarily function sum partition of the nontrivial zeros of the Riemann zeta function, as to derive from a dimensionless tensor function.

2.1 Dimensionless Tensors (Gravitation).

We will understand as tensor dimensionless; one who has the degrees of freedom or components of a tensor. This amount of components is dimensionless.

A general result for the number of components of a tensor dimensional d is: $n(T_d) = d^2 \cdot (d^2 - 1)/12$. Where $n(T_d)$ represents the number of components of the tensor in d dimensions. For the gravitational field; the number of components of the tensor is: $d = 4$; $n(T_G) = 4^2(4^2 - 1)/12 = (4^4 - 4^2)/12$

Previous tensor is essential; Since it generates through the spin 2; the number of dimensions of the Group E8 lattice. $dim(l8) = 240 = 2 \cdot (s + 1)_{s=2} \cdot n(T_G)$

As we have shown repeatedly in other articles, this amount is the geometric vacuum by the E8 group, through the lattice of dimension eight with 240 components. One of the main results is to obtain the density of Baryons.

Considered pairs electron–positron disintegrate into photons. And considering the electron as the fundamental state of the vacuum with mass and electrical charge, has the density of Baryons is: $(2 \cdot \ln(m_{pk}/m_e) + \alpha^{-1} - 240)/2 = \Omega_b$

$m_{pk} = \textit{Planck mass}$; $m_e = \textit{electron mass}$; $\alpha^{-1} = 137.035999173 =$ Inverse fine structure constant to zero momentum.

$\Omega_b = (103.0556831 + 137.035999173 - 240)/2 = 0.04584115$

Observe that the number of components of the tensor of the gravitational field meets the following equality (the first six Fibonacci numbers dividers of the dimension of the lattice R8): $n(T_G) = 4^2(4^2-1)/12 = \sum_{F_n/240} F_n = 1+1+2+3+5+8 = 20$; $1 \cdot 1 \cdot 2 \cdot 3 \cdot 5 \cdot 8 = dim(R8) = 240$

2.1.1 Equivalences of the dimension of the lattice R8, generated by dimensionless tensors.

In this section are shown different ways of expressing the dimension of lattice R8 (Group E8), as a function of different tensors equivalents. Also will give an interpretation of the possible physical meaning of these equivalences.

2.1.2 Dimensionless tensors equivalences.

1. $dim(R8) = 240 = 2 \cdot (s+1)_{s=2} \cdot n(T_G) \equiv (s+1)_{s=1} \cdot (s+1)_{s=2} \cdot n(T_G)$
2. $dim(R8) = 240 = n(T_{d=4}) \cdot n(T_{d=3}) = [4^2(4^2-1)/12] \cdot [3^2(3^2-1)/12] \cdot 2$; Where the factor multiplicative two, is due to rupture of the vacuum in virtual particle antiparticle pairs.
3. $dim(R8) = 240 = [n(T_{d=7})/\cos\theta_{s=2}] - \frac{1}{240} + \frac{(s+1)s_{=1/2}}{240^2} - \Omega_b = [(7^2-1) \cdot 7^2/12]/(2/\sqrt{6}) - \frac{1}{240} + \frac{(1/2+1)1/2}{240^2} - (103.0556831 + 137.035999173 - 240)/2$
4. $dim(R8) = 240 = 2 \cdot (s+1)_{s=2} \cdot n(T_G) \equiv (s+1)_{s=1} \cdot (s+1)_{s=2} \cdot n(T_G) \equiv 2 \cdot dim(SU(11))$
5. Hypothetical X, Y bosons, and theories of Grand unification (GUTs); and their modes of decay. Electrical charges such as number of states.

X, Y bosons decay modes: $X \Rightarrow u + u$; $X \to e^+ + \overline{d}$ $\;Y \to e^+ + \overline{u}$; $Y \to d + u$; $Y \to \overline{d} + \overline{v_e}$

The sums of electrical charges of these modes of decay, with three additional states due to colour (QCD). $3(\frac{4}{3}+\frac{4}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3})+1\,(positron)=12$

Number of states (electrical charges) of the modes of the X, Y boson decays: $N(e,c,X,Y)=12$; $dim(R8)=240=2\cdot(s+1)s_{=2}\cdot n(T_G)\equiv(s+1)s_{=1}\cdot(s+1)s_{=2}\cdot n(T_G)\equiv n(T_G)\cdot N(e,c,X,Y)$

2.1.3 Five solutions of the equation energy momentum. Equivalence of gravitational tensor components.

Our previous work ("The zeros of Riemann's Function And Its Fundamental Role In Quantum Mechanics"), has shown that the existence of five solutions of this equation, is a demand physical and mathematical; allowing, for example, demonstrate that they can only exist five spins (spin 2 maximum of the graviton). These five natural solutions are given by:

$$E^2=m^2c^4+p^2c^2=\begin{array}{|c|}\hline (imc^2+pc)(-imc^2+pc)=E_1^2\\ \hline (imc^2-pc)(-imc^2-pc)=E_2^2\\ \hline (mc^2+ipc)(mc^2-ipc)=E_3^2\\ \hline (-mc^2+ipc)(-mc^2-ipc)=E_4^2\\ \hline i(imc^2+pc)(mc^2+ipc)=-E_5^2\\ \hline\end{array}$$

Equivalence with the number of components of the tensor of the gravitational field is exact. On the one hand each solution is the product of four components, in terms of energy. Therefore, must be: five solutions x 4 components of energy, gives exactly 20 components; IE: $n_s(solutions)\cdot n_E(energy)=5\cdot 4=(4^2-1)4^2/12$

On the other hand, the fundamental interactions of these four positive energy solutions is given by the matrix 4 x 4 = 16 components.

The dimension of the lattice R8 is given by the following two quadratics equations:

1. $x_1^2-x_1-240=0$; $x_1=16$
2. $x_2^2+x_2-240=0$; $x_2=15=\sum_s 2s+1=dim(SU(4))$
3. $x_1\cdot x_2=240=n(T_{d=4})\cdot n(T_{d=3})$
4. $n(T_{d=4})+n(T_{d=3})=26d$; $26d-\sum_s 2s+1=11d$
5. $26d=(4d)^2+(3d)^2+(1d)^2=(5d+i)(5d-i)$ $\quad 26d=4d!+2d!$ $\quad SU(4)/SU(3)=SU(2)U(1)$

2.1.4 The matrix tensor 240 x 240 (Group E8-Lattice R8)

We rewrite the equation (42) as: $\pi^2 \cdot (\pm e)/\left(\sqrt{m_{Pk} \cdot m_e} \cdot \sqrt{G_N}\right) = [\sum_n^{\infty} \exp(-t_n)]^{-1}$ (43)

As you can see, the previous equation has in the numerator elementary electrical charge; and the denominator the resulting mass of the square root of the product of the mass of Planck and electron, with a multiplicative factor which is the square root of the gravitational constant. The ratio of this equation is a dimensionless quantity of two masses. Since the vacuum is compound for lattice R8, with dimension 240, and taking into account that you have to count on the magnetics moments; as well as the spins modules; if gravity is quantized, making it equal to the potential of vacuum; it would have to the tensor matrix R8 (240 x 240) and coupling the magnetic moments and the spins modules; summation would be representation of the partition function of the non-trivial zeros of the Riemann zeta function.That is:

1. $\mu_B = e \cdot \hbar / 2m_e \cdot c$; $\mu \cdot \hbar / - g_s \cdot \mu_B = s$
2. $m_1 \cdot m_2 \cdot G_N \cdot (s+1)s/r = (s+1)s \cdot \hbar^2 / m \cdot r^2$; $\sqrt{m_1 \cdot m_2} \cdot \sqrt{G_n} \sqrt{(s+1)s} = \sqrt{(s+1)s} \cdot \hbar / \sqrt{m} \cdot r$

Therefore, the equations derived from 1 and 2; taking into account tensor matrix interaction of all particles of the vacuum (240 x 240), you have finally:

$$\pi^2 \cdot [(\pm e)/\left(\sqrt{m_{Pk} \cdot m_e} \cdot \sqrt{G_N}\right)] = [\sum_n^{\infty} \exp(-t_n)]^{-1} = (240^2 \cdot \pi^2 \cdot \sum \cos\theta_s)/\delta(e, \mu, \tau)$$

$\delta(e, \mu, \tau) =$ Coupling factor due to the interaction matrix of electrically charged leptons (muon, tau and electron). $\cos\theta_s = s/\sqrt{s(s+1)}$

	$\overline{\tau}$	$\overline{\mu}$	$\overline{e}$	$\overline{\gamma}$
τ	γ	$\nu + \nu$	$e + \tau$	$\overline{\tau}$
μ	$\nu + \nu$	γ	$\tau + \overline{\tau} + 4\nu$	$\overline{\mu}$
e	$e + \tau$	$\tau + \overline{\tau} + 4\nu$	γ	$\overline{e}$
γ	τ	μ	e	γ

2.1.4.1 The Couplin Factor $\delta(e, \mu, \tau)$ and the Gravity.

1. $\frac{m_\tau}{m_\mu} = 4^2 + \cos\theta_{s=2} + 1/[(4^2 + \cos\theta_{s=2}) \cdot (1 + \cos(2\pi/10))]$

2. $\ln(m_\tau/m_\mu)/\sqrt{2\cdot(2+\cos\theta_{s=2})} \approx \sqrt[4]{2} = \delta(e,\mu,\tau)$

3. $2\cdot[(m_\tau/m_\mu)-14]/(11\cdot\alpha_{EM}(M_Z)) = \ln(M_X^2/M_Z^2)$; $M_X =$ boson mass GUT unification scale.

Finally has: $\pi^2\cdot[(\pm e)/\left(\sqrt{m_{Pk}\cdot m_e}\cdot\sqrt{G_N}\right)] = [\sum_n^\infty \exp(-t_n)]^{-1} = [(240^2\cdot\pi^2\cdot\sum\cos\theta_s)/\sqrt[4]{2}] - (m_\tau/m_\mu)\cdot(5\cdot\ln\pi-5)$ (44)

Isolating factor π^2, you get: $(\sqrt{m_{Pk}\cdot m_e}\cdot\sqrt{G_N}) \Big/ \left\{2e\cdot[\sum_n^\infty \exp(-t_n)]\right\} = \pi^2/2$ Therefore, the tensor - scalar ratio is:

$$r(T/S)_B = \left\{2e\cdot[\sum_n^\infty \exp(-t_n)]\right\} \Big/ (\sqrt{m_{Pk}\cdot m_e}\cdot\sqrt{G_N}) = \cdots$$

$$\cdots 2e\cdot\left\{[(240^2\cdot\pi^2\cdot\sum\cos\theta_s)/\sqrt[4]{2}] - (m_\tau/m_\mu)\cdot(5\cdot\ln\pi-5)\right\}^{-1} \Big/ (\sqrt{m_{Pk}\cdot m_e}\cdot\sqrt{G_N}) = \frac{2}{\pi^2} \quad (45)$$

2.1.5 Simplified Calculation Tensor-Scalar Ratio B Modes: Ricci Scalar Curvature Sphere in Four Dimensions.

Once that has been shown; as the tensor-scalar ratio is derived from the scale unification of gravity, and electromagnetism, by computing the elementary electric charge; is very simple to prove that this ratio obeys a tensor scalar ratio equation; given by the ratio of tensor factor (24) of the group SU(5); which represents all possible decay modes of the 12 bosons (X, Y) into a quark u and a lepton (1e unit of electric charge); multiplying the dimensionless tensor (24) by the equation $(\pm e)^2\cdot[\sum_n^\infty \exp(-t_n)]^2/(m_{Pk}\cdot m_e\cdot G_N)$, and dividing by the Ricci scalar, for a four-dimensional sphere; given by: $4(4-1)/\pi^2$. So you finally get back the tensor-scalar ratio: $[24\cdot(\pm e)^2\cdot[\sum_n^\infty \exp(-t_n)]^2/(m_{Pk}\cdot m_e\cdot G_N)]/[4(4-1)/\pi^2)] = [24/\pi^4]/(12/\pi^2) = 2/\pi^2$

Being equivalent to the ratio of the inverse of the volume factor of a sphere in eight dimensions and the Ricci scalar curvature for a radius π ; (sphere four dimensions) : $V^{-1}(S8d) = (24/\pi^4)$

$r(T/S)_B = V^{-1}(S8d)/[4(4-1)/\pi^2] = 2/\pi^2$

3 Dimensionless Quantization Of Gravity.Matter Density And Dark Matter Density.

General relativity of Einstein measures the curvature or deflection of photons produced by the mass of an object with the following equation:

$\theta_C = 4 \cdot m \cdot G_N / c^2 \cdot d$ This angle θ_C of deflection depending on the distance d

If the geometry of space-time that determines the curvature thereof; and besides this curvature depends on the infinite sum of quantum oscillators as dimensionless ratios of circular curvatures; then a natural choice for these circular curvatures is to consider the following series:

$\sum_{n=0}^{\infty} \frac{4m \cdot G_N \cdot c^2 \cdot (-1)^n}{m \cdot c^2 (d_n/d_0) \cdot G_N}$; $d_n/d_0 = 2n+1$; And this choice has to be adequate, since on the one hand you have all the spins, because: $2n+1 = 2(\frac{3}{2}+\frac{1}{2}+0)n+1$; As can be seen, the spin 2 graviton as decay, through gravitino, a fermion a scalar boson and a photon. Where n is the number of particles.The alternate sign positive negative, determined by $(-1)^n$ be related to parity and baryogenesis by the following rule: For n even the vacuum decays into particle antiparticle pairs symmetrically; ie: $2n_+ + 1 \to m_{3/2} + \overline{m}_{3/2} + \cdots + f + \overline{f} + \cdots + \gamma + \gamma$ .For n odd vacuum decays into particle-antiparticle pairs form antisymmetric; ie: $2n_- + 1 \to m_{3/2} + \overline{m}_{3/2} + \cdots + f + \overline{f} + m_{3/2} + f + \cdots + \gamma$

$\Omega_m = 1 \Big/ \left(\sum_{n=0}^{\infty} \frac{4 \cdot (-1)^n}{2n+1} \right) = 1/4(\frac{\pi}{4}) = 1/\pi = 0.3183098862\,(46)$. This result allows us to obtain both the vacuum energy density; as well as the density of dark matter, by:

$\Omega_\Lambda = 1 - \frac{1}{\pi} = 0.6816901138$; $\Omega_D = \Omega_m - \Omega_b = \frac{1}{\pi} - \Omega_b = 0.3183098862 - 0.04584115 = 0.2724687362 \approx \frac{4}{\pi} - 1\,(47)$

4 Tensor - scalar ratio B modes: Dimensionless Quantization Of Gravity.

4.0.6 Gravitational waves amplitudes: GR

Amplitudes of gravitational waves, according to the theory of General Relativity are given by: $h(R,t) = \frac{4 \cdot G_N^2 \cdot m_1 m_2}{z \cdot c^4 \cdot r} \cos[2\pi f(z - ct)/c]$

Where f is the frequency, r is the (constant) distance and z is the distance from source to observer. For the quantization of the sum of all the amplitudes of the gravitational waves, z, r will be equal. As the angle equal to 2Pi, or zero.

In this way, with the modifications dimensionless curvatures, this time due to quantum dimensionless spherical curvatures; must be the sum of the quantum amplitudes, or; tensor-scalar ratio B modes; we have:

$\sum_{n=0}^{\infty} \frac{4 \cdot G_N^2 \cdot m_1 m_2 \cdot c^4 \cdot (-1)^{2n}}{G_N^2 \cdot c^4 \cdot (r_n/r_0)^2 \cdot m_1 m_2} = 4 \cdot \sum_{n=0}^{\infty} \left(\frac{(-1)^n}{2n+1} \right)^2 = \frac{\pi^2}{2}$ .Since the previous summation, consists of the sum of the inverses of all odd matrices; these are thus of order 2 dimensionless tensors Therefore the tensor-scalar ratio B modes is.: $r(T/S)_B = 2/\pi^2$ $(48a)$

4.0.7 The Connection to the Kaluza-Klein Levels. Minimal SUSY SU(5). Compactification Scale.

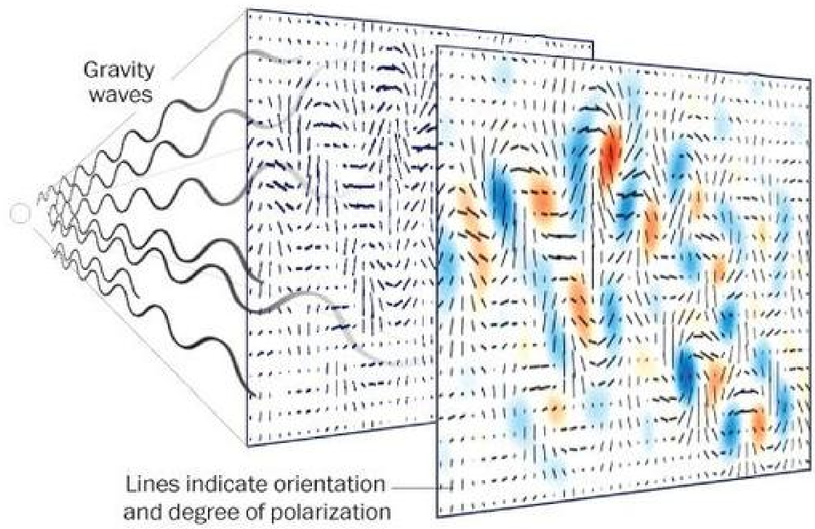
Proton Lifetime from SU(5) Unification in Extra Dimensions (Pag 14)

> "The dimensionless quantity $g_U \equiv g_5 \frac{1}{\sqrt{2\pi R}}$ is the four-dimensional gauge coupling of the gauge vector bosons zero modes. The combination $M_X = \frac{2M_c}{\pi}$,
> proportional to the compactification scale $M_c \equiv \frac{1}{R}$,
> is an effective gauge vector boson mass arising from the sum over all the Kaluza-Klein levels:" $\sum_{n=0}^{\infty} \frac{1}{(2n+1)^2 M_c^2} = \frac{1}{2M_X^2}$

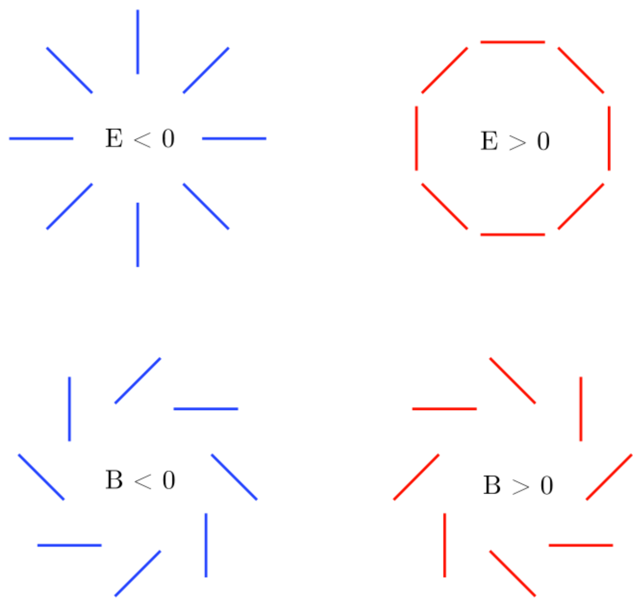
$\sum_{n=0}^{\infty} \frac{4}{(2n+1)^2 M_c^2} = \frac{2}{M_X^2} \rightarrow \sum_{n=0}^{\infty} \frac{4}{(2n+1)^2} = (2M_c^2/M_X^2) = \pi^2/2$

$r(T/S)_B = (M_X^2/2M_c^2)$ $(48b)$

5 Tensor - scalar ratio B modes: Casimir effect.



In the 1990s, physicists theorized that rapid inflation during the big bang would also generate **gravity waves**, which would leave their mark by polarizing light in the cosmic afterglow. Extremely sensitive telescopes at the South Pole have detected such skewed light waves, but scientists have spent almost a decade ensuring that the phenomenon was not the result of other factors.



If considered expanding dimensional space; where gravitational and electromagnetic waves move at the same speed in all three spatial dimensions. If you consider that gravitational waves have a length greater than the electromagnetic wave; then you may think that electromagnetic waves are enclosed in gravitational waves for a given time. This effect would be equivalent to confine electromagnetic waves of vacuum between two plates; and therefore equivalent to the Casimir effect.

The frequency of the wave is, in this case: $\omega_n = c\sqrt{k_x^2 + k_y^2 + \frac{n^2 \cdot \pi^2}{a^2}}$ Where ψ stands for the electric component of the electromagnetic field, and, for brevity, the polarization and the magnetic components are ignored here. Here, k_x and k_y are the wave vectors in directions parallel to the plates, and $k_n = \frac{n \cdot \pi}{a}$ is the wave-vector perpendicular to the plates. Here, n is an integer, resulting from the requirement that ψ vanish on the metal plates.

Being, "a", the distance between which are enclosed electromagnetic waves by gravity, at a given instant. The ground state with n = 1; and substituting "a ^ 2", the square of the modulus of the spin of the graviton. Then the average for the three dimensions, or vector addition for all three dimensions would be:

$\omega_{n=1}^2 = c^2 \cdot \left(\frac{\pi^2}{2(2+1)} + \frac{\pi^2}{2(2+1)} + \frac{\pi^2}{2(2+1)}\right) = c^2 \cdot \frac{\pi^2}{2}$ Dividing the above equation by the speed of light squared; is obtained again tensor-scalar ratio B modes.

$r(T/S)_B = 2/\pi^2$

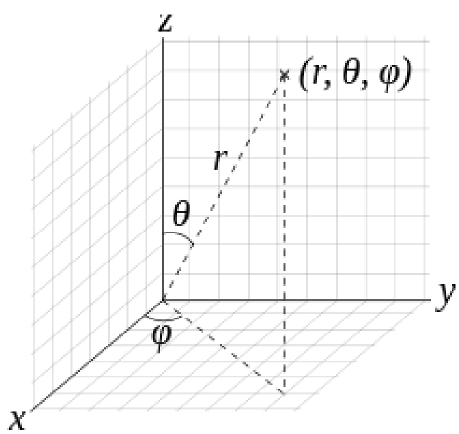
Equation (46) Gets the density of matter, i.e.: the inverse of the density of matter is the quantum dimensionless unit of mass. Mathematically the tensor-scalar ratio obtained is equivalent to the inverse of sum the dimensionless quantized unit of mass in the range zero and Pi. $\int_0^{\pi} mdm = (\pi^2/2)\ \pi^2$ (scalar). spin 1 square module (tensor) is equal to spin 2. $2 = (1+1)\cdot 1$

The dimensionless quantized unit of mass is Pi, is not mere speculation; since, for example,the mass ratio Higss boson, electron mass obeys a compactification in six dimensions; ie: $(m_h/m_e) = 4\cdot(2\pi)^6 \rightarrow m_h \approx 125.764 Gev$

6 Equivalences of constant $\pi^2/2$

One of the most significant relationships is that which allows to obtain the dimensionless length of the fine structure constant, as a function of spherical coordinates of the angle $\pi^2/2$

$l_\gamma = \sqrt{\alpha^{-1}/4\pi} = 3.302268663$



$\varphi = \theta$; $x = r\cdot\sin\theta\cos\theta$; $y = r\cdot\sin\theta\sin\theta$; $z = r\cdot\cos\theta$; $r = l_\gamma$; $y = \pi$; $\theta = \pi^2/2 = \int_0^{\pi} zdz = Volume\ factor\ four\ dimensions$

$\pi/\sin^2(\pi^2/2) = 3.302272374 \approx l_\gamma$ Lattice packing density spheres twenty-four dimensions: $\rho(l\ 24d) = \pi^{12}/12!$

$\pi/\sin^2(\pi^2/2) - \rho^2(l\ 24d) = l_\gamma = 3.302268663$ (49)

Therefore constant $\pi^2/2$; It is both an angle (sum of angles), and the volume factor of a four-dimensional space. $\int_0^{\pi} \theta d\theta = \pi^2/2$

6.1 Higgs boson mass.

$m_h = m_{VH}/(1+\sin^2(\pi^2/2))$; $m_{VH} = 246.2196509\, Gev$

$m_{VH} = 246.2196509\, Gev$ (equivalente Higgs vacuum mass) $m_{VH}/(1+\sin^2(\pi^2/2)) = m_{VH}/(1+0.951342681) = 126.177\, Gev$

6.2 The expansion factor of the universe and the constant $\pi^2/2$

Later showed that the expansion of the universe is completely determined, both in its inflationary phase, and its linear expansion; by this constant.The inflationary expansion is framed in a hyperbolic space De Sitter.Advance of the outcome; have for the Hubble constant:

$1/H = t_{P_k}[l_\gamma \cdot \exp(\exp(\pi^2/2))] = 4.337823935 \cdot 10^{17}\ s$

$t_{P_k} = Planck\ time = \sqrt{\hbar \cdot G_N/c^5}$; $l_\gamma = \sqrt{\alpha^{-1}/4\pi}$

7 The Spins and the Tensor-Scalar ratio B modes.

In (3) section, was obtained the density of matter; by dimensionless quantization of gravity and in accordance with the General relativity of Eisntein.This quantization implies that the universe's expansion the simultaneous emission of gravitons, gravitinos a boson of spin 1 (possibly bosons X, Y) or photon, a fermion and possibly a spin zero scalar boson is produced; because thus met, for the amount of particles, all spines dependent: $2(\frac{3}{2}+\frac{1}{2}+0)n+1$

7.1 Polarization Plane Electromagnetic Waves.

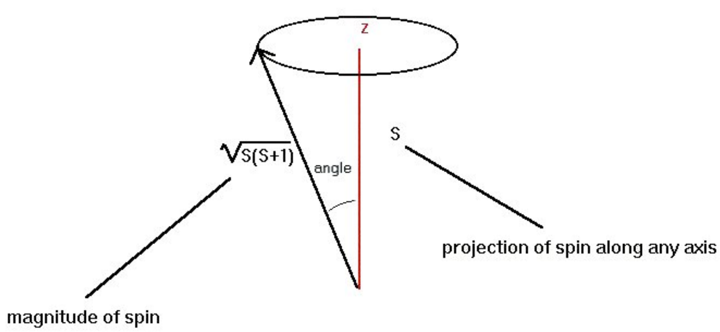
The polarization of a uniform plane wave describes how the locus of the tip of the vector $\overrightarrow{E}$ (in a plane perpendicular to the propagation direction) at a given time-dependent space point. In the most general case this locus is an ellipse and we say the wave is elliptically polarized; and under certain conditions the ellipse may degenerate into a circle or a straight line segment, in which case the polarization is called circular or linear polarization respectively. Suppose, for definiteness, a uniform plane wave that propagates under the positive Z direction, this means that the overall electric field for a monochromatic wave of frequency ω can be written, taking into account that $\overrightarrow{E} \perp \overrightarrow{u_z}$, as $\overrightarrow{\hat{E}}(z,t) = \overrightarrow{\hat{E}_0} \cdot e^{j(\omega t - kz)} = (\hat{E}_{0x}\overrightarrow{u_x} + \hat{E}_{0y}\overrightarrow{u_y}) \cdot e^{j(\omega t - kz)} = \cdots$

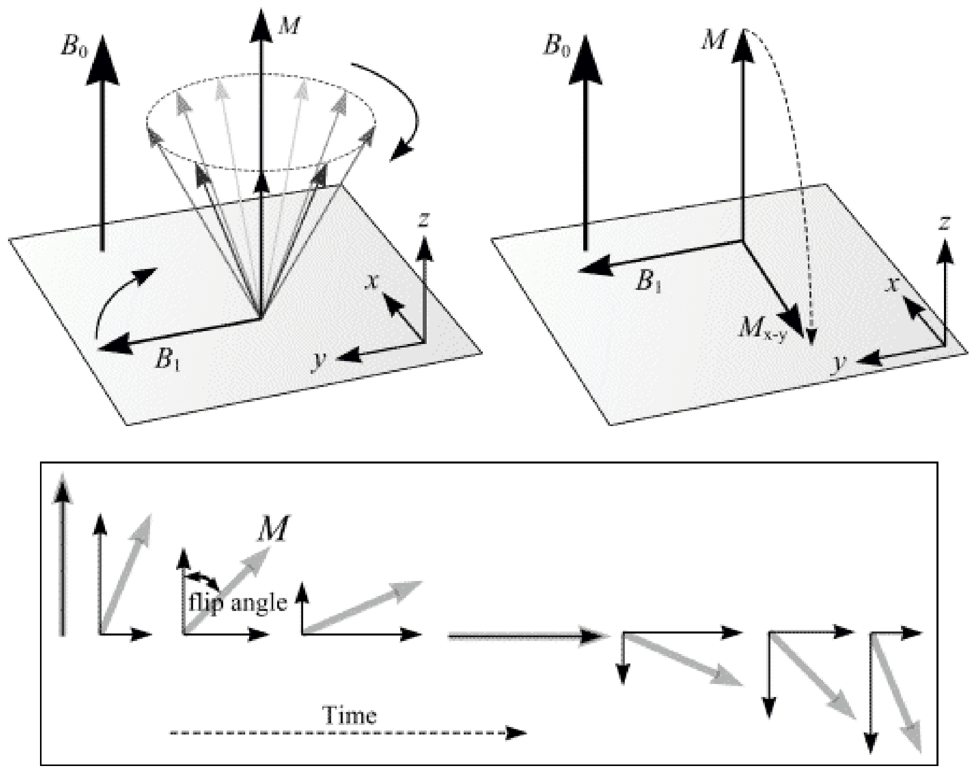
$= (\hat{E}_{0x}e^{-j(kz)}\overrightarrow{u_x} + \hat{E}_{0y}e^{-j(kz)}\overrightarrow{u_y})e^{j(\omega t)}$.

In the previous expression the French circumflex above a variable indicates that this is complex. In accordance with the previous expression electrical field Phasor is composed of two components, the x component and the component y; Like this $\overrightarrow{\hat{E}}_z = \hat{E}_x(z)\overrightarrow{u_x} + \hat{E}_y(z)\overrightarrow{u_y}/\hat{E}_x(z)$ and $\hat{E}_y(z) = \hat{E}_{0y}e^{-j(kz)}$

In this expression $\hat{E}_{0x}$ and $\hat{E}_{0y}$ are the complex amplitudes of $\hat{E}_x(z)$ and $\hat{E}_y(z)$, respectively, and as any numbers complex is characterized by a modulus and a phase. The polarization of a wave depends on the phase of $\hat{E}_{0y}$ with respect to $\hat{E}_{0x}$ but not the absolute phases of $\hat{E}_{0x}$ and $\hat{E}_{0y}$. We agree, then, in choosing reference phase $\hat{E}_{0x}$ ($\hat{E}_{0x}$ is assigned zero phase angle), and δ called the phase $\hat{E}_{0y}$ with respect to the phase of $\hat{E}_{0x}$; ie δ is the phase difference between the x and y components of $\overrightarrow{\hat{E}}(z)$. If $\hat{E}_{0x} = a_x$, $\hat{E}_{0y} = a_y e^{j\delta}$ then $\overrightarrow{\hat{E}}(z) = (a_x\overrightarrow{u_x} + a_y e^{j\delta}\overrightarrow{u_y})e^{-j(kz)}$ and instant field is $\overrightarrow{E}(z,t) = Re[\overrightarrow{\hat{E}}(z)e^{j(\omega t)}] = a_x\cos(\omega t - kz)\overrightarrow{u_x} + a_y\cos(\omega t - kz + \delta)\overrightarrow{u_y}$ whose module is $E(z,t) = |\overrightarrow{E}(z,t)| = \left(a_x^2\cos^2(\omega t - kz)\overrightarrow{u_x} + a_y^2\cos^2(\omega t - kz + \delta)\overrightarrow{u_y}\right)^{1/2}$ and whose direction in the plane x - y, given by angle Θ, is:

$\Theta(z,t) = \arctan\left(\frac{a_y\cos(\omega t - kz + \delta)\overrightarrow{u_y}}{a_x\cos(\omega t - kz)\overrightarrow{u_x}}\right)$





If really in the inflationary expansion, particles of all spins are simultaneously emitted; and being the graviton particle responsible for gravitational waves, then we have the following equality cosines of the spins that give the corresponding to the cosine of the cone angle of the spin of the graviton, that is:

$\Theta_G = \arctan(\cos\theta_{s=1/2)}/\cos\theta_{s=1}) = \arctan(\cos\theta_{s=2})$ (49)

$\Theta_G = \arctan([(1/2)/\sqrt{(1/2+\ 1)1/2}]/[1/\sqrt{(1+1)1}]) = \arctan(2/\sqrt{(2+1)2})$

This angle that unifies all the cones of the spins, since for the gravitino: $\cos\Theta_G = (3/2)/\sqrt{(3/2+\ 1)3/2}$

Being the invariant spins, also is this polarization angle; and therefore it is invariant under changes of scale, including the inflationary.

7.1.1 Scattering.

In the simplest case consider an interaction that removes particles from the "unscattered beam" at a uniform rate that is proportional to the incident flux I of particles per unit area per unit time, i.e. that: $dI/dQ = -QI$ where Q is an interaction coefficient and x is the distance traveled in the target.

The above ordinary first-order differential equation has solutions of the form: $I = I_0 e^{-Q\triangle x} = I_0 e^{-\frac{\triangle x}{\lambda}}$,where I_0 is the initial flux, path length Δx $\equiv$ $x - x_0$ the second equality defines an interaction mean free path λ. Equating $\frac{\triangle x}{\lambda} = \tan\Theta_G = \cos\theta_{s=2}$; It is necessarily the tensor-scalar ratio of the B modes is: $-\ln(\tan\Theta_G) = -\ln(\cos\theta_{s=2}) \approx 2/\pi^2$; $-\ln(\tan\Theta_G) = -\ln(2/\sqrt{6}) = 0.2027325541 = r(T/S)_B \approx 2/\pi^2$ (50)

Empirically the difference between $-\ln(2/\sqrt{6}) - 2/\pi^2$; seems to be due to an adjustment for the fine structure constant (at zero momentum.)

$-\ln(2/\sqrt{6}) - \alpha^2/\sqrt{2\pi - (\pi^2/2) - 1} + e^{-(4^2 + 1/\tan\Theta_G)} = 2/\pi^2$ (51)

8 The Energy of the Vacuum. Energy GUT Scale Unification Theories.

This section will be shown; as the energy of the vacuum depends on both, and view partition function based on the non-trivial zeros of the Riemann zeta function; and the scale factor of inflation. Fulfilling the equation of state for the density and pressure: $\rho + 3p < 0$; $\rho + 3p = -2\rho$; $3p = -3\rho$

8.1 Vacuum Energy. Cosmological Constant.

As proven by the equations (35) and (36),***(1.1.3.1.1 on page 17)*** the function $\ln[(\sum_n e^{-t_n})]$ is the sum of masses (or energy); allowing to derive, equality of the gravitational field with the electromagnetic, for the calculation of the quantized elementary charge.

8.1.1 Equation of State Pressure-Energy Density. GR

The Lemaître Metric Friedmann-Robertson-Walker or FLRW model is an exact solution of the Einstein field equations of General Relativity.

This solution applied to the cosmological model; implying a negative pressure deriving from negative energy density, given by: $\rho_\Lambda + 3p_\Lambda = -2\rho_\Lambda$

Isolating the term of the energy density in the left side of the above equation; an energy density is obtained; which is five times the value of the sum of the term of pressure, plus the energy density; that is: $\rho_\Lambda = -3p_\Lambda - 2\rho_\Lambda$ (52)

Equation (52) is absolutely equivalent to the five solutions of the energy-momentum equation.

Since the logarithm; ($\ln[(\sum_n e^{-tn})]$) is negative; exactly this implies a negative energy or negative surface of a triangular area of a hyperbolic geometry. Also a constant negative entropy (cosmological constant)

Since there are five solutions for the energy-momentum equation (see: ***(2.1.3 on page 22) 2.1.3 "Five solutions of the equation energy momentum. Equivalence of gravitational tensor components."***), then the energy of the vacuum is: $5 \cdot \ln[(\sum_n e^{-t_n})] = \ln(m_v/m_{Pk})$ $(52b)$

$m_{Pk}c^2 \cdot (\sum_n e^{-t_n})^5 = m_{vacuum} \cdot c^2 = 1.220840604 \cdot 10^{19} GeV \cdot (1374617.4545188)^{-5} = 2.487423278 \cdot 10^{-3}\ eV$ $(52c)$

8.1.2 The Value of the Vacuum: a Function of the Minimum Fluctuation or Uncertainty Principle in Seven Dimensions.

This section will show, that effectively; space-time-energy is based on a seven-dimensional geometry compacted in circles; and four extended.

The same dimension lattice R8 is the sum of the Cartesian coordinates of a sphere in seven dimensions; or, equivalently, the dimension of the lattice R8 is the square of the norm of the first five Fibonacci numbers, divisors of dim(R8), plus; the integer part of the inverse of the fine structure constant (for zero momentum), represented by the sum of the squares of eleven and four dimensions; that is: $R8 = 1e_1 + 2e_2 + 3e_3 + 5e_4 + 8e_5 + 11e_6 + 4e_7$

$dim(R8) = \left\|R8\right\|^2 = 1^2 + 2^2 + 3^2 + 5^2 + 8^2 + 11^2 + 4^2 = 240\,;\ (1^2 + 2^2 + 3^2 + 5^2 + 8^2) = \lfloor \ln(m_{Pk}/m_e) \rfloor = 103\,;\ \lfloor \alpha^{-1} \rfloor = 11^2 + 4^2 = 137$

Since the dimension of the lattice R8; representing the vacuum; is holography; by a space of eight dimensions (seven); then necessarily the five solutions of the energy momentum equation must be extended to seven dimensions. With this extension, taking into account the two factors of each solution; 70 solutions are obtained. $5 \cdot 2 \cdot 7 = 70$

At the same time; These 70 solutions are the number of particles of a sphere in 24 dimensions; since: $\sum_{n=1}^{24} n^2 = 70^2$ And the 24 dimensions are really all possible states of the permutations of the dimensions of a four dimensional space; that is: $24d = 4d!$

The extension to seven dimensions of the solutions of the energy-momentum equation; also implies, to express the previous 24-dimensional summation with the octonions. And this is the partition of the group SU(5) by the group SU(3) and the group SU(2) (eight and three dimensions. Eleven dimensions).In other words, the GUT scale unification.

$70 = (1e_0+2e_1+3e_2+4e_3+5e_4+6e_5+7e_6+8e_7)+(9e_0+10e_1+11e_2+12e_3+13e_4+14e_5+15e_6+16e_7)+\cdots$
$\cdots+(17e_0+18e_1+19e_2+20e_3+21e_4+22e_5+23e_6+24e_7)$

$\left\|1e_0+2e_1+3e_2+4e_3+5e_4+6e_5+7e_6+8e_7\right\|^2 = 204 = x_1^2$; $\left\|9e_0+10e_1+11e_2+12e_3+13e_4+14e_5+15e_6+16e_7\right\|^2 = 1292 = x_2^2$
$\left\|17e_0+18e_1+19e_2+20e_3+21e_4+22e_5+23e_6+24e_7\right\|^2 = 3404 = x_3^2$

Empirically, the sum of the masses of the tau and muon leptons is obtained; of the three coordinates previous eight dimensional as:

$x_3^2 + x_1^2 + \sqrt{7!+1} + \ln(137) - \frac{\sin(2\pi/L_7)}{x_2^2} = (m_\tau + m_\mu)/m_e$; $L_7 = \left(2\cdot(2\pi)^7/[16\pi^3/15]\right)^{1/9}$ = Dimensionless radius in seven dimensions; compactification in circles.

Uncertainty Principle in d Dimensions

"Yuh-Jia Lee and Aurel Stan, An Infinite-dimensional Heisenberg Uncertainty Principle" For a d dimensional space, the minimum value of uncertainty or fluctuation of the vacuum is given by the equation : $(\triangle E_d \triangle t_d/\hbar_d)^2 \geq (d^2/[4\cdot(2\pi)^{d-1}])$

So the minimum value of the fluctuation of the vacuum for a seven-dimensional space; is: $min(\triangle_{7d}) = \sqrt{[4\cdot(2\pi)^{7-1}]/7^2} = (\hbar_{7d}/\triangle E_{7d}\triangle t_{7d})$

However; since the vacuum energy is negative; then necessarily, both the mass and time have to be imaginaries; because only in this way we obtain:

$min(\triangle_{7d}) = -\sqrt{[4\cdot(2\pi)^{7-1}]/7^2} = (\hbar_{7d}/\triangle iE_{7d}\triangle it_{7d})$ $(53a)$ Imaginary masses are allowed for exceed the speed of light; which is not in conflict with general relativity; since it is the same spacetime which accelerates and this acceleration is not restricted.

But another even more fundamental consequence is that space, time and energy are inseparable. It's actually a single unified system. The same uncertainty principle demonstrated; since every dimension of space has associated a number of non-zero energy, whether virtual or real energy. That the vacuum energy is negative

directly implies that the no observable edge of the universe, with expansion above the speed of light; this expansion is generated by the system, not separable space-time-energy vacuum oscillations with imaginary masses.

Later arrive at surprising inevitable consequences; but not for that, no less real.

Equation (53a), as the total vacuum fluctuation; including the share, the particle-antiparticle pairs generated by photons; then only for the own vacuum expansion (expansion energy); be necessary to subtract the contribution of the photons. This contribution will be the inverse of the logarithm of the fine structure constant (zero momentum); therefore, we have: $-\sqrt{[4\cdot(2\pi)^{7-1}]/7^2}-\frac{1}{\ln(\alpha)} = -70.87148955-\frac{1}{\ln(0.007297352565)} = -70.87148955+0.2032419671 = \cdots$

$$\cdots - 70.66824758 \approx -5\cdot\ln[(\sum_n e^{-t_n})] = 70.6684302$$

A more accurate value is given, with regularization term, by: $-\sqrt{[4\cdot(2\pi)^{7-1}]/7^2}-\frac{1}{\ln(\alpha)}-(min(\triangle_{7d}))^2\cdot(10\cdot 4\pi/137) = -5\cdot\ln[(\sum_n e^{-t_n})] = -70.6684302 = \ln(m_v/m_{Pk})$

$-1/\ln(\alpha) \approx r(T/S)_B$

And finally you get the value of the vacuum is exactly equivalent to the fluctuation of the same, in seven dimensions. Therefore the seven dimensions compacted; must exist. Moreover; boson mass higss is a function of this fluctuation in seven dimensions; that is: $(m_h/m_e) \approx 1/7^2\cdot[min(\triangle_{7d})]^2 = 4\cdot(2\pi)^6$

8.2 GUT Unification Energy Scale: Mass Bosons X and Y

Considering that there must be an isomorphism between the constant $\pi^2/2 = 1/r(T/S)_B$; as the sum of the dimensionless unit mass quantized ($\int_0^{\pi} mdm = \pi^2/2$); and the unification of theories GUT scale mass; then taking into account that the X, Y bosons, they decay into electrons and taking into account the gravitational coupling of the cosine of the spin cone of the graviton (which is a measure of the probability; derived tensor-scalar ratio B modes); it is to the mass of the GUT unification scale or mass of bosons X, Y; and discounting the vacuum energy (given by equation 52b):

$$M_{GUT} = M_{X,Y} = [m_{Pk}^2\cdot((\textstyle\sum_n e^{-t_n})^4]/[\sqrt{8\pi}\cdot(\cos\theta_{s=2})\cdot m_e] = \cdots$$

$$\cdots\left[\left(\frac{\int_0^{m_{Pk}} mdm}{\sqrt{8\pi}}\right)\left(\sum_n e^{-t_n}\right)^4\cdot\sqrt{(s+1)s=2}\right]\Big/ m_e \quad (53) \quad ; \quad m_{Pk} =$$

Planck mass

$M_{X,Y} = [m_{Pk}^2 \cdot ((\sum_n e^{-t_n})^4]/[\sqrt{8\pi} \cdot (\cos\theta_{s=2}) \cdot m_e] = 3.557666167 \cdot 10^{-11} Kg \rightarrow M_{GUT} = M_{X,Y} = 1.995704445 \cdot 10^{16}\, GeV$

8.2.1 Empiricals Relations X Boson Mass, Compactification Mass Scale, Ratio.

1. $(m_{Pk}/\sqrt{8\pi})/M_c = 26 \cdot \sin^2(\pi^2/2) = 26 \cdot (m_{VH}/m_h - 1)$; m_{VH} (Higss Vacuum) $m_h = 126.177\, GeV$
2. $(m_{Pk}/\sqrt{8\pi})/M_c = e^{\pi} + \ln(\pi^2/2) - \frac{1}{496[1+\cos(\pi/4)]}$
3. $(m_{Pk}/\sqrt{8\pi})/M_c = e^{\pi} + \ln\ln(\alpha^{-1})$; Fine structure constant, zero momentum. $\alpha^{-1} = 137.035999173$
4. $(m_{Pk}/\sqrt{8\pi})/M_c = 8\pi - \frac{10}{8\pi}$

8.3 Gauge Coupling Unification.

As shown by equations (42) and (53); unification occurs by direct decay of the vacuum by gravitinos and bosons X, Y (decay state compactification scale). And being the gravitino mass; the square root of the product of the mass of the electron, the Planck mass and the square of the modulus of the spin 3/2; then it must meet for the gauge coupling unification:

$$1/\left[\ln\left(m_{Pk}/\sqrt{m_{Pk} \cdot m_e \cdot (s+1)s = 3/2}\right)\right] \approx 1/8\pi = \alpha_G$$

As proven; the vacuum is represented by the lattice R8 (which allowed us to calculate the density of baryons). In turn, it has also been demonstrated that the equation for the energy-momentum supports four solutions of positive energy, and a positive-negative fifth. Far from being a mathematical artifact; these four solutions really have to exist, allowing to obtain the minimum value of uncertainty of energy; among other things. Now, if the vacuum is effectively represented by the lattice R8 with 240 dimension, must necessarily extend these four solutions (four dimensions) using the octonions; to eight dimensions.

R8 lattice dimension is obtained; as the square of the interaction matrix of eight solutions multiplied by the squared modulus gravitino spin 3/2, that is: $dim(R8) = 8^2 \cdot (s+1)s_{=3/2} = 240$ (a). The dimension of the lattice R8; can be expressed equivalently by the group SU(5), SU(7), and the maximum number of hyper-spheres that touch each other in a space of five dimensions (with spin 2 factor):

1. $dim(R8) = 2 \cdot dim(SU(5)) \cdot 5 = 240$
2. $dim(R8) = dim(SU(7)) \cdot 5$
3. $dim(R8) = K(5d) \cdot (s+1)s_{=2}$

Since, as has been proven, the dimensionless unit quantized mass is π ; So necessarily, the eight solutions of the energy-momentum equation must represent the area of a hyperbolic sector in de Sitter space; and therefore be equal to the logarithm or law scaling, the ratio between the Planck mass and the mass of the gravitino (equation (a)); that is: $8\pi \approx \ln(m_{Pk}/m_{3/2})$; $m_{3/2} = \sqrt{(s+1)s_{=3/2} \cdot m_{Pk} \cdot m_e}$; $\ln(m_{Pk}/\sqrt{(s+1)s_{=3/2} \cdot m_{Pk} \cdot m_e}) = 25.10302182 \approx 8\pi$ (54)

So, by the equation (54), it follows immediately that the gauge coupling unification is: $\alpha_G = 1/8\pi$

Being the regularization given by: $8\pi - [1/\ln(M_X/M_Z)] - \{1/[8 \cdot \ln^2(M_X/M_Z) \cdot r(T/S)_B]\}$ (56)

8.3.1 Very Interesting Ratio Boson X,Y Mass, Gravitino Mass.

453.060 rows of the characters of Kazhdan-Lusztig polynomials for the split real group G of type E8.

6 + 6 Bosons X,Y

$M_X/m_{3/2} = 2 \cdot 12^2 \cdot \chi(E8) = 2 \cdot 12^2 \cdot 453060$; $2 \cdot 12^2 = dim(SU(4^2+1))$

9 Geometry and Structure of Space-Time - Energy

To date, there is a differentiation between the space time and energy as separable physical entities.This separation, as we shall see, does not occur at the level of the discrete quantization of spacetime.The same principle of uncertainty of Heisenberg; proves it, because physically and mathematically, this principle implies that every "point" of space is assigned a non-zero amount of energy. Moreover, the value of the vacuum energy with negative pressure is inseparable from any "point" region of spacetime. This inseparability level quantization of spacetime; has its manifestation in the expansion, extension or "creation" of spacetime.

Therefore: space, time and energy system; is in fact the same physical entity, not separable.

This non-separability, has absolutely divergent implications with the current notion of the universe; and specifically with the principle of conservation of energy. This principle should be generalized and modified, so that the non-separability of space-time-energy is consistent.

The fundamental equation we use, is which unifies gravitation and electromagnetism:

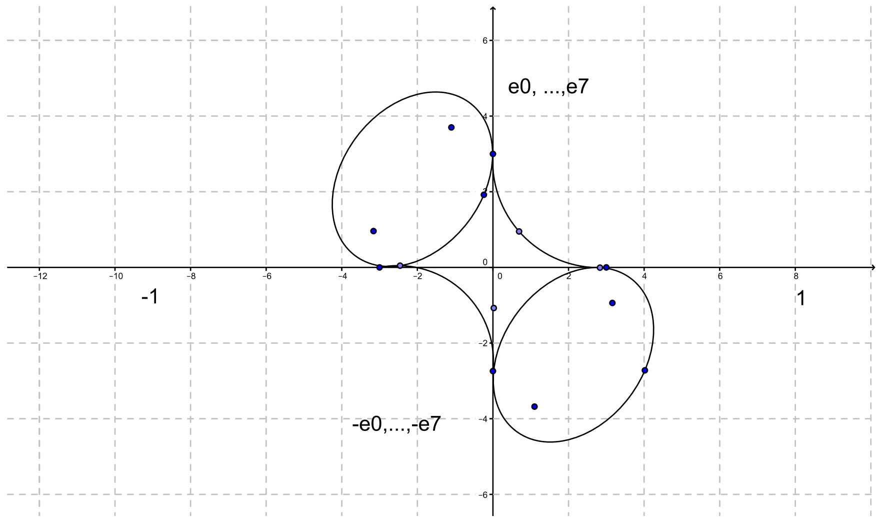
$$4\pi^2 \cdot (\pm e) \cdot [\sum_n^{\infty} \exp(-t_n)] - 4 \cdot \sqrt{m_{Pk} \cdot m_e \cdot G_N} = 0 \rightarrow 4\pi^4 \cdot (\pm e)^2 \cdot [\sum_n^{\infty} \exp(-t_n)]^2 - 4 \cdot m_{Pk} \cdot m_e \cdot G_N = 0 \quad (57)$$

Equation (57), on the one hand means that the electromagnetic and gravitational forces are of opposite sign; which produces a net force, zero. Also this equation is consistent with General Relativity; because the part of the equation corresponding to the gravitational field, is the equation of curvature deflection of the photons by gravitational fields of the GR, multiplied by the distance, radius, or length.The part of the equation that corresponds to the electromagnetic field; is a dimensionless multiplicative factor that can be equivalently interpreted as: 1) the area of a two-dimensional torus with radius R and r, equal to Pi; that is:

$4\pi^2 Rr = 4\pi^4$; $R = r = \pi$

2) This factor is the product of four coordinates, which satisfy the four solutions (positive energy) of the energy-momentum equation; and are a complete rotation of a circle (compacted dimension) with axis coordinates is given by: $i, -1, -i, 1$

The two equivalent interpretations; have the physical consequence, and in accordance with equation (57) that really what this equation is a wormhole; formed by ripping a three-dimensional torus, and deformed; by the repulsive force (electric charges) to be stabilized by the gravitational attractive force of the same magnitude and opposite sign.



9.1 The Five Solutions Of The Energy-momentum Equation: Compactification of Dimensions. Quaternions and Octonions.

In this section we will show that, indeed; compacted dimensions are real. We will establish the type of compactification and physical results demonstrate high accuracy, confirming absolutely; both the reality of the extra dimensions compacted in circles; well as the type of compactification.

The reality of the existence of these five solutions; four of them with positive energy; represent a fundamental change in the interpretation of quantum mechanics. First: these solutions with imaginary components of energy and momentum are not observable; since they must be above the barrier of the speed of light, and having an imaginary value. This apparent violation of special relativity; is not so, if you consider the underlying geometry of space-time-energy.

This geometry , as it has been shown (and we will demonstrate in this section) ; it is of a hyperboloid of one sheet ; or what is the same: a wormhole . Inside this space wormhole speed is limited to light . But outside or contour , or outer surface of the wormhole , the speed is necessarily greater than that of light . And this is a consequence of the geometry of the outer surface of the wormhole ; and consistent with the five solutions of the equation of energy - momentum. The speed of these unobservable states of the particle

; is no longer dependent on the speed ; if the mass; as we will show . In reality; isomorphic rotations between quaternions and octonions force us to conclude that the speed is actually infinite ; time stops (as one would expect from a very intense gravity at the scale of the Planck length). Although this statement sounds crazy ; infinite speed ; it is not, if you consider that an infinite speed is not distinguishable from zero speed when the path is a closed circle.

Secondly: These unobservable states of the particles would be responsible for the probabilistic nature of quantum mechanics. But at the same time; these unobservable states involve a physical reality independent of the observer. A clear example of this is the value of the vacuum; which exists independently of the observer; which is responsible for the expansion of space-time-energy of the universe. And this physical phenomenon is independent of whether or not there exist observers.

You have to take into account that quantum mechanics does allow higher than the speed of light : 1) the (unobservable) virtual particles . 2) Considering the spread back in time half the field having positive electron energies , Richard Feynman showed that causality is violated unless you allow some particles to travel faster than light. But if the particles could travel faster than light then, from the point of view of another inertial observer would seem as if traveling back in time and opposite charge.

Feynman thus reached graphically understand that the particle and its anti have the same mass m spin J but opposite charges. This allowed him to rewrite perturbation theory precisely in the form of diagrams , called Feynman diagrams with traveling back and forth in time particles. This technique is now extended to calculate the amplitudes in quantum field theory.

This was developed independently by Ernest Stueckelberg , and therefore has been called the Feynman and Stueckelberg interpretation of antiparticles.

It should be noted, too; that these five solutions of the energy-momentum equation; solutions are not hidden type variables; since these five solutions are intrinsic to the same mathematical reality of the factorization of the equation of energy-momentum; and as will be shown in this section are existing both mathematically, and physically real.

Start, first; with isomorphisms between five solutions of the energy-momentum equation, and turns with quaternions and octonions.

$(imc^2 + pc)(-imc^2 + pc) = E_1^2$	
$(imc^2 - pc)(-imc^2 - pc) = E_2^2$	
$(mc^2 + ipc)(mc^2 - ipc) = E_3^2$	$= E^2 = m^2c^4 + p^2c^2$
$(-mc^2 + ipc)(-mc^2 - ipc) = E_4^2$	
$i(imc^2 + pc)(mc^2 + ipc) = -E_5^2$	

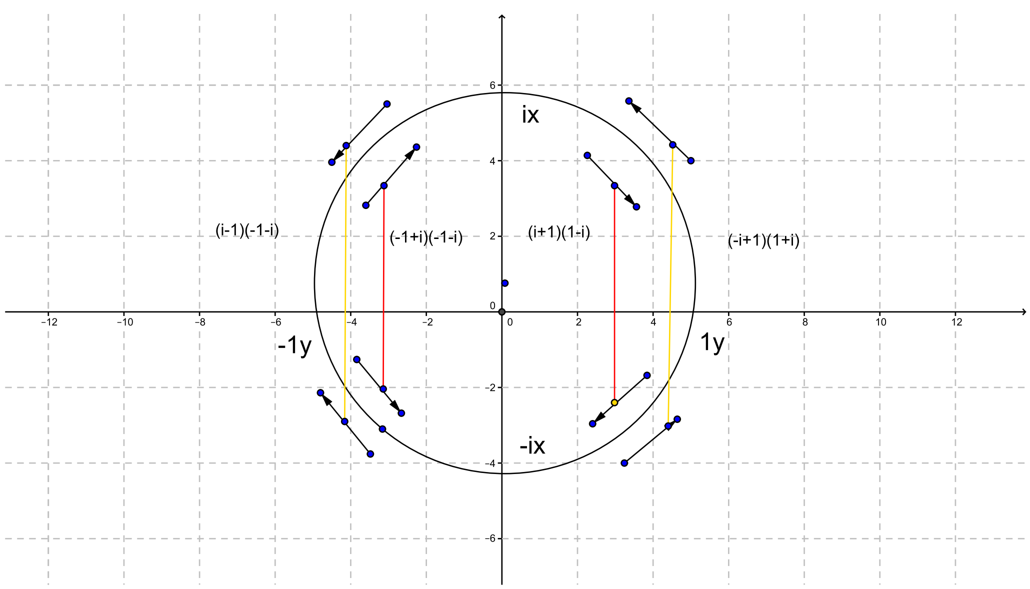
The above table, with the five solutions, can reduce to their dimensional factors, its real and imaginary componenetes, regardless of the energy and momentum; thus we have:

$(i+1)(-i+1) = 1$ (1)	
$(i-1)(-i-1) = 1$ (2)	
$(1+i)(1-i) = 1$ (3)	Table I
$(-1+i)(-1-i) = 1$ (4)	
$i(i+1)(1+i) = -1$ (5)	

As can be seen, equation (1) is a permutation of the (3), the (2) is a permutation of (4); in a bidirectional way; in both cases. The permutation occurs between the terms of each factor.

$P\{(i{+}1)(-i{+}1)\}_{\overleftrightarrow{(i+1)},\overleftrightarrow{(-i+1)}} = (1{+}i)(1{-}i)$; $P\{(i{-}1)(-i{-}1)\}_{\overleftrightarrow{(i-1)},\overleftrightarrow{(-i-1)}} = (-1+i)(-1-i)$

The above transformation operations can be displayed perfectly with the following figure:



As can be seen in the previous figure; there are two full circle turns, and opposite.

How do you physically interpret these two opposite turns?. What are the physical sense?.

The answer is in the equation (57); in which a zero net energy occurs between the gravitational and electromagnetic field. This necessarily implies zero net force, in principle, zero speed rotation.

Now; the equalities of Table I are equivalent to make a full turn with the exponents of quaternions; that is:

$(i+1)(-i+1)=1$ (1a)		$i\cdot i\cdot i\cdot i=1$ (1b)
$(i-1)(-i-1)=1$ (2a)		$j\cdot j\cdot j\cdot j=1$ (2b)
$(1+i)(1-i)=1$ (3a)	$\equiv$	$k\cdot k\cdot k\cdot k=1$ (3b)
$(-1+i)(-1-i)=1$ (4a)		$(ijk)(ijk)(ijk)(ijk)=1$ (4b)
$i(i+1)(1+i)=-1$ (5a)		$i(i+1)(1+i)=-1$ (5b)

Table II

Normalizing the dimensionless value seen from the mass; factor $4\pi^4$ ***is obtained precisely:*** $4\pi^4=(i\pi)^4+(j\pi)^4+(k\pi)^4+(ijk\pi)^4$

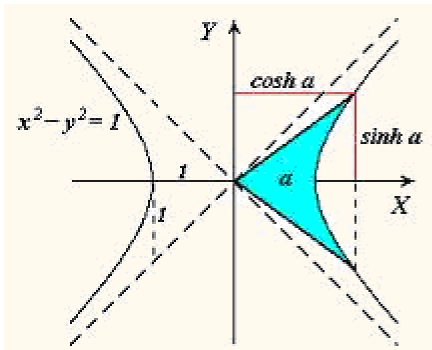
The above equation also represents a sum of four-dimensional volumes .And also is part of the factor of volume of a sphere in eight dimensions; given that: $V(sphere\,8d)=\pi^4/4!$

Having four solutions of positive energy and a negative energy; thus, to fulfill the Heisenberg uncertainty principle and the value of the energy of the "real" particles; is necessary to reduce the energy, to the minimum possible value of uncertainty, given by: $min(\triangle E\triangle t)=2\triangle E\triangle t=\hbar$

If one takes into account the four solutions of positive energy; the minimum value is immediately given by the vector sum of the square of the four states of positive energy. But this solution is not entirely satisfactory, not having, with the state of negative energy. Now; as mentioned at the beginning this section, if there is indeed a hyperbolic geometry with wormholes caused by the unification of the gravitational field and the electromagnetic; then it is necessary to generalize special relativity to take account the outside of the wormhole. This generalization is obtained automatically as the differential equation of the hyperbolic arc cosine; that is:

$\frac{d}{dx}(\arg\cosh(x))=1/\sqrt{x^2-1}$

Using the mathematical formalism of special relativity: $\frac{d}{dx}(\arg\cosh(x))=1/\sqrt{x^2-1}=1/\sqrt{\tanh^{-2}(q)-1}$; $\tanh^{-1}(q)=(v/c)$; $v>c$



For inside the wormhole, bounded by the light cone compacted circle; differential equation corresponds to the sine argument, or $\tanh(q) = v/c$; that is (Special Relativity within the cone of light):

$\frac{d}{dx}(\arg\sin(x)) = 1/\sqrt{1-x^2} = 1/\sqrt{1-\tanh^2(q)}\,;\ \tanh(q) = (v/c)\,;\ v < c$

For the five solutions of the equation of energy-momentum; and according to special relativity, there is; to the outside of the wormhole; the equation:

$E = \sqrt{E_1^2+E_2^2+E_3^2+E_4^2}/\sqrt{(E_1^2+E_2^2+E_3^2+E_4^2+|-E_5^2|/E^2)-1} = 2E/2 = E\ ;\ |-E_5^2| = -i(imc^2+pc)(mc^2+ipc)$

$1/\sqrt{\tanh^{-2}(q)-1} = 1/\sqrt{5-1}\ ;\ \tanh^{-1}(q) = \sqrt{5} \to \arg\tanh(1/\sqrt{5}) = q = \ln[(\sqrt{5}+1)/2] = \ln\varphi$

The above equation is correct; since the particle is really at rest in a superposition of five states of energy; while its total energy corresponds to the "real" particle.

Where the square of the rest energy is the difference between the square of the positive energies of the four states, and the square of negative energy state. That is:

$E_T^2 = E_1^2+E_2^2+E_3^2+E_4^2-(-E_5^2); E = \sqrt{E_1^2+E_2^2+E_3^2+E_4^2}/\sqrt{(E_T^2/E^2)-1} = 2E/2 = E$ (58)

It is important to note; that equation (58) is equivalent in conventional relativistic version; provided that the mass is imaginary, that is:

$2imc^2/\sqrt{1-5} = 2imc^2/\sqrt{1-5} = 2imc^2/2i = mc^2$ (59)

9.1.1 Nonlocality of Quantum Mechanics. Zero Velocity and Instantaneous Velocity; or Infinite. States of Net Energy Zero of Virtual Quantum Wormholes.

The equation (58) and (59) have a direct physical interpretation; that a real particle, while not interfered, measured or observed; found as a superposition of energy states, corresponding to the five solutions of the equation of energy-momentum. This superposition produces a final state of the particle duplicate.Now; by equation (57), which is net zero energy between the gravitational field and electromagnetic; quantum wormhole is produced.

Both the double-slit experiment (with emitted particles individually); as the Cassimir effect with attractive force or repulsive force version (an electric conductive plate, and the other magnetic conductive plate); the vacuum energy that depends on the geometry of interference appears; as well as the nature of the materials from which they are constructed, forming a particular geometric shape.

And in particular; in the double slit experiment (the version with particles emitted one by one); the existence of one or two slits along with the emitted particle modifies the energy state of the vacuum; which causes the virtual particle associated with the real particle passes through one of the slits and interfering with the real particle.

What actually happens in the double slit experiment; in the version of launching a single particle; is that the companion of the real particle (one could say that an additional excited state of the unobservable vacuum by moving to a higher speed of light) actually passes through the other slit to form the interference pattern with the part of the real particle. But net zero energy quantum wormhole; of the virtual particle, companion of the real particle; implies that the speed of motion of the zero energy, is infinite. Therefore there is no energy transfer: We can say with all property that is pure space which moves so instant. The correctness of this interpretation is derived from the application of the relativistic addition of velocities and zero energy when the speed is infinite; that is:

$$v_f = \lim_{v_1, v_2 \to \infty} (v_1 + v_2/[1 + \frac{v_1 \cdot v_2}{c^2}]) = 0 \; ; \; v_2 = v_1 = \infty \; (60)$$

The above equation, which is the application of the relativistic addition of velocities leads when both speeds are infinite; to which the composite speed is zero. Finally for the energy of the virtual partner, we have:

$$imc^2/\sqrt{1-(v=\infty)^2/c^2} = 0 = mc^2/\sqrt{(v=\infty)^2/c^2 \; - 1} = 0 \; (61)$$

9.1.2 The Reality of the Existence of the Compacted Dimensions. Type of Compactification. The Unification Group SU(5) (GUT). Areas of Hyperbolic Sectors. Electron Mass.

First, ten complex dimensions are implicit in the five solutions of the energy-momentum equation.Each solution consists of two complex factors, which are reducible by the Tables I and II, to complex dimensions.

(2.1.5) In section (2.1.5); already the volume of a sphere in eight dimensions was used to obtain the tensor-scalar ratio of the B modes.

In reality the eight dimensions; counting, with the time at the last level of the quantization of space-time-energy becomes more spatial dimension; would the different states of the permutations of the four dimensions not compacted. This operation of all permutations of the four dimensions, involving the generation of the eight dimensions, the-dimensional lattice R24 (which give the integer value of the vacuum, 70. Logarithm ratio of Planck mass, vacuum mass.) and finally the joint existence of the ten dimensions, eleven if time is counted.

With the five solutions of the energy-momentum equation, we can generate the Lie group SU(5); which contains the group SU(3), SU(2) and U(1).

$$5E_T^2 \rightarrow SU(5) \rightarrow 4d! \rightarrow \sum_{n=1}^{4d!} n^2 = 70^2$$

$$8d!/(4d! \cdot 4d!) = 70 = \sqrt{\sum_{n=1}^{4d!} n^2}\ ;\ 2[7d!/(4d! \cdot 3d!)] = 70$$

$dim[SO(8)] \cdot 5 = [n(T_G) = 4^2(4^2-1)/12] \cdot 7\ ;\ n(T_G)$ Number of components of the tensor of the gravitational field. Equals the number of components of all factors of five solutions of the energy-momentum equation (Table I, II).

9.1.2.1 Octonions and Four Positive Solutions of the Energy-Momentum Equation.

$$\begin{array}{|c|}\hline -i\cdot -i\cdot -i\cdot -i=1 \\ \hline -j\cdot -j\cdot -j\cdot -j=1 \\ \hline -k\cdot -k\cdot -k\cdot -k=1 \\ \hline (-ijk)(-ijk)(-ijk)(-ijk)=1 \\ \hline \end{array} + \begin{array}{|c|}\hline i\cdot i\cdot i\cdot i=1 \\ \hline j\cdot j\cdot j\cdot j=1 \\ \hline k\cdot k\cdot k\cdot k=1 \\ \hline (ijk)(ijk)(ijk)(ijk)=1 \\ \hline \end{array} \equiv \begin{array}{|c|}\hline e_0^4=e_0^8=1 \\ \hline e_1^4=e_1^8=1 \\ \hline e_2^4=e_2^8=1 \\ \hline e_3^4=e_3^8=1 \\ \hline e_4^4=e_4^8=1 \\ \hline e_5^4=e_5^8=1 \\ \hline e_6^4=e_6^8=1 \\ \hline e_7^4=e_7^8=1 \\ \hline \end{array}$$

$$dim[SU(2)]\cdot \begin{array}{|c|}\hline e_0^4=e_0^8=1 \\ \hline e_1^4=e_1^8=1 \\ \hline e_2^4=e_2^8=1 \\ \hline e_3^4=e_3^8=1 \\ \hline e_4^4=e_4^8=1 \\ \hline e_5^4=e_5^8=1 \\ \hline e_6^4=e_6^8=1 \\ \hline e_7^4=e_7^8=1 \\ \hline \end{array} \equiv \ dim[SU(5)] = 24 = 4! \ \text{Table III}$$

Table III clearly shows that the three dimensions are those that walking to the octonions; are permutations of a four-dimensional space; and generating the lattice of twenty-four dimensions. Twenty-four dimensional sphere, in cartesinas coordinates; at the same time, gives the whole value of the square of the logarithm of the ratio of Planck mass, mass (mass-energy equivalent) of vacuum. Being the geometry of a quantum wormhole (rupture deformation of a torus); of a hyperbolic space; the factor $24\pi^4$ is equivalent to the surface of six torus (or a single torus of genre six); to a four-dimensional volume and also to a volume in eight dimensions.That is:

$24\pi^4 = 6\cdot S(surface\ torus = 4\pi^2[(R=\pi)(r=\pi)] \equiv \ Volume\ 8d(2\cdot 2\cdot 2\cdot 3\cdot \pi^4) = dim[SU(3)]\cdot dim[SU(2)]\cdot \pi^4 \equiv 2\cdot V(4d) = 2(3\cdot 8\cdot \pi\cdot \pi)(\pi^2/2)$

The factor $4\pi^4$ is actually pure space as a torus. This pure space is achieved by canceling the gravity giving a zero value and then canceling the electromagnetic field, ie:

$4\pi^4\cdot(\pm e)^2\cdot[\sum_n^\infty \exp(-t_n)]^2 - 4\cdot m_{Pk}\cdot m_e\cdot G_N = 0\ ;\ -4\cdot m_{Pk}\cdot m_e\cdot G_N = 0\ ;\ 4\pi^4\cdot(\pm e)^2\cdot[\sum_n^\infty \exp(-t_n)]^2/(\pm e)^2\cdot[\sum_n^\infty \exp(-t_n)]^2 = 4\pi^4$

Four different quantized electric charges: $(4/3)$, $(\pm 1/3)$, $(2/3)$, ± 1

But this cancellation is partial, apparently, since the value of the vacuum can not be canceled. Likewise not completely cancel gravitation; due to the contribution of the gravitino. Therefore, the factor $((i\pi)^4 + (j\pi)^4 + (k\pi)^4 + (ijk\pi)^4)/4 = \pi^4$; , has to be the sum of the areas of hyperbolic sectors; whose terms are:

1. $\ln\Big(m_{Pk}/\sqrt{(m_{Pk}/\sqrt{8\pi})\cdot m_e}\Big)$
2. $5\cdot\ln[(\sum_n e^{-t_n})] = \ln(m_{Pk}/m_{vacuum})$
3. $(1+\cos\theta_{s=1})/5\cdot 2$

$\pi^4 = \ln\Big(m_{Pk}/\sqrt{(m_{Pk}/\sqrt{8\pi})\cdot m_e}\Big) + \ln(m_{Pk}/m_{vacuum}) + (1+\cos\theta_{s=1})/5\cdot 2 + 1/\Big[\ln\Big(m_{Pk}/\sqrt{(m_{Pk}/\sqrt{8\pi})\cdot m_e}\Big)\cdot\ln^2(m_{Pk}/m_{vacuum})\Big]$ (62)

9.1.2.2 The Electron Mass

$\arg\tanh(1/\sqrt{5}) = \ln\varphi$; $\arg\tanh(1/\sqrt{5}) = \sqrt{\alpha\left(\left[\ln(m_{Pk}/m_e) + \frac{m_e}{(m_\tau+m_\mu+m_e)\tanh(3\cdot\ln\varphi)}\right]^2 - 24\pi^4\right)\Big/5\cdot 2}$ (63)

9.1.2.3 X, Y bosons mass. GUT Scale

$(i+1)(-i+1) = 1$ (1a)	$\equiv$	$i\cdot i\cdot i\cdot i = 1$ (1b)
$(i-1)(-i-1) = 1$ (2a)		$j\cdot j\cdot j\cdot j = 1$ (2b)
$(1+i)(1-i) = 1$ (3a)		$k\cdot k\cdot k\cdot k = 1$ (3b)
$(-1+i)(-1-i) = 1$ (4a)		$(ijk)(ijk)(ijk)(ijk) = 1$ (4b)
$-i(i+1)(1+i) = \pm1$ (5a)		$-i(i+1)(1+i) = 1$ (5b)

Table IV

$(i+1)(-i+1) = 1$ (1a)	$\equiv$	$-i\cdot -i\cdot -i\cdot -i = 1$ (1b)
$(i-1)(-i-1) = 1$ (2a)		$-j\cdot -j\cdot -j\cdot -j = 1$ (2b)
$(1+i)(1-i) = 1$ (3a)		$-k\cdot -k\cdot -k\cdot -k = 1$ (3b)
$(-1+i)(-1-i) = 1$ (4a)		$(-ijk)(-ijk)(-ijk)(-ijk) = 1$ (4b)
$-i(i+1)(1+i) = 1$ (5a)		$-i(i+1)(1+i) = 1$ (5b)

Table V

$(\pi\cdot -i\cdot -i\cdot -i\cdot -i)(\pi\cdot -j\cdot -j\cdot -j\cdot -j)(\pi\cdot -k\cdot -k\cdot -k\cdot -k)(\pi\cdot(-ijk)(-ijk)(-ijk)(-ijk))(\pi\cdot 1) = \pi^5 = V_1$

$(\pi \cdot i \cdot i \cdot i \cdot i)(\pi \cdot j \cdot j \cdot j \cdot j)(\pi \cdot k \cdot k \cdot k \cdot k)(\pi \cdot (ijk)(ijk)(ijk)(ijk))(\pi \cdot 1) = \pi^5 = V_2$

$V_1 + V_2 = 2\pi^5 \approx m_{Pk}/M_{X,Y}$; $VolumeTorus\,10d = \pi^5/12 = V(T10d) \rightarrow 24 \cdot V(T10d) = 612.0393696 \approx m_{Pk}/M_{X,Y}$

9.2 Type of Compactification of the Seven Extra Dimensions. Quantum Strings

Being dimension (240) lattice R8, associated with the group E8; this dimension can be expressed as a surface of a 7-sphere in Cartesian coordinates, with the octonions, ie:

$\left\| 240 \right\|^2 = (1^2 + 2^2 + 3^2 + 5^2 + 8^2 = \lfloor \ln(m_{Pk}/m_e) \rfloor) + (11^2 + 4^2 = \lfloor \alpha^{-1} = 137 \rfloor)$

With the five first Fibonacci numbers consecutive product and greater than one; also get a volume four-dimensional equal to the dimension of the lattice R8.

$2 \cdot 3 \cdot 5 \cdot 8 = 240 = dim(lattice\, R8)$

So the product, $2 \cdot 3 \cdot 5 \cdot 8 \cdot \pi^4$ it is an eight-dimensional volume.

And the eight-dimensional volume gives both dimensionless radii values (smaller radius and major radius) of compactification in seven dimensions; and therefore the type of compactification.

1. Minor radius: $2 \cdot 3 \cdot 5 \cdot 8 \cdot \pi^4 = 4 \cdot r_7^8$; $r_7^8 = [4(2\pi)^7]/(8 \cdot \pi^{7/2}/\Gamma(7/2))$; $r_7 = 2.95694905822489$

2. larger radius: $1 \cdot 2 \cdot 3 \cdot 5 \cdot 8 \cdot \pi^4 = R_7^9$; $R_7^9 = [2(2\pi)^7]/(\pi^{7/2}/\Gamma(7/2))$; $R_7 = 3.05790095610237$

Being the general equation for the minor and major radius in n dimensions: $r^{n+1} = [4(2\pi)^n]/((n+1) \cdot \pi^{n/2}/\Gamma(n/2))$; $R^{n+2} = [2(2\pi)^n]/(\pi^{n/2}/\Gamma(n/2))$

9.2.1 The Spherical Volume in Eight Dimensions of Dimensionless Lattice Tensor R8 ($240 \cdot 240$).

This tensor already we use in ***(2.1.4)*** , for the calculation of the tensor-scalar ratio of the B modes. Is the interaction matrix of all possible states of the lattice R8, which represents the vacuum. As a volume in eight dimensions; since: $240 \cdot 240 = (2 \cdot 3 \cdot 5 \cdot 8)(2 \cdot 3 \cdot 5 \cdot 8)$

What is really extraordinary is that this eight-dimensional, volume is just the volume of a sphere in eight dimensions; whose radius is the dimensionless radius derived from the fine-structure constant (zero momentum).

$R_{\gamma} = \sqrt{\alpha^{-1}/4\pi}$; $\alpha^{-1} = 137.035999173$; $R_{\gamma} = 3.3022686633525$

$(\pi^4/24) \cdot R_{\gamma}^8 = 57396.7729968374$; $(\pi^4/24) \cdot R_{\gamma}^8 + \ln^2 [\sum_{n}^{\infty} \exp(-t_n)] + 5 \cdot \ln 2 = 57599.9998136897 \approx 240^2$ (64)

9.2.2 Holographic Principle: Seven Extra Dimensions Compacted in Circles. Value of the Higgs Vacuum. Mass of the Higgs Boson.

This section will show, as the value of the Higgs vacuum is obtained as the area of the hyperbolic sector; derived from the sum of squared modules of the spins and of a factor that depends on the radius curvature smaller dimensionless (calculated above) in seven dimensions. This derivation is based on the known solution to the Hamiltonian equation $\hat{H} = (\hat{p}^2/m_0) + V(r)$ by solving the Schrödinger equation with this Hamiltonian.

Being the general solution given by: $V_{eff}(r) = V(r) + (\hbar^2(s+1)s/m_0 r^2)$ (65)

The holographic principle is based on the observation that kissing numbers in dimension D for lattice (L) with $d \leq 8d \neq 5$ ***;holds:*** $k(2 = d) \cdot n = k(d \leq 8\, d \neq 5)$

$k(2) = 6$; $k(3) = 2 \cdot k(2) = 12$; $4 \cdot k(2) = k(4)$; $k(6) = 72 = 12 \cdot k(2)$; $k(7) = 126 = 21 \cdot k(2)$; $k(8) = 40 \cdot k(2)$

$(k(7)/k(2)) + (k(6)/k(2)) + (k(4)/k(2)) + (k(3)/k(2)) + (k(2)/k(2)) = k(5) = 40 = 8 \cdot 5 = k(8)/k(2)$ (66)

Equation (65) clearly expresses what is holographic principle; since the number of equivalents hyperspheres in d dimensions, which may touch a hypersphere equivalent without intersections; is a holography in the plane with $n \cdot k(2) = k(d \leq 8\, d \neq 5)$

Equation (65) is isomorphic to the number of terms of factors of all possible solutions to the energy-momentum equation; ie: $5 \cdot 8 = 40 = k(5)$

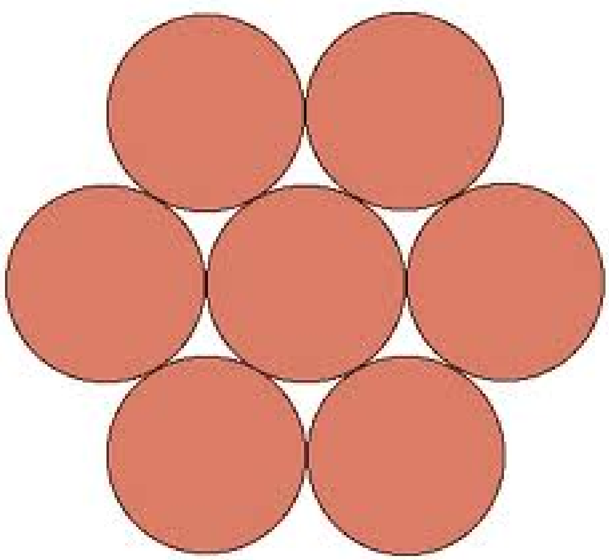
The second holographic isomorphism with the solutions of the energy-momentum equation; is the fact that having the fifth solution can be duplicated by the terms, + i,-i; then has six solutions; ie, the equivalence holds:

$$\left.\begin{array}{|c|}\hline (imc^2+pc)(-imc^2+pc)=E_1^2 \\ \hline (imc^2-pc)(-imc^2-pc)=E_2^2 \\ \hline (mc^2+ipc)(mc^2-ipc)=E_3^2 \\ \hline (-mc^2+ipc)(-mc^2-ipc)=E_4^2 \\ \hline i(imc^2+pc)(mc^2+ipc)=-E_5^2 \\ \hline -i(imc^2+pc)(mc^2+ipc)=E_5^2 \\ \hline \end{array}\right. \equiv k(2)=6$$

9.2.2.1 The Holographic Principle: Mass of the Higgs Boson. Considering the previous six solutions; and compacting in circles these six dimensions; it would have: $(2\pi)^6$ Now; since each solution has four terms, two for each factor of the product; then it is finally:

$(m_h/m_e) \approx 4 \cdot (2\pi)^6 \to m_h \approx 125.7648\ GeV$

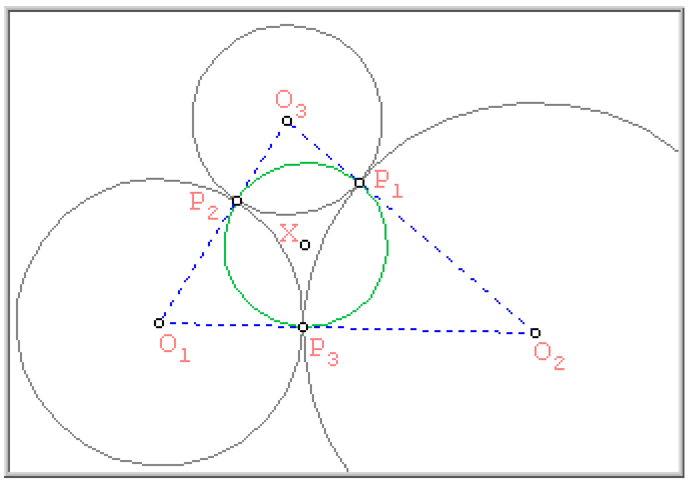
If this holographic principle is applied strictly (equation (66)); You can also theorize that the vacuum would behave like circles-string; projecting these circular flat compactifications; following the minimum lattice; ie, six circles touching one central in the plane; or what is the same: holography in the plane of seven dimensions compacted in circles.



9.2.2.2 The Holographic Principle: Mass Equivalent Higgs Vacuum .

Theorem 1. ***The value of the Higgs vacuum, in areas of a hyperbolic space; is the sum of the square of all spins modules, plus curvature of interaction (Equation 65) of three tangent strings, generating another string, according to the following figure, with its corresponding radius of curvature of interaction. The three tangents strings have the same radius.***

The contribution of uncertainty in seven dimensions is a term to subtract; also the interaction of the hyperbolic ideal triangles.



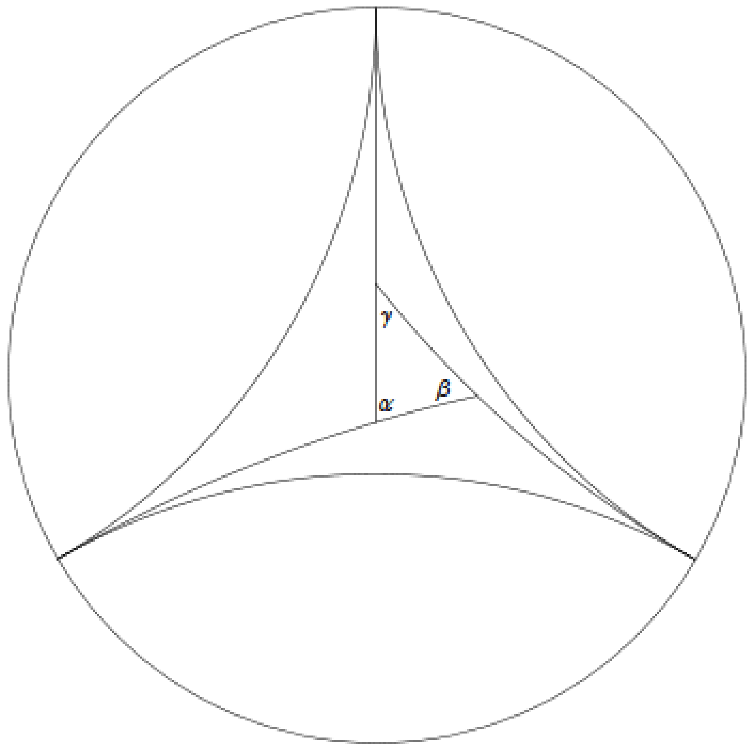
$r_1 = r_2 = r_3 = r_7$; $3/r_7^2 = 1/r_4^2$, $\sqrt{3/r_7^2} = 1/r_4 = 0.585756052425421$; $\sum_s (s+1)s = 12.5$

$2(7^2/[4(2\pi)^6]) = 3.98186813996069 \cdot 10^{-4}$; $\alpha^2/3 \cdot (4 \cdot \ln\varphi) = 9.22174526860172 \cdot 10^{-6}$

$\ln(m_{VH}/m_e) = \sum_s (s+1)s + \sqrt{3/r_7^2} - \{2(7^2/[4(2\pi)^6]) - \alpha^2/3 \cdot (4 \cdot \ln\varphi)\} = 13.0853670873567$ (67)

$e^{13.0853670873567} = m_{VH}/m_e = 481839.855274124 \rightarrow VH = 246.21964932154 GeV \rightarrow \cdots$

$\cdots G_F = 1/(VH \cdot \sqrt[4]{2})^2 = 1.16637871395182 \cdot 10^{-5}\, GeV^{-2}$



Ideal Triangle. Area= π *Lenght* $= \infty$

Likewise, all the permutations of these six dimensions-circles and forming groups of three tangent circles; generates exactly the dimension of the lattice R8, the group E8. (240) Simultaneously, all permutations of seven dimensions minus the product of the number of components of the tensor of the gravitational field; isomorphic to the number of terms of the multiplicative factors of the five solutions of the energy-momentum equation (20).; multiplied by the seven dimensions (octonions, imaginary values); equals the sum of the squares of all the states produced by permutations of four dimensions; that is:

$$7! - 20 \cdot 7 = \sum_{n=1}^{4!} n^2 = 70^2 = \left\lfloor \ln^2(m_{PK}/m_{vacuum}) \right\rfloor \ ; \ 6!/3 = 240$$

9.2.2.2.1 The density of matter as a function of the number of hyperspheres lattices from two dimension; to eight dimensions.

$k^{-1}(2)+k^{-1}(3)+k^{-1}(4)+k^{-1}(6)+k^{-1}(7)+k^{-1}(8)+k^{-2}(5)+\{([(\pi^2/3)-2]^2-1)\cdot 240^2\}^{-1}+e^{-(1/\Omega_b)} \approx \Omega_D = (1/\pi)$ (68)

$6^{-1}+12^{-1}+24^{-1}+72^{-1}+126^{-1}+240^{-1}+40^{-2}+\{([(\pi^2/3)-2]^2-1)\cdot 240^2\}^{-1}+e^{-(1/0.0457990607417)} = 0.318309886201212$

$0.318309886201212 \approx 0.318309886183791 = 1/\pi$

9.2.3 The Model of a String in a Box: Probabilities. Physical Interpretation.

The model of a string in a box; in quantum mechanics, is the known result given by the equation: $\psi(x)$ The probability density for finding the particle at a given position depends upon its state, and is given by: $P_n(x) = \psi^2(x) = (2/L)\cdot\sin^2(n\cdot\pi\cdot x/L)$; where L is the lenght of the box. And x is the lenght of the position of the string in the box. With $n = 1$ (ground state).

In the above equation; changing only the length of the string into the box, be a circle ; that is: $P(2,L) = (2/L)\cdot\sin^2(2\cdot\pi/L)$ (69)

9.2.3.0.2 Probability of a string of one dimension with a length equal to the larger box compactification radius (7d). Mass of the Higgs boson.

$m_{VH}\cdot P(2,R_7) = m_h$ (70) ; $246.2196508\,GeV\cdot(2/3.05790095610237)\cdot\sin^2(2\pi/3.05790095610237) = 126.1771047\,GeV$

9.2.3.0.3 Probability of six strings with a length equal to the smallest radius in seven dimensions (six, isomorphic to holography in the plane of the six-dimensional tangent circles. Holography surface mouth quantum wormholes).Cosmological constant, or vacuum value.

$P^{-6}(2,r_7)-(7/r_7) \approx \{\ln(m_{Pk}/m_\Lambda) = 5\cdot\ln[(\sum_n e^{-t_n})]\}$

$P(2,r_7)-(7/r_7) = 70.6682192602962$

$P^{-6}(2,r_7)-(7/r_7)+1/\{(P^{-6}(2,r_7)-(7/r_7))^2\cdot[(12\pi/27)^2-1]\} = 5\cdot\ln[(\sum_n e^{-t_n})]$ (71)

9.2.3.1 Eight dimensions (octonions). The interaction matrix eight dimensions. Masses of three electrically charged leptons. Tau, Muon and Electron. Firstly; define the exchange interaction of the lepton flavor, as a unified continuous function. Understand by unified continuous function: the eight elements matrix; formed by variations with repetition of two leptons; taken from the total set of the three leptons, tau, muon and electron. This matrix represents the simultaneous conversion of the three leptons interaction. The reference mass is the electron; which as has been shown to calculate the density of baryons, is the vacuum state with nonzero mass and electric charge; more fundamental or lowest possible energy.

This matrix is:

Reference mass: electron $ee = \gamma\gamma$	$e\mu$	$e\tau$
μe	$\mu\mu$	$\mu\tau$
τe	$\tau\mu$	$\tau\tau$

Since; have defined as the interaction-conversion function is continuous and all possible processes are simultaneous; The probability for each element of the matrix is 1. This function; so defined is equivalent (probability 1) to the following matrix generated by octonions:

$ee = \gamma\gamma \equiv e\overline{e} \to e = e_0$; $\overline{e} = e_1$; $\mu = e_2$; $\overline{\mu} = e_3$; $\tau = e_4$; $\overline{\tau} = e_5$; $\gamma = e_6$; $\overline{\gamma} = e_7$

$(ee = \gamma\gamma) \to (e_0 e_0)^4 = 1$	$e\mu = e_0 e_2 = e_2 \to (e_0 e_2)^4 = 1$	
$\mu e = e_2 e_0 = e_2 \to (e_2 e_0)^4 = 1$	$\mu\mu = e_2 e_2 = -1 \to (e_2 e_2)^4 = 1$	$\cdots\cdots$
$\tau e = e_4 e_0 = e_4 \to (e_4 e_0)^4 = 1$	$\tau\mu = e_4 e_2 = -e_1 \to (e_4 e_2)^4 = 1$	

$e\tau = e_0 e_4 = e_4 \to (e_0 e_4)^4 = 1$	
$\mu\tau = e_2 e_4 = e_1 \to (e_2 e_4)^4 = 1$	Table VI
$\tau\tau = e_4 e_4 = -1 \to (e_4 e_4)^4 = 1$	

	1	e_1	e_2	e_3	e_4	e_5	e_6	e_7
1	1	e_1	e_2	e_3	e_4	e_5	e_6	e_7
e_1	e_1	-1	e_4	e_7	$-e_2$	e_6	$-e_5$	$-e_3$
e_2	e_2	$-e_4$	-1	e_5	e_1	$-e_3$	e_7	$-e_6$
e_3	e_3	$-e_7$	$-e_5$	-1	e_6	e_2	$-e_4$	e_1
e_4	e_4	e_2	$-e_1$	$-e_6$	-1	e_7	e_3	$-e_5$
e_5	e_5	$-e_6$	e_3	$-e_2$	$-e_7$	-1	e_1	e_4
e_6	e_6	e_5	$-e_7$	e_4	$-e_3$	$-e_1$	-1	e_2
e_7	e_7	e_3	e_6	$-e_1$	e_5	$-e_4$	$-e_2$	-1

$Table\ VI\ \equiv$

$(ee = \gamma\gamma) \equiv 1^4 = 1$	$e\mu \equiv e_1^4 = 1$	$\mu e \equiv e_2^4 = 1$
$\tau e \equiv e_3^4 = 1$	$\mu\mu \equiv e_4^4 = 1$	$\tau\mu \equiv e_5^4 = 1$
$e\tau \equiv e_6^4 = 1$	$\mu\tau \equiv e_7^4 = 1$	$\tau\tau \equiv e_0^4 = 1$

Table VII

$Table\ VII\ \equiv$

$(ee = \gamma\gamma) \equiv 1^8 = 1$	$e\mu \equiv e_1^8 = 1$	$\mu e \equiv e_2^8 = 1$
$\tau e \equiv e_3^8 = 1$	$\mu\mu \equiv e_4^8 = 1$	$\tau\mu \equiv e_5^8 = 1$
$e\tau \equiv e_6^8 = 1$	$\mu\tau \equiv e_7^8 = 1$	$\tau\tau \equiv e_0^8 = 1$

Table VIII

Tables VI, VII, and VIII; they are also equivalent to the matrix of 3 x 3 elements given by the interaction of the three leptons, in each of which; one particle-antiparticle pair appears. (Photons). That is:

Reference mass: electron $eee = \gamma\gamma e$	$e\bar{e}\mu$	$e\bar{e}\tau$
$\mu\bar{\mu}e$	$\mu\bar{\mu}\tau$	$\mu\bar{\mu}\mu$
$\tau\bar{\tau}e$	$\tau\bar{\tau}\mu$	$\tau\bar{\tau}\tau$

Table IX

The previous tables are generated by a continuous function; by three tangent circles, which generates the vacuum by the smallest radius in seven dimensions; r_7. This continuous flavor change function of the three charged leptons, is isomorphic to a quantum computation with three qubits; that is: $2^3 = 8 = 3^2 - 1 = dim[SU(3)] \equiv (2d)^{3d} = 8d$

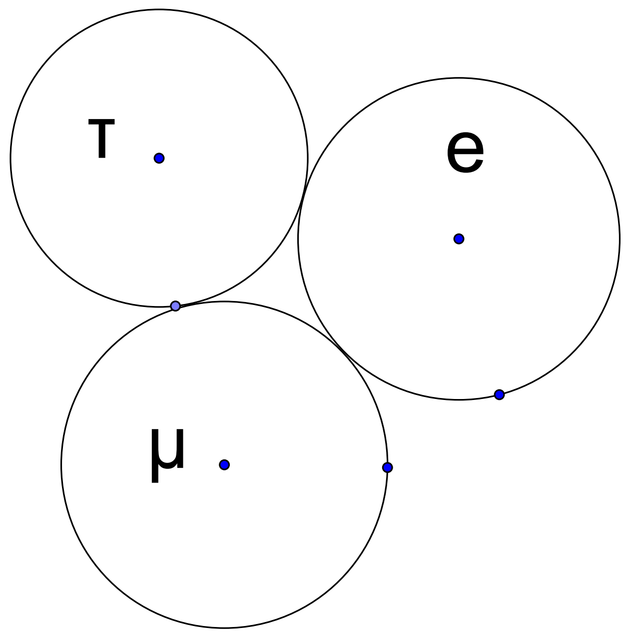


Table IX defines a space of eight dimensions. These eight dimensions are equivalent to all states of simultaneous transformation of the three leptons; tau, muon and electron. In each of the transformations involved one particle antiparticle pair of one of the leptons and another lepton. This setting corresponds to three strings compacted in circles; isomorphic to three dimensions. And all continuous and simultaneous modes of vibration of these three strings; are those that generate the eight dimensions. Thus; the ratio of the sum of mass and the mass difference of the three leptons, relative to the mass of the electron; must be a direct function of minor radius in seven dimensions; elevated to eight potency (the eight states of transformation-interaction) .

But these eight dimensions-states; must include the dimensionless uncertainty in eight dimensions; that is (***"An Infinite-dimensional Heisenberg Uncertainty Principle"***):

$$(\hbar^8)^2 \Big/ \left(\sum_{d=1}^{8} (\triangle x \triangle p)^8\right)^2 \geq \{[(4\cdot(2\pi)^{8-1}]/8^2\} \rightarrow \cdots$$

$$\cdots \rightarrow min\left\{\hbar/(\triangle x \triangle p)\right\}_{8d} = \left(\sqrt{4\cdot(2\pi)^{8-1}]/8^2}\right)^{1/8}$$

The above equation must be corrected to include the electroweak interaction; which, through the exchange of W and Z bosons; the change of the three flavors of leptons (tau, muon and electron) and quarks occurs. This correction term is mass ratio W boson, Z boson mass; or the cosine of the Weinberg angle. So finally we get:

$min\left\{\hbar/(\triangle x\triangle p)\right\}_{8d,\,\theta_W} = \left(\sqrt{4\cdot\cos^2\theta_W\cdot(2\pi)^{8-1}]/8^2}\right)^{1/8}$; $\cos^2\theta_W = (m_W^2/m_Z^2) = 1-(2\varphi^3-8)^2$

Finally the mass ratio tau, less mass muon, less electron mass; relative to the mass of the electron; we have:

(72) $S_-(\tau,\mu,e) = (m_\tau - m_\mu - m_e)/m_e = \left[r_7^8 \Big/ \left(\left(\sqrt{4\cdot\cos^2\theta_W\cdot(2\pi)^{8-1}]/8^2}\right)^{1/8}\right]\cdot \left[1+\left(\sqrt{4\cdot\cos^2\theta_W\cdot(2\pi)^{8-1}]/8^2}\right)^{dim[SU(3)]-dim[SU(2)]/8}\Big/ 240\alpha - 1\right] + \alpha\cdot P(2,l_\gamma)$

Where: $\left[1+\left(\sqrt{4\cdot\cos^2\theta_W\cdot(2\pi)^{8-1}]/8^2}\right)^{5/8}\Big/ 240\alpha - 1\right]$ it is the contribution by the group SU(2) bosons W, Z and photon.

$P(2,R_\gamma) = 2\cdot\sin^2(2\pi/R_\gamma)/R_\gamma$; $R_\gamma = \sqrt{\alpha^{-1}/4\pi}$

Other equations equivalent to equation (72) are:

1. $[r_7^8/2\cdot\sin(2\pi/R_\gamma)] + \ 1/r_7^4\sqrt{(\frac{4\pi}{9})^2-1} = S_-(\tau,\mu,e) = (m_\tau - m_\mu - m_e)/m_e$

2. $[7\cdot r_7^8/(\ln(248)+7)] - \frac{1}{(2+\ln\varphi)\cdot 8} = (m_\tau - m_\mu - m_e)/m_e$; $\frac{1}{(2+\ln\varphi)\cdot 8} \approx \frac{1}{18+\left(\sqrt{4\cdot\cos^2\theta_W\cdot(2\pi)^{8-1}]/8^2}\right)^{1/8}}$

3. $[r_7^8/(2\cdot\ln(m_{PK}/m_e)+\frac{96}{77})^{1/8}] + \frac{1}{r_7^4\cdot\cos^2\theta_{13}} = (m_\tau - m_\mu - m_e)/m_e$; $2\theta_{13} = \arg\cos(\sqrt{r_7/R_\gamma}) =$ neutrino mixing angle

$(96/77) \approx [3+\ln(2\pi e)]^{1/8}$

$r_7^8\cdot\alpha^{1/9} + e^\pi\cdot\ln(\alpha) + P(2,R_7)/8 = (m_\tau - m_\mu - m_e)/m_e$

$(3^8/2) - (4\cdot\ln\varphi)^2\cdot 3 - 1/[240\cdot 4\cdot\ln\varphi] = (m_\tau - m_\mu - m_e)/m_e = S_-(\tau,\mu,e)$

$\varphi = (\sqrt{5}+1)/2$

The ratio of the sum of the masses of the three leptons, relative to the mass of the electron; is given by:

$\{[(4\cdot(2\pi)^{8-1}]/8^2\}/8\cdot\sin^8(\pi^2/2)\ -2-\ 1/\pi = (m_\tau+m_\mu+m_e)/m_e$

$r_7^8(1-\frac{m_W^2}{m_Z^2})\sqrt{8}-\frac{\pi^2}{8\cdot r_7^4} = r_7^8\cdot\sin^2\theta_W\cdot\sqrt{8}-\frac{\pi^2}{8\cdot r_7^4} = (m_\tau+m_\mu+m_e)/m_e$; $(8\cdot r_7^4 = 611.5970157) \approx (m_{Pk}/m_{GUT})$ (73)

Ratio tau mass/muon mass: $(m_\tau/m_\mu) = 8\cdot 2+(\cos\theta_W/\ln 8 - 1) + 2/(mq_u+mq_c+mq_t+mq_d+mq_s+mq_b/m_e) = 16.81665554$

Important empirical relationships must be investigated:

$min\left\{\hbar/(\triangle x\triangle p)\right\}_{8d,\,\theta_W} = \left(\sqrt{4\cdot\cos^2\theta_W\cdot(2\pi)^{8-1}]/8^2}\right)^{1/8} = 1.84969689944125 \approx \alpha^{-1/8} = (0.00729735256454443)^{-1/8} = 1.84971293610021$

$[R_7^8/\sin(2\pi/(3+8))]^{1/8} \approx R_\gamma = \sqrt{\alpha^{-1}/4\pi}$

9.2.4 The Masses $\triangle m_{21}$, $\triangle m_{32}$ Of The Oscillations Of Neutrinos. The Double Matrix In Eight Dimensions.

Following exactly the same mechanism of the matrix in eight dimensions of the three leptons; We can theorize a double matrix eight dimensions; in which interact, simultaneously, the matrix of the three electrically charged leptons (tau, muon and electron) and the matrix of the three neutrinos. So that the masses of the oscillation values for solar neutrinos and atmospheric neutrinos; should be a function of the product of compactification in eight dimensions; on the one hand; the smallest radius in seven dimensions and the largest radius in seven dimensions. And the second oscillating mass should be a function of the smaller radius in seven dimensions and radius corresponding to the fine structure constant (zero momentum). That is:

$\triangle m_{21}^2 \equiv \triangle m_{sol}^2 = 7.59\,^{+0.20}_{-0.21}\times 10^{-5}\,eV^2$; $\triangle m_{21} = m_e/(r_7^8\cdot l_\gamma^8\cdot\cos\theta_{s=1}) = 510998.928\,eV/(r_7^8\cdot l_\gamma^8\cos\theta_{s=1}) = \cdots$

$\cdots = 510998.928\,eV/(r_7^8\cdot l_\gamma^8\cdot\cos(2\pi/8)) = 8.74349406\times 10^{-3}\,eV \rightarrow \triangle m_{21}^2 = 7.644868838\times 10^{-5}\,eV^2$ (74)

$|\triangle m_{32}^2| \equiv \triangle m_{atm}^2 = 2.43\,^{+0.13}_{-0.13}\times 10^{-3}\,eV^2$

$\triangle m_{32} = m_e/(r_7^8\cdot R_7^8\cdot\sin^2_{eff}\theta_W) = 510998.928eV/(r_7^8\cdot R_7^8\cdot 0.2315648207) = 0.049386625\,eV \rightarrow \cdots$

$\cdots |\triangle m_{32}^2| = (0.049386625\ eV)^2 = 2.439038729 \times 10^{-3}\ eV^2$

Equivalences based on r_7

1. $(m_e/r_7^8 \cdot r_7^8)^2 \Big/ \alpha \cdot 4\pi = 2.440404517 \times 10^{-3}\ eV^2 \approx |\triangle m_{32}^2|$

2. $(m_e/r_7^8 \cdot r_7^8)^2 \cdot \tan 2\theta_{13} = 7.647609592 \times 10^{-5}\ eV^2 \approx \triangle m_{21}^2$; $\tan 2\theta_{13} = \tan(\arg\cos(\sqrt{r_7/R_\gamma}))$

9.2.4.0.1 Neutrino Mass Derived From The Symmetry Breaking Lattice R8 (240) The equation that allowed us to obtain the baryon density; by breaking the symmetry of the lattice dimension R8, group E8 (240); also allow us to obtain a very accurate at least estimate, the average mass of the neutrino.This equation, remember, is:

$(2 \cdot \ln(m_{PK}/m_e) + \alpha^{-1} - 240)/2 = \Omega_b$

The above equation expresses mathematical asymmetry between pairs of photons (fine structure constant to zero momentum) and electron-positron pairs in the vacuum (virtual particles). Thus; representing the inverse of the fine structure constant for zero momentum, photons; We can replace these photons by a neutrino and an antineutrino pair; which is consistent with the existing physical phenomenology; that is:

$2 \cdot \ln(m_{PK}/m_e) \equiv e + \overline{e}$; $\alpha^{-1} \equiv \gamma \equiv \nu_x + \overline{\nu}_y$; $y, x = 1, 2, 3$; $\alpha^{-1} \equiv \gamma \equiv \nu_x + \overline{\nu}_y \rightarrow min[\ln(\bar{m}_\nu/m_{PK})] = \alpha^{-1}/2$

$min(\bar{m}_\nu) = m_{PK} \cdot e^{-(\alpha^{-1}/2)} = 3.808367273 \cdot 10^{-38}\ kg \rightarrow min(\bar{m}_\nu) = 2.136337457 \times 10^{-2}\ eV$

$min(\sum_\nu m_v) = 3 \cdot 2.136337457 \times 10^{-2}\ eV = 0.0640901237\ eV$ (75)

9.2.5 The Exact Symmetry Between The Masses Of Quarks, And The Three Electrically Charged Leptons (Tau, Muon And Electron), With The Double Matrix In Eight Dimensions.

This symmetry is obtained by change in flavor between the three quarks; up, charm, top, in the quarks, down, strange and bottom. And conversely.

The set of quarks; up, charm and top; whose sum of electric charges is 2; and equal to the sum of electric charges of muon and tau; can be considered as three quarks with different color charge. This implies that the sum of its mass-states is color neutral; or no color charge.

Just as in the case studied; of the three leptons with electric charge; and considering the eight strings; these first three quarks (u, c, t) also obey the matrix eight dimensions. The second group of quarks (d, s, b) also obey the matrix of the eight quantum strings. In the latter case; the sum of the electric charges is equal to the electric charge of one of three electrically charged leptons (e, tau and muon).Also this second group of three quarks take three different charge states color; thus again, the sum of its states masses is a neutral unified state, no color charge. Being as quarks, leptons, different vibrational quantum states of the eight strings (which are generated by the three fundamental strings); then the continuous interaction function must meet to mass ratio of quarks (u, c, t) / (d, s, b) = 2 (tau / muon); that is:

$(mq_u + mq_c + mq_t)/(mq_d + mq_s + mq_b) = 2(m_\tau/m_\mu)$ (76) The factor of two is because the ratio of the sum of the electric charges of the quarks group (u, c, t) / (d, s, t) = 2 Still two; the sum of electric charges muon and tau lepton.

$(mq_u + mq_c + mq_t) \to 8$ *interaction states* ; $(mq_d + mq_s + mq_b) \to$ 8 *interaction states* ;

$(mq_u + mq_c + mq_t)/(mq_d + mq_s + mq_b) \to (8+8)2 \approx 2(m_\tau/m_\mu)$

$(0.0216GeV + 1.275GeV + 172.3GeV)/(0.048GeV + 0.935GeV + 4.18GeV) = (173.5966\,GeV)/(5.163\,GeV) = 33.62320356$

$(173.5966\,GeV)/(5.163\,GeV) = 33.62320356 \approx 2(m_\tau/m_\mu) = \cdots\cdots$

$\ldots 2(1.776820438\,GeV/0.1056583714\,GeV) = 33.63331112$

The mass ratio of the first group of three quark (u, c, t), electron mass; meet compactification in eight dimensions smaller radius in seven dimensions. The correction term is due to the electroweak angle (exchange bosons W, Z) and the main Cabibbo angle.For the second group of quarks, the equation; is derived directly from equation (76)

$(r_7^8 \cdot \cos^2\theta_W/\sin\theta_c)(m_\tau/m_\mu)(1+\frac{1}{(m_\tau/m_\mu)^2}) = (mq_u + mq_c + mq_t)/m_e$ (77); $\cos^2\theta_W = \frac{m_W^2}{m2_Z}$; $\theta_c = 13.04^{\text{o}}$

$(r_7^8 \cdot \cos^2\theta_W/\sin\theta_c)(m_\tau/m_\mu)(1+\frac{1}{(m_\tau/m_\mu)^2}) = 338501.9267 \approx (mq_u + mq_c + mq_t)/m_e = (0.0216 + 1.275 + 172.3)GeV/5.10998298 \cdot 10^{-4}\,GeV =$

$(0.0216 + 1.275 + 172.3)GeV/5.10998298 \cdot 10^{-4}\,GeV = 339720.0865$

$(r_7^8 \cdot \cos^2\theta_W/\sin\theta_c) \cdot \frac{1}{2} = (mq_d + mq_s + mq_b)/m_e$; $(r_7^8 \cdot \cos^2\theta_W/\sin\theta_c) \cdot \frac{1}{2} = 10064.48417 \approx (0.048 + 0.935 + 4.18)GeV/5.10998298 \cdot 10^{-4}\,GeV$

$(0.048 + 0.935 + 4.18) GeV / 5.10998298 \cdot 10^{-4}\, GeV = 10103.75185$

Ratio tau mass/muon mass: $(m_\tau / m_\mu) = 8 \cdot 2 + (\cos\theta_W / \ln 8 - 1) + 2/(mq_u + mq_c + mq_t + mq_d + mq_s + mq_b/m_e) = 16.81665554$

9.2.5.0.2 Ratios Mass Quark Pairs With Change Of Flavor And Colour. Pairs of quarks changing flavor by exchanging a W boson;

at the same time when a quark emits or absorbs a gluon, that quark's color must change in order to conserve color charge by gluons. For example, suppose a red quark changes into a blue quark and emits a red/antiblue gluon. The net color is still red. This is because - after the emission of the gluon - the blue color of the quark cancels with the antiblue color of the gluon. The remaining color then is the red color of the gluon. This function color change and flavor again have eight dimensions. Group them in pairs, the quarks of the first two groups ((u, c, t), (d, s, b)); so; pairs that are staggered low to high mass, ie:

(u, d) ; (c, s) ; (t, b) ; $f(u, d) = (mq_u + mq_d)/m_e$; $f(c, s) = (mq_c + mq_s)/m_e$; $f(t, b) = (mq_t + mq_b)/m_e$

The above three functions of the ratios of quark pairs, relative to the mass of the electron; to be a function of flavor change and color; these ratios necessarily have to be a function of a quantum string in eight dimensions, at the same time a function dependent on the mass of the boson W. Since the W boson also interacts with the electromagnetic field; then the dimensionless length quantum string is that derived from the fine structure constant. We have the following semi-empirical equations with these requirements:

- $(mq_u + mq_d)/m_e = P^{-8}(2, R_\gamma) = [\frac{2}{R_\gamma}\sin^2(2\pi/R_\gamma)]^{-8}$; $P^{-8}(2, R_\gamma) = 135.582969431528 \rightarrow 135.582969431528 \cdot 5.10998298 \cdot 10^{-4}\ GeV = 6.9282 \cdot 10^{-2}\, GeV$
- $mq_u + mq_d = 6.9282 \cdot 10^{-2}\, GeV \approx (0.0216 + 0.048)\, GeV = 0.0696\, GeV$
- $(mq_u + mq_d)/m_e = (m_W/m_e) \cdot \alpha_{em}(M_Z) \cdot \alpha_s(M_Z) \cdot \sin(2\pi/R_8)$; $R^{8+2} = [2(2\pi)^8]/(\pi^{8/2}/\Gamma(8/2))$
- $\sqrt[10]{[2(2\pi)^8]/(\pi^{8/2}/\Gamma(8/2))} = \sqrt[10]{[2(2\pi)^8]/(\pi^{8/2}/(\pi^4/3))} = 3.29229748809338$
- $m_W = 80.38421\, GeV$; $\alpha_{em}(M_Z) \cdot \alpha_s(M_Z) \cdot \sin(2\pi/R_8) = (128.962)^{-1} \cdot (0.1184) \cdot 0.943534522755962 = 8.66258956082458 \cdot 10^{-4}$

- $(m_W/m_e) \cdot \alpha_{em}(M_Z) \cdot \alpha_s(M_Z) \cdot \sin(2\pi/R_8) = [(80.38421/5.10998928 \cdot 10^{-4}) \cdot 8.66258956082458 \cdot 10^{-4}] \cdot m_e = 0.06963354\,GeV = mq_u + mq_d$

- $(mq_c + mq_s)/m_e = (P^{-1}(2, R_\gamma)+1)^8 = (2.8472498614477)^8 = 4319.21322186945; (mq_c + mq_s) = m_e \cdot 4319.21322186945$

- $(mq_c + mq_s) = 5.10998928 \cdot 10^{-4} GeV \cdot 4319.21322186945 = 2.2070876 GeV \approx 0.935\,GeV + 1.275\,GeV$

- Weak mixing angle ($\hat{\theta}(M_Z)(\overline{MS})$) $(mq_c + mq_s)/m_e = (m_W/m_e) \cdot \alpha_s(M_Z) \cdot \sin^2 \hat{\theta}(M_Z)(\overline{MS}) = (m_W/m_e) \cdot 0.1184 \cdot 0.23126$

- $(mq_c + mq_s) = m_W \cdot 0.1184 \cdot 0.23126 = 80.38421\,GeV \cdot 0.1184 \cdot 0.23126 = 2.2010148\,GeV \approx 0.935\,GeV + 1.275\,GeV$

- $(mq_t + mq_b)/m_e = (P^{-1}(2, R_\gamma)+2)^8/[4 \cdot P^2(2, R_\gamma) \cdot \alpha_s(M_Z)] = (47995.7896677647/0.1184 \cdot 1.17221886400971) = 345814.12875435$

- $(mq_t + mq_b) = m_e \cdot 345814.12875435 = 5.10998928 \cdot 10^{-4} GeV \cdot 345814.12875435 = 176.710431217\,GeV \approx 172.3\,GeV + 4.18\,GeV$

- $(mq_t + mq_b)/m_e = (m_W + m_Z)/\sqrt{\sin(2\pi/R_\gamma)} \cdot m_e$; $(mq_t + mq_b) = (80.38421\,GeV + 91.1876\,GeV)/\sqrt{0.945278306} = 176.454095\,GeV$

- $176.454095\,GeV \approx 172.3\,GeV + 4.18\,GeV$

9.2.5.0.3 The Glueballs: The Value Of The Vacuum Higss Multiplied By The Probability of a Quantum String in Eight Dimensions. *9.2.5.0.2*

In the previous paragraph it has been theoretically and accurately calculate the experimental values of the sums of pairs of quarks masses. This calculation is based on a probability of a quantum string in eight dimensions, which changes the flavor and color of the quarks. As we mentioned: *"Pairs of quarks changing flavor by exchanging a W boson; at the same time when a quark emits or absorbs a gluon, that quark's color must change in order to conserve color charge by gluons."*

Since; with the change in flavor between two quark, remains invariant color charge we theorize that this probability; a quantum string in eight dimensions (eight gluons); is actually the value of the ratio of the Higgs vacuum, with the lowest possible energy state of a glueball. That is:

$g_b(0) \approx VH \cdot P^8(2, R_\gamma) = 246.2196509\, GeV \cdot 0.00737555759541773 = 1.8160072163366\, GeV$ (78)

The outcome of equation (78) is in perfect agreement with the calculations made by the QCD theory, based on lattices. For the value of the a glueball on the basic state possible, gives a value of: $1.73 GeV$ ***The glueball spectrum from an anisotropic lattice study***

If the value of the fine structure constant (zero momentum), as the probability is taken in eight dimensions; a more refined result is obtained, given by:

$g_b(0) = \alpha{\cdot}VH = [(246.2196509 GeV)/137.035999173]{\cdot}(r_7/R_7) = 1.73743461 GeV$ (78b)

$g_b(0) = VH \cdot P^8(2, R_\gamma) \cdot \sin\theta_c/2 \cdot \alpha_s(M_z) = 1.730354\, GeV$ (78c)

Strong coupling Z boson energy scale: $\alpha_s(Mz) = 8{\cdot}2{\cdot}P^8(2, R_\gamma)(1 + P^8(2, r_7)) = 0.1183954689$

9.2.6 The Strings Compactification In Eleven Dimensions. Higss Vacuum Value. Sum Quark Masses. Masses Bosons: W, Z, and h

As already mentioned, the extra dimensions are actually the result of simultaneous and different modes of variations with repetition of two strings. This function is equivalent to SU(3); with dimension-eight. Similarly, there is an equivalence between these eight dimensions, the octonions and a computation with three qubits (the three circles tangent-string). The eleven dimensions are generated by the sum of the group SU(3) + group SU(2) (bosons W, Z, and photon).

At the same time; the product group SU(3), SU(2) and U(1), form the unification group SU(5). Being 3, 2 and 1; dimensions whose product generates the permutations of three dimensions and the basic set of six strings; which generate by the strong holographic principle, Kissing numbers for different lattices from two dimensions (except the fifth dimension), up to eight dimensions.

Thus; for the sums of the masses of all quarks, which change flavor by W bosons, Z, the group SU(2) (in three dimension); must be dimensionless functions compactification in eleven dimensions; ie dimensionless lengths, raised to the power eleven. Including the value of the vacuum Higss, bosons W, Z, and the boson h. The compactification is defined as the ratio of the sum of masses respect always; the mass of the electron.

But for the existence of these eleven dimensions; allowing the calculation of the value of vacuum Higss; necessarily time becomes another dimension of space genre. This means that the last level of the quantized scale space, time ceases to exist for a vacuum, without real matter; but consisting of virtual particles whose velocity is greater than that of light. Moreover: the speed can be infinite. This aspect will be developed later.If indeed, time becomes space-like dimension eleven; then; the uncertainty of the entropy of the momentum disappears; leaving only the uncertainty of the entropy of space or position. This entropy should make a contribution to the compactification in eleven dimensions that allow us to calculate the value of the vacuum Higss. The conversion of eight dimension; timelike, spacelike in dimension; make a contribution of negative entropy to total entropy; in the form of the logarithm of the dimensionless dimension eight dimensions. Finally, to minimize the value of the vacuum of Higgs, the minor radius is used in eleven dimensions. Given the compactification in eleven dimensions and total entropy; only type space, we have the following equation for the value of the vacuum Higgs:

$(2d)^{3d} = 8d \equiv SU(3)\ ;\ SU(3) + SU(2)\ (W, Z, \gamma) = 11d$

$r_{11} = \sqrt[12]{4 \cdot (2\pi)^{11}/(12 \cdot 2\pi^{11/2})/\Gamma(11/2)} = \sqrt[12]{4 \cdot (2\pi)^{11}/12 \cdot (64\pi^5/945)} = 3.82117253323579$

$\triangle_{11d} = \sqrt{4 \cdot (2\pi)^{10}/11^2}; R_8 = \sqrt[10]{2 \cdot (2\pi)^8/(2\pi^{8/2})/\Gamma(8/2)} = 3.29229748809338$

Entropic *uncertainty:* $H_x + H_p = \ln\pi + 1 = (\ln(\sqrt{2\pi}) + \frac{1}{2}) + (\ln(\sqrt{\pi/2}) + \frac{1}{2})\ ;\ t = 0 \rightarrow H_p = 0+$

$H_T = H_x - \ln(R_8) = (\ln(\sqrt{2\pi}) + \frac{1}{2}) - \ln(R_8)$

$r_{11}^{11} \cdot H_T = r_{11}^{11} \cdot [(\ln(\sqrt{2\pi}) + \frac{1}{2}) - \ln(R_8)]\ ;\ \{r_{11}^{11} \cdot [(\ln(\sqrt{2\pi}) + \frac{1}{2}) - \ln(R_8)]\}/\sqrt[4]{2}(1 + \frac{1}{11^2 \cdot \sqrt{\sin^8(2\pi/11) \cdot 240}}) = VH/m_e$ (79)

$\{r_{11}^{11} \cdot [(\ln(\sqrt{2\pi}) + \frac{1}{2}) - \ln(R_8)]\}/\sqrt[4]{2}(1 + \frac{1}{11^2 \cdot \sqrt{\sin^8(2\pi/11) \cdot 240}}) = 481839.861790542 \rightarrow VH = 246.2196526\, GeV$

Equivalence of equation (79), extremely interesting: $\sum_s \arcsin(\cos\theta_s)_{radians} = \cdots$

$\cdots 3.242271614 \approx 2^5/\pi^2 = 3.242277877 = 2^4 \cdot r(T/S)_B \quad \cos\theta_s = s/\sqrt{s(s+1)}$

$\sum_{d=1}^{8} k(d) = 2+6+12+24+40+72+126+240 = 522$; $k(d) =$ Kissing number lattice d dimensions ***(Kissing Number)***

$VH/m_e \; = \Big[\{2 \cdot (\sum_{d=1}^{8} k(d))/(\sum_{s} \arcsin(\cos\theta_s)_{radians})\} \cdot \triangle_{11d}/\sqrt[4]{2}\Big] \Big/ (1 + \frac{\alpha}{4\pi \cdot \sin\theta_c})$; $\theta_c = 13.04^{o}$ Main Cabibbo angle.

$\triangle_{11d} = \sqrt{4 \cdot (2\pi)^{10}/11^2}$; $2 \cdot (\sum_{d=1}^{8} k(d))/(\sum_{s} \arcsin(\cos\theta_s)_{radians}) \approx \varphi^{12}$; $\varphi = (1+\sqrt{5})/2$

Main Cabibbo Angle and Extra Dimensions.

Fact. $(1-\sqrt{1-r_7/R_\gamma})/3 = (1-\sqrt{1-2.95694905822489/3.3022686633525})/3 = 0.225542169391119$ $\arcsin(0.225542169391119) = 13.03476171^{o}$

$13.03476171^{o} \approx \theta_c = 13.04^{o}$

Masses W Boson and Z Boson. $(m_W+m_Z)/m_e = R_\gamma^{11}/(1+\sin^2_{eff}\theta_W)^2 (80)$; $\sin^2_{eff}\theta_W = 0.23155 \approx (\ln\varphi)^2 = 0.2315648207 \approx \tan\theta_c = \tan 13.04^{o} = 0.231603652$

$(80.38421\ GeV + 91.1876\ GeV/5.10998298 \cdot 10^{-4}\ GeV = 335758.085 = (3.302268663525)^{11}/(1+0.23155)^2 = 335762.6156$

$(3.302268663525)^{11}/(1+0.2315648207)^2 = 335754.5343$

$[R_\gamma^{11}/(1+(\ln\varphi)^2)^2]/(1+\cos\theta_W) = m_Z/m_e$ (81); $\cos\theta_W = \sqrt{1-(2\varphi^3-8)^2}$

$[R_\gamma^{11}/(1+(\ln\varphi)^2)^2]/(1+\cos\theta_W) = [(3.302268663525)^{11}/(1+0.2315648207)^2]/(1+\sqrt{1-(2\varphi^3-8)^2}) = 178448.0149 \rightarrow m_Z = 91.186744\ GeV$

Sum Quarks Mass. $\sum_{q=1}^{6} m_q/m_e = R_7^{11}/\cos^2\theta_W(GUT) = 218603.72695809/(5/8) = \cdots$

$\cdots 349765.963132944$ (82)

$349765.963132944 \cdot 5.10998298 \cdot 10^{-4} GeV = 178.72981185 GeV \approx (172.3 GeV + 4.18\ GeV + 1.275\ GeV + 0.935\ GeV + 0.0216\ GeV + 0.048\ GeV)$
$= 178.7596\ GeV$

h Boson Mass. $R_7^{11}/\sin(2\pi/R_7) = 218603.72695809/0.885167852479958 = 246963.021019835$ (83)

$246963.021019835 \cdot 5.10998298 \cdot 10^{-4}\, GeV = 126.1976834\, GeV$

9.3 The Fractal Character of Space-Time-Energy.

Net zero energy; due to the unification of electromagnetism and gravity is equivalent to an infinite speed to make zero a finite amount of energy; that is:

$4\pi^4 \cdot (\pm e)^2 \cdot [\sum_n^{\infty} \exp(-t_n)]^2 - 4 \cdot m_{Pk} \cdot m_e \cdot G_N = 0$; $mc^2/\sqrt{(\frac{v}{c})^2 - 1} = 0$; $v = \infty$

For there to be an infinite or instantaneous velocity; need an infinite length with a finite frequency. The two simplest possibilities for the existence of an infinite length in a finite surface area, are two: a) An ideal hyperbolic triangle. In this case the length of the perimeter of the ideal triangle is infinite and its area is π . b) A factral. A factral has infinite length in a finite area.

We will show that there are strong indications that there is a factral dimension derived from the five solutions of the equation of energy-momentum.

With the five solutions of the equation of energy-momentum, a net total energy had: $E_T^2 = E_1^2 + E_2^2 + E_3^2 + E_4^2 - (-E_5^2) = 5E^2$

And for a real particle:

$E = \sqrt{E_1^2 + E_2^2 + E_3^2 + E_4^2}/\sqrt{(E_1^2 + E_2^2 + E_3^2 + E_4^2 + |-E_5^2|/E^2) - 1} = 2E/2 = E$

$|-E_5^2| = -i(imc^2 + pc)(mc^2 + ipc$; $1/\sqrt{\tanh^{-2}(q) - 1} = 1/\sqrt{5-1}$; $\tanh^{-1}(q) = \sqrt{5} \to \arg\tanh(1/\sqrt{5}) = q = \ln[(\sqrt{5}+1)/2] = \ln\varphi$

The above result, is equivalent to the following equation:

$E\varphi^3 - \sqrt{E_1^2 + E_2^2 + E_3^2 + E_4^2} = E\varphi^3 - 2E = E\sqrt{5} \to E = (E\varphi^3 - E\sqrt{5})/2$; $\phi^3 = [(1+\sqrt{5})/2]^3$

The mix of energy states:

$\sqrt{E_1^2 + E_2^2 + E_3^2 + E_4^2 - (-E_5^2)} + \sqrt{E_1^2 + E_2^2 + E_3^2 + E_4^2} = E\varphi^3$

The fractal dimension of space-time-energy is obtained from the four solutions of positive energy; considering that each state is itself divisible by four other states; and so on. In this way the fractal dimension is given by:

$$4+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{\ddots}}}=[4;\overline{4}]=\varphi^{3}\ (84)$$

9.3.0.1 Nonlocality. Infinite Speed Equivalent to Zero Speed. Fractal Length.

As mentioned at the beginning of this section; infinite speeds is possible with a constant frequency. This is the frequency that corresponds to the vacuum.Similarly, the existence of a fractal length allows to obtain immediately the infinite speed; that is required to meet zero net energy unification of the electromagnetic and the gravitational field.

$L\ fractal = L_{fc} = \infty\ ;\ L_{fc} = l_0\cdot\sqrt{(v=\infty)^2/c^2\ -1} \equiv il_0\cdot\sqrt{1-\frac{(v=\infty)^2}{c^2}}\ ; L_{fc}\cdot f_K = v = \infty$

$E = E_0/\sqrt{(v=\infty)^2/c^2\ -1} = 0 = 4\pi^4\cdot(\pm e)^2\cdot[\sum_{n}^{\infty}\exp(-t_n)]^2 - 4\cdot m_{Pk}\cdot m_e\cdot G_N = 0$

$t = t_0/\sqrt{(v=\infty)^2/c^2\ -1} = 0$

As you can see, from the last equation on the dilation of time (when the speed is infinite); time is cancelled (zero value) and becomes a spatial dimension. This conversion of time genre to genre space is obtained by the inverse of t ($1/t\ = \infty$).

This change of time in space, in a fractal (infinite) length, is necessary to maintain the consistency of the uncertainty principle. That is:

$1/t = L_{fc} = \infty\ ;\ \hbar/L_{fc} = p = 0\ ;\ \hbar/\triangle t = \triangle E = 0\ ;\ \triangle t = \infty$

That time it acquires both values is not a paradox. The explanation lies in relativity. An ideal observer (a supposed hypothetical observer who could observe directly scales the Planck length) at rest; would deduct, having no energy exchange; between two coordinates of space there is no change neither movement. From the point of view of this ideal observer time acquires an infinite value; as though it were an infinite time watching two pairs of coordinates (eg rectilinear) could not distinguish between a state of instant movement (infinite speed) and a state of absolute rest; without any exchange

of energy, which has a zero value. The opposite happens within quantum wormholes; in which there is a movement with infinite speed; through infinite length ideal triangles formed by the faces of the two ideal rotating tetrahedra which form the quantum wormhole. In this framework, time is zero.

Since infinite speed with no exchange of energy (zero energy); an observer will not be able to say whether between two space coordinates movement there. Only in entangled quantum systems, and when the observer perform a measurement, you might find that the speed is infinite. Therefore, and as shown by the equation speeds addition to the resultant two infinite speeds velocity is zero. And this proves the equivalence between infinite speed and zero speed (no energy exchange), to an observer, while not perform any measurement in a system of two quantum entangled particles.

$$v_f = \lim_{v_1, v_2 \to \infty} (v_1 + v_2/[1 + \frac{v_1 \cdot v_2}{c^2}]) = 0\ ;\ v_2 = v_1 = \infty$$

9.3.0.1.1 The real existence of infinite speed. Zero energy. Radius quantum string as inscribed circle in an ideal triangle with infinite length.

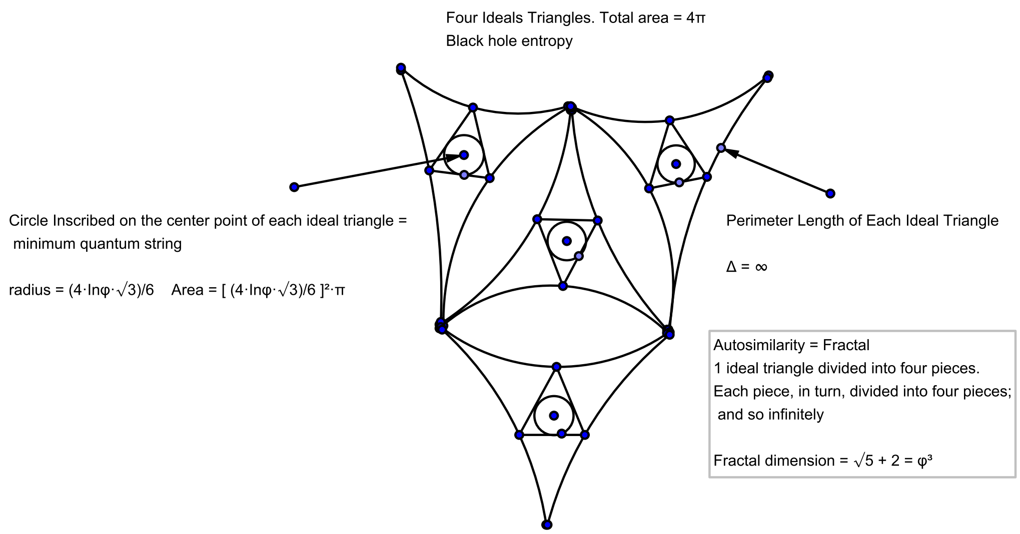

Four Ideals Triangles. Total area = 4π
Black hole entropy
Circle Inscribed on the center point of each ideal triangle =
minimum quantum string
radius = (4·lnφ·√3)/6   Area = [(4·lnφ·√3)/6]²·π
Perimeter Length of Each Ideal Triangle
Δ = ∞
Autosimilarity = Fractal
1 ideal triangle divided into four pieces.
Each piece, in turn, divided into four pieces;
and so infinitely
Fractal dimension = √5 + 2 = φ³

Figure A

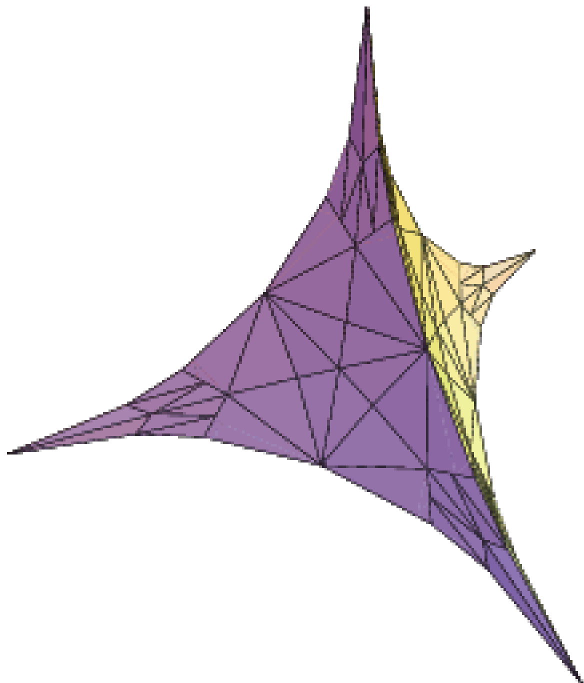


Figure B

Ideals triangles with inscribed circles.

An ideal triangle is a geometric figure of a hyperbolic geometry in the Poincare's disk model.The total length of this triangle is infinite, and its area is finite and equal to π .Infinite speed is immediately obtained by the product of this infinite length by the constant frequency of vacuum.

Both, by the uncertainty principle; as the decrease of energy by the version of special relativity to the surface outside the light cone; energy must be zero, that is:

$L_{I\triangle} = \infty$; $\hbar / L_{I\triangle} = p = 0 \rightarrow E = 0$; $L_{I\triangle} \cdot f_{Kv} = v = \infty$; $mc^2 / \sqrt{(\frac{v}{c})^2 - 1} = 0$

The figure (figure A) above; as you can see, it is the hologram on the plane of the ideal tetrahedron (Figure B).

Note in the figure A, each inscribed circle is at the center point of the ideal triangle; within the equilateral triangle; which touches the midpoints of each side of the ideal triangle.The four ideal triangles, the figure above, have in total an area of $\pi + \pi + \pi + \pi = 4\pi$.And this is exactly the area that corresponds to the entropy of a black hole; where it is assumed; that time is dilated with an infinite

value; ie: time is canceled. Following the theory of quantum strings as circles; we can make the assumption that if this really infinite speed corresponds to a reality independent of the observer (which allows us to obtain a value of zero energy); then we can propose that the inscribed circle, its radius, within the ideal triangle; would allow to obtain the value of the Higgs vacuum, as a compactification in eleven dimensions; since time is canceled and becomes a purely spatial dimension. Since, as we have proved in section 9.2.6; the value of the vacuum Higss is a function of a compactification in eleven dimensions.

Black hole entropy: $S_{BH} = \frac{A}{4 \cdot l_{PK}^2} = \frac{c^3 A}{4 G_N \hbar}$; $A = 16\pi(G_N m/c^2)^2$; $(\pi + \pi + \pi + \pi)/16\pi = 1/4$

Higgs vacuum: function in eleven dimensions, derived from quantum string radius centered at the midpoint of the four ideal triangles. Radius of the circle inscribed in an equilateral triangle that touches the three middle points of a Ideal triangle. ($r_{\bigcirc I}$)

1. $r_{\bigcirc I} = (4 \cdot \ln \varphi)\sqrt{3}/6$; $[(2\pi \cdot r_{OI})^{11}/(4\pi/9)^2]/(1+\frac{1}{(r_7^2/3)^{11}}) = VH/m_e = 481839.861147263 \rightarrow VH = 246.2196523 GeV (85)$ $(4\pi/9) = Volume(3d)/3$

2. $(4\pi/9) \equiv (\,Area\; four\; ideal\; trinagles\,)/3 \times 3\; Matrix$

3. **The lack of entropy of position uncertainty**. $p = mv = 0$; $[(\pi - \ln\sqrt{2\pi})\pi/2]^{11} \cdot P(2, R_7)(1 + \frac{\alpha}{20(2\varphi^3 - 8)}) = VH/m_e$; $(\pi - \ln\sqrt{2\pi}) = \pi + H_x + H_p - H_p - \frac{1}{2}$

4. $(2\varphi^3 - 8) = \sin\theta_W$; $P(2, R_7) = m_h/VH = [2 \cdot \sin^2(2\pi/R_7)]/R_7$

5. $(4\pi/9)/(2\pi \sin\theta_{dTh})^2 = 1/(8\pi) = \alpha_G$ **coupling unification planck scale** $\theta_{dTh} =$ **Diedral angle Tetrahedron.** $(\sin\theta_{dTh}) \cdot (\sin\theta_{dThI}) = \cos\theta_{s=2}$; $\theta_{dThI} = \frac{2\pi}{6}$ **dihedral angle of an ideal tetrahedron (the three dihedral angles equals). Maximal volume ideal tetrahedron with dihedral angle** $\frac{2\pi}{6}$

6. $\sin\theta_{dThI} = \sqrt{s(s+1)}$; $s = \frac{1}{2}$

7. $[(4 \cdot \pi \cdot r_{\bigcirc I}^2)^{11} \cdot \sin^7(2\pi/r_7)/2]/(1 + \frac{1}{(1+\sin^2(2\pi/R_\gamma))^{11}} = VH/m_e = 481840.911906532 \rightarrow VH = 246.2201892\, GeV$

8. $[(4 \cdot \pi \cdot r^2_{\bigcirc I})^{11}/(5+\cos^{-1}\theta_{s=2})]/(1+\frac{m_e \cdot \sqrt{10}}{m_W}) = 481839.85686755 \to VH = 246.2196501\, GeV$

9. **Area equilateral triangle touching the midpoints of the three sides of the ideal triangle.** $\triangle_{I\triangle ID} = (4 \cdot \ln\varphi)^2\sqrt{3}/4$

10. $[(4 \cdot \pi \cdot r^2_{\bigcirc I})^{10}/\triangle_{I\triangle ID}]/(1+\frac{\sin^2(2\pi/R_7)}{\Delta^2_{8d}}) = VH/m_e$; $\Delta^2_{8d} = [4 \cdot (2\pi)^7]/8^2$

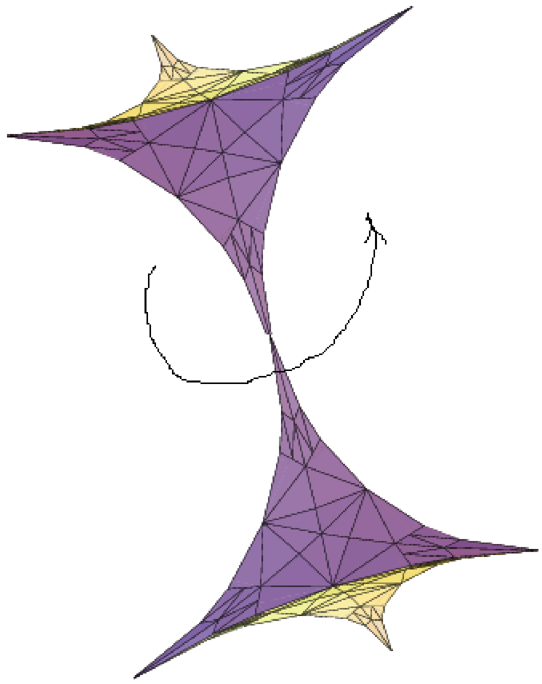
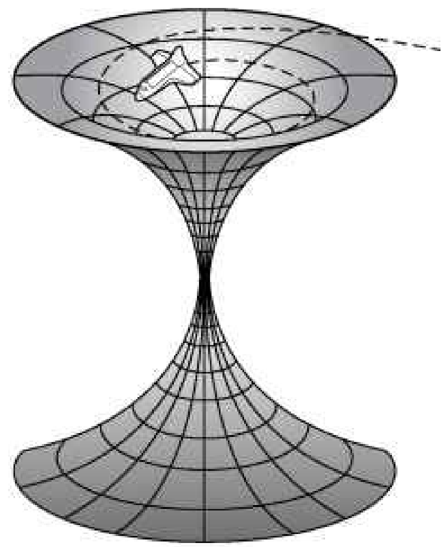
11. **Planck mass ratio, mass GUT scale**

12. $m_{PK}/m_{GUT} = \exp(4 \cdot \triangle_{I\triangle ID}) = 612.355227836166 \to m_{GUT} = 1.99368 \cdot 10^{16}\, GeV$

9.3.0.1.2 Rotating Quantum Wormholes. ***A wormhole is obtained immediately with the union of two ideal hyperbolic tetrahedron. And this operation; produces exactly constant unified coupling Planck scale; which is the inverse of the surface of two tetrahedrons united, one inverted. In the figure below you can see graphically (Figure C). But we need to rotate this configuration; ie: rotating wormhole.***

$\alpha_G = 1/(4\pi + 4\pi) = 1/8\pi$

Figure C

These quantum wormholes, can be interpreted as entangled states (non locality, infinite speed). Going even further; it could be suggested that the configuration of the two ideal tetrahedron rotating; and joined, could be very massive gravitinos. The above suggestion is in perfect agreement with the estimates we have given in equation (41) for the mass of gravitinos. 1.1.4 8.3

Therefore, again gravitino mass is obtained by: $m_{3/2} \approx e^{-8\pi} \cdot m_{PK}$

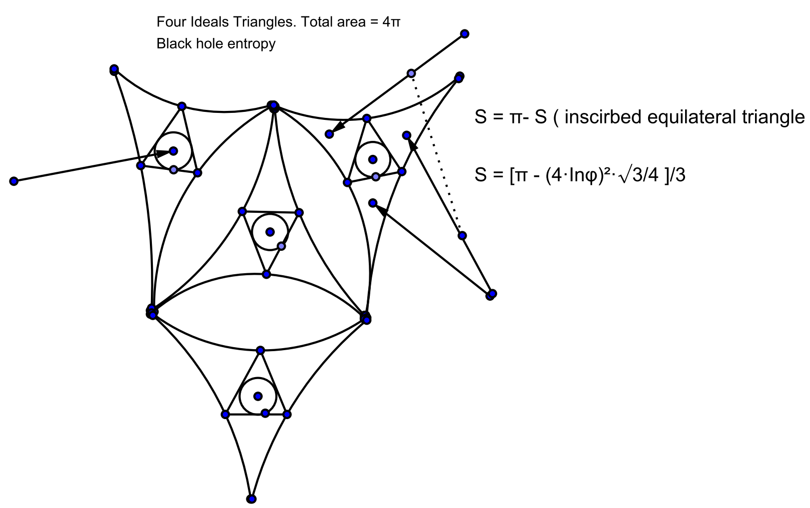
Where the law of logarithmic scale is equivalent to a coordinate in a hyperbolic space, ie: $e^{8\pi} = (\sinh(8\pi) + \cosh(8\pi)) \approx (m_{PK}/m_{3/2})$

An interesting possibility is that the decay of gravitinos; that would be the final destination of the interior of black holes, could be an alternative solution to the paradox of information loss from black holes. By this is meant that the radiation from a black hole would have corrections, you have virtual contributions decay modes of gravitinos that would avoid the emission of pure entangled states.

9.3.0.1.3 Important Characteristics of Quantum Wormholes Generated by Rotating Ideal Tetrahedrons. In this section an out-line of the main features of the geometry of the configuration of the ideal triangles is performed; wherein the equilateral triangle is inscribed touching the three midpoints of the sides of the ideal triangles. Likewise, account shall be taken inscribed circular strings, of these equilateral triangles.

- **Difference equilateral triangle area inscribed in a Ideal triangle and the surface of the Ideal triangle. Higgs boson mass, h**

- $[\pi - (4 \cdot \ln\varphi)^2 \cdot \sqrt{3})/4]/3 = 0.512421505 \approx P(2, R_7) = 0.5124574918 \rightarrow m_h \approx VH \cdot (\pi - (4 \cdot \ln\varphi)^2\ )/3 = 246.2196509\,GeV \cdot 0.512421505 = 126.1682441$



-

- **Uncertainty model string in a box**

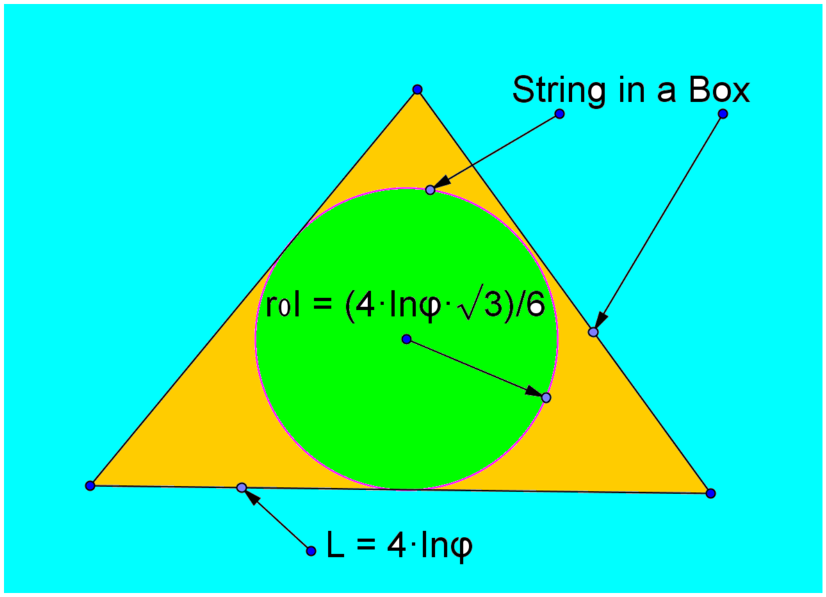
-

- $\triangle x \triangle p/\hbar = \frac{1}{2}\sqrt{\frac{\pi^2}{3} - 2}\ ;\ \frac{1}{2}\sqrt{\frac{\pi^2}{3} - 2} - \left(\pi - 2 - \frac{1}{2}\sqrt{\frac{\pi^2}{3} - 2}\right)\Big/10^3 = 0.5672880777 \approx \pi - (4 \cdot \ln\varphi)^2 \cdot \sqrt{3}\,)/4 - \pi \cdot r^2_{\bigcirc I} = 0.5762880616$

- **Fine structure constant (zero momentum): function area ideal tetrahedron in eleven dimensions.**

- $11 \cdot 4\pi - \sqrt[4]{10/\ln 137} - r_7^2/(4 \cdot 137 \cdot 248) = \alpha^{-1} = 137.035999174397$
- **Max Volume Ideal Tetrahedron**
- $(\sin^{-1}(2\pi/11) - 1\,)^{-1/11} \approx V_{I\,Tetrahedron}$
- **The entropic uncertainty of the position and the radius of the string inscribed in the equilateral triangle.**
- $\pi - [4r_{\bigcirc I} = 4(4 \cdot \ln\varphi \cdot \sqrt{3}/6)] - \sin(2\pi/5)/\pi^9 - \left[\sum_n^{\infty} \exp -(t_n)\right] \Big/ (4 \cdot \ln\varphi \cdot 496)/(2\pi/3) = 0.9198938533204635 = H_x - 1/2 = \ln(\sqrt{2\pi})$
- **Area of the circle inscribed in the equilateral triangle of the ideal triangle. Neutrino oscillation angles θ_{12} , θ_{13}.**
- $\pi r_{\bigcirc I}^2/3 = 0.323325484068957; \pi r_{\bigcirc I}^2/3 \approx \sqrt{1 - (r_7/R_\gamma)} = 0.323373491754321$
- $\arcsin(\pi r_{\bigcirc I}^2/3) = 18.864155^{\circ} \approx 2\theta_{13}$
- $\arcsin(\sqrt{1 - (r_7/R_\gamma)}) = 18.867062565^{\circ} = 2\theta_{13}$
- $\arcsin(\sqrt{\pi r_{\bigcirc I}^2/3}) = 34.65385288^{\circ} = \theta_{12} \approx \arcsin(\sqrt[4]{\sqrt{1 - (r_7/R_\gamma)}}) = 34.6567931^{\circ}$
- **Area of equilateral triangle inscribed in ideal triangle. Neutrino oscillation angle θ_{23}**
- $\arcsin(\sqrt{[(4 \cdot \ln\varphi)^2 \cdot \sqrt{3}/4]/3}) = 46.99413^{\circ} = \theta_{23}$

9.3.0.1.4 The Electron. Mean lifetime infinite. The Vacuum State of Minimum Mass and Electric Charge. Figure D



In this case, for the calculation of the mass of the electron, as Planck mass ratio, electron mass; be used again the minimum length of the string, this time with the radius of the circle inscribed in the equilateral triangle that touches the three middle points of the ideal triangle (to minimize the value of the vacuum). As you can see in Figure D, this configuration is equivalent to the quantum-mechanical model of a string in a box. Since we are assuming that the vacuum is formed by discrete units rotating wormholes, generated by the union of two ideal tetrahedra (rotating); and as demonstrated above, the vacuum Higgs is a compactification of eleven dimensions of the circle with the radius described; then the mass of the electron would be a hyperbolic coordinate of a function of eleven wormholes, and a correction term produced by the dimensionless uncertainty; model of a string in a box.

There are two very compelling reasons; to function Planck-electron mass ratio is a function of a hyperbolic coordinate; or what is the same: the logarithmic scaling law, which we demonstrated in other studies, derived from the uncertainty principle.

a) The equation that unifies electromagnetism and gravitation, which allows us to calculate the exact value of the elementary electric charge as a function of the Planck mass, that of the electron, and the partition function of the non-trivial zeros of the Riemann zeta function . Since this partition function is a sum of exponentials; and as demonstrated, this implies a logarithmic summation by differential equations, then the ratio mentioned necessarily have to be a hyperbolic coordinate.

b) The radius $r_{\bigcirc I}=(4\cdot\ln\varphi)\sqrt{3}/6$ counting the whole wormhole (the two ideal tetrahedra); has the following property:

$\left\{(4{\cdot}2{\cdot}r_{\bigcirc I}{+}1)/[1\ +P(2,R_\gamma)/(m_\tau{+}m_\mu{+}m_e/m_e)]\right\}/[(1\ +P(2,R_\gamma)/(m_\tau - m_\mu-m_e/m_e)^2]=(\frac{4}{3})^2+(\frac{2}{3})^2+(\frac{-1}{3})^2+(\frac{1}{3})^2+3=\frac{7^2}{3^2}$

Number of strings forming wormhole (the two ideal tetrahedra), except for radii, $r_{\bigcirc I}$; and also counting the number of sides of each ideal triangle.

$N(strings)_{Vormhole}=[(3\cdot4)_{Id\triangle}+(3\cdot4)_{Ins\triangle}]2=48\equiv dim[SU(7)]$

This uncertainty has to be one eighth power of the dimensionless uncertainty; since they are eight basic inscribed circles, four for each ideal tetrahedron forming the quantum wormhole.

The dimensionless uncertainty model of a string in a box, is given by:

Ground state n $=1$ $\triangle x\triangle p/\hbar=\frac{1}{2}\sqrt{\frac{n\pi^2}{3}-2}$;Two states virtual pairs. $(2\triangle x\triangle p/\hbar)^8=(\frac{\pi^2}{3}-2)^4$

Finally; counting the two ideal tetrahedra, the eleven dimensions and the value of the dimensionless uncertainty, we have the following equation for the ratio of Planck mass, electron mass:

$\exp(11\cdot2\cdot4\cdot r_{\bigcirc I})\cdot\sqrt{8\pi}\cdot(\frac{\pi^2}{3}-2)^4\Big/\left[1+(\pi r_{\bigcirc I}^2\cdot r_7^8)^{-1}\right]=(m_{PK}/m_e)=2.38912573335925\cdot10^{22}$ (86)

$G_N=6.6748415\cdot10^{-11}N\cdot m^2/K^2g$

Since; due to the infinite length of the ideal triangles that form the wormhole, then speed is infinite (equivalent to zero velocity for an observer at rest relative to the edges of the ideal tetrahedrons). This is the infinite speed annulling the time coordinate; (as we have already proved) taking zero. But for an observer outside the edges of the rotating ideal tetrahedrons; the time it takes an infinite value; that is: the lifetime of the electron is infinite; hence the absolute stability; to also be the state of lowest possible energy of a quantum wormhole with mass and electric charge, as we have shown.

And from the point of view of an observer within the cone of light; that is, an observer with a limited speed of light, the vacuum acquires a non-zero mass.

Thus; the electron mass is a principal point of reference. All calculations of mass ratios, appear to be made with reference to the mass of the electron.

9.3.0.1.5 The Electron: The lowest Energy State of a Wormhole, Equivalent to a Blackhole / Wormhole Kerr-Newman Type.

Brief historical introduction. Will make a short historical review on the electron as a black hole. We will quote directly to the wikipedia encyclopedia.

> **"In physics, there is a speculative notion that if there were a black hole with the same mass and charge as an electron, it would share many of the properties of the electron including the magnetic moment and Compton wavelength. This idea is substantiated within a series of papers published by Albert Einstein between 1927 and 1949. In them, he showed that if elementary particles were treated as singularities in spacetime, it was unnecessary to postulate geodesic motion as part of general relativity.**
> **Quantum mechanics permits superluminal speeds for an object with as small a mass as the electron over distance scales larger than the Schwarzschild radius of the electron."**
> Blackhole electron

Firstly; the fundamental role of lattices will be established, including laminated lattices. As already shown in this work, there is a mathematical fact that led us to establish what we call, strong holographic principle. This principle is based on the mathematical observation that all the kissing numbers of dimensions less than or equal to eight (except the fifth dimension), can be represented in the plane, by the fact that for each dimension (less than or equal to eight), his kissing number is divisible for six, which is the kissing number of dimension two; or the plane. The fact that the ideal triangles, forming wormholes, can be represented in the hyperbolic Poincare disk model (plane), is another added evidence of the strong holographic principle.

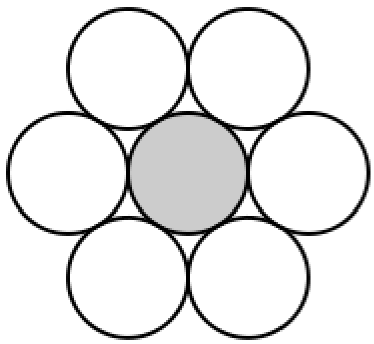
Now we must ask: And the dimensions nine, ten and eleven, which is the appropriate lattice model; and the relationships they have with the other mentioned lattices?

The answer lies in another observation, which once applied to subsequent practical calculations, allows to establish the nature of lattices in nine, ten and eleven dimensions, which are involved in the structure and dynamics of space-time-energy.

Choosing lattices nine, ten and eleven dimensions) is based on the following very singular and extraordinary equations::

- 1) $\sum_{d=2, d\neq 5}^{d=7} k(ld) = k(l8) = 240 = 6 + 12 + 24 + 72 + 126 \equiv lattice\ R8$
- $k(l5)k(l2) = k(l8) = 240$ ($lattice\ R8$)
- $\forall k(ld)$, $d \leq 8,\ d \neq 5;\ \rightarrow k(ld) \equiv 0(mod\, k(l2))$
- 2) $k(l6) + k(l7) + k(l8) = k(\ Lambda11\ max\ ) = 438$; **The Lattice LAMBDA11**
- $l6 \cdot l7 \cdot l8 = 6 \cdot 7 \cdot 8 = k(\ Lambda10\ ) = 336$; The Lattice LAMBDA10 , $(8 + 7 + 6)/3 = 7d$; $8 + 7 + 6 \equiv dim[SO(7)]$
- $k(\ Kappa9.2\ ) = 198 = k(l6) + k(l7)$; $k(\ Lambda10\ ) = k(\ Kappa9.2\ ) + 137 + 1$; $137 = k(l8) - \sum_{F_n/k(l8)} F_n^2 = \lfloor \alpha^{-1} \rfloor$ $F_n = Fibonacci\ number$
- $\sum_{d=1}^{8} k(ld) + k(\ Kappa9.2\ ) = k(l2)! = 720 = k(l8) \cdot 3 = 240 \cdot 3$ **The Lattice KAPPA9.2**
- $k(\ Lambda11\ max\ ) = k(\ Kappa9.2\ ) + k(l8)$
- $k^2(\ Lambda11\ max\ ) + 7! = 196884 = k^2(\ Lambda11\ max\ ) + 15 \cdot k(\ Lambda\ 10\ )$; $15 = dim[SU(4)]$; $26d - 15d = 11d$
- $15 = \sum_s 2s + 1$
- Monster group, Wikipedia
  "The monster was predicted by Bernd Fischer (unpublished) and Robert Griess (1976) in about 1973 as a simple group containing a double cover of Fischer's Baby Monster group as a centralizer of an involution. Within a few months the order of M was found by Griess using the Thompson order formula, and Fischer, Conway, Norton and Thompson discovered other groups as subquotients, including many of the known sporadic groups, and two new ones: the Thompson group and the Harada–Norton group. Griess (1982) constructed M as the automorphism group of the Griess algebra, a **196884-dimensional commutative nonassociative algebra**. John Conway (1985) and Jacques Tits (1984, 1985) subsequently simplified this construction."
  Monster Group

- $k(\ Lambda26\ ) = 196884$; **The Lattice LAMBDA26**
- **Strong holographic principle:** $k(Kappa9.2) \equiv 0(modk(l2))$; $k(Lambda10) \equiv 0(mod\, k(l2))$; $k(\ Lambda11\ max\ ) \equiv 0(mod\, k(l2))$
- $k(\ Lambda26\ ) \equiv 0(mod\, k(l2))$



-
- 3) $k(\,Kappa9.2\,)+k(\,Lambda10\,)+k(\,Lambda11\,max\,) = k(l2)(248+1)$
- E8 exceptional simple Lie group with dimension 248.
- **4) Higgs vacuum** $[k^2(Lambda11max)\cdot 8\pi]/2\cdot 5\cdot(1+\frac{\sin^2(2\pi/5)}{\pi\cdot k(\ Lambda11\ max\ )}) = VH/m_e$
- $(438^2 \cdot 8\pi)/10 \cdot (1 + \frac{\sin^2(2\pi/5)}{\pi\cdot 438}) = 481839.8292504$; $481839.8292504 \rightarrow VH = 246.219636\, GeV$
- $\left[\sum_{d=1}^{8} k^2(ld) + k^2(\ Kappa9.2\ ) + k^2(\ Lambda10\ ) + k^2(\ Lambda11\ max\ )\right] + (k(l8) - \ln(248) - 4)^2 = VH/m_e = 481839.84466841\ (87)$
- $\sum_{d=1}^{8} k^2(ld) + k^2(\ Kappa9.2\ ) + k^2(\ Lambda10\ ) + k^2(\ Lambda11\ max\ ) + k^2(l8) - \frac{37\cdot 137}{7} = VH/m_e = 481839.8571$
- 5) $\left\lfloor \sum_{d=3}^{8} k(ld)/4\cdot P^2(2, R\gamma) \right\rfloor = k(Lambda11max); \sum_{d=3}^{8} k(ld) = 2(2^{k(l2)+k(l1)} + 1) = 2 \cdot 257$; 257 Fermat prime. $k(l2) + k(l1) \equiv 8$ dimensions

- $2 \cdot (2^{2^{3strings}} + 1) = 2 \cdot 257$
- $k(\ Lambda11\ max\ ) + k(\ Lambda10\ ) - \sum_{d=1}^{8} k(ld) - k(l8) - 1 = 11d$
- $k(\ Lambda11\ max\ ) + k(\ Lambda10\ ) - k(\ Kappa9.2\ ) = 24^2$
- $\left\lfloor \left[\sum_{d=1}^{8} k(ld) + k(\ Kappa9.2\ ) + k(\ Lambda10\ ) + k(\ Lambda11\ max\ ) \right] \Big/ 11 \right\rfloor = 135 = k(l7) + k(l2) + k(l1) + 1$

Radius of the Event Horizon (Electron), or Schwarzschild Radius of Electron:

$r_{sh}(e) = 2m_e G_N / c^2$; $G_N = 6.6748415 \cdot 10^{-11} N \cdot m^2/K^2 g$; $l_{PK} = \sqrt{\hbar G_N / c^3}$

$\ln(l_{PK}/r_{sh}(e)) = (r_{\bigcirc I} = 4 \cdot \ln\varphi \cdot \sqrt{3}/6) \cdot 11 \cdot 4 \cdot 2 + \sqrt{\left(\sum_{d=3}^{8} k(ld)\right)/137}; \exp\Big((r_{\bigcirc I} = 4 \cdot \ln\varphi \cdot \sqrt{3}/6) \cdot 11 \cdot 4 \cdot 2 + \sqrt{\left(\sum_{d=3}^{8} k(ld)\right)/137}\Big) = \frac{l_{PK}}{r_{sh}(e)}$

$\exp\Big((r_{\bigcirc I} = 4 \cdot \ln\varphi \cdot \sqrt{3}/6) \cdot 11 \cdot 4 \cdot 2 + \sqrt{\left(\sum_{d=3}^{8} k(ld)\right)/137}\Big) = 1.19456182107408 \cdot 10^{22} = \frac{l_{PK}}{r_{sh}(e)} = \frac{m_{PK}}{2 \cdot m_e}$ (88)

(89) $2 \cdot (m_e^2 G_N / r_{sh}(e)\ ) = m_e c^2 \rightarrow Two\ states = Two\ \ Blackholes = one\ \ Wormhole$

> The final conclusion is that the electron is really a quantum wormhole; and not only the electron, if not all the particles; except, perhaps, the particles having no mass at rest and move at the speed of light; are also quantum wormholes.

9.3.1 A Extraordinary Connection: Quantum Wormholes and the Monster Group.

The relationship between the structure of space-time-energy and the monster group, we have shown with the equation:

$$k^2(Lambda11max)+7! = 196884 = k^2(Lambda11max)+15{\cdot}k(Lambda10)$$

We will quote again, wikipedia, to give the definition of the Monster group:

From Wikipedia, the free encyclopedia

"In the mathematical field of group theory, the monster group M or F1 (also known as the Fischer–Griess monster, or the Friendly Giant) is a group of finite order:

$2^{46} \cdot 3^{20} \cdot 5^{9} \cdot 7^{6} \cdot 11^{2} \cdot 13^{3} \cdot 17 \cdot 19 \cdot 23 \cdot 29 \cdot 31 \cdot 41 \cdot 47 \cdot 59 \cdot 71 = 808{,}017{,}424{,}794{,}512{,}875{,}886{,}459{,}904{,}961{,}710{,}757{,}005{,}754{,}368{,}000{,}000{,}000 \approx 8 \cdot 1053$

It is a simple group, meaning it does not have any proper non-trivial normal subgroups (that is, the only non-trivial normal subgroup is M itself).

The finite simple groups have been completely classified (see the Classification of finite simple groups). The list of finite simple groups consists of 18 countably infinite families, plus 26 sporadic groups that do not follow such a systematic pattern. The monster group is the largest of these sporadic groups and contains all but six of the other sporadic groups as subquotients. Robert Griess has called these six exceptions pariahs, and refers to the others as the happy family.

Existence and uniqueness

The monster was predicted by Bernd Fischer (unpublished) and Robert Griess (1976) in about 1973 as a simple group containing a double cover of Fischer's Baby Monster group as a centralizer of an involution. Within a few months the order of M was found by Griess using the Thompson order formula, and Fischer, Conway, Norton and Thompson discovered other groups as subquotients, including many of the known sporadic groups, and two new ones: the Thompson group and the Harada–Norton group. Griess (1982) constructed M as the automorphism group of the Griess algebra, a 196884-dimensional commutative nonassociative algebra. John Conway (1985) and Jacques Tits (1984, 1985) subsequently simplified this construction.

Griess's construction showed that the monster existed. Thompson (1979) showed that its uniqueness (as a simple group satisfying certain conditions coming from the classification of finite simple groups) would follow from the existence of a 196883-dimensional faithful representation. A proof of the existence of such a representation was announced by Norton (1985), though he has never published the details. Griess, Meierfrankenfeld & Segev (1989) gave the first complete published proof of the uniqueness of the monster (more precisely, they showed that a group with the same centralizers of involutions as the monster is isomorphic to the monster)

Representations

The minimal degree of a faithful complex representation is 196883, which is the product of the 3 largest prime divisors of the order of M. The character table of the monster, a 194-by-194 array, was calculated in 1979 by Fischer and Donald Livingstone using computer programs written by Michael Thorne. The smallest linear representation over any field has dimension 196882 over the field with 2 elements, only 1 less than the dimension of the smallest complex representation.

The smallest faithful permutation representation of the monster is on $2^4 \cdot 3^7 \cdot 5^3 \cdot 7^4 \cdot 11 \cdot 13^2 \cdot 29 \cdot 41 \cdot 59 \cdot 71$ (about 1020) points.

The monster can be realized as a Galois group over the rational numbers (Thompson 1984, p. 443), and as a Hurwitz group (Wilson 2004).

The monster is unusual among simple groups in that there is no known easy way to represent its elements. This is not due so much to its size as to the absence of "small" representations. For example, the simple groups A100 and SL20(2) are far larger, but easy to calculate with as they have "small" permutation or linear representations. The alternating groups have permutation representations that are "small" compared to the size of the group, and all finite simple groups of Lie type have linear representations that are "small" compared to the size of the group. All sporadic groups other than the monster also have linear representations small enough that they are easy to work with on a computer (the next hardest case after the monster is the baby monster, with a representation of dimension 4370).

Monster group

Be the product of all primes dividing the monster group (M), with order $2^{46} \cdot 3^{20} \cdot 5^9 \cdot 7^6 \cdot 11^2 \cdot 13^3 \cdot 17 \cdot 19 \cdot 23 \cdot 29 \cdot 31 \cdot 41 \cdot 47 \cdot 59 \cdot 71 = O_r(M)$

$$\prod_{p/O_r(M)} p = 2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13 \cdot 17 \cdot 19 \cdot 23 \cdot 29 \cdot 31 \cdot 41 \cdot 59 \cdot 71; \left(\prod_{p/O_r(M)} p \right) \cdot 2(m_\tau + m_\mu + m_e/m_e)(1 + \tfrac{1}{\ln(240 \cdot 2) \cdot 137}) = \tfrac{l_{PK}}{r_{sh}(e)} = 1.1945617293596699 \cdot 10^{22} \quad (89)$$

The smallest faithful permutation representation of the monster is on $2^4 \cdot 3^7 \cdot 5^3 \cdot 7^4 \cdot 11 \cdot 13^2 \cdot 29 \cdot 41 \cdot 59 \cdot 71 = P_r(M)$

$$(90)\ P_r(M) \cdot (11^2 + P^{-1}(2, R\gamma))[1 + \{(196884 \cdot 378 \cdot \ln 2/11 \cdot 7) - 378 \cdot \ln 2/11\}^{-1}] = \tfrac{l_{PK}}{r_{sh}(e)} = 1.19456182107408 \cdot 10^{22} = \exp\Big((r_{\bigcirc I} = 4 \cdot \ln \varphi \cdot \sqrt{3}/6) \cdot 11 \cdot 4 \cdot 2 + \sqrt{\Big(\sum_{d=3}^{8} k(ld)\Big)/137} \Big)$$

$P^{-1}(2, R\gamma) = ([2 \cdot \sin^2(2\pi/R_\gamma)]/R_\gamma)^{-1} = (0.541345283550078)^{-1}$

$378 = \sum_{p/O_r(M)} p = 2+3+5+7+11+13+17+19+23+29+31+41+$ $47+59+71 = 240+137+1$

$\big(\sum_{p/O_r(M)} p\big) - 1 = \big(\sum_{d=3}^{8} k(ld)\big) - 137 = 514 - 137 = 1 + \sum_{n=1}^{12} F_n$; $F_n =$ Fibonacci number n$\sum_{n=1}^{12} F_n = 1{+}1{+}2{+}3{+}5{+}8{+}11{+}13{+}21{+}34{+}55{+}89{+}144$

$[(26!/196884)\cdot(R_7/r_7)^4\sqrt{26}]/[1+(196884\cdot\ln\varphi)^{-1}] = \frac{l_{PK}}{r_{sh}(e)} = 1.19456278580017\cdot 10^{22}$ (91)

9.3.2 The Monster Group (M) and the Vacuum.

As just shown, the electron is a state of minimum energy of a wormhole. This wormhole implies a double state of the particle according to the four positive energy solutions of the energy-momentum equation. If of the order of the group M, we remove the minimum energy state with nonzero mass and electric charge (electron); there can only be the value of the vacuum. Therefore the value of the vacuum has to be a function of the order of gupo M and the ratio of the Planck length, radius of the black hole electron. The adjustment of this value, it seems, must be a function of the area of the equilateral triangle inscribed in Ideal triangle; which is the geometric basis of quantum wormholes. Since we know the value of the vacuum, calculated by the partition function of the non-trivial zeros of the Riemann zeta function; then you may find this regularization factor. finally; the value of the vacuum by the order of the group M, is given by the following equation:

$\ln[O_r(M)/(l_{PK}/r_{sh}(e)\,)\,] - (2\cdot S(\triangle_{I\triangle i})+1)/S(\triangle_{I\triangle i}) \approx \ln(m_{PK}/m_v) =$ $5\cdot\ln\,[\sum_{n}^{\infty}\exp(-t_n)]^{-1}$; $S(\triangle_{I\triangle i}) = \frac{(4\cdot\ln\varphi)^2\sqrt{3}}{4}$ (92)

$\ln[O_r(M)/(l_{PK}/r_{sh}(e))] = 73.2917710726429$; $(2\cdot S(\triangle_{I\triangle i})+1)/S(\triangle_{I\triangle i}) = 2.62331388221075$

$73.2917710726429 - 2.62331388221075 = 70.6684571904322 \approx 5\cdot\ln\,[\sum_{n}^{\infty}\exp(-t_n)]^{-1} = 70.6684301773922$

The same result is obtained if the ratio is calculated with Planck mass, electron mass. In this case; the regularization terms are the spin module of the gravitino, and the coupling constant unification at the Planck scale.

$$\ln[O_r(M)/(m_{PK}/m_e)] - \sqrt{s(s+1)_{s=3/2}} + \frac{10^2}{(\alpha_G = 8\pi)^3} = 70.6684313467982 \approx$$
$$5 \cdot \ln[\sum_n^{\infty} \exp(-t_n)]^{-1} = 70.6684301773922 \ (93)$$

Leech lattice

The only 24-dimensional arrangement where 196560 unit balls simultaneously touch another. This property is also true in 1, 2 and 8 dimensions, with 2, 6 and 240 unit balls, respectively, based on the integer lattice, hexagonal tiling and E8 lattice, respectively.

$$\exp\left(4\pi - \sin^8(2\pi/R_7) + \frac{\cos^4\theta_W(GUT)}{\sqrt{196560}} - \frac{1}{196560} + \frac{1}{([P^{-1}(2,R_\gamma)+11]\cdot 196560 \cdot \ln 196560)}\right) = 196883.000000041$$

Group (M) : Higgs Vacuum. Higgs h **Boson Mass** $O_r(M) = (2^{46}\cdot 3^{20}\cdot 5^9\cdot 7^6\cdot 11^2\cdot 13^3)\cdot(17\cdot 19\cdot 23\cdot 29\cdot 31\cdot 41\cdot 47\cdot 59\cdot 71)$

$(E_{PK}/VH) = (17\cdot 19\cdot 23\cdot 29\cdot 31\cdot 41\cdot 47\cdot 59\cdot 71)(11\pi-1)/5\cdot\alpha$; E_{PK} = Planck Energy (GeV); VH = Energy Higgs vacuum = 246.2196509 GeV

$17+19+23+29+31+41+47+59+71-1 = 336 = k(l10); k(Lambda10) = k(l10) = 336$

$cardinal\ \{17+19+23+29+31+41+47+59+71-1\} = 10$

$(17^2+19^2+23^2+29^2+31^2+41^2+47^2+59^2+71^2+1^2)/10 = 15394/10$

$(15394/10)/(1+[1+\cos\theta_W]^{-8}) = 1529.66101100755 \approx \ln^2(m_{PK}/m_h) \rightarrow m_h \approx 126.1883242\ GeV$

9.4 The isomorphism in the configurations of the four positive solutions of the energy-momentum equation and Tsirelson bound for the CHSH inequality. (Bell's theorem)

The first Tsirelson bound was derived as an upper bound on the correlations measured in the CHSH inequality. It states that if we have four (Hermitian) dichotomic observables A_0, A_1, B_0, B_1 (i.e., two observables for Alice and two for Bob) with outcomes $+1, -1$ such that $[A_i, B_j] = 0$ for all i,j, then:

$$\langle A_0B_0\rangle + \langle A_0B_1\rangle + \langle A_1B_0\rangle - \langle A_1B_1\rangle \leq \sqrt{8}$$

Fact. ***Four positive energy solutions energy-momentum equation***

$$\left.\begin{array}{|c|}\hline (imc^2+pc)(-imc^2+pc)=E_1^2 \\ \hline (imc^2-pc)(-imc^2-pc)=E_2^2 \\ \hline (mc^2+ipc)(mc^2-ipc)=E_3^2 \\ \hline (-mc^2+ipc)(-mc^2-ipc)=E_4^2 \\ \hline \end{array}\right. = E^2 = m^2c^4 + p^2c^2$$

States table

$(++)(-+)$
$(+-)(--)$
$(++)(+-)$
$(-+)(--)$

$(++)(-+)$	$\equiv \langle A_0B_0\rangle + \langle A_0B_1\rangle$
$(+-)(--)$	$\equiv \langle A_1B_0\rangle - \langle A_1B_1\rangle$

$(++)(+-)$	$\equiv \langle A_0B_0\rangle + \langle A_1B_0\rangle$
$(-+)(--)$	$\equiv \langle A_0B_1\rangle - \langle A_1B_1\rangle$

9.4.0.1 Direct Relationship Between the Fractal dimension φ^3 And the Compacted Dimensions (Dimensionless Radius in Seven Dimensions, Fine Structure Constant Radius).

$[\pi\cdot\sin(2\pi/8)]/\sqrt{3/R_\gamma^2 + p^{10}(2,r_7)\cdot[(4\pi/9)^2-1] - \frac{1}{\sqrt[4]{2}(VH/m_e)(6+2\cdot\sin^2(2\pi/R_7))}} = 4.23606797749895 \approx \varphi^3$

$\varphi^3 = 4.23606797749979$

1. ***Ratio fractal area/ area ideal triangle***: $\varphi^3/\pi = 1.34838231578476 \approx (2\pi - \pi^2/2) = 1.34838310663491$

2. $(\varphi^3/\pi) + (\sum_n e^{-t_n})/(\ln 137 - 4) == 1.34838310653498 \approx (2\pi - \pi^2/2)$

3. ***Sum of angles sinus arc, the cosines of the spins***: $2^4/[2\pi - (\varphi^3/\pi)] \approx \sum_s \arcsin(\cos\theta_s)_{radians}$; $\cos\theta_s = s/\sqrt{s(s+1)}$

4. $2^4/[2\pi-(\varphi^3/\pi)] = 3.24227735694826 \approx 3.24227161398496 = \sum_s \arcsin(\cos\theta_s)_{radians}$

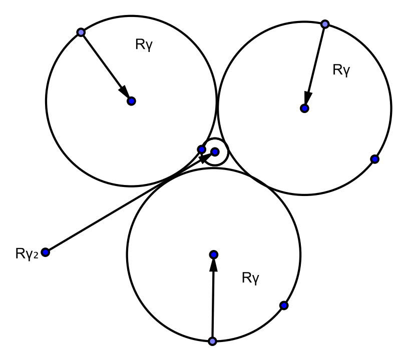
5. ***Side length triangle formed by the points of tangency of a circle inscribed within the ideal triangle (which is hyperbolic)***.

6. $L_{I\triangle} = 4 \cdot \ln \varphi$

7. $2^4/[2\pi-(\varphi^3/\pi)]-\sum_s \arcsin(\cos\theta_s)_{radians} \approx (4\cdot\ln\varphi+1)/R_\gamma^{11}$; $2^4/[2\pi-(\varphi^3/\pi)] - (4\cdot\ln\varphi+1)/R_\gamma^{11} = 3.24227161357872$

8. $2^4/[2\pi-(\varphi^3/\pi)]-(4\cdot\ln\varphi+1)/R_\gamma^{11} = 3.24227161357872 \approx \sum_s \arcsin(\cos\theta_s)_{radians}$

9. ***String inside, tangent to three strings with fine structure constant radius.*** $L_{I\triangle}$



$R_{\gamma 2} = [(3/R_\gamma) + 2\cdot\sqrt{3/R_\gamma^2}]^{-1}$; $[e^{R_{\gamma 2}}/\sin(2\pi/6)] + (10/\pi^2[m_\tau + m_\mu + m_e/m_e]) + \frac{\alpha}{2\cdot\tanh^2(\ln\varphi^3)\cdot VH/m_e} = 1.92484730023841 \approx 4\ln\varphi = L_{I\triangle}$

$\ln[20 + 10\cdot(\cos\theta_{s=2} + \cos\theta_{s=1/2})^{-1}] \approx R_\gamma + (m_e/m_W)$

9.5 The Strong Holographic Principle, the Dimensions Lattices and the Coupling Constants.

The strong holographic principle is a physical-mathematical fact; by which quantum information is encoded in surfaces whose kissing number is six ($n \cdot k(l2) = k(ld)$).

These six circles (the plane), are tangent to seventh center circle (holography in the plane of the seven dimensions compacted when the time it takes a nonzero value).

This strong holographic principle goes much further. This section will prove without any shadow of a doubt, that the angular partition of the circle, depending on the number of dimensions and the groups SU(3) and SU(2); to calculate the coupling constants of the strong interaction, and electromagnetic; for very singular values. The function of the angular partition will correspond to the sine of the angle; thus as the length of a one dimensional string is calculated; as a projection of a unit radius of a string. We leave of an identity that is the sum of the absolute values of all electric charges; assuming that the theory of unification-based group SU(5) is correct in its foundations.

The choice of the sum of the electric charges is based on the equation we have already shown that unifies gravity and electromagnetism **1.1.4,** with zero net energy. That is, the electromagnetic force is opposite to the gravitational and backwards. This means that you can maintain a stable wormhole, due to the equality of the two forces; and also this allows the quantum wormhole is not closed, but it has an open space connection between the two quantum black holes that form it.

$\sum_q |q| = \frac{11}{3} = |\frac{4}{3}| + |\frac{1}{3}| + |\frac{-1}{3}| + |\frac{2}{3}| + |-1|$; $\sum_q |q| = \frac{11}{3} \equiv \frac{11d}{3d}$; $11d - [dim(\ SU(2)\ ) \equiv 3d] = [dim(\ SU(3)\ ) \equiv 8d]$ (94)

$\sin(2\pi/3) = \sqrt{s(s+1)_{s=1/2}}$; $\sin(2\pi/8) = 1/\sqrt{s(s+1)_{s=1}}$; $\sin(2\pi/11) = 0.540640817455598 \approx \cos(2\pi/2\pi) = 0.54030230586814$

9.5.0.2 Electromagnetic Coupling Constant Zero Momentum.

$11d - 3d = 8d \equiv 11d - 3c$; $3c \equiv dim(\ SU(2)\ ) \rightarrow Z, W^+, W^-$ Three colors strong force. Three bosons.

Of the vacuum we remove the strong interaction, the weak; and we have the electro-gravitational interaction.

$\sin^{-8}(2\pi/11) = 137.002771016481$; $k(\ Lambda11\ max\ ) = k(l11) = 438$; $k(l8) = 240$; $\frac{VH}{m_e} = 481839.8583 = \frac{246.2196509\ GeV}{5.109989276\cdot 10^{-4} GeV}$

$\sin^8(2\pi/11) - \frac{\sin^8(2\pi/11)}{k(l11)\cdot[k(l8)\cdot\sin^8(2\pi/11)]^4} - \frac{1}{(11/\ln 2)\cdot k(l11)\cdot(VH/m_e)} = \alpha(0) = 0.00729735256445316$ (95)

$\alpha^{-1}(0) = 137.035999174714$

2) $k(\ Kappa9.2\ ) = k(l9) = 198$; $k(l8) + k(l9) = kl(11)$

(96) $\frac{1}{kl(11)} + \frac{1}{k(l9)} - \frac{1}{\triangle_{11d}\cdot\sqrt{kl(8)}} - \frac{1}{(2\pi\cdot r_{OI}-1)\cdot 248\cdot(VH/m_e)} = 0.00729735256428138 \approx \alpha(0)$; $\triangle_{11d} = \sqrt{\frac{4\cdot(2\pi)^{11-1}}{11^2}}$

3) $\left[\sum_{d=1}^{11} \ln(\ k(ld)\ )\right] \cdot \pi \cdot \left(1 + \frac{1}{4\cdot P^2(2,R_{\gamma 2})\cdot 137^2}\right) = 137.03599919291 \approx \alpha^{-1}(0)$; $P(2,R_{\gamma 2}) = [2\cdot\sin^2(2\pi/R_{\gamma 2})]/R_{\gamma 2}$; $R_{\gamma 2} = \sqrt{\frac{137}{4\pi}}$

9.5.0.3 Strong Interaction Coupling Constant: Singular Values.

$f(\alpha_s) = \sin^3(2\pi/3)$; 3 Colors.Three quarks hadrons. One loop corrections. $\alpha_s(E^2) = \frac{12\pi}{(33-2n_f)\cdot\ln(E^2/\Lambda^2_{QCD})} = \frac{12\pi}{21\cdot\ln(E^2/\Lambda^2_{QCD})}$; $\Lambda_{QCD} = m_Z/\sqrt{m_Z/m_e}$

$\Lambda_{QCD} = m_Z/\sqrt{m_Z/m_e} = 91.1876 GeV/\sqrt{91.1876\ GeV/5.109989276\cdot 10^{-4} GeV} = 0.2158628403\ GeV$

Effective Strong Coupling Constant. $\alpha_{s\ eff} = \sin^3(2\pi/3) = 0.6495190529; \sin^3(2\pi/3)\cdot\frac{3}{2} = 0.9742785795 \approx \cos\theta_c = 0.9742127819$

Strong Coupling Constant at the Scale of the Neutron Energy. $[\sin^3(2\pi/3)\cdot(r^4_{OI}\cdot\pi^2)] - P^8(2,R_\gamma)\cdot\alpha_s(M_Z) = \frac{12\pi}{(33-2n_{f=6})\cdot\ln(E^2_{neutron}/\Lambda^2_{QCD})}$ (97)

$r_{OI} = \frac{4\cdot\ln\varphi\cdot\sqrt{3}}{6} =$ Radius of a circle inscribed in equilateral triangle inscribed in a Ideal triangle.**9.3.0.1.4** $\theta_c = 13.04^{\circ} =$ Cabibbo angle

$r^4_{OI}\cdot\pi^2$ (eight gluons $\equiv 4\cdot 2$) $P^8(2,R_\gamma) = [2\cdot\sin^2(2\pi/R_\gamma)/R_\gamma]^8$; $\alpha_s(M_Z) \approx 0.1184$

Strong coupling constant at the scale of glueball ground state energy. $\sin^3(2\pi/3)\cdot\cos^2\theta_{s=2} \approx \frac{12\pi}{(33-2n_{f=6})\cdot\ln(E^2 g_b(0)/\Lambda^2_{QCD})} \to g_b(0) \approx 1.71566 GeV$

(98)

Strong Coupling Constant Z Boson Energy Scale. (99) $\sin^3(2\pi/3)/\ln(k(l8)) = 0.11851155 \approx 0.1184 = \alpha_s(M_Z)$

9.5.0.4 Coupling Constant Unification Planck Scale.

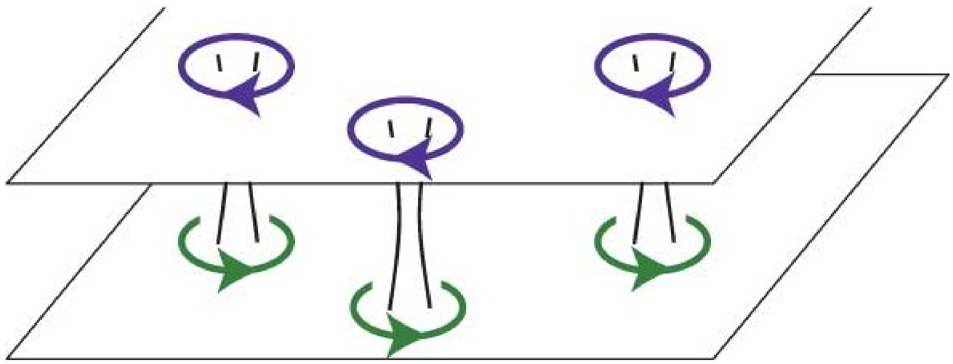
$\alpha_G = \frac{1}{8\pi} = \sin^3(2\pi/3)\cdot\sin^8(2\pi/8) - \frac{k(l3)}{2\cdot k(l8)\cdot\pi^3} + [(4\pi/9)^2 - 1]\cdot\alpha^2(0)\cdot[\sin^3(2\pi/3)\cdot\sin^8(2\pi/8)]^2 = 0.0397887357699575$ (100)

9.6 The Space-Time-Energy: Quantum Wormholes and the Strong Holographic Principle.

From the fact that all the particles with non-zero mass at rest, are quantum wormholes; we must ask how the movement and where it occurs; of the particles that are observed to a much larger distance scale of the quantum space-time-energy (quantum wormholes). Just seems to be a possibility: the particles, as they are observed, they would move on surfaces, which form lattices quantum wormholes.

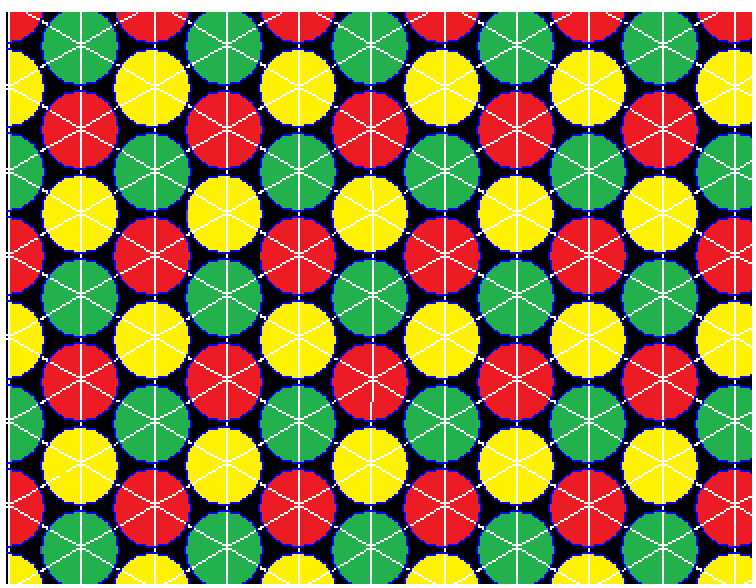
They can not move through wormholes, inside or on the boundary of hyperbolic surface of the wormhole; since in both cases the speed would be greater than that of light. Yes, it could make virtual particles and the "action" at a distance, without exchanging energy, of quantum entangled particles.

The following figure shows a visualization of these surfaces generated by lattices of the mouths of quantum wormholes.



And it is exactly; the physical consequence of the strong holographic principle. The dimensions of all lattices (we have selected); except the five dimension; can be represented in six circles surfaces that touch each to one center (seven compacted dimensions).

Therefore, it appears that the space-time-energy sheets would behave as surfaces with a lattice in circles; that would be the mouths of quantum wormholes.



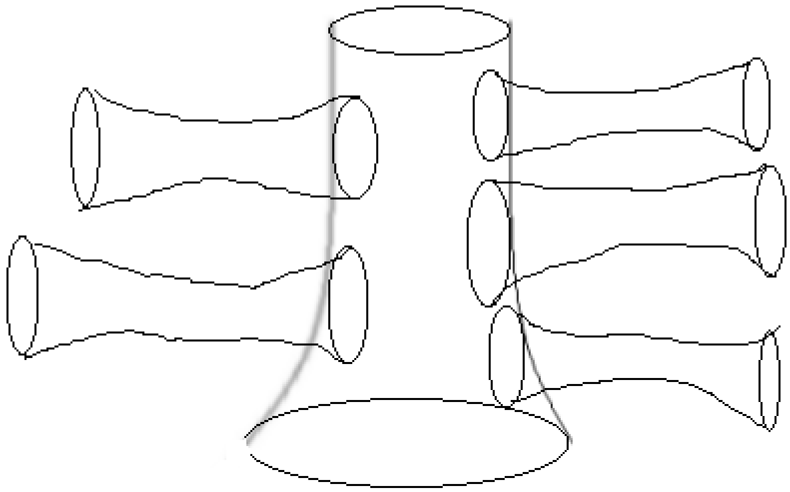
Now; as shown in previous sections, there has to be an instant or infinite speed; in quantum wormholes. This is necessary so that the net gravitational and electromagnetic energy is zero; as has been already proved. With an infinite speed rotation, which would be zero, to an observer outside the quantum wormhole (there is no exchange of energy and hence the observer can not distinguish an infinite speed to zero speed); it would have, if special relativity out of the wormhole is applied, a negative acceleration, ie:

$$\lim_{v\to\infty} \frac{c^2 v^2}{(c^2 - v^2) r} = -\frac{c^2}{r}$$

But the above equation is incompatible with the current universe; which has a positive acceleration. Therefore, one should adopt the reference system of the wormhole for a positive acceleration. This means that, effectively, the suitability of special relativity holds for the hyperbolic contour surfaces. With reference system quantum wormholes, we have:

$$\lim_{v\to\infty} \frac{c^2 v^2}{(c^2 + v^2) r} = +\frac{c^2}{r}$$

The strong holographic principle has deeper implications. How should consider that the dimension of a lattice is the product of two-dimensional lattice, multiplied by n planes?. The answer is simple: for each circle of plane (mouth of a wormhole), there is a multiple connectivity to other wormholes. This connectivity, the number of connections is precisely: $n_c(\ k(ld)\ ) = k(ld)/k(l2) = k(ld)/6\ (101)\ ;\ n_c =$ Number of connections



Connections Q. Wormholes Nc(k(ld))=k(ld)/k(l2)

Nc(k(l11))=73

$k^2(l11) + n_c^2(\, k(l11)\,) + k^2(l2) - (\, k(l10) - 11) = 196884$

$n_c(\, k(l11)\,) = 73 = k(l6) + 1$

The above equation allows for full connectivity between all quantum space units; and with infinite speed.

Also, the strong holographic principle explains that the model of a string in a box is adequate.

Equation (100) allowed us to derive the coupling constant unification at the Planck scale. The following equation will prove that the value of the Higgs vacuum; can be expressed by the probability (model a string in a box), two strings whose length of the box is the number of dimensions-states given by equation (100). The probability is, at the same time, dependent on the eleven-dimensional space (time ceases to have physical meaning, becomes a spatial dimension).

$VH/E_{PK} = \left\{[P(2,3)\cdot P(2,8)]^{11}/k(l8)\cdot k(l3)\right\}\left(1+\frac{\pi}{k^2(l3)}\right)\cdot\left(1+\frac{1}{k(l11)\cdot\varphi^{k(l3)}}\right)$ (102)

$P(2,3) = (2 \cdot \sin^2(2\pi/3))/3$; $P(2,8) = (2 \cdot \sin^2(2\pi/8))/8$; Planck Energy (GeV); VH = Energy Higgs vacuum = 246.2196509 GeV

$k^2(l3) = 12^2$; $k(l11) = 438$; $k(l8) = 240$; $\varphi = (1+\sqrt{5})/2$

Also the value of the Higgs vacuum is expressed as a probability of a string in eleven dimensions; directly from the angular partition of the circle into eleven dimensions. That is:

$[P^{11}(2,11)/k(l11) \cdot 2 \cdot \sin(2\pi/11)](1 + \frac{1}{[\ln k(l8) - 4]^2 \cdot k(l11)}) = VH/E_{PK}$ **(103)** $P(2,11) = (2 \cdot \sin^2(2\pi/11))/11$

$[2 \cdot \sin(2\pi/11)]^{-1} = 1.924828433 \approx 4 \cdot \ln\varphi = 1.924847301$

The equations (103 and 102) show very clearly; that the generation of all dimensions is a consequence of the strong holographic principle: the angular partition of the circle.

9.6.0.4.1 Electron Mass ratio-Equivalent Mass Higgs Vacuum: Largest and Smallest Radius in Eleven Dimensions Compactified in Circles. Probability of Strings in Eleven Dimensions. Lattice Kissing Number in Eleven Dimensions.

$r_{11} = \{4 \cdot (2\pi)^{11}/[12 \cdot 2\pi^{11/2}/\Gamma(11/2)]\}^{1/12} = \left[4 \cdot (2\pi)^{11} \Big/ \left(12 \cdot \frac{64\pi^5}{945}\right)\right]^{1/12} =$ 3.82117253323579 $k(l11) = 438$

$P(2, r_{11}) = [2 \cdot \sin^2(2\pi/r_{11})/r_{11}]$; $[P^{11}(2, r_{11}) \cdot \ln R_\gamma / k(l11)] \cdot (1 + \frac{1}{\triangle^2_{8d}}) = \frac{m_e}{VH}$ (104)

$\triangle^2_{8d} = 4 \cdot (2\pi)^7/8^2$; $\ln R_\gamma = \ln\left(\sqrt{\alpha^{-1}/4\pi}\right)$

$R_{11} = \left[2 \cdot (2\pi)^{11} \Big/ \left(\frac{64\pi^5}{945}\right)\right]^{1/13} = 3.95612566496389$: $[P^{11}(2, R_{11})/k(l11)] \big/ \big(1 + \frac{1}{\sin\theta_w \cdot R^8_\gamma}\big) = \frac{m_e}{VH}$ (105) ; $\sin\theta_W = 2\varphi^3 - 8$

9.6.0.4.2 Electron Mass Ratio-Planck Mass. Probability of Strings in Twenty-Six Dimensions. Minor and Major Radius Twenty-Six Dimensions (Compactifying in Circles). Dimension Lattice Monster Group (196884).

$r_{26} = \{4 \cdot (2\pi)^{26}/[27 \cdot 2\pi^{26/2}/\Gamma(26/2)]\}^{1/27} = \left[4 \cdot (2\pi)^{26} \Big/ \left(27 \cdot \frac{\pi^{13}}{239500800}\right)\right]^{1/27} =$ 6.439897303731951

$R_{26} = \left[2 \cdot (2\pi)^{26} \Big/ \left(\frac{\pi^{13}}{239500800}\right)\right]^{1/28} = 6.612405391175636$

$P(2, R_{26}) = 2 \cdot \sin^2(2\pi/R_{26})/R_{26}$; $k(l3) = 12$; $k(l26) = 196884$; $196884 = 16407 \cdot k(l3)$

$P^{26}(2, R_{26}) \cdot k(l3)/[k(l26) \cdot \left(1 + \frac{\ln\varphi}{26^2}\right) \cdot \left(1 + \frac{\alpha^2}{4\pi^2 \cdot \ln 3}\right)] = \frac{m_e}{m_{PK}}$ (105)

$P^{26}(2, r_{26})/[k(l26) \cdot (\sin\theta_W \cdot \cos\theta_W) \cdot (1 + \frac{\alpha(M_Z)}{k(l3)})] = \frac{m_e}{m_{PK}}$ (106) $\alpha(M_Z) = 1/128.962$; $\sin\theta_W = 2\varphi^3 - 8$

9.6.0.4.3 Mass of Proton. Function of the Probability of a String on Twenty-Six Dimensions. Major Radius in Twenty-Six Dimensions. Contribution of Gluons. Main Cabibbo Angle.

Permutations: $(u_1, u_2, d); (u_2, u_1, d); (u_1, d, u_2); (u_2, d, u_1); (d, u_1, u_2); (d, u_2, u_1)$

$cardinal\,\{(u_1, u_2, d)\,;\,(u_2, u_1, d)\,;\,(u_1, d, u_2)\,;\,(u_2, d, u_1)\,;\,(d, u_1, u_2)\,;\,(d, u_2, u_1)\} = 6 \equiv k(l2) \equiv 3d! \equiv 6\,quarks \equiv 6\,leptons$

$cardinal\,\{(u_1, u_2, d)\,;\,(u_2, u_1, d)\,;\,(u_1, d, u_2)\,;\,(u_2, d, u_1)\,;\,(d, u_1, u_2)\,;\,(d, u_2, u_1)\} \cdot 3\,colors = 18$

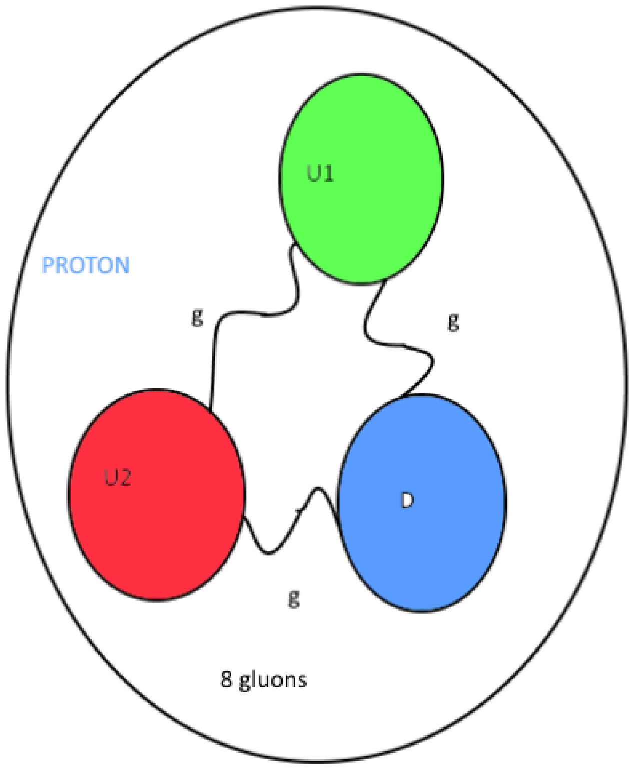
$cardinal\,\{(u_1, u_2, d)\,;\,(u_2, u_1, d)\,;\,(u_1, d, u_2)\,;\,(u_2, d, u_1)\,;\,(d, u_1, u_2)\,;\,(d, u_2, u_1)\} \cdot 3c + 8\,gluons = 26d$

$1\Big/R_7 \cdot \left(\sqrt{2(2+1)_{s=2}} - 1\right) = 1\Big/3.05790095610237 \cdot (\sqrt{6} - 1) = 0.225611606935755 \approx \sin\theta_c = 13.04^{\circ}$

$1\Big/\sin\theta_c \cdot \left(\sqrt{2(2+1)_{s=2}} - 1\right) = R_7$

$(8g + 6q) \cdot 8g = 112\,states$

$m_{Pk} \cdot P^{26}(2, R_{26})\Big/\left[8 \cdot \ln R_7 \cdot \left(1 + \frac{\sin^8\theta_c}{112 \cdot \alpha}\right)\right] = m_p = 1.67262177548094 \cdot 10^{-27}\,Kg$ **(107)**



9.6.0.4.4 Derivation of the Elementary Unit of Electric Charge. Angular Partition Function of the Circle in Eleven Dimensions. The Necessary Existence of Bosons X, Y of the GUT Theories.
$\left(\left|\frac{4}{3}\right| + \left|\frac{1}{3}\right| + \left|\frac{-1}{3}\right| + \left|\frac{2}{3}\right|\right) \cdot 3\ colors = 3(\frac{8}{3}) = 8 \equiv 8d\ ;\ 8+3 \equiv 11d$ Photon spin module. $\sqrt{1\cdot(1+1)} = \sqrt{2}$

$$\sqrt{\left[\exp\left(-\sqrt{\sin^{-8}(2\pi/11)\cdot\sqrt{1\cdot(1+1)}}\right)\cdot m_{PK}\right]^2\cdot G_N} \Bigg/ \left(1+\frac{112\cdot m_e}{\sin^{-8}(2\pi/11)\cdot(m_\tau+m_\mu+m_e)}\right) =$$

$e = 1.602176565 \cdot 10^{-19}C$ (107)

$$5! - 8 = 112\ ;\ 8\cdot\sum_s 2s+1 = 120\ ;\ \sum_s 2s+1 \equiv dim[SU(4)]$$

9.6.0.4.5 Spins and Electric Charges. Quarks and Bosons X,Y.
$\frac{2s\cdot(-1)^{2s}}{3} = q\ ;\ s = 1/2\ ,\ \frac{2(1/2)\cdot(-1)^{2(1/2)}}{3} = -\frac{1}{3}\ ;\ s = 1\ ;\ \frac{2(1)\cdot(-1)^{2(1)}}{3} = \frac{2}{3}$

$s = 3/2$; $\frac{2(3/2)\cdot(-1)^{2(3/2)}}{3} = -1$; $s = 2$; $\frac{2\cdot 2\cdot(-1)^{2\cdot 2}}{3} = \frac{4}{3}$

$(gravitino, graviton) \rightarrow \frac{2(3/2)\cdot(-1)^{2(3/2)}}{3} + \frac{2\cdot 2\cdot(-1)^{2\cdot 2}}{3} = \frac{1}{3} = \frac{2(1/2)\cdot(-1)^{2(1/2)}}{3} + \frac{2(1)\cdot(-1)^{2(1)}}{3} \rightarrow (electron\ ,\ photon)$

9.6.1 Experimental Evidence of Propagation of Correlations Over the Speed of Light.

While writing this article; have been published the results of two experiments testing the theory, which in this article has been developed on the necessary existence of exceeding the speed of light, without energy exchange.

We will quote part of the summary of the first article.

"For systems with only short-range interactions, Lieb and Robinson derived a constant-velocity bound that limits correlations to within a linear effective light cone.
In many cases we find increasing propagation velocities, which vio- late the Lieb-Robinson prediction, and in one instance cannot be explained by any existing theory. Our results demonstrate that even modestly-sized quantum simulators are well-poised for studying complicated many-body systems that are intractable to classical computation"

Non-local propagation of correlations in long-range interacting quantum systems
P. Richerme1, Z.-X. Gong1, A. Lee1, C. Senko1, J. Smith1, M. Foss-Feig,1 S. Michalakis,2 A. V. Gorshkov,1 and C. Monroe1 1Joint Quantum Institute, University of Maryland Department of Physics and National Institute of Standards and Technology, College Park, MD 20742 2Institute for Quantum Information and Matter, California Institute of Technology, Pasadena, CA 91125 (Dated: January 22, 2014)
http://arxiv.org/abs/1401.5088

The second article.

The key to explaining a wide range of quantum phe- nomena is understanding how entanglement propagates around many-body systems. Furthermore, the controlled distribution of entanglement is of fundamental importance for quantum communication and computation. In many situations, quasiparticles are the carriers of information around a quantum system and are expected to distribute entanglement in a fashion determined by the system interactions [1]. Here we report on the observation of magnon quasiparticle dynamics in a one-dimensional many-body quantum system of trapped ions representing an Ising spin model [2, 3]. Using the ability to tune the effective interaction range[4–6], and to prepare and measure the quantum state at the individual particle level, we observe new quasiparticle phenomena. For the first time, we reveal the entanglement distributed by quasiparticles around a many-body system. Second, for long-range interactions we observe the divergence of quasiparticle velocity and breakdown of the light-cone picture[7–10]that is valid for short-range interactions. Our results will allow experimental studies of a wide range of phenomena, such as quantum transport [11, 12], thermalisation [13], localisation [14] and entanglement growth [15], and represent a first step towards a new quantum-optical regime with on-demand quasiparticles with tunable non-linear interactions.

Observation of entanglement propagation in a quantum many-body system. P. Jurcevic,1,2,∗ B. P. Lanyon,1,2,∗ P. Hauke,1,3 C. Hempel,1,2 P. Zoller,1,3 R. Blatt,1,2 and C. F. Roos1,2,† 1Institut fu¨r Quantenoptik und Quanteninformation, ¨ Osterreichische Akademie der Wissenschaften, Technikerstr. 21A, 6020 Innsbruck, Austria 2 Institut fu¨r Experimentalphysik, Universita¨t Innsbruck, Technikerstr. 25, 6020 Innsbruck, Austria 3 Institut fu¨r Theoretische Physik, Universita¨t Innsbruck, Technikerstr. 25, 6020 Innsbruck, Austria (Dated: January 27, 2014)
http://arxiv.org/abs/1401.5387

9.6.2 External Potential of Quantum Wormholes.

By equation as shown, which unifies gravitation with electromagnetism; the energy of the basic unit of quantum space-time-energy is zero (quantum wormhole). But as is well known, by the uncertainty principle continuous fluctuations occur, ie virtual particles.

$$4\pi^4 \cdot (\pm e)^2 \cdot [\sum_n^\infty \exp(-t_n)]^2 - 4 \cdot m_{Pk} \cdot m_e \cdot G_N = 0$$

The law of logarithmic scale (ratios of two masses, radii, etc) change, as already mentioned, are surfaces of sectors of hyperbolic triangles.

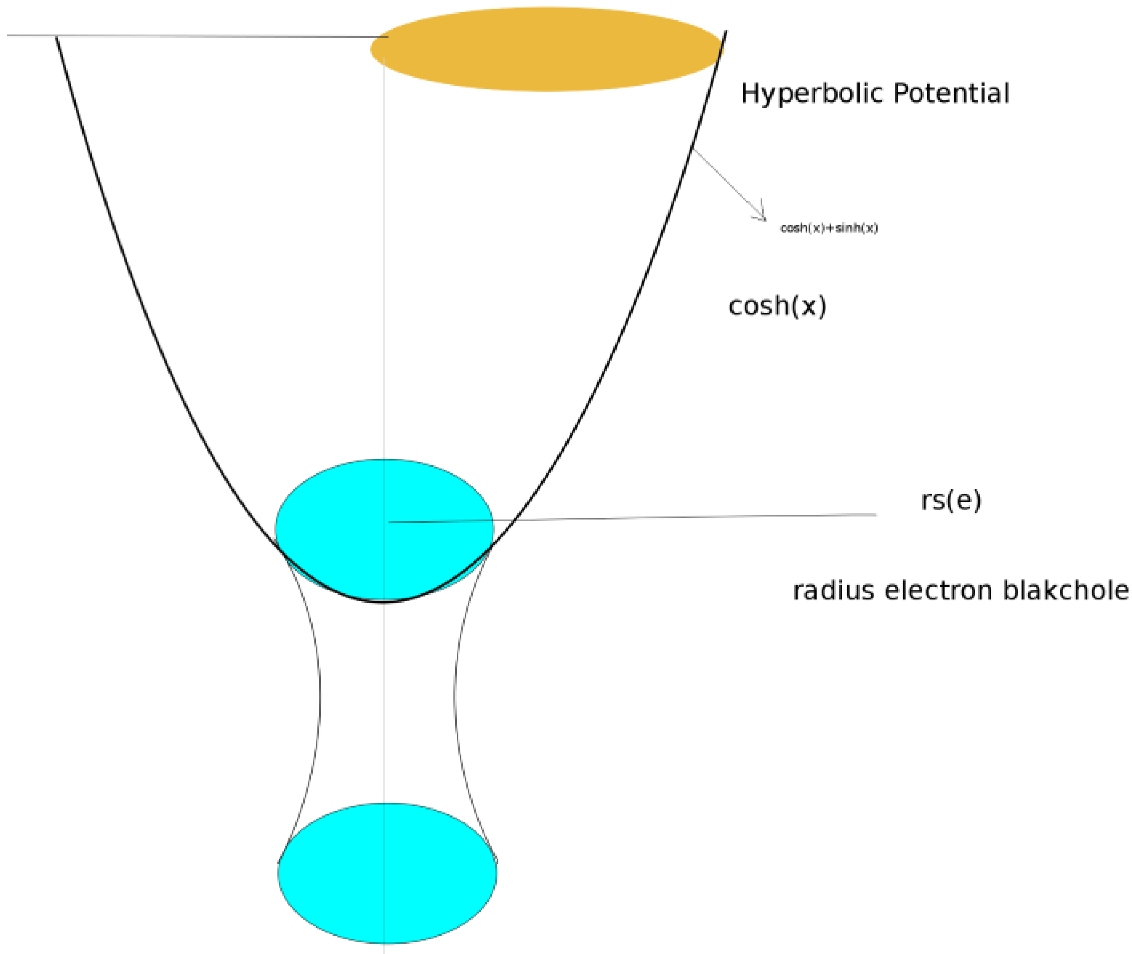
So the potential, or mass ratios and radii, will the hyperbolic cosine of these surfaces. This potential so defined implies the symmetry of the two possible ratios of two quantities; that is, the positive potential corresponds to the ratio of the greatest quantity and the smallest quantity. The negative potential is the ratio of the smallest and the largest quantity.

$P(m_1, m_2) = 2 \cdot \cosh(x) = e^x + e^{-x} (virtual\ pairs)$; $e^x = m_1/m_2$; $e^{-x} = m_2/m_1$; $m_1 > m_2$

$(m_1/m_2) = \cosh(x) + \sinh(x) = e^x$

The solution of the Schrödinger equation, independent of time; is absolutely equivalent to the potential we have shown, with an imaginary value. It is important to note that the solution of the Schrödinger equation, independent of time; directly involves the cancellation of time in quantum wormholes.

$e^{ix} \equiv \psi(\overrightarrow{r}, t) = \varphi(\overrightarrow{r}, t) e^{-\frac{i}{\hbar} Et}$



9.6.2.0.6 Summary of this Section and Precedents..

We have proven in this section, and with the prior work described in the previous sections, the following physical mathematical facts:

1. The spacetime energy is a single physical entity, not separable. The apparent separability effect is purely due to the scale of observation; which leads to a breakdown of symmetry, of what might be called the superparticle: Basic unit "final" time-space-energy.

2. These basic units are defined, non-point size; ie are quantized. Likewise, these basic units are interconnected wormholes.

3. The nonseparability of the physical entity spacetime energy; manifests in the existence of the virtual particles called. These virtual particles, whose velocity of propagation is greater than that of light, are actually the manifestation of fluctuations of quantum wormholes. These quantum wormholes are the union of two quantum black holes.

4. The stabilization of wormholes is a consequence of the exact cancellation of the electro-gravitational forces. Therefore, there are two elementary electric charges of opposite sign; whose force of attraction is canceled by the negative sign of the gravitational repulsion force scales the Planck length. This repulsion force must necessarily be due to the gravitino. Thus; is an unperturbed state, the wormhole would be stable for the union of two quantum black holes, with open throat. The net electric charge is zero (sum of the two electric charges of opposite sign)

5. The electron is the manifestation of the state of lowest possible energy of quantum wormholes, which form the fabric of space time energy. For this reason it is completely stable. Later we will show that the proton is another ground state of a quantum wormhole; which manifests the strong force. The proton is completely stable (if not exciting, supply him with energy).

6. Therefore the four solutions of the energy momentum equation; as for the duplication of the energy needed for a quantum black hole equals the rest energy of the particle (two quantum black holes = a worm hole = two states quantum-entangled particles); necessarily imply the existence at a time, two states of the same particle.

7. One of the states of the particle, is the potential corresponding to the observed energy scale of the "real" particle. The other state of the particle state is not observable; because, this state corresponds to the quantum scale of the wormhole; underlying any particle and is the ground state of the vacuum.

8. The zero energy of quantum wormholes imply an infinite speed. This infinite speed we have shown mathematically from the point of view of special relativity, the zero energy of wormholes; well as for the existence of infinite lengths in finite surfaces: the ideal hyperbolic triangle. Four ideal triangles form one of the quantum black holes. The entropy of a black hole is just the sum of the surfaces of these four ideal triangles: 4π

9. This infinite speed in quantum wormholes (the basic unit of spacetime energy) is what prevents an observer within the light cone; that is, with speed limit of light; can directly observe and perform a measurement on these quantum a worm holes. We again point out that any particle, as a last resort (minimum possible scale length); is associated with a corresponding quantum wormhole.

10. Has been established as the strong holographic principle and lattices, with their corresponding kissing numbers, play a fundamental role in the interconnectivity of quantum a wormholes, and therefore energy spacetime as a whole; as a global unit.

11. **This interconnection of all units of spacetime energy through quantum wormholes; explained first, nonlocality nature of spacetime energy; since as we have proven, time ceases to exist (time is emerging due to the limitation of the speed of light to the "real" observable particle states), and the speed of propagation of correlations is infinite, without energy exchange . The propagation of correlations (quantum information without energy exchange); occurs through quantum wormholes connecting all the space so instantaneous (infinite speed). Second: quantum wormholes (the union of two quantum black holes = two states) explain the phenomenon of interference when the double-slit experiment is reproduced and a single particle at a time is sent. The phenomenon is exactly equivalent to the Casimir effect: the quantum wormhole, associated with the particle; which, is attached to other quantum wormholes, call them, virtual, affect, excite these virtual quantum wormholes. And in one of the slits (the slit that does not pass the actual particle), the virtual quantum wormhole, reproduces duplicate real particle, so virtualized state; passing the other slit and interfering with the real particle.**

12. **But in reality all are waves: perturbations and ripples of spacetime energy. Corpuscle-wave duality does not exist. If you observe what is called a particle (to distinguish wave denomination) at ever smaller scales; Ripples of the basic units of space-time-energy would be found. And since these are basic units of finite size, are interconnected, and their calculations are due to n-dimensional strings in a box; then**

the unequivocal conclusion is that: all are waves. There is no wave particle duality, as already shown by several experiments. The Copenhagen interpretation of quantum mechanics is not correct. As we have shown there is a quantum reality independent of the observer which is the basis of all phenomena. And this quantum reality although not observable by the separation limit of the speed of light, exceeding the speed of light; itself manifests its effects and is independent of the observer. It is much more according to the underlying reality; Bohm interpretation of quantum mechanics.

13. The interconnection of all quantum basic units (quantum wormholes), implies that the so-called vacuum; it influences the real particles and their states; and backwards. More specifically: since real particles, are states of energy of the basic vacuum units; and these basic vacuum units, are mutually connected; adequate physical description depends not only on the state of the real particle; If not, also own vacuum, of which it forms part, of non-separable form.

14. **That quantum wormsholes are rotating; raises the resolution of the following problem; therefore important cosmological implications, well as an additional gravitational effect: If all the basic quantum units (quantum wormholes) are rotating , *what is the total net value of the rotating spacetime energy as a whole, or totality?. What is the function that describes and computes the possible rotation of the whole universe?. A proper rotation of the vacuum (quantum interconnected wormholes) would imply a very small acceleration, additional, dependent of vacuum. This possibility should not be neglected: the equivalence to the Unruh effect is evident.***

Unruh effect.
$K_B \cdot T \cdot c \cdot 2\pi/\hbar = a$; (Acceleration)

10 Right Interpretation Of Quantum Mechanics.Bohm's interpretation: more accurate

The vacuum structure is made up of discrete units of circular strings-mouths quantum wormholes. This structure, likewise, presents a general entanglement of all discrete units of the space-time-energy. And these discrete units of vacuum, have the quality for which time is canceled. The apparently probabilistic nature of quantum mechanics is the result of the impossibility of an observer who is within the cone of light, to observe these discrete units whose speed exceeds the speed of light.

Therefore the current interpretation of quantum mechanics is not correct; since the experimental fact of nonlocality is not derived from the theory itself. Corpuscle-wave duality, by itself, does not explain the non-locality of quantum mechanics. Neither interpretation is correct that while not observed or measured, the reality is not defined. This is patently false; since, we have proven that yes there is a reality independent of the observer : are virtual states, which factored into four positive energy solutions of the equation of energy-momentum.

Similarly compactification equations that allowed us to calculate mass ratios; prove without any doubt that there is a reality independent of the observer and more deterministic than might be supposed at first.

The concept of separability, first, space-time, and secondly, energy; is a misconception, since the same principle of uncertainty assigned a virtual energy value of each coordinate of space-time. This feature of non-separability is placed directly manifest in the corrections of the virtual particles. Corrections to fit the experimental values, for example, anomalous electron magnetic moment, etc., etc.. Therefore, the assertion of quantum mechanics, that reality is not defined until a measurement is made; is false, it is not correct. That reality is not observable of virtual particles; that has not been measured; the same intrinsic and observer-independent reality, is influenced that calculates the reality of unobservable reality independent of the observer.

The same vacuum value has the property of being independent of the observer. Its value is independent of whether or not measured. So, again, the cheerful assertion that reality is not defined is manifestly false. Something very different is the interaction of virtual states (pure geometry of the vacuum) with real states, which leads to an inability of the observer to measure those states with above speed of light. And this leads to a probabilistic mathematical treatment. In short unobservable but real (higher speed of light) states, called virtual states are that generate by interacting with the states properly called real, the indeterministic nature of quantum mechanics. Ie: deterministic virtual states to interact with real states; cause probabilistic mixture states.

But the total incorrectness of the interpretation of quantum mechanics, the Copenhagen interpretation, has been demonstrated *experimentally with the Afshar experiment. This experiment has been corroborated by other independent experiments; for which we have no doubt of its validity. In this experiment, it can detect which slit passes the photon without destroying the interference pattern. When the photon is detected by the photo-detector particle nature of the photon is shown. But not only this experiment proves the invalidity of the Copenhagen interpretation, also evidenced by the continuing reality of nature. A remarkably clear example is the photosynthesis of plants. The absorbed light energy is transmitted chlorophyll outer electrons of the molecule, which are outside of it and produce a kind of electric current inside the chloroplast in joining the electron transport chain. This energy can be used in the synthesis of ATP via photophosphorylation, and the synthesis of NADPH. Both compounds are required for the next phase or Calvin Cycle, where the first sugar to be used to the production of sucrose and starch is synthesized. Electrons that yield chlorophylls are reset by the oxidation of H2O, which process generates plants O2 released into the atmosphere.*

This continuous interaction of photons that produce the outer electrons leave the electronic cape and produce photosynthesis; occurs regardless of the observation; therefore the Copenhagen interpretation of that reality is created by the observer is simply a complete aberration and manifestly false.

10.0.2.1 The Double-Slit Experiment (version of a single particle emitted): What Really Happens. For the four solutions of the energy-momentum equation; the vector sum of these four states of positive energy, resulting in a particle is accompanied, to put it graphically, by a virtual state; that is actually pure vacuum state with zero energy. When both slits are set; and a particle one by one, an interference pattern is output occurs. The interpretation of quantum mechanics is that the probability "wave" can be said to "pass through space" because the probability values that one can compute from its mathematical representation are dependent on time.

The Copenhagen interpretation is similar to the path integral formulation of quantum mechanics provided by Feynman. The path integral formulation replaces the classical notion of a single, unique trajectory for a system, with a sum over all possible trajectories. The trajectories are added together by using functional integration.

But what really should happen is that both the virtual state (pure space with greater than light speed. Cancelled time. Zero energy. Excited states of quantum wormholes interconnected); as the real call, both states exist at the same time. In this way, one of the states (the so-called real and virtual state) through one of the slits and interferes with the other state, which also passes through the other slit.

Have in mind that the geometric properties that interfere with vacuum, modify the behavior of the same, by interacting with a specific local settings. Example very clear and experimentally: The Casimir effect.

When local geometric conditions are modified (including detectors after the slits, etc); in this case, a slit is closed, the interference pattern disappears. In this case the virtual state is absorbed by the new local configuration of space-time, and only through the open slit, the particle called real.

The solution of the Schrödinger equation; independent of time, it is simply a rotation in a hyperbolic space, and consistent with special relativity. Normalizing to the unit coordinate space x, and the coordinate space ct:

x' = x coshq - c t senhq c t' = - x senhq + ct coshq

$$\psi(\overrightarrow{r},t) = \varphi(\overrightarrow{r},t)\cdot[\cosh(\tfrac{i}{\hbar}Et) - \sinh(\tfrac{i}{\hbar}Et)] = \varphi(\overrightarrow{r},t)\cdot e^{-\frac{i}{\hbar}Et} \quad \textbf{(108)}$$

11 Quantum decoherence and Probabilities Derived from String-States. Gravitational Potential Origins of the Collapse of the Wave Function.

11.1 The Equivalences: a Fundamental Characteristic of a Unified Theory.

Will be understood as equivalents, in the strict mathematical sense; those functions, equations or processing operation; which give the same numerical value, or otherwise, the same result between two or more physical processes. As a result of these equivalences, we can say that the physical processes are equivalent under the corresponding operations when they generate the same numeric value, or operational results.Thus, the operational physical processes that yield the same result are indistinguishable. And this feature is necessary and natural in a unified theory; in which all observables (speed limit of light) and unobservables (higher than the speed of light quantum wormholes, pairs of virtual particles.) from operations are transmutable.

Next, show the most important equivalences inherent in the unified structure of spacetime energy.

Operational Equivalence of electric charges with the eight dimensions, the group SU(3), and the eight factors of the four solutions of the energy-momentum equation (positive energy).

Fractional electric charges. q_f ; $3c =$ Charge three colors (QCD) $n_s(E-M) =$ number of energy-momentum equation solutions (two factors)

$3c\sum_{q_f}|q_f| \equiv 8d \equiv n_s(E-M)\cdot 2f$; $3c\sum_{q_f}|q_f| = 3c\cdot\left(\left|\frac{4}{3}\right| + \left|\frac{1}{3}\right| + \left|\frac{-1}{3}\right| + \left|\frac{2}{3}\right|\right)$

$3c\sum_{q_f}|q_f| \equiv k(l2) + k(l1) \equiv 8d \equiv (2d)^{3d} \equiv 8\ gluons \equiv x^*x = x_0^2 + x_1^2 + x_2^2 + x_3^2 + x_4^2 + x_5^2 + x_6^2 + x_7^2$; $x_0 = x_1 = \cdots x_7 = 1$

$\frac{x-x^*}{2} = x_1e_1 + x_2e_2 + x_3e_3 + x_4e_4 + x_5e_5 + x_6e_6 + x_7e_7$

$3c\sum_{q_f}|q_f| = (3c)^4\prod_{q_f} q_f \equiv 8 \equiv 6q + 1l + 1h$; $6q =$ six quarks ; $1l =$ one charged lepton (tau, muon, electron) ; $1h =$ one Higgs boson

$Q(6q) = \frac{2}{3} - \frac{1}{3} + \frac{2}{3} - \frac{1}{3} + \frac{2}{3} - \frac{1}{3} = 1 \equiv -Q(1l)$; $Q(6q) + Q(1l) + 1h = Q(6q + 1l + 1h) = 0$

$4\pi^4\cdot(\pm e)^2\cdot[\sum_n^\infty \exp(-t_n)]^2 - 4\cdot m_{Pk}\cdot m_e\cdot G_N \equiv Q(6q+1l+1h) \equiv mc^2/\sqrt{(v_\infty^2/c^2) - 1}$ (109)

Equivalences three dimensions: three generations of quarks, leptons and three bosons X, Y (GUT theories).

$3d \equiv 3g(q,l) \equiv 3B(X,Y)$; $\{X_r, X_b, X_g, Y_r, Y_b, Y_g\}$

Equivalences three-dimensional permutations: six quarks, six leptons, six bosons X, Y (GUT theories), counting color charge, and k(l2) latice.

$6q \equiv 6l \equiv 6B(X,Y)_c \equiv 3d! \equiv 6d \equiv k(l2)$ (110)

Equivalences k(l3) lattice: six leptons and six quarks, twelve standard model bosons.

$k(l3) \equiv 6q + 6l \equiv 8g + 1W^{\pm} + 1Z + 1\gamma + 1h \equiv k(l2) \cdot k(l1)$ (111)

Equivalences k(l4) lattice; sum of the number of standard model particles (Higgs energy field limit), permutations of four dimensions; group SU(5) and SU(7).

$k(l4) \equiv 8g + 1W^{\pm} + 1Z + 1\gamma + 1h + 6q + 6l \equiv 4d! \equiv 8d \cdot 3d \equiv 3c \sum_{q_f} |q_f| \cdot$

$dim[SU(2)] \equiv SU(3) \cdot SU(2) \cdot U(1) \equiv SU(5)$ (112)

$2 \cdot SU(5) \equiv SU(7)$; $k(l5) \cdot k(l2) \equiv k(l8)$

Operational equivalences between fractional electric charges, the sum of the spins and the angle unifying Weinberg, scale GUT.

$$\left(\sum_{q_f} |q_f| \right)^{-1} \equiv \sin^2 \theta_W(GUT) \ (113) \ ; \ \left(\frac{\sum_{q_f} |q_f|}{\sum_s s} \right)^{-1} \equiv \cos^2 \theta_W(GUT) \ (114)$$

Operational equivalences: equations (112) and (113). Probability of a string-state of three dimensions and a string-state of eight dimensions. Angular partition of the circle, (plane). Particle model string in a box.

$$\left(\frac{\sum_{q_f} |q_f|}{\sum_s s} \right)^{-1} \equiv \cos^2 \theta_W(GUT) \equiv P(2,3) + P(2,8) = P(\ P(2,3) \cup P(2,8)\ ) \ (115)$$

Probability exclusive events: $P(2,3) + P(2,8) = P(P(2,3) \cup P(2,8))$

$P(2,3) = 2 \cdot \sin^2(2\pi/3)/3 = \frac{1}{2} \equiv min(\ \triangle x \triangle p/\hbar) \equiv \cos^2 \theta_{s=1}$

$P(2,3) = P(2,4) = \frac{1}{2}$

$$P(2,8) = 2 \cdot \sin^2(2\pi/8)/8 = \frac{1}{8} \equiv \frac{\left(\sum_{q_f} |q_f| \right)^{-1}}{3}$$

$$\left(\sum_{q_f} |q_f|\right)^{-1} \equiv \sin^2\theta_W(GUT) \equiv 6\cdot(\ P(2,3)\cdot P(2,8)\ ) \equiv k(l2)\cdot(\ P(2,3)\cdot P(2,8)\ ) \equiv$$

$cardinal\ \{3X_b, 3Y_b\}\cdot(\ P(2,3)\cdot P(2,8)\ )$ (116)

Probability not exclusive events: $(\ P(2,3)\cdot P(2,8)\ ) = P(P(2,3)\cap P(2,8))$

$$\frac{\sqrt{s(s+1)_{s=1/2}}}{\sqrt{s(s+1)_{s=1}}} \equiv \sin\theta_W(GUT) \equiv \sqrt{\left(\sum_{q_f} |q_f|\right)^{-1}} \quad (117)$$

Equivalence SU(6) (also matrix 6 x 6) group and the number of particles of the standard model to include the triplicity of color charge (limit of Higgs vacuum energy).

$dim[SU(6)] \equiv cardinal\ \{3c\cdot 6q + 8g + 6l + 1W^{\pm} + 1Z + 1\gamma\}$

$\{6\times 6\} \equiv cardinal\ \{3c\cdot 6q + 8g + 6l + 1W^{\pm} + 1Z + 1\gamma + 1h\}$

Operational equivalences 4 x 4 matrix: fractional electric charges, nonzero spins, and the matrix of the four solutions of the energy-momentum equation.

$4\times 4 \equiv 4q_f \times 4q_f \equiv n_s(E-P)\times n_s(E-P) \equiv (\ P(2,3)\cdot P(2,8)\ )^{-1}$

Solution positive quadratic equation that equals the lattice in R8.

$x^2 - x - 240 = 0$; $x_1 = 16; x_2 = -15$ $\quad x^2 + x - 240 = 0$; $x_3 = -16; x_4 = 15$

$4\times 4 \equiv 4q_f \times 4q_f \equiv n_s(E-P)\times n_s(E-P) \equiv (\ P(2,3)\cdot P(2,8)\ )^{-1} \equiv x_1 \equiv -x_3$

$\sum_s 2s+1 \equiv dim[SU(4)] \equiv x_4 \equiv -x_2$

11.2 Unitarity, and the Existence of Collapse of the Wave Function, Independent of the Observer.

The universe is deterministic macroscopic scales. However, a microscopic scale (quantum mechanics) seems indeterministic. This indeterminacy of quantum mechanics is due, as we have demonstrated, for the existence of unobservable states caused by quantum wormholes. These states may be identified as virtual states, which may be greater than the speed of light. The unitarity of quantum mechanics, ie the sum of the probabilities of all possible events is one; must be at the heart of the same unifying force. This unifying force would occur at scales of GUT theories; where the bosons X, Y, transmuted into quarks and leptons backwards. Also by these bosons, gravity with the other forces would be unified. Thus; there must be a probability function that is unitary and that relies on symmetry breaking through groups SU(2) and SU(3).

Where: SU(3) is the group of the electroweak force, and SU(3) is the group of the strong force.

11.2.1 Unitary probability. Probability of inclusive events, groups SU(2) and SU(3).

This is when the importance equivalences we have shown it appears; as a fundamental aspect of the unification scale, and therefore the unitarity or probability one.

The unitary probability is understood as the probability that there is any particle, is either in the group of the electroweak force, the strong force, or gravity; necessarily be 1: unitary. This implies that always exists to coordinate space-time a virtual particle, or energy associated spacetime inseparable; it becomes not separable, the space-time energy physical entity. This unitarity or probability 1, is equivalent to the reverse probability of equivalent probability, derived from the equalization of the gravitational and electromagnetic forces, the equation defining the zero energy of the quantum wormholes, ie:

$$P = 0 \equiv \; 4\pi^4 \cdot (\pm e)^2 \cdot [\sum_n^{\infty} \exp(-t_n)]^2 - 4 \cdot m_{Pk} \cdot m_e \cdot G_N = 0$$

$$P = 1 \equiv 4\pi^4 \cdot (\pm e)^2 \cdot [\sum_n^{\infty} \exp(-t_n)]^2 \Big/ 4 \cdot m_{Pk} \cdot m_e \cdot G_N$$

$$P = 1 \equiv 1 - 4\pi^4 \cdot (\pm e)^2 \cdot [\sum_n^{\infty} \exp(-t_n)]^2 - 4 \cdot m_{Pk} \cdot m_e \cdot G_N \equiv 4\pi^4 \cdot (\pm e)^2 \cdot [\sum_n^{\infty} \exp(-t_n)]^2 \Big/ 4 \cdot m_{Pk} \cdot m_e \cdot G_N \quad (118)$$

11.2.1.1 Unitary Probability : groups SU(2) and SU(3).

The unitary probability always implies the existence of a real or virtual particle associated with each basic unit of spacetime energy; the quantum wormholes. This probability is a function of non-exclusive events; dependent states of the groups SU(3) and SU(2).

The equation of this unitary probability is expressed as:

$$P(\,P(2,3)\cup P(2,8)\,) = P(2,3)+P(2,8)-6\cdot[-P(2,3)\cdot P(2,8)] = 1 \quad (119)$$

$P(2,3) + P(2,8) = \left(2\cdot\sin^2(2\pi/3)/2\right) + \left(2\cdot\sin^2(2\pi/8)/8\right) = \frac{1}{2}+\frac{1}{8} \equiv \frac{1}{2} + \frac{\left(\sum_{q_f}|q_f|\right)^{-1}}{3} = \cos^2\theta_W(GUT)$

$-6\cdot[-P(2,3)\cdot P(2,8)] = \sin^2\theta_W(GUT)$; $P(P(2,3)\cup P(2,8)) = P(2,3)+P(2,8) - 6\cdot[-P(2,3)\cdot P(2,8)] = \cos^2\theta_W(GUT)+\sin^2\theta_W(GUT) = 1$

The second term of the equation (119) is a negative probability, and multiplied by the factor six we explain below.

The six factor is due to the existence of six bosons X, Y (three states of different color for each boson).The probability of inclusive events is composed of the product of the probability of the group SU(2) multiplied by the probability of the group SU(3). They are therefore; the product of the probabilities of two strings; groups dependent symmetry breaking SU(2) and SU(3) This probability is negative due to the negative energy of the vacuum, as we will show below.

11.2.1.1.1 Negative Probability Dependent on the Negative Energy of the Vacuum. Mass of the Bosons X, Y. Mass of the Higgs Boson. Interaction Matrix of the Four Fractional Electric Charges and the Four Positive Energy Solutions of the Energy-Momentum Equation.

The negative energy of the vacuum, given by the equation:

$$\ln(m_v/m_{PK}) = 5\cdot\ln\left[\sum_{n}^{\infty}\exp(-t_n)\right]$$

This negative vacuum energy is divided by the 4 X 4 matrix of the four fractional charges and / or the 4 X 4 matrix of the four positive energy solutions of the energy-momentum equation. This partition of the vacuum energy, is what generates the mass of the bosons X, Y and the mass of the

Higgs boson h. The generating function of both masses depends on the states of the fractional electric charges; the transmutation of a quark produced in a lepton (and backwards) through the mediation of the bosons X, Y.

The mass of the Higgs boson h, depends on a neutral function for the electric charges. This function is generated by the sum of six quarks plus an electrically charged lepton and boson h (electron, muon or tau); giving a zero electric charge, corresponding to the zero electric charge boson h. It therefore has eight states. The mass of the Higgs boson h, is therefore given by:

1. $Q(6q) = 1 = \left(\frac{2}{3} - \frac{1}{3} + \frac{2}{3} - \frac{1}{3} + \frac{2}{3} - \frac{1}{3}\right) = 1$; $Q(6q) + Q(1l^-) + Q(h) = Q(0) = 0$; $N_{states}(\ Q(6q) + Q(1l^-) + Q(h)\ ) = 8$

2. $3c\sum_{q_f} |q_f| \equiv 8$

$$\ln(m_h/m_e) = \frac{5 \cdot \ln\left[\sum_n^{\infty} \exp(-t_n)\right]}{-4^2} + N_{states}(Q(6q)+Q(1l^-)+Q(h)) = 12.41677689 \rightarrow$$
$m_h = m_e \cdot e^{12.41677689} \rightarrow m_h = 126.1704567\ GeV$ (120)

The mass of bosons X, Y (both equal); is a function of the partition of the vacuum energy between the negative matrix -4 X 4. The matrix value must be negative; since the value of the vacuum, function of the logarithm of the partition function of the non-trivial zeros of the Riemann zeta function is also negative; so the 4 X 4 matrix must be negative for a positive value of energy to the masses of the bosons X, Y and boson h. For the masses of the bosons X, Y the number of states is the difference of the eight states defined for obtaining the mass of the Higgs boson, h; least six states of electric charges of the quarks which can obtain the fractional electric charges of bosons X, Y (4/3, 1/3). This allows us to obtain the number of states by:

$Q(6q) - \left(\frac{2}{3} - \frac{1}{3} + \frac{2}{3} - \frac{1}{3}\right) = Q(Y) = \frac{1}{3}$; $Q(6q) - \left(\frac{2}{3} - \frac{1}{3} - \frac{1}{3} - \frac{1}{3}\right) = Q(X) = \frac{4}{3}$; $N_{states}(\ Q(X) + Q(Y)\ ) = 4$

$N_{states}(Q(6q)+Q(1l^-)+Q(h)) - N_{states}\left[Q(1l^-) + Q(h)\right] - N_{states}(Q(X) + Q(Y)\ ) = 2 = N_{states}\left[Q(6q) - N_{states}(\ Q(X) + Q(Y)\ )\right]$

$$(121)\ (m_{PK}/m_{X,Y}) = e^{\left(\frac{5\cdot\ln\left[\sum_{n}^{\infty}\exp(-t_n)\right]}{-4^2}+N_{states}[Q(6q)-N_{states}(\,Q(X)+Q(Y)\,)]\right)} = \ldots$$

$$\cdots = e^{\left(\frac{5\cdot\ln\left[\sum_{n}^{\infty}\exp(-t_n)\right]}{-4^2}+2\right)} = e^{6.41677688608701}$$

$$(m_{PKç}/m_{X,Y}) = 612.02797996496 \approx 2\pi^5$$

Now we are able to obtain the negative probability, under the negative vacuum energy that allows us to obtain the unitary probability.

$$\frac{5\cdot\ln\left[\sum_{n}^{\infty}\exp(-t_n)\right]}{-4^2}+2 = \ln(m_{PK}/m_{X,Y})\ ;\ \frac{5\cdot\ln\left[\sum_{n}^{\infty}\exp(-t_n)\right]}{-4^2}+6 = \ln(m_h/m_e)$$

$$P(E_{vacuum}, E_{boson\ h}) = [\ln(m_h/m_e) - 6] \Big/ 5\cdot\ln\left[\sum_{n}^{\infty}\exp(-t_n)\right] = P(E_{vacuum}, E_{X,Y}) = [\ln(m_{PK}/m_{X,Y}) - 2] \Big/ 5\cdot\ln\left[\sum_{n}^{\infty}\exp(-t_n)\right] = -\tfrac{1}{4^2}$$

$$P(E_{vacuum}, E_{boson\ h}) = P(E_{vacuum}, E_{X,Y})$$

$P(\ P(2,3) \cup P(2,8)\ ) = P(2,3) + P(2,8) - 6\cdot P(E_{vacuum}, E_{X,Y}) = 1 = P(2,3)+P(2,8)-6\cdot[-P(2,3)\cdot P(2,8)] = \cos^2\theta_W(GUT)+\sin^2\theta_W(GUT) = 1$ (122)

11.2.1.1.2 The unitary probability direct function of the probability of a string whose length, dimensionless, is the spin from the gravitino.

$P\left(2, s=\frac{3}{2}\right) = 1 = P_{unitary}\ ;\ P\left(2, s=\frac{3}{2}\right) = 2\cdot\sin^2\left(2\pi/\frac{3}{2}\right)/\frac{3}{2} = 1 = P_u$ (123)

The mass of bosons X, Y; is also obtained as the probability of inclusive events; arising from probabilities intersection groups SU(3) and SU(2). In this case, there is the probability of two strings, raised to the power three, for the three different colors and a multiplicative factor of twelve (six bosons X, Y. six antibosons X, Y).

$$\frac{\left\{12\cdot[P(2,3)\cdot P(2,8)]^3\right\}^{-1}\cdot\left(\frac{12\pi}{33-2n_f}\right)\cdot\left(1+\left\{12\cdot[P(2,3)\cdot P(2,8)]^3\right\}\cdot\left(\frac{\alpha}{2\cdot\sqrt{10}}\right)\right)}{(1+(240\cdot\alpha)^{-12})} = 612.027298324269 \approx \frac{m_{PK}}{m_{X,Y}} \quad (124)$$

$\frac{12\pi}{33-2n_f} = \frac{12\pi}{33-2\cdot 6} = \frac{12\pi}{21}$; $n_f =$ Number of flavors of quarks.

The mass of the bosons X, Y: derivation from the gravitino mass and the Planck mass.

$$m_{3/2} = \sqrt{m_{PK}\cdot m_e\cdot s(s+1)_{s=\frac{3}{2}}}$$

$$m_{X,Y} = \left\{\left[m_{PK}^2\cdot m_{3/2}\cdot 12^2\right]^{1/3}\cdot\tan^2(4)_{rad}\right\}\cdot\left(1+\left[5\cdot\ln\pi\cdot 12^2\right]^{-1}\right) \quad (125)$$

$\tan^2(4)_{rad} = \tan^2\left(\frac{4\cdot m_{PK}\cdot G_N}{c^2\cdot l_{PK}}\right)_{rad}$; $l_{PK} = \sqrt{\frac{\hbar\cdot G_N}{c^3}}$

$\frac{4\cdot m_{PK}\cdot G_N}{c^2\cdot l_{PK}}$ **Quantum light deflection curvature (General Relativity)**

12 The Mass of the Proton, Neutron, and the Sum of the Masses of the Charged Leptons: Direct Function of the Ratio of the Mass of Bosons X, Y and Planck mass.

As will be shown shortly, the proton is stable. The following equations show very clearly, that the masses of the proton, the neutron and charged leptons (tau, muon and electron) are a function of the interaction of the three bosons X, Y (three different colors for each boson) This implies an arrow opposite of decay; which confirms the stability of the proton; as we will demonstrate shortly.

$$\frac{m_p}{m_e} = 3\cdot e^{\left(\frac{5\cdot\ln\left[\sum_n^{\infty}\exp(-t_n)\right]}{-4^2}+2\right)} + \frac{1}{\ln\left[\sum_n^{\infty}\exp(-t_n)\right]} + \frac{\sqrt{8\pi}}{196884=k(l26)} = 1836.15267240381 \ (126)$$

$$\frac{m_n}{m_e} = \frac{m_p}{m_e} + \frac{10}{3+\sin(2\pi/5)} + \frac{1}{\frac{m_p}{m_e}\cdot\left\{\left(\cos\theta_{s=2}+\cos\theta_{s=1/2}\right)^2+3c\cdot 6q+8g\right\}} = 1838.6836604994 \ (127)$$

Sum Mass of Electrically Charged Leptons. Electron, Muon and Tau.

$$\left(m_\tau + m_\mu + m_e\right)/m_e = 6\cdot e^{\left(\frac{5\cdot\ln\left[\sum_n^{\infty}\exp(-t_n)\right]}{-4^2}+2\right)} + \ln\left(\sin^2\theta_W\cdot\pi^{12}\right) - \frac{3\alpha}{2\cdot(3c\cdot 6q+8g)} = 3684.91929635505 \ \ (128)$$

12.0.1.1.3 The Stability of the Proton.

$$\frac{\left[m_p - m_e\cdot\frac{4\pi}{3}\right]\cdot m_{PK}\cdot G_N}{(\pm e)^2\cdot\left(\sum_n^{\infty}\exp(-t_n)\right)^2} = \frac{m_Z}{m_e} \ \ (129)$$

$$\left(\frac{VH}{m_e}\right)\cdot\left(\frac{2\cdot[k(l8)-1]}{k(l5)}\right)\cdot\left(\sum_n^{\infty}\exp(-t_n)\right) = \frac{4\pi}{3} = \left(\frac{VH}{m_e}\right)\cdot\left(\frac{2\cdot[240-1]}{240/6}\right)\cdot\left(\sum_n^{\infty}\exp(-t_n)\right) \ (130)$$

$$\left(\frac{VH}{m_e}\right) = \frac{246.2196509\ GeV}{5.109989276\cdot 10^{-4}\ GeV}$$

12.0.1.1.4 Free Neutron Decay.Gravitational Source.

$$\lambda_c(n) = \frac{h}{m_n\cdot c}\ ;\ \left(\frac{\lambda_c^2(n)\cdot c}{m_n\cdot G_N}\right)\cdot\frac{10\cdot\alpha^6}{8} = 881.3824274\ s \ (131)$$

$$\alpha = (137.035999173)^{-1} \quad ; \quad 10 \equiv 8g + 1\gamma + 1G$$

13 The Possible Existence of Macroscopic Gravitational Effects Produced by Gravitational Quantum Mechanical Effects.

That the space-time-energy lattice is composed of discrete units of quantum wormholes, whose state of minimum energy with mass and electric charge, is the electron; seen by an observer at a given scale, makes us think of the gravitational energy of the virtual electrons. This gravitational energy would have a temperature equivalent, applying equation Unruh effect, would produce an acceleration of the same spin-space quantum level. It would be a rotation of the space itself, the effect of gravitational energy outside the event horizon obsevable of quantum wormholes; that is, the gravitational energy of the electron with a radius equal to the Planck constant (h-bar), divided by the product of the mass of the electron by the speed of light.

13.1 Unruh effect.Acceleration generated by the equivalent temperature of the gravitational energy of the electron.

Compton wavelength of the electron.

$$\lambda_c(e) = h/m_e c$$

Gravitational energy (energy graviton with zero rest mass. Nonzero mass motion) to the distance of Compton wavelength of the electron $\lambda_c(e)$

$$E_G[\, e, \lambda_c(e)\,] = m_e^2 \cdot G_N/\lambda_c(e)$$

Unruh effect.

$$\hbar \cdot a/2\pi \cdot c \cdot k_B = T \rightarrow a = 2\pi \cdot c \cdot k_B \cdot T/\hbar$$

$$a(\ E_G[\ e, \lambda_c(e)\ ]\ ) = E_G[\ e, \lambda_c(e)\ ] \cdot 2\pi \cdot c/\hbar$$

Gravitational acceleration dependent radius of virtual electron (Heisenberg uncertainty principle).

$$r_H(e) = \hbar/m_e c\ ;\ a(\ r_H(e)\ ) = m_e^2 \cdot G_N/r_H^2(e) = a(\ E_G[\ e, \lambda_c(e)\ ]\ ) \quad (132)$$

The equation (132) shows clearly that the effect Unruh and the gravitational acceleration of an electron (virtual) to the distance of a radius derived from the principle of uncertainty; are exactly the same and equal acceleration.

Now; we must also take into account the acceleration or velocity change produced by photons accompanying the electron; that is: **Scharnhorst effect.**

We will quote Wikipedia:

From Wikipedia, the free encyclopedia
"The Scharnhorst effect is a hypothetical phenomenon in which light signals travel faster than c between two closely spaced conducting plates. It was predicted by Klaus Scharnhorst of the Humboldt University of Berlin, Germany, and Gabriel Barton of the University of Sussex in Brighton, England. They showed using quantum electrodynamics that the effective refractive index, at low frequencies, in the space between the plates was less than 1 (which by itself does not imply superluminal signaling). They were not able to show that the wavefront velocity exceeds c (which would imply superluminal signaling) but argued that it is plausible.
Explanation.
Owing to Heisenberg's uncertainty principle, an empty space which appears to be a true vacuum is actually filled with virtual subatomic particles. These are called vacuum fluctuations. As a photon travels through a vacuum it interacts with these virtual particles, and is absorbed by them to give rise to a virtual electron-positron pair. This pair is unstable, and quickly annihilates to produce a photon like the one which was previously absorbed. The time the photon's energy spends as subluminal electron-positron pairs lowers the observed speed of light in a vacuum.
A prediction made by this assertion is that the speed of a photon will be increased if it travels between two Casimir plates.[2] Because of the limited amount of space between the two plates, some virtual particles present in vacuum fluctuations will have wavelengths that are too large to fit between the plates. This causes the effective density of virtual particles between the plates to be lower than that outside the plates. Therefore, a photon that travels between these plates will spend less time interacting with virtual particles because there are fewer of them to slow it down. The ultimate effect would be to increase the apparent speed of that photon. The closer the plates are, the lower the virtual particle density, and the higher the speed of light.[3]
The effect, however, is predicted to be minuscule. A photon travelling between two plates that are 1 micrometer apart would increase the photon's speed by only about one part in 10^36.[4] This change in light's speed is too small to be detected with current technology, which prevents the Scharnhorst effect from being tested at this time."

$\triangle c = \frac{11\pi^2\alpha^2}{90^2} \cdot \frac{\hbar^4}{m_e^4 \cdot c^3 \cdot d^4} \to \triangle c / \left(\frac{\hbar^4}{m_e^4 \cdot c^3 \cdot d^4} \right) = \frac{11\pi^2\alpha^2}{90^2}$

The acceleration of rotation of space-time itself, with the Scharnhorst-Unruh effect; finally would give a constant acceleration; in the

whole spacetime coordinate equal to:

$$g(0) = \left(m_e^2 \cdot G_N / r_H^2(e)\right) / \left(\triangle c / \left(\frac{\hbar^4}{m_e^4 \cdot c^3 \cdot d^4}\right)\right) = 5.71293023558312 \cdot 10^{-10} m/s^2 \quad (133)$$

$$G_N = 6.6748415 \cdot 10^{-11} \; N \cdot m^2/Kg^2$$

13.2 Applications of Vacuum Rotational Acceleration. Lunar Orbit Anomaly.

13.2.1 Lunar Orbit Anomly. Laser Ranging Experiment.

Studies on the moon, made by NASA and the Johnson Space Center, quantified an anomaly in the measurements of the lunar orbital evolution. This finding may be important for cosmology. The Lunar Laser Ranging Experiment informs Apollo semimajor axis of the crescent Moon at a rate of 3.82 ± 0.07 cm / year, abnormally high.

Adopting the value of acceleration of rotation of the vacuum; which is a constant for each coordinate space; that is, it is independent of the distance. If there masses involved in physical effects; these masses should modify this value of acceleration. You can expect an effect-modified gravitational interaction of the rotating space value and the masses involved. The correction can be expected to be logarithmic. A renormalization correction type. Specifically: the logarithm of the mass considered, divided by Planck's mass; that is:

$$\ln(m_1/m_{PK}) \; ; \; \ln(m_2/m_{PK})$$

The observed anomaly of increase of the eccentricity of the lunar orbit; would, in fact, ***an apparent result***. The same space with a twist acceleration with the magnitude calculated by the equation (133) would force the laser photons to travel more space on your back and forth, to be reflected in the reflectors located on the Moon. This effect depends on the value of the rotational acceleration of the vacuum and the logarithmic correction shown. Since the laser photons, moving between the Earth and the Moon; then the masses to consider are the Earth and the Moon. The time would therefore be the 86164 seconds of an Earth day, multiplied by 365 days a year.Two-factor, double roundtrip path of the laser photons between the Moon and Earth.

$m_{☾} = mass \; Moon = 7.3477 \cdot 10^{22} \; Kg$; $m_{\oplus} = mass \; Earth = 5.97219 \cdot 10^{24} \; Kg$; $m_{PK} = 2.176345963 \cdot 10^{-8} \; Kg$

$g(0) \cdot 2 \cdot 86164 s \cdot 365 \cdot \left(\ln(m_{\otimes}/m_{PK}) / \ln\left(m_{☾}/m_{PK}\right)\right) = 0.0381823589598273\ m/Year \rightarrow \approx 3.82\ cm/Year$ (134)

13.3 The rotation speed of the galaxies. The absence of dark matter.

The constant velocity that is observed in galaxies; that is independent of the distance; is a consequence of the constant acceleration that exists in all space coordinate. This constant acceleration, as we have proven, is gravitational quantum-mechanical origin (Equation (133)). For a galaxy; very approximate equation depends only on the acceleration of the vacuum (equation (133)) and its mass. With a term of logarithmic correction, which is the ratio of the galaxy mass, Planck mass. Equation has been tested with two tables of galaxies, two articles cited.

Galaxy rotation speed $= V_{rG}$

$$V_{rG} = \left[\left(\sqrt[4]{g(0) \cdot M_G \cdot G_N \cdot \ln\left(M_G/m_{PK}\right)} \right) / \ln\ln\left(M_G/m_{PK}\right) \right] \cdot C \quad (135)$$

$$C = \left(1 + \left(-5 \cdot 2 \cdot \ln\left[\sum_n^{\infty} \exp(-t_n) \right] \right)^{-1/2} \right)$$

Galaxy mass $= M_G$

13.3.1 Calculation table of speeds of galaxies with equation (135)

Then; is a table with the rotation speeds calculated with the equation (135) and the observed speeds. These tables of speeds, are of the following articles:

1. Vera C. Rubin, David Burstein, W. Kent Ford, Jr. and Norbert Thonnard. ROTATION VELOCITIES OF 16 Sa GALAXIES AND COMPARISON OF Sa, Sb, AND Sc PROPERTIES.The Astrophysical Journal, 289: 81-104, 1985 February 1.

2. Vera C. Rubin, David Burstein, W. Kent Ford, Jr. and Norbert Thonnard. ROTATIONAL PROPERTIES OF 23 Sb GALAXIES. The Astrophysical Journal, 261: 439-456, 1982 October 15.

Table rotational velocities Galaxies I

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TABLE 2

ADDITIONAL PARAMETERS FOR Sa GALAXIES

NGC IC UGC (1)	Distance (Mpc) (2)	B_T (mag) (3)	Δm_b (mag) (4)	Δm_i (mag) (5)	$B^{i,b}$ (mag) (6)	M_B (mag) (7)	$V(R_f)$ (km s^{-1}) (8)	V_{max} (km s^{-1}) (9)	$\mathcal{M}(R_{25})$ (10^{10} $M_\odot$) (10)	$\mathcal{M}(R_{25})/L_B$ (11)	$\mathcal{M}(R_{25})/L_H$ (12)
N1024	71.7	13.8	0.30	0.72	12.8	−21.5	140	272	23.5	3.8	0.6
N1357	39.3	12.60	0.09	0.27	12.24	−20.7	256	269	21.8	7.4	...
N2639	66.5	12.65	0.09	0.34	12.22	−21.9	324	324	46.9	5.2	1.5
N2775	24.3	11.20	0.09	0.19	10.92	−21.0	273	299	27.8	7.1	2.0
N2844	29.8	13.65	0	0.55	13.10	−19.3	163	163	4.87	6.0	2.4
N3898	23.1	11.7	0	0.44	11.3	−20.5	269	269	23.8	9.6	2.9
N4378	48.6	12.28	0	0.06	12.22	−21.2	283	322	41.8	8.9	...
N4594	18.5	9.27	0.11	0.65	8.51	−22.8	367	367	73.6	3.6	1.2
N4698	20.	11.39	0	0.46	10.93	−20.6	248	248	17.0	6.3	2.9
U10205	135.	14.4	0.05	0.52	13.8	−21.9	243	275	55.1	6.2	1.4
I724	117.	13.8	0.02	0.76	13.0	−22.3	286	374	91.9	7.1	2.1
N3281	62.3	12.62	0.28	0.51	11.83	−22.1	229	...	...	...	...
N3593	12.4	11.7	0	0.70	11.0	−19.5	108	...	...	...	...
N4419	20.	11.95	0.05	0.82	11.08	−20.4	181	...	...	...	...
N4845	20.	12.17	0.01	0.95	11.2	−20.3	175	...	...	...	...
N6314	138.	13.85	0.20	0.55	13.10	−22.6	229	...	...	...	...

Sun Mass $= M_\odot = 1.98855 \cdot 10^{30}\ Kg$

Table calculation equation (135).(Table rotational velocities Galaxies I)

	Galaxy Mass $10^{10} M_\odot$	Galaxy R. Velocity Eq (135) km/s	Galaxy R. Velocity Observed km/s
N1024	23.5	273.234	272
N1357	21.8	268.147	269
N2639	46.9	324.837	324
N2775	27.8	284.974	299
N2844	4.87	184.255	163
N3898	23.8	274.104	269
N4378	41.8	315.609	322
N4594	73.6	363.629	367
N4698	17	251.961	248
U10205	55.1	338.208	275
I724	91.9	384.415	374

Table rotational velocities Galaxies II

TABLE 2

MAGNITUDES, VELOCITIES, MASSES, AND $\mathfrak{M}/L$ RATIOS FOR PROGRAM Sb GALAXIES[a]

Name NGC (1)	Distance (Mpc) (2)	B_T (mag) (3)	Δm_b (mag) (4)	Δm_i (mag) (5)	$m_c^{i,b}$ (mag) (6)	M_B (mag) (7)	$V(R_f)$ (km s^{-1}) (8)	$V(R_{25}^{i,b})$ (km s^{-1}) (9)	$\mathfrak{M}(R_{25})$ ($10^{10}\mathfrak{M}_\odot$) (10)	$\mathfrak{M}(R_{25})/L$ (solar units) (11)
4800	19.5	12.30	0.0	0.39	11.91	−19.55	175	179	3.65	3.39
2708	35.5	(13.6)	0.02	0.54	13.0	−19.8	241	241	19.9	15.4
3067	28.3	12.70	0.05	0.72	11.93	−20.33	150	161	5.78	2.74
4448	19.0	12.0	0.29	0.74	11.0	−20.4	190	190	9.24	4.29
1515	19.1	11.83	0.0	1.14	10.69	−20.72	155	153	7.41	2.45
1353	30.0	12.25	0.02	0.64	11.59	−20.80	226	226	16.6	5.12
1325	30.0	12.32	0.02	0.78	11.52	−20.87	184	184	14.8	4.27
7537	57.3	13.80	0.07	1.05	12.68	−21.11	141	144	8.83	2.04
U11810	98.3	(14.7)	0.04	0.91	13.8	−21.2	187	197	30.7	6.53
7171	57.4	13.00	0.22	0.38	12.40	−21.39	213	213	25.2	4.50
7217	24.7	11.10	0.41	0.13	10.56	−21.40	258	254	22.7	4.02
1620	68.4	(13.6)	0.19	0.74	12.7	−21.5	248	252	44.0	7.10
3054	43.1	12.13	0.25	0.34	11.54	−21.63	239	239	34.2	4.90
2590	95.8	(14.0)	0.10	0.94	13.0	−21.9	252	256	60.4	6.75
2815	45.5	12.66	0.59	0.82	11.25	−22.04	280	280	48.3	4.74
1417	81.5	12.75	0.13	0.34	12.28	−22.28	328	330	85.4	6.72
1085	136.	(13.6)	0.11	0.19	13.3	−22.4	310	310	77.8	5.48
7083	59.6	12.00	0.13	0.36	11.51	−22.37	222	222	44.7	3.24
U12810	165.	(14.4)	0.11	0.78	13.5	−22.6	235	235	66.0	3.87
3145	68.8	12.35	0.20	0.54	11.6	−22.58	273	275	59.5	3.49
3223	52.4	11.79	0.45	0.38	10.96	−22.64	254	255	52.6	2.97
7606	47.5	11.55	0.18	0.66	10.71	−22.67	246	246	57.4	3.15
3200	65.3	12.29	0.27	0.82	11.20	−22.87	282	282	85.1	3.89

Table calculation equation (135).(Table rotational velocities Galaxies II
)

	Galaxy Mass $10^{10}M_{\odot}$	Galaxy R. Velocity Eq (135) km/s	Galaxy R. Velocity Observed km/s
4800	3.65	171.422	179
2708	19.9	262.095	241
3067	5.78	192.328	161
4448	9.24	216.296	190
1515	7.41	204.669	153
1353	16,6	250.464	226
1325	14.8	243.370	184
7537	8.83	213.853	144
U11810	30.7	292.142	197
7171	25.2	278.054	213
7217	22.7	270.876	254
1620	44.0	319.687	252
3054	34.2	300.145	239
2590	60.4	346.074	256
2815	48.3	327.237	280
1417	85.4	377.420	330
1085	77.8	368.716	310
7083	44.7	320.953	222
U12810	66.0	353.841	235
3145	59.5	344.775	275
3223	52.6	334.299	255
7606	57.4	341.688	246
3200	85.1	377.088	282

13.3.1.1 Velocities Galaxies Clusters.

A slight modification of equation (135) to calculate quite accurately the observed rotation velocities for clusters of galaxies, the article: **M. Milgrom, A Modification Of The Newtonian Dynamics: Implications For Galaxies, The Astrophysical Journal, 270:371-383,1983 july 15**

Table rotation velocities Clusters Galaxies

TABLE 3
MASSES AND M/L_V VALUES FOR GALAXY CLUSTERS

Cluster	Cz (km s^{-1})	σ (km s^{-1})	M (10^{12} $M_\odot$)	L_V (10^{12} $L_{V,\odot}$)	M/L_V (s.u)
A98	31168[a]	887[a]	141	21[b]	6.8
A154	19746[a]	904[a]	175	11[b]	15.4
A168	13557[a]	605[a]	38	12[b]	3.1
A194	5312[a]	414[c]	9	1.8[d]	5.0
A401	22379[e]	1390[c,e]; 967[c,e]	944; 221	18[b]	52; 12.3
A1314......	10215[a]	701[a]	71	3.1[d]	23.0
A1367......	6552[a]	634[a]	50	3.3[d]	15.0
Coma	6821[a]	975[a]	279	9.4[d]; 30[j]	30; 9.3
A1940......	41686[a]	616[a]	29	17[b]	1.7
A2029......	23000[f]	1540[f]	1413	38[b]	37
Hercules ...	10775[g]	652[g]	53	3.6[d]	14.7
A2197......	9082[a]	352[a]	5	4.2[d]	1.1
A2199......	9250[a]	887[a]; 541[h]	185; 26	5.7[d]	32; 4.5
A2256......	18069[a]	1357[a]	905	23[b]	39
A2670......	22590[i]	890[i]	158	10[b]	15.8

For clusters of galaxies the semi-empirical equation is expressed by:

Galaxy cluster rotation speed $= V_{rG(cl)}$

$$V_{rG(cl)} = \Bigg[\left(\sqrt[4]{g(0) \cdot M_{G(cl)} \cdot G_N \cdot \ln\left(M_{G(cl)}/m_{PK}\right)} \right) / \ln\ln\left(M_{G(cl)}/m_{PK}\right) \cdot$$
$$\ln\ln\ln\left(M_{G(cl)}/m_{PK}\right) \Bigg] \cdot C \quad (136)$$

$$C = \left(1 + \left(-5 \cdot 2 \cdot \ln\left[\sum_n^{\infty} \exp(-t_n) \right] \right)^{-1/2} \right)$$

Table calculation equation (136).(Table rotational velocities Clusters Galaxies)

	Galaxy Mass (CL)$10^{12}M_\odot$	Galaxy (CL) R. Velocity Eq (136) km/s	Galaxy (CL) R.Velocity Observedkm/s
A98	141	865.439	887
A154	175	913.312	904
A168	38	624.195	605
A194	9	435.946	414
A901	944;221	1390.112;969.011	1390;967
A1314	71	729.419	701
A1367	50	668.380	634
Coma	279	1025.903	975
A1940	29	583.534	616
A2029	1413	1537.135	1540
Hercules	53	678.157	652
A2197	5	376.548	352
A2199	185;26	926.05;567.86	887;541
A2256	905	1375.570	1357
A2270	158	890.345	890

14 The Inflation Factor: Direct Consequence of the Dimensionless Quantization of Gravity.

14.1 Conditions to be Fulfilled by the Inflation Factor.

1. First condition: inflation should not distinguish between acceleration and speed; or what is the same: acceleration = velocity in the form of differential equation

2. The dimensionless factor of inflation must be derived from the dimensionless quantization of gravity. Dimensionless quantum curvatures

3. The inflation factor must correspond to the interaction of three strings circles; just as in the case Higgs vacuum.

4. The inflation factor is, as in special relativity, a twist in a hyperbolic space.

5. The inflationary vacuum corresponds to a hyperbolic de Sitter space.

14.1.1 Inflation Factor: Acceleration = Velocity in the Form of Differential Equation.

$\frac{dx^2}{d^2t} = \frac{dx}{dt}$ (137)

Equation (137) has the solution: $t = \frac{dx}{x} \to \int t dt = \int \frac{dx}{x} \to t^2/2 = \ln x + C \to e^{t^2/2} = xe^C$

The equation (137) satisfies the first condition.

14.1.2 Factor inflation: quantum dimensionless curvatures.

$4 \cdot m \cdot G_N/c^2 \cdot r$; $4 \cdot m_{PK} \cdot G_N/c^2 \cdot l_{PK} = 4$ (Oscillator basic curvature)

Sum of all oscillators of curvature; dependent on the spins.

$4 \cdot \sum_{n=0}^{\infty} \left(\frac{(-1)^n}{2n+1} \right)^2 = \pi^2/2$ (138)

14.1.3 Inflation Factor: Interaction Sum of Curvatures Three Strings Circles.

$3 \cdot \sum_{n=1}^{\infty} \frac{1}{n^2} = \pi^2/2$ (139)

14.1.4 *Final Inflation Factor : Relativistic Twist on a Hyperbolic Space*.

Substituting the solution of equation (137); the results of (138) and (139); and making a twist on a hyperbolic space; relativistic. That is:

$$e^{t^2/2} = xe^C \ ; \ t^2/2 = 4 \cdot \sum_{n=0}^{\infty} \left(\tfrac{(-1)^n}{2n+1}\right)^2 = \pi^2/2 = 3 \cdot \sum_{n=1}^{\infty} \tfrac{1}{n^2} = \pi^2/2$$

$$x = ct = \cosh\phi + \sinh\phi \ ; \ e^{\pi^2/2} = \phi \ ; \ e^C = R\gamma = \sqrt{\alpha^{-1}/4\pi}$$

$$R\gamma \cdot e^{e^{\pi^2/2}} = R_\gamma \cdot [\cosh\phi + \sinh\phi]$$

Making the initial time of inflation, the Planck time; we finally obtain a value for the Hubble constant:

$$t_{PK} \cdot R\gamma \cdot \left[\cosh\left(e^{\pi^2/2}\right) + \sinh\left(e^{\pi^2/2}\right)\right] = H_0^{-1} = 5.391464909495279 \cdot 10^{-44} s \cdot 8.0457241354872 \cdot 10^{60} = 4.3378239347958496 \cdot 10^{17} s \ (140)$$

The consequences of the result of the equation (140) are: **1) The universe grew to its current size in exactly the Planck time lapse**. **2) The Hubble constant; is actually twice the frequency of the vacuum, since:**

$$\ln\left(R\gamma \cdot \left[\cosh\left(e^{\pi^2/2}\right) + \sinh\left(e^{\pi^2/2}\right)\right]\right) = 140.240246366662 \approx -2 \cdot 5 \cdot \ln\left[\sum_{n}^{\infty} \exp(-t_n)\right] - \left(\sqrt{(s+1)s_{=1/2}} \diagup \cos\theta_W\,(GUT)\right)$$

3) The age of the universe, does not correspond with 13,780 million years; by incorrect interpretation and understanding of what really is the Hubble constant.

The Hubble constant or formulation as Hubble's law; by the speed increases depending on the distance; it is a consequence of the existence of quantum mechanical gravitational acceleration of the vacuum and constant, all over the space coordinate. This constant expressed by the equation (133) is related to the Hubble constant, by the following equation:

Mass of the Universe: $M_U = m_{PK} \cdot R\gamma \cdot \left[\cosh\left(e^{\pi^2/2}\right) + \sinh\left(e^{\pi^2/2}\right)\right]$

$$g(0) = \left(m_e^2 \cdot G_N / r_H^2(e)\right) / \left(\triangle c / \left(\tfrac{\hbar^4}{m_e^4 \cdot c^3 \cdot d^4}\right)\right) = 5.71293023558312 \cdot 10^{-10} m/s^2$$

$$c = \sqrt[4]{M_U \cdot G_N \cdot g(0) \cdot \left(\tfrac{25}{6} - r_7 + 248^{-2}\right)} = 2.99792458 \cdot 10^8 \ m/s \ (141)$$

$$r_7^8 = [4(2\pi)^7]/(8 \cdot \pi^{7/2}/\Gamma(7/2))$$

$$c/\left(g(0) \cdot \left[\tfrac{25}{6} - r_7 + 248^{-2}\right]\right) = H_0^{-1} \ (142)$$

4**) The exact and correct calculation; of the anomaly of the Lunar orbital eccentricity; shows that this acceleration of vacuum**

that permeates all space, constantly, and interacts with the masses; modifying the kinematic conditions of the rotation of galaxies. The character of almost constant rotation of galaxies; is thus fully explained by the existence of this gravity-acceleration of quantum mechanical vacuum itself. ***So, do not exist at all, the dark matter. Never be found.***

14.1.4.1 *Orbital Lifetime Limits from Gravitational Radiation. Two States, Two electrons. Quantum Wormholes. Quantum Mechanical Origin of the Hubble Constant.*

The orbital lifetime of two masses, rotating around each other;

expressed by general relativity, by the following equation:

$t = \frac{5 \cdot c^5 \cdot r^4}{256 \cdot G_N^3 \cdot (m_1 \cdot m_2) \cdot (m_1 + m_2)}$ (143)

Substituting in equation (143) the radio, by the Planck length; and the masses by the masses of two electrons, with a corrective term due to photons; given by the fine structure constant and the cosine of the Weinberg angle, you get exactly the Hubble constant. That is:

$H_0^{-1} = \frac{5 \cdot c^5 \cdot l_{PK}^4 \cdot \alpha^2}{256 \cdot G_N^3 \cdot (m_e \cdot m_e) \cdot (m_e + m_e) \cdot \cos\theta_W}$; $\cos\theta_W = m_W / m_Z = \sqrt{1 - (2\varphi^3 - 8)^2}$ (144)

$\varphi = \frac{\sqrt{5}+1}{2}$

15 Conclusions.

Throughout this work; has been shown as there is a unification of all forces. This unification implies the existence of quantum wormholes, which are the basic units of inseparable space-time energy system. The strong holographic principle is a manifestation of how the space-time energy, is organized into multiple dimensions lattices. This principle, in its last result requires that the correct model of quantum strings, is that of a string in a box. There are unobservable states of the particles; and these unobservable states (above the speed of light) are the ultimate underlying reality. The deterministic probabilistic nature of quantum mechanics, is caused by the impossibility of observe the unobservable states; which leads, by the interaction of the (real) observable and unobservable states ("virtual") to the probabilistic nature of quantum mechanics. But this does not mean that there is no underlying structure independent of the observer. On the contrary, there is a reality independent of the observer and in principle; deterministic nature. That there are quantum wormholes, whose net energy is zero; it has been also shown by the equation that equals the gravitational and electromagnetic forces, to calculate precisely the elementary electric charge and mass of the electron.

Likewise; the partition function obtained from the non-trivial zeros of the Riemann zeta function; is an essential and fundamental character in quantum mechanics.

We have also shown as the collapse of the wave function; the unitary probability is a consequence of both the unification of all forces, and the gravitational character of the unitary probability, by the interaction of the gravitino mainly.

The current interpretation of quantum mechanics (the Copenhagen interpretation) is absolutely erroneous. It is much more correct interpretation of Bohm: the pilot-wave theory (The de Broglie–Bohm theory).In the double-slit experiment: it really happens that the associated state (excitation quantum interaction worm hole; underlying the particle, with the rest of the quantum wormholes forming the lattice of space-time) of the particle passes also by one of the slits and interacts with its own particle associated.

The instantaneous change of one of the observables of an entangled quantum system; It is a requirement of quantum wormholes mutually interconnected through space. Since these quantum wormholes have zero net energy; we have shown that the propagation speed is infinite. And this latter effect explains perfectly the call action at a distance; which is not derived from the present quantum mechanics, neither explains nor gives a value of their speed of propagation.

It has been shown that the Hubble constant is of quantum mechanical origin. Similarly, the age of the universe derived from this constant, is an absolute and incorrect interpretation of the true nature of this constant. This constant is closely related to the frequency of the vacuum; also, with the gravitational acceleration, of the vacuum itself

The vacuum gravitational acceleration has allowed us to calculate accurately; well as explain the apparent anomaly orbital eccentricity of the orbit of the Moon; you can not explain, nor by the same General Relativity of Eisnstein.

In short; This paper is a general "revolution" of physics.

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