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Axiomatization of unification theories: The fundamental role of the partition function of non-trivial zeros (imaginary parts) of Riemann's zeta function. Two fundamental equations that unify gravitation with quantum mechanics.

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ABSTRACT. 1) Using the partition function for a system in thermodynamic equilibrium; and replacing the energy-Beta factor (Beta = 1/[Boltzmann constant x temperature]) by the imaginary parts of the nontrivial zeros Riemann's zeta function; It is obtained, a function that equals the value of elementary electric charge and the square root of the product of the Planck mass, the electron mass, and the constant of universal gravitation.

2) Using this same partition function (thermodynamic equilibrium) the Planck constant (Planck mass squared, multiplied by the constant of universal gravitation) is calculated with complete accuracy; As a direct function of the square of the quantized constant elementary electric charge.

These two fundamental equations imply the existence of a repulsive acceleration of the quantum vacuum. As a direct consequence of this repulsive acceleration of the quantum vacuum; The repulsive energy of the quantum vacuum is directly derived from the general relativity equation for critical density.

As a consequence of this repulsive acceleration, we establish provisional equations that allow us to calculate with enough approximation the speed of rotation within the galaxies; As well as the diameter of galaxies and clusters of galaxies.

To obtain this results, completely accurate; several initial hypotheses are established. These hypotheses could say, that become physical-mathematical theorems, when they are demonstrated by empirical data. Among others, it is calculated accurately baryon density as well as the mass density.

Hypothesis-axioms are demonstrated by their practical application for the empirical calculation of baryon density, antimatter-matter asymmetry factor, Higgs vacuum value, Higgs boson mass (mh1), and mass prediction of Quark stop, about 745-750 GeV. This boson would not have been discovered because its decay would be hidden by the almost equal masses of the particles involved in the decay. We think that this type of hidden decay is a general feature of supersymmetry.

The physico-mathematical concept of quantum entropy (entropy of information) acquires a fundamental relevance in the axiomatization of the theories of unification.

Another fundamental consequence is that time would be an emergent dimension in the part of the universe called real (finite limit velocities). In the part of the virtual universe and not observable; The time would be canceled, would acquire the value t = 0.This property would explain the instantaneity of the change of correlated observables of interlaced particles; And the instantaneous collapse of the wave function, once it is disturbed (measured, observed with energy transmission to the observed or measured system).

To get a zero time, special relativity must be extended to hyperbolic geometries (virtual quantum wormholes). This natural generalization implies the existence of infinite speeds, on the strict condition of zero energy and zero time (canceled). This has a direct relationship with soft photons and soft gravitons with zero energy, from the radiation of a black hole; And that they would solve the problem of the loss of information of the black holes.

The main equation of unification of electromagnetism and gravitation; It seems necessarily imply the existence of wormholes, as geometrical manifestation of hyperboloid of one sheet, and two sheets. In the concluding chapter we discuss this point; and others highly relevants.

The relativistic invariance of elementary quantized electric charge is automatically derived.

Abstract. Utilizando la funcion de particion para un sistema en equilibrio termodinamico; y substituyendo el factor energia-Beta (Beta = 1/[constante de Boltzman por temperatura]), por las partes imaginarias de los ceros no triviales de la funcion zeta de Riemann; se obtiene, una funcion que iguala el valor de la carga electrica elemental y la raiz cuadrada del producto de la masa de Planck, la masa del electron, y la constante de la gravitacion universal.

Para obtener este resultado, completamente exacto; se establecen varias hipótesis iniciales. Estas hipótesis, se podría decir, que se convierten en teoremas físico-matemáticos, cuando se demuestran los datos empíricos. Entre otros, se calcula con precisión la densidad de bariones, así como la densidad de masa.

El valor del vacío Higgs se deriva de estas hipótesis. La ecuación principal de la unificación del electromagnetismo y la gravitación; parece implicar necesariamente la existencia de los agujeros de gusano, como manifestación geométrica del hiperboloide de una hoja y dos hojas. En el capítulo de conclusiones, se discuten este punto; y otros de gran relevancia.

La invarianca relativista de la carga electrica elemental cuantizada, se deriva automaticamente.

0.1. Introducción

Two important unresolved problems of quantum mechanics would have a common solution with the consideration of time as an emerging dimension. These two fundamental unresolved problems are: 1) The instantaneous collapse of the wave function, or its equivalent in the instantaneous change of an observable correlate between two quantum interlaced particles, particles A and B; By measuring, for example, the polarization of two photons (A, B) that are physically separated by an arbitrarily large distance. Once the polarization state of photon A is measured, photon B instantaneously acquires a state of polarization perpendicular to the polarization of photon A. If photon A, when performing the measurement, acquires the polarization state V or vertical; Then the photon B and instantaneously acquires the state of polarization H, or horizontal.

2) The second fundamental problem is how to combine quantum mechanics with general relativity. The difficulty is that general relativity is independent of the space-time background; While quantum mechanics is not independent. In saying that it is not independent, we are referring to the time-dependent Schrödinger equation.

To unite quantum mechanics and general relativity we consider it necessary to use Schrödinger's equations independent of time.

As can be seen, the two fundamental unresolved problems have a direct relation to the nature of time; And concretely with the property of time as an emergent dimension in the real quantum vacuum. This emergent property of time would be defined as: Time has a finite value in the non-virtual void (real, non-virtual particles); But in turn, the time must acquire a zero value for the virtual vacuum and for the interlocking states, as with the wave function before any measurement or interference with the mixing states defining the wave function is performed. More precise: Quantum mechanics allows virtual particles to move at a faster speed than light. Nor does general relativity prevent movements above the speed of light. In fact, if the theory of inflation is correct, the space expanded at an exponential rate, and therefore higher than the speed of light. There is the Scharnhorst effect, whereby the speed of photons between two conducting plates would be greater than that of light.

And this is when the equation (1) presented in this paper appears on the scene. This equation implies a zero net energy. It is independent of time and space; Since it depends only on universal constants such as the elementary electric charge, the Planck constant, the mass of the electron, Planck's mass, the universal gravitation constant, and the partition function of the imaginary parts of the non-trivial function zeros Zeta of Riemann. That net energy (equation (1) can easily be transformed to take on the dimension of an energy) is zero is equivalent to the energy decrease with a generalization of special relativity. This generalization, as we shall demonstrate, implies that time as dimension is annulled in the virtual void; Acquires the value zero. The first implication that time acquires zero value is the solution to the instantaneous change problem of two correlated observables between two quantum entangled particles, or the instantaneous collapse of the wave function when it is disturbed (measured or observed). What would really happen is that, indeed, no energy is transmitted between the two interlaced particles, since with the generalization of special relativity, this energy would be zero if and only if time is also zero; That is to say: t = 0 -> instantanedidad. What would be transmitted, then, so that there is a physical causality between the measurement made on particle A and the change in t = 0, on particle B ?: A movement at infinite speed of pure space, with zero energy And at zero time. This is where the curvature properties of hyperboloids come in, or what could be defined as wormholes. A hyperboloid has two curvatures: the inside (K = +1), and the outside (K = -1). A movement of pure space at infinite speed performed by the exterior of a hyperboloid to enter, at the end of the movement, inside the hyperboloid; Equals a curvature change from -1 to +1. This change, it seems, would be responsible for the change in correlated observables between quantum entangled particles. Likewise, it could be considered a movement of pure space with infinite velocity by the inside of the hyperboloid and that ends out by the outside of the hyperboloid.

Equation (1) becomes a two-leaf hyperboloid (open throat wormhole), if one takes into account the entropy value of the vacuum energy. Entropy measured as the ratio natural logarithm, Planck energy / vacuum energy.

Without the addition of the constant and invariant entropy of vacuum energy; Equation (1) becomes, by raising each of its members to the squared and taking into account the two possible states of the electric charge (+, -), in an equation equivalent to the light cone of a Minkowski space defining The special relativity.

All the possible implications of equation (1) will be discussed and its theoretical derivation and, therefore, its physical-mathematical derivation will be exposed.

The probabilistic nature of quantum mechanics would be precisely produced by the non-existence (or annulment of t = 0) of time at the level of unobservable states; That is: virtual particles and interlocking states of the wave function without disturbing, measuring or observing. If the time ceases to exist, or it takes the value zero; Then there can simultaneously exist an infinity of states that transform each other instantaneously (t = 0). For example: the group of permutations of n vectors, states or set of particles. The set of the simultaneous sum of n states. The sum of states generated by the sum of the divisors of n states or set of particles. Therefore, the assertion that there is no concrete reality until the act of measurement is performed; Is at least rather reckless. Another very different thing is that there is a concrete reality and independent of the act of observation or measurement; But which is not apprehensible precisely because of the limits of the lightness that divides the so-called real universe and the virtual universe (velocities greater than that of light, including the upper limit of infinity). The clearest example is the value of the energy of the vacuum which is deduced from general relativity. This value is independent of whether it is measured or not. Its value gives it an equation and it is deterministically fixed. It will be shown that this vacuum energy implies a constant repulsive acceleration. This same repulsive acceleration at scales of galaxies would explain the problem of rotation speeds that are fairly accurate and independent of distance, in principle, within galaxies. So the so-called obscure matter, in fact, would not exist at all. This will be analyzed in the final part of this work, being subject to the achievement of a quantum theory of gravity that necessarily can imply modifications of the classic general relativity of Einstein.

That time acquires zero value is guaranteed if the maximum limit of the Planck mass is taken, and this limb is considered as the state of a quantum black hole (of spherical symmetry) with Schwarzschild radius. For this quantum black hole, general relativity gives for the dilatation of time a value exactly of t '= 0

To conclude this introduction, it must be emphasized that the interpretative perception that virtual particles are a mere mathematical artifice of calculus by renormalization; It seems more than reckless. The renormalization method that demonstrates its predictive-empirical potential with up to 13 or more digits in resolution digits (eg: anomalous magnetic moment of the electron); It should not be considered a mere mathematical-physical artifice; If not, on the contrary, it would reflect the exact reality of the existence of multi-states of infinite dimension according to the simultaneous and instantaneous existence of states, if and only if time is an emergent dimension in the part of the universe called real, and is a Dimension that cancels out or takes the zero value for the unobservable part of the (virtual) universe with infinite value limit velocities (zero energy condition, zero force, as reflected in equation (1))

$$r_s\left(m_{PK}\right)=\frac{2\cdot m_{PK}\cdot G_N}{c^2}$$

The dilatation of time according to general relativity would be:

$$t'=t\cdot\sqrt{1-\frac{2\cdot m_{PK}\cdot G_N}{r_s\left(m_{PK}\right)\cdot c^2}}=t\cdot\sqrt{1-1}=0$$

Finally, we will show the equivalence of a time with zero value and a time with infinite value and that will depend on an imaginary observer with finite velocity that observes, for example, a circular disc or string spinning at an infinite speed.

This will be discussed in detail in the main hypothesis section.

0.2. The fundamental equation that unifies gravitation with electromagnetism

In this first section we present this fundamental equation in which the partition function of the nontrivial zeros of Riemann's zeta function plays a fundamental role. Subsequently will be exposed its theoretical foundation and its theoretical-heuristic derivation.

$$\pi^2 \cdot (\pm e) \cdot \left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right] = \pm\sqrt{m_{PK} \cdot m_e \cdot G_N}\ (1)$$

$\pm e =$ `Elemental electrical charge;` $\zeta\left(s = \frac{1}{2} + i \cdot t_n\right) =$ 0 `( Non-trivial zeros Riemann's zeta function );` $m_{PK} =$ `Mass of Planck;` $m_e =$ `Mass of the electron;` $G_N =$ `Constant of universal gravitation.`

Values of the imaginary parts of the first 10 nontrivial zeros of the Riemann zeta function (15 decimals):

t1 = 14.134725141734693, t2 = 21.022039638771554, t3 = 25.010857580145688, t4 = 30.424876125859513, t5 = 32.935061587739189, t6 = 37.586178158825671, t7 = 40.918719012147495, t8 = 43.327073280914999, t9 = 48.005150881167159, t10 = 49.773832477672302

$$\left[\sum_{n=1}^{10} \exp\left(-t_n\right)\right]^{-1} = 1374617.4545188 \simeq \left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right]^{-1}$$

The non-trivial zeros partition function of the Riemann zeta function for the first 1000 non-trivial zeros using the functions of Mathematica 11.0.1 is:

$$\left[\frac{1}{\sum_{n=1}^{1000} e^{-N[\Im(\rho_n),20]}}\right] = 1374617.454518844354$$

$$\left[\sum_{n=1}^{1000} \exp\left(-N\left[Im\left[ZetaZero\left[n\right]\right], 20\right]\right)\right]^{-1} = 1374617.454518844354$$

0.3. Auxiliary Hypotheses

0.3.1. The functional equivalence tool. Functional equivalence will be understood as a specific type of isomorphism, namely: the isomorphism between functions.

The utility of functional equivalence is to show the physical-mathematical links between seemingly unrelated concepts; But that once this functional equivalence is established, they allow us to discover very close relations between mathematical concepts and / or theorems with physical concepts that have not been taken into account until that moment.

We will consider several fundamental types of functional equivalences.

a) Strict functional equivalence. This equivalence of functions will be that which makes equivalent or indistinguishable two functions for the same domain of definition of values of both functions.

Important examples: 1) the entropy (in information theory) of a single state not equiprobable function is given by: $\ln n/n$;for a particular quantized state n (natural numbers).

Limiting the domain of the previous function to the set of natural numbers, we obtain the following functional equivalence between the entropy of non-equiprobable states (only a quantized state n) and the inverse of the approximate (asymptotic) quantity of prime numbers smaller or equal to n . It will be used as an equivalence symbol: $\equiv$

$$H_{s=1}(n) = \ln n/n \equiv \sim \pi^{-1}(n) = (n/\ln n)^{-1} \ (2)$$

Where in (2), s = 1 symbolizes a single state.

A first practical application of the functional equivalence given by (2); Is the finding, in principle empirical; That the inverse of the fine-structure constant for zero momentum is very close to:

$$\alpha^{-1}(0) \simeq \left(137 + \frac{\ln 137}{137} = 137.035912269531...\right)$$

A much more precise value is obtained by including the correction of the maximum entropy of a pair (electron-positron) of electrons, with respect to the limiting mass of Planck; this is: $H(m_{PK},\ 2\cdot m_e) = 2\cdot\ln(m_{PK}/m_e)$

$$\alpha^{-1}(0) \simeq 137 + \frac{\ln 137}{137} + \left[2\cdot H^2(m_{PK}, 2\cdot m_e)\cdot(2/e)^2\right]^{-1}$$

Where : $(2/e) = min\left[(H_x\cdot H_p)^{-1}\right]$; $H_x\cdot H_p \geq (e/2)$ Entropic uncertainty for Planck's non-barred constant.

$$137 + \frac{\ln 137}{137} + \left[2\cdot H^2(m_{PK}, 2\cdot m_e)\cdot(2/e)^2\right]^{-1} = 137.0359992366 \simeq 137.035999173$$

A value practically accurate to the best known value is obtained for $\alpha^{-1}(0)$; With the heuristic correction due to the contribution of the mass ratios of leptons with electric charge, τ, μ, e ;respect to the mass of the electron:

$\sum_{l-}(m_{l-}/m_e) = 3684.919296$; $\gamma =$ Euler–Mascheroni constant

$$\alpha^{-1}(0) = 137 + \frac{\ln 137}{137} + \left[2\cdot H^2(m_{PK}, 2\cdot m_e)\cdot(2/e)^2\right]^{-1} - \left[\left(\sum_{l-}(m_{l-}/m_e)\right)^2\cdot 2\cdot\gamma\right]^{-1} = 137.035999172807\ (3)$$

This first example, extensive, of application of functional equivalence; It sets forth in its entirety, to show the usefulness of functional equivalence to establish important relationships, which so far had been unnoticed. Obviously, this concrete case shows without any doubt, in our modest way of thinking, the deep relation of prime numbers to quantum mechanics. This relationship will be reinforced in the calculation of the density of baryons, which will be discussed later.

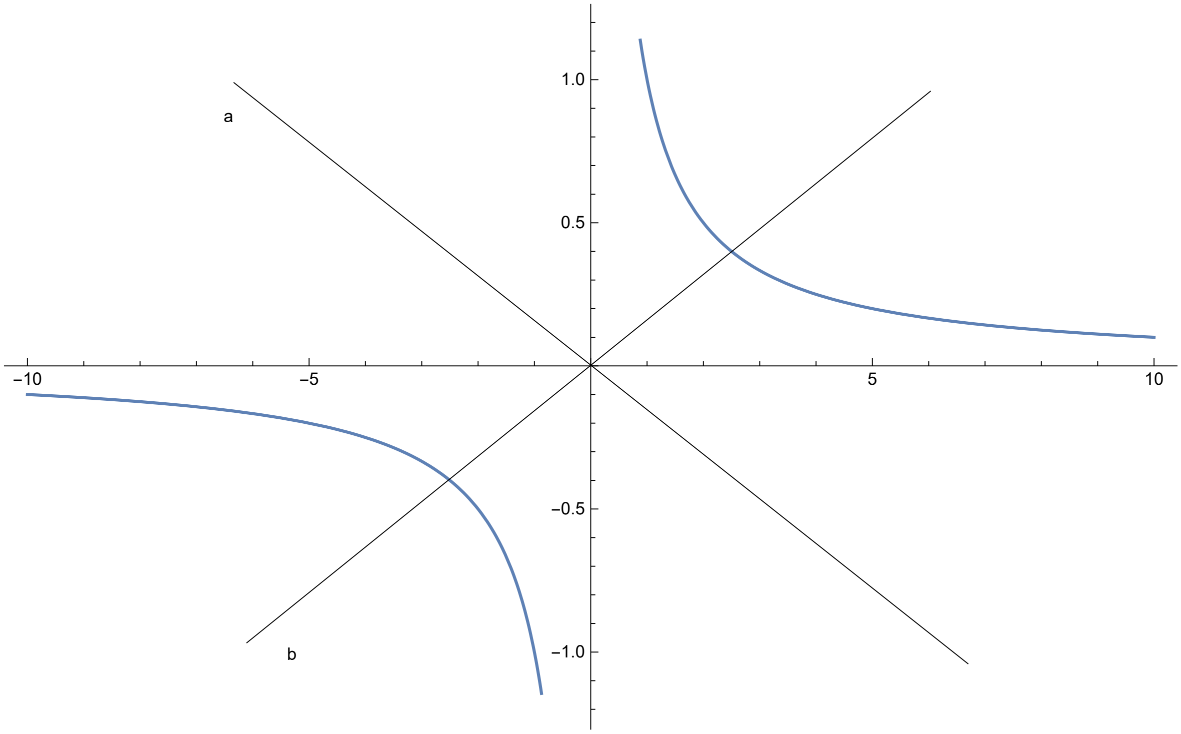
2) Example: The maximum entropy of n equiprobable quantum states is: $\ln n$

Strict functional equivalence allows us to establish the equivalence between the sum of circular quantum curvatures and / or quantum probabilities($p\left(n\right)=1/n$), for the interval of quantum dimensionless radii between 1 and n, and the maximum entropy $H\left(n\right)$. That is:

$$H\left(n\right)=\ln n\equiv\int_{1}^{n}dn/n \;(4)$$

It should be noted that the quantum probability $p\left(n\right)=1/n$, Is functionally equivalent to the equation of a hyperbola. And a hyperbola rotating about the axis a ,generates a hyperboloid of one sheet (wormhole with an open throat). As the hyperbola rotates around the axis b , It generates a hyperboloid of two sheets (not connected worm hole).

FIGURE 0.3.1. Hipérbola



Equation (4) plays a fundamental role, not only for the equation that will allow us to obtain the density of baryons, Ω_b ; But it also shows the fundamental role of quantum entropies, and hence the concept of quantum information, in a more complete theory of quantum mechanics.

Due to its importance, its derivation from Heisenberg's uncertainty principle will be demonstrated.

Derivation of the maximum quantum entropy (with respect to the maximum possible mass: Planck mass) of the Heisenberg uncertainty principle. Let be a pair of particles (particle-antiparticle and / or pairs of interlaced particles) for which Heisenberg's uncertainty principle is fulfilled: $\triangle x_1 \cdot \triangle p_1 \geq \hbar/2$; $\triangle x_2 \cdot \triangle p_2 \geq \hbar/2$

Let's set the minimum possible uncertainty, that is:

$$(\triangle x_1 \cdot \triangle p_1 = \hbar/2 = \triangle x_2 \cdot \triangle p_2) \rightarrow 2 \cdot \triangle x_1 \cdot \triangle p_1 = 2 \cdot \triangle x_2 \cdot \triangle p_2 = \hbar \, (5)$$

If we hypothesize that they are particle-antiparticle pairs generated by a photon; Then from (5) it follows:

$2 \cdot \triangle x_1 \cdot \triangle m_1 c = 2 \cdot \triangle x_2 \cdot \triangle m_2 c$; $2 \cdot \triangle x_1 \cdot \triangle m_1 = 2 \cdot \triangle x_2 \cdot \triangle m_2$. Isolating the uncertainties of position and mass we obtain:

$2 \cdot (\triangle x_1/\triangle x_2) = 2 \cdot (\triangle m_2/\triangle m_1)$

To obtain the maximum possible entropy a scaling change sum must be made; In which the mass of Planck or the length of Planck is the maximum possible. This sum is functionally equivalent to the sum of quantum curvatures or quantum probabilities between the mass intervals of a given particle and the Planck mass, if we choose the masses instead of the lengths, that is:

$H\left(m_{PK}, m_0\right) = \int_{m_0}^{m_{PK}} dm/m = H\left(l_0, l_{PK}\right) = \int_{l_{PK}}^{l_0} dl/l \ ; \ H\left(m_{PK}, m_0\right) = \int_{m_0}^{m_{PK}} dm/m = \ln\left(m_{PK}/m_e\right)$

$l_0 = \hbar/m_0 c \ ; \ l_{PK} = \sqrt{\hbar \cdot G_N/c^3}$

Finally, the maximum entropy, or number of pairs, for particle-antiparticle pairs is:

$$H\left(m_{PK}, 2m_0\right) = 2 \cdot \ln\left(m_{PK}/m_0\right) \ (6)$$

b) Exact numerical functional equivalence. This equivalence will be that in which the two functions have different form, but their numerical value is equal for their respective domains of definition.

Example: $\pi \ ; \ \int_{-1}^{1} \frac{dx}{\sqrt{1-x^2}} \equiv 2 \cdot \int_{-1}^{1} \sqrt{1-x^2}dx \equiv \int_{-\infty}^{\infty} \frac{dx}{1+x^2}$

In this example it is also possible to observe, in the first equation, a strict functional equivalence (by change of variable) with the special relativity equation $x = v/c \ ; \ \left(1-x^2\right)^{-1/2}$

c) Approximate numerical functional equivalence. This equivalence will be one in which the two functions have different form, but their numerical value is very approximate for their respective domains of definition.

This type of equivalence is, of course, the one that must be used very cautiously; And provided that the same functional equivalence appears repeatedly in several experimental data. This equivalence must be required to appear in several well-established experimental or theoretical data (property of unification theories), precisely to increase the probability that equivalence is not a mere coincidence. It is the most delicate functional equivalence, by the very definition of it.

Example: cosine Weinberg angle or mass ratio W boson / Z boson.

1) Requirement of reiteration. 2) Quasi-exact equivalence (very approximate, possible regularization effects)

$\cos\theta_W = \frac{m_W}{m_Z} \ ; \ m_W = 80.385 \, GeV \ ; \ m_Z = 91.1876 \, GeV \ ; \ \cos\theta_W \simeq\equiv \sqrt{1 - \left(\frac{2}{\varphi^3}\right)} \ ; \ \varphi =$ Golden number

$m_Z \cdot \sqrt{1 - \left(\frac{2}{\varphi^3}\right)} = 80.384217 \, GeV \simeq 80.385 \, GeV$

Reiteration:

$$\cos\left(\frac{2\pi}{2\cdot\ln\left(m_Z/m_e\right)}\right)\cdot m_Z\cdot\left[1+\frac{\cos^2\left(2\pi/\varphi^2\right)}{\sum\limits_{l-}\left(m_{l-}/m_e\right)}\right]^{-1}=80.38399927\,GeV\simeq 80.384217\,GeV\simeq 80.385\,GeV=m_W$$

$$dim\left(E_8\,Lattice\right)=240\,;\ \left\lfloor\frac{\left(240-\left\lfloor\alpha^{-1}\left(0\right)\right\rfloor\right)}{2}\right\rfloor+\left(1-\frac{2}{\varphi^3}\right)=\left\lfloor\frac{240-137}{2}\right\rfloor+\left(1-\frac{2}{\varphi^3}\right)\simeq\ln\left(m_{PK}/m_e\right)$$

$$\left(1-\frac{2}{\varphi^3}\right)=1-\sin\theta_W$$

$$m_{PK}=2.1764702547\cdot10^{-8}Kg\,;\ m_e=9.1093856\cdot10^{-31}Kg$$

$$\ln\left(\frac{2.1764702547\cdot10^{-8}Kg}{9.1093856\cdot10^{-31}Kg}\right)=51.5278562875786$$

$$\left\lfloor\frac{240-137}{2}\right\rfloor+\left(1-\frac{2}{\varphi^3}\right)=51.5278640450004\simeq\ln\left(m_{PK}/m_e\right)$$

Although it is not the purpose of this work to explain the previous functional equivalence of the cosine of the Weinberg angle; At least the physical-mathematical argument of the justification of this equivalence will be shown.

Mainly the fractal nature of the decay of the graviton in two photons, by the electro-gravitational part; And the fractal equivalence of the decay of the three bosons of the electroweak SU(2) group (photon, W boson and Z boson). There is an equivalence with the possible fractality of the four non-compacted space-time dimensions.

Equivalence of the amount of particles in the decay of two gravitons in four photons, and of the photon in a pair W +, W- and Z, Z.

$$\begin{cases} G\rightarrow & \gamma+ & \gamma \\ G\rightarrow & \gamma+ & \gamma \end{cases}=A\left(G\right)$$

$$\begin{cases} G\rightarrow & \gamma\rightarrow & W^{+}+ & W^{-} \\ & \gamma\rightarrow & Z+ & Z \end{cases}=B\left(\gamma\right)$$

$$dim\left[n\left(A\left(G\right)\right)-2G\right]=4\equiv dim\left[n\left(B\left(\gamma\right)\right)-2\gamma\right]\equiv dim\left(4\,dimensions\right)\equiv 2\cdot spin\,graviton$$

But so much $A\left(G\right)$ as $B\left(\gamma\right)$ are equivalent to the decay of the less massive Higgs boson ($m_{h1}=125.0901\,GeV$), given by:

$$\left\{ \begin{array}{llll} h_1 \rightarrow & W^+ + & W^- & \\ & & & = C(\gamma) \\ h_1 \rightarrow & Z+ & Z & \end{array} \right.$$

In fact, equivalences would be more general and would be related to the equivalence between the number of space-time dimensions, the number of bosons mediating the different forces, and the sum of spins for particle-antiparticle pairs plus the time dimension; this is:

Number of spin bosons 0 supersymmetry theories NMSSM = 7. 1 graviton boson, gravitation. 1 Boson photon, electromagnetism. 1 Boson gluon, strong force. 1 time dimension.$7h + 1G + 1\gamma + 1g + t \equiv 2 \cdot \sum_s s + t \equiv n\,(11d)$

For the Higgs vacuum limit ($V_H = \sqrt{\frac{(\hbar c)^3}{G_F \cdot \sqrt{2}}}$), and therefore for the non-supersymmetric part of the vacuum, the equivalences would be:

$8g + 1G + 1\gamma + 1h_1 \equiv n\,(11d)$

$$V_H = \sqrt{\frac{(\hbar c)^3}{G_F \cdot \sqrt{2}}} = 246.21965079413\,GeV$$

The above equivalence seems to imply, to suggest; That time would be an emergent dimension in the so-called real vacuum, and when there are or arise mediator particles (boson h1) with non-zero mass at rest. This aspect will be dealt with in greater depth in the section of the main hypotheses.

Of the 11 dimensions, 7 would be compacted in circles and would be equivalent to the amount of bosons of the Higgs vacuum; As will be shown in the hypothesis section.

Also the number of dimensions can be considered equivalent to amount of states. The idea of the fractality of the 4 uncompacted dimensions is based on the fact that the fractal dimension would be the sum of infinite states represented by the recurrent probability of obtaining 1 state out of four possible, and then adding this probability to the 4 states; Making this operation repeatedly infinite, that is:

$$\left(\left(4 + \left(4 + \frac{1}{4}\right)^{-1}\right)^{-1} + 4\right)^{-1} + 4 \cdots = [4; 4, 4, 4 \cdots] = \varphi^3 = \sqrt{5} + 2$$

Given the decay scheme $B(\gamma)$; The W +, W-, Z, Z bosons would be equivalent to the 4 dimensions. If we count on an infinite number of pairs W +, W-; And ZZ, then the unit probability would be given by the following heuristic-empirical equation:

$$\left(\frac{m_W}{m_Z}\right)^2+\left(\frac{2m_W}{2\left(m_W+m_Z\right)}\right)^2=1$$

$$\frac{m_W}{m_Z}=\cos\theta_W\ ;\ \frac{2m_W}{2\left(m_W+m_Z\right)}=\sin\theta_W$$

The functional equivalence of the fractality of the 4 dimensions-states (W +, W-, ZZ) is expressed:

$$\frac{2m_W}{2\left(m_W+m_Z\right)}=\sin\theta_W\equiv\frac{2}{\varphi^3}=\frac{2}{[4;4,4,4\cdots]}=\frac{2}{\varphi^{dim[SU(2)]}}$$

Empirically, the above equation becomes exact with the inclusion of a correction factor, corresponding to the fine-structure constant at the mass scale of the Z boson, $\alpha\left(M_Z\right)\sim\dfrac{1}{128.96}$

$$\frac{2m_W\cdot\left[1+\alpha\left(M_Z\right)\right]}{2\left(m_W+m_Z\right)}=\sin\theta_W\equiv\frac{2}{\varphi^3}\ (7)$$

$$n\left(4d\right)\equiv dim\left[SU\left(2\right)\right]+t$$

That the hypothesis of the fractality is not merely a point coincidence, the equation (7) seems to be reinforced with the confirmation of the numerical functional equivalences that will be discussed below. Among these equivalences, the calculation of the anomalous magnetic moment of the electron will be shown with an accuracy that is in total agreement with the best known experimental data.

Approximate numerical functional equivalences involving fractality for 1 dimension (or states), 2 dimensions, 3 dimensions, 7 dimensions and 11 dimensions. General fractal function[n;n,n,n...]

a) Empirical verification of the approximate numerical equivalence between the fractality for 3 (SU(2)) dimensions generated by the function $[3;3,3,3\cdots]$ And the quantum radius (sphere generated by the spherical symmetry of the photons) obtained from the inverse of the fine structure constant for zero momentum. $R_\gamma=\sqrt{\dfrac{\alpha^{-1}\left(0\right)}{4\pi}}$

The formula for the fractality of n dimensions or quantity of states, given by the continuous fraction, with general form$[n;n,n,n\cdots]$, Is expressed by:

$$[n;n,n,n\cdots]=n+\frac{1}{2}\cdot\left(\sqrt{n^2+2^2}-n\right)$$

$$[3;3,3,3\cdots]\sim\equiv R_\gamma$$

$$[3;3,3,3\cdots]=3+\frac{1}{2}\left(\sqrt{13}-3\right)\sim\equiv R_\gamma\,;3+\frac{1}{2}\left(\sqrt{13}-3\right)=3.302775637731\sim\equiv R_\gamma=3.3022686633525$$

Getting a better approximation for the regularization of $\sum\limits_{l-}m_{l-}/m_e$ y $\tan\theta_W\left(\varphi^3\right)=\dfrac{\frac{2}{\varphi^3}}{\sqrt{1-\left(\frac{2}{\varphi^3}\right)^2}}$:

$$[3;3,3,3\cdots]-\left(\tan\theta_W\left(\varphi^3\right)\cdot\sum_{l-}\left(m_{l-}/m_e\right)\right)^{-1}=3.30226895051826$$

$$[3;3,3,3\cdots]-\left(\tan\theta_W\left(\varphi^3\right)\cdot\sum_{l-}\left(m_{l-}/m_e\right)\right)^{-1}-\left(\varphi^3\cdot\ln\pi\cdot\frac{m_\tau}{m_e}\cdot\frac{m_\mu}{m_e}\right)^{-1}=3.30226866368693\simeq\equiv R_\gamma$$

Calculation anomaly magnetic moment of the electron as the main function of the quantum radius R_γ , the fine structure constant for momentum 0, the electrically charged lepton masses and the quarks masses.

It is hypothesized that this quantum radius is a fractal function of three states, corresponding to the bosons of the electroweak group SU(2) (photon, bosons W and Z), or their functional equivalence by the three electrically charged leptons (electron, tau and muon). Therefore, the subtraction of 2 states that would be equivalent, in this case, to the contributions of lepton tau and muon; Would correspond to the main part that would be $2\pi\alpha^{-1}(0)$, And that would correspond to the state of the electron. The heuristic-empirical equation is:

$$a_e=\left[2\pi\cdot\alpha^{-1}(0)+R_\gamma-2+\frac{\alpha(0)}{e}-\left(\frac{m_\tau\cdot m_\mu}{m_e^2}\cdot\ln\left(\frac{m_\tau}{m_\mu}\right)\right)^{-1}+\left(\frac{6\cdot\alpha_s(M_Z)\cdot\alpha(M_Z)}{\sum_q m_q/m_e}\right)\right]^{-1}=0.0011596521809093\ (8)$$

The value of a_e established by CODATA: $1.15965218091(26)\cdot10^{-3}$ (electron magnetic moment anomaly)

$\alpha_s(M_Z)=0.1184\,;\ \alpha(M_Z)=128.96^{-1}$

Masses of the quarks:

$m_u = 0.0216\, GeV,\ m_d = 0.046\, GeV,\ m_c = 1.275\, GeV,\ m_s = 0.935\, GeV,\ m_b = 4.18\, GeV,\ m_t = 173.7\, GeV$

The fractality of 1 dimension $[1;1,1,1\cdots]$: Relation with the sine of the electroweak effective angle and with the tangent of the main angle of Cabibbo ($\theta_{c12} \simeq 13.04^{\text{o}}$)

$[1;1,1,1\cdots] = \dfrac{\sqrt{5}+1}{2} = \varphi$

Equiprobable entropy of $[1;1,1,1\cdots]$: $H([1;1,1,1\cdots]) = \ln\varphi$

$\ln^2 x = \displaystyle\int_1^x \frac{2\cdot\ln x\cdot dx}{x}$

$$H^2([1;1,1,1\cdots]) \equiv \sin^2\widehat{\theta}_W(M_Z) \equiv \tan\theta_{c12}\ (9)$$

$\ln^2\varphi = 0.231564820578\ ;\ \sin^2\widehat{\theta}_W(M_Z) = 0.231564820578\ ;\ \arctan(0.231564820578) = 13.0378883732^{\text{o}}$

2-dimensional fractality $[2;2,2,2\cdots]$ and its possible relation with the cosine of the electroweak angle($\cos\theta_W = \dfrac{m_W}{m_Z}$):

$[2;2,2,2\cdots] = \sqrt{2}+1$

Equiprobable entropy:

$H([2;2,2,2\cdots]) = \ln\left(\sqrt{2}+1\right)\ ;\ H([2;2,2,2\cdots])\cdot\left(1+\dfrac{2}{\pi\cdot\sum_{l-}(m_{l-}/m_e)}\right) \simeq\equiv \cos\theta_W = \dfrac{m_W}{m_Z}\ (10)$

$H([2;2,2,2\cdots])\cdot\left(1+\dfrac{2}{\pi\cdot\sum_{l-}(m_{l-}/m_e)}\right) = 0.881525856257 \rightarrow m_W \simeq 91.1876\, GeV\cdot 0.881525856257 = 80.38422\, GeV$

The 7-Dimensional Fractality $[7;7,7,7\cdots]$ and its relation to the Higgs vacuum ratio / Higgs boson h1 mass.

$[7;7,7,7\cdots] = 7+\dfrac{1}{2}\cdot\left(\sqrt{53}-7\right) = 7.14005494464026$

The entropy of equiprobable states of the 7 Higgs bosons (prime number, and therefore not factorizable):

$$H([7;7,7,7\cdots]) \sim\equiv \frac{V_H}{m_{h1}}\ (11)$$

$$\ln\left([7;7,7,7\cdots]\right)\sim\equiv\frac{V_H}{m_{h1}}$$

$$\ln\left([7;7,7,7\cdots]\right)=1.96572047164965\sim\equiv\frac{246.2196507941\,GeV}{125.0901\,GeV}$$

$$\frac{246.2196507941}{1.96572047164965}=125.256695\,GeV$$

The fractality of the 11 dimensions $[11;11,11,11\cdots]$**,Equivalent to the number of bosons mediating the electromagnetic, gravitational, strong and Higgs field (** $n\left(1G,8g,1\gamma,1h_1\right)=11\equiv 11d$ **); In the limit of the Higgs vacuum, or maximum limit in the non-supersymmetric part: Higgs vacuum value.**

It is based on three main hypotheses: 1) The energy distribution of the Higgs vacuum is spatially uniform; That is, thermodynamic equilibrium. With this hypothesis, the function of partitioning of the statistical mechanics arises naturally, making changes of variables by pure numbers ($\frac{E}{k_B\cdot T}=x$), and considering the Higgs vacuum itself as the composite of a single state.

2) The second hypothesis is formulated according to the first hypothesis: The energy of the vacuum of Higgs (V_H) would be the principal function of the partition function of the statistical mechanics of a single state, dependent on x and relative to the energy or mass of the electron; that is to say:

$$f\left(V_H/E_e\right)=\exp\left(x\right)\cdot C$$

3) The third hypothesis is equal x, by the fractral dependent on the 11 dimensions, or its functional equivalent: 11 bosons exchange of all forces (8 gluons, 1 photon, 1 graviton and Higgs boson less massive h1).

The constant C would depend on the decays of the W and Z bosons, in the rest of non-bosonic particles with non-zero mass at rest, up to the limit of the Higgs vacuum; That is to say: the 6 leptons and the 6 quarks.

An indispensable condition is that the total probability is unity, by adding up the probabilities of all decays; Since the existence of the unit state of the Higgs vacuum has probability 1.

The empirical verification of the unit probability of the decay of the W and Z bosons in all fermions, except for the top quark (having a mass higher than the W and Z bosons)

$$B\left(W\to d\overline{u}\right)+B\left(W\to s\overline{u}\right)+B\left(W\to b\overline{u}\right)+B\left(W\to d\overline{c}\right)+B\left(W\to s\overline{c}\right)+\cdots$$
$$\cdots+B\left(W\to b\overline{c}\right)=0.6832\pm0.0061=\sum_q B(W\to q\overline{q})$$

$$B\left(Z\to e^+e^-\right)=0.03363\,;\;B\left(Z\to\mu^+\mu^-\right)=0.03366\,;\;B\left(Z\to\tau^+\tau^-\right)=0.033658$$

$B\left(Z\rightarrow\nu_{e}\overline{\nu_{e}}\right)=B\left(Z\rightarrow\nu_{\mu}\overline{\nu_{\mu}}\right)=B\left(Z\rightarrow\nu_{\tau}\overline{\nu_{\tau}}\right)\simeq0.069$

$B\left(Z\rightarrow l\bar{l}\right)=B\left(Z\rightarrow e^{+}e^{-}\right)+B\left(Z\rightarrow\mu^{+}\mu^{-}\right)+B\left(Z\rightarrow\tau^{+}\tau^{-}\right)+B\left(Z\rightarrow\nu_{e}\overline{\nu_{e}}\right)+\cdots$

$\cdots+B\left(Z\rightarrow\nu_{\mu}\overline{\nu_{\mu}}\right)+B\left(Z\rightarrow\nu_{\tau}\overline{\nu_{\tau}}\right)=0.307948$

The sum total of the decay probabilities in all fermions:

$\sum_{q}B\left(W\rightarrow q\bar{q}\right)+B\left(Z\rightarrow l\bar{l}\right)=0.6832+0.307948=0.991148\simeq1$

It can be seen that the number of W and Z bosons for the unit probability sum is 6 W bosons and 6 Z bosons.

The heuristic-empirical equation would be as follows:

Fractal Value $[11;11,11,11\cdots]=11+\frac{1}{2}\cdot\left(\sqrt{11^{2}+2^{2}}-11\right)=\varphi^{5}$

Exact numerical functional equivalences:

$[11;11,11,11\cdots]\equiv2\sum_{s}s+1+\frac{1}{2}\cdot\left(\sqrt{\left[\sum_{s}2s+1\right]\cdot\left[\sum_{s}s\right]}-\left[\sum_{s}2s+1\right]\right)$; $s=spin$

$\exp\left(-\varphi^{5}\right)\equiv\exp\left(-\frac{E}{k_{B}T}\right)$

$$\frac{\exp\left(-\varphi^{5}\right)}{\frac{6(m_{W}+m_{Z})+m_{W}\cdot(1+\alpha(M_{Z}))}{(m_{W}+m_{Z})}+\frac{m_{W}}{m_{Z}}}=\frac{\exp\left(-\varphi^{5}\right)}{6+\sin\theta_{W}+\cos\theta_{W}}=\frac{E_{e}}{V_{H}}\ ;\ E_{e}=$$

Electron energy.

$$\frac{V_{H}}{E_{e}}=\exp\left(\varphi^{5}\right)\cdot\left(6+\sin\theta_{W}+\cos\theta_{W}\right)\ (12)$$

$\frac{20}{e}-\frac{\alpha\left(M_{Z}\right)}{V_{H}/m_{h1}}\simeq\equiv\left(6+\sin\theta_{W}+\cos\theta_{W}\right)$

$\left|\left\{\sum\left(W\rightarrow q\bar{q}\right),\sum\left(W\rightarrow l\bar{\nu}\right),\sum\left(Z\rightarrow l\bar{l}\right),\sum\left(Z\rightarrow q\bar{q}\right)\right\}\right|=20=$ Total cardinal of the set of all decay states of the W and Z bosons in leptons and quarks. $\{(Z\rightarrow q\bar{q})\}=\left\{\left(Z\rightarrow u\bar{u}\right),\left(Z\rightarrow c\bar{c}\right),\left(Z\rightarrow d\bar{d}\right),\left(Z\rightarrow s\bar{s}\right),\left(Z\rightarrow b\bar{b}\right)\right\}$

$\{\sum\left(W\rightarrow l\bar{\nu}\right)\}=\{\left(W\rightarrow e\overline{\nu_{e}}\right),\left(W\rightarrow\tau\overline{\nu_{\tau}}\right),\left(W\rightarrow\mu\overline{\nu_{\mu}}\right)\}$

$$\frac{V_{H}}{E_{e}}=\frac{\exp\left(\varphi^{5}\right)\cdot20}{e}\cdot\left(1+\frac{\alpha\left(0\right)}{20\cdot\Omega_{\Lambda}}\right)^{-1}(13)$$

Cosmological parameters of the energy density of the vacuum and the mass density:

$\Omega_{\Lambda} = 1 - \pi^{-1} = 0.681690113816209 =$ Vacuum energy density; $\Omega_m = \pi^{-1} = 0.318309886183791 =$ Density of mass

These parameters will be deduced in the next section of the main hypotheses.

$\frac{V_H}{E_e} = \dfrac{\exp\left(\varphi^5\right) \cdot 20}{e} \cdot \left(1 + \dfrac{\alpha\left(0\right)}{20 \cdot \Omega_{\Lambda}}\right)^{-1} \equiv \dfrac{\exp\left(\varphi^5 + 2\right)}{\left(1 + \dfrac{\ln \varphi}{10^2}\right)}$

$$\frac{\exp\left(\varphi^5 + 2\right)}{\exp\left(\Omega_{\Lambda}\right) \cdot \left(1 + \dfrac{\alpha\left(0\right)}{2\pi \cdot \exp\left(2\Omega_{\Lambda}\right)}\right)} = \frac{m_{h1}}{m_e} \quad (14)$$

$$\frac{\exp\left(\varphi^5 + 2\right)}{\exp\left(\Omega_m\right) \cdot \left(1 + \alpha\left(M_Z\right) \cdot 2\pi\right)} = \frac{m_W + m_Z}{m_e} \quad (15)$$

$$\frac{m_{h1}}{\exp\left(\Omega_m\right)} \cdot \left(1 + \frac{\alpha\left(M_Z\right)}{4 \cdot \cos\theta_W}\right) = m_Z \quad (16)$$

$$\frac{m_Z}{m_e} = \exp\left(\varphi^5 + 1\right) \cdot \left(1 + \frac{\alpha\left(M_Z\right)}{2\pi\left[\dfrac{2m_W}{V_H}\right]}\right) \quad (17)$$

This section will be concluded with the numerical functional equivalences that relate the sine and cosine of the electroweak angle to the sum of the masses of the quarks, the less massive glue ball (which we consider the most logical candidate to the mass gap) and the Higgs VH . We add some additional numerical functional equivalences that we consider should be investigated.

$g(0^{++}) = 1.73 \pm 0.08\, GeV$; $\sum_q m_q \simeq 180.1576\, GeV$

$$\sum_q m_q + g(0^{++}) \simeq\equiv \frac{V_H}{\sin\theta_W + \cos\theta_W} \quad (18)$$

$$\sum_q m_q + g(0^{++}) \simeq 181.8876\,GeV\ ;\ \frac{V_H = 246.21965079413\,GeV}{\sin\theta_W + \cos\theta_W} = 181.89156\,GeV$$

$$(m_W + m_Z)\cdot\left(1 + \frac{\alpha\,(0)}{\pi}\right) \simeq\equiv m_t - g(0^{++})\ (19)$$

$$(m_W + m_Z)\cdot\left(1 + \frac{\alpha\,(0)}{\pi}\right) = (80.385\,GeV + 91.1876\,GeV)\cdot\left(1 + \frac{\alpha\,(0)}{\pi}\right) = 171.971132174\,GeV$$

$$m_t - g(0^{++}) = 173.7\,GeV - 1.73\,GeV = 171.97\,GeV$$

$$6\cdot\sin\theta_{c12} \simeq\equiv \sin\theta_W + \cos\theta_W$$

$$\frac{20}{e} - 6 \simeq\equiv \sin\theta_W + \cos\theta_W$$

$$\begin{pmatrix} \gamma \\ Z^0 \end{pmatrix} = \begin{pmatrix} \cos\theta_W & \sin\theta_W \\ -\sin\theta_W & \cos\theta_W \end{pmatrix}\begin{pmatrix} B \\ W_3 \end{pmatrix}$$

$$\cos\theta_W - \sin\theta_W \simeq\equiv \frac{\ln 2}{\ln 2 + 1} + \frac{2\cdot m_e}{m_W + m_Z} - \frac{\sum_{n=1}^{\infty}\exp\left(-t_n\right)}{\ln\left(\frac{2\cdot m_Z}{m_e}\right)} = 0.409389790627373$$

$$\cos\theta_W - \sin\theta_W = 0.409389790510237$$

d) Physical functional equivalences. These equivalences will be divided into two categories: a) Functional equivalences of form with the same dimensions.

Functional equivalence of form shall be understood with the same dimensions; To that equivalence in which two physical functions or equations have the same algebraic form and the same dimensions in their dimensional analysis (mass, length and time, M, L, T).

Example: Particle at a spherical symmetry potential. This potential is important and directly related to equation (1), since this type of potential is derived from Coulomb's law, serving as a model to describe an electron in a hydrogen atom.

The equivalence of algebraic form and its dimensional analysis is manifested, regardless of the factor of the spin, by its relation with the principle of uncertainty of Heinsenberg; By the following equivalence:

1) For the effective potential and for the vacuum ($V\,(r) = 0$): $V_{eff}\,(r) = \dfrac{\hbar^2\cdot s\,(s+1)}{2m\cdot r^2} = E\,(energy)$

2) The square of the dimensionless ratio derived from Heisenberg's uncertainty principle: $\dfrac{\hbar^2}{\left(\triangle x\cdot\triangle p\right)^2}$

The functional equivalence of form and dimensional between the equations of 1) and 2):

$$\frac{\hbar^2}{2m \cdot r^2 \cdot E} \equiv \frac{M^2 L^4 T^{-2}}{M \cdot L^2 \cdot M L^2 T^{-2}} \; ; \; \hbar^2 \equiv \hbar^2 \; ; \; 2m \cdot r^2 \cdot E \equiv (\triangle x \cdot \triangle p)^2 \equiv M \cdot L^2 \cdot M L^2 T^{-2}$$

The functional equivalence of final form and dimensional, can be expressed by:

$$\frac{\hbar^2}{2m \cdot r^2 \cdot E} \equiv \frac{\hbar^2}{(\triangle x \cdot \triangle p)^2} \tag{0.3.1}$$

The former functional equivalence of form, will show all its potential for the calculation of the mass of the Higgs boson, mh1 (125.0901 GeV).

b) Functional equivalence of form by change of variable.

This functional equivalence shall be understood; As that which allows to obtain an equivalence of algebráica form, although the dimensional analysis is different; (M, L, T).

Example: equation (1) that unifies gravitation with electromagnetism is equivalent to form functional and by change of variable to the equation of the light cone of special relativity (hyperboloid with closed or strangulated junction). Equally, it is equivalent to this same hyperboloid of the cone of light; The square of the total energy. Let us see these two functional equivalences of form, by change of variable:

1) Equation (1): $\left(-\pi^2 \cdot e \cdot \left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right]\right)^2 = x^2 \; ; \; \left(\pi^2 \cdot e \cdot \left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right]\right)^2 = y^2 \; ; \; z^2 = \left(\sqrt{2 \cdot m_{PK} \cdot m_e \cdot G_N}\right)^2$

The development has been performed for the possible pair of values of the elemental quantized charge $\pm e$

$$x_0^2 + y_0^2 - z_0^2 = 0 \equiv x_1^2 + y_1^2 - z_1^2$$

2) Total energy equation: $E^2 = \left(mc^2\right)^2 + (pc)^2 \; ; \; E^2 = z_2^2 \; ; \; \left(mc^2\right)^2 = x_2^2 \; ; \; (pc)^2 = y_2^2$

$$x_2^2 + y_2^2 - z_2^2 = 0 \equiv x_3^2 + y_3^2 - z_3^2$$

$$x_0^2 + y_0^2 - z_0^2 \equiv x_2^2 + y_2^2 - z_2^2$$

These two types of physical equivalence can be very useful in finding common links involving a common physico-mathematical origin for apparent different quantitative and qualitative aspects of distinct, apparently unrelated physical laws.

0.4. Main hypotheses

A theory that unifies all forces requires unavoidable conditions. These conditions can be summarized in a first main hypothesis of initiation.

First condition. There can be no free parameters in a unification theory. When we demand that no free parameters exist, we mean: all parameters are deduced deterministically within the theory. Their values are fixed by certain equations of the unification theory.

For example: the electroweak angle, the angles of Cabibbo, the angles of the oscillations of the neutrinos. The dimensionless ratios of masses of elementary particles. Etc.

Second condition. There can be no qualitative or quantitative physical aspects that are independent of theory; That is: non-derivable or deductible within the physical-mathematical framework of unification theory. Here is the great question of whether there is a Gödel theorem for physics.

For example: A theory of unification must demonstrate if there is a maximum limit to the value of the spin. If we suppose that this maximum limit corresponds to the spin of the graviton, s = 2; Then the theory must deduce this hypothetical maximum limit. The very fact of deducing the maximum limit for the spin value clearly implies that the spin is a property related to other properties and / or invariants of the theory. This relationship can be established, for example, with the maximum number of possible electric charges and with certain operations derived from the dimensions of space-time-energy.

With these two initial conditions of unification, we will expose the main hypotheses that will form the logical corpus of a possible unification theory. These hypotheses must obey two premises: a) All the hypotheses are not contradictory to each other. B) All hypotheses are consistent with verified or verifiable experimental facts. Therefore, it is also required that from the hypotheses derived already established experimental data and predicted new verifiable experimental data.

If from an hypothesis we derive an experimental data with a high degree of accuracy, then the hypothesis can be considered as a physical theorem; Since the empirical data corroborate and prove it.

Set of main hypotheses. 1) Space-time is composed of 4 non-compacted space-time dimensions, plus 7 dimensions packed in circles.

2) The type of compactification in circles is deduced from the extended gravity to d dimensions and from the extension of the principle of uncertainty of Heisenberg to d dimensions.

3) There are two sides of the same universe mutually related: the virtual universe not observable by observers with limit of the speed of light. And the actual "real" universe of the observers with limit of the speed of light. This separation is due to the generalization of special relativity for velocities greater than that of light in the virtual part and not observable by observers with the limit of the speed of light of the "real" universe.

4) In the virtual universe time acquires the value zero, $t = 0$; So that several states can simultaneously exist at the same time. The disappearance of time in the virtual universe can amount to its conversion into a space-like dimension. There are, then, infinite speeds of pure space, with $t = 0$ and energy $= 0$

5) An observer of the "real" universe will not be able to distinguish a circle rotating at an infinite velocity from a circle rotating at a zero speed. Both systems are indistinguishable for an observer with finite speed limit and do not receive any signal (energy) that comes from the circles. This mental experiment is also equivalent to an observer who can not distinguish whether there is a movement with infinite speed or zero velocity between two points of space x1, x2. If it is only movement of pure space without transmission of energy; Both systems are non-distinguishable for an observer with finite limit velocity.

6) The maximum possible number of dimensions compacted in circles can not be greater than 7. Only in 7 dimensions, 0,1 and in 3 dimensions is possible the binary product of vectors; Which generate another vector perpendicular or orthogonal. As is well known, the above is a consequence of Hurwitz's theorem. This requirement is basic and necessary for the existence of the principle of uncertainty that is mathematically the binary product of the position vector by the quantity of movement vector. But it is also a basic and necessary requirement if one considers the origin of the universe by photons, which are waves formed by the electric and magnetic field, which are orthogonal.

For dimensions other than 0,1,3 or 7, the quantum vector product with natural numbers, with the orthogonality requirement, is reduced to permutations. For example: the vector generated by the quantum vector product of 7 elements, forms the eighth dimension that is orthogonal. As is well known, orthogonality is an essential property in quantum mechanics. To give only two examples: Hermite polynomials for solutions of the one-dimensional harmonic oscillator. Or the Legendre polynomials and their associated functions for quantum problems with spherical symmetry. These spherical harmonics are orthogonal functions on the spheres expressible by these polynomials.

Since, by hypothesis 4, the time in the virtual vacuum is t = 0; Then all possible states are restricted to the cross vector products for 0,1,3 and 7 dimensions; The permutations, and finally: the sum or mixture of states generated by the sum of binary scalar products, when the angle between two vectors of a binary scalar product of vectors is 0 °.

An important property is that the binary product of two quantum vectors (natural numbers) are not distinguishable in their value when it is true that the angle for the cross product is 90 ° or orthogonal; And when the angle for the binary scalar product is 0 °; this is:

$$a \times b = \|a\| \, \|b\| \cdot \sin\left(\pi/4\right) \equiv a \cdot b = \|a\| \, \|b\| \cdot \cos\left(0\right)$$

7) The number of pairs of vacuum is defined by the maximum number of spheres in 8 dimensions (time becomes space-type dimension) that are mutually tangent to a central one; Ie 240 or its functional equivalent, the number of non-zero roots of group E8. This forms the R8 lattice.

8) The 8 dimensions packed in circles are equivalent to the only possible solution of the equation of Catalan $x^a - y^b = 1 \; ; \; a, b > 1 \; ; \; x, y > 0$ which gives rise to the maximum possible group of exchange bosons with mass at zero rest; In this case, the SU(3) group or the gluons. $3^2 - 1 = 8 \equiv SU(3)$

In turn, these 8 maximum dimensions would be generated by all possible polarization states of a photon in 3 dimensions; that is to say: $2^3 = 8$ .By functional equivalence would be 8 photons or equivalently 4 gravitons; since it holds for the spins: $8 \cdot (s = 1) \equiv 4 \cdot (s = 2)$

It seems therefore that the number of dimensions uncompacted in circles (bosons) are generated by gravity, 4d

9) The energy of the vacuum is determined by the maximum possible entropy that depends on a direct function of the compacted 7 dimensions. This function would be multifunctional. On the one hand, 1) the number of permutations of the 7 dimensions. 2) the sum of the squares of the 24 dimensions generated by all possible states of the permutations of the 4 dimensions uncompacted (4! = 24).In turn these 24 dimensions are the product of the 8 dimensions (7 +1 time converted into dimension space type) by the 3 classic and uncompacted dimensions. And this last result is the well-known group SU(5) of the great unification theories (GUT).

The 11 total dimensions are therefore the sum of SU(3) + SU(2), equivalent to 4d + 7d. 28 being the group SO(8) = 7 x 4

The original 26 dimensions of the bosonic string theory would be equivalent to these 24 spheres in 4 dimensions, plus the central one, plus the time dimension: 24 + 1 + 1t = 26

The reduction of the 26 dimensions would arise from the subtraction of these 26 dimensions from the number of dimensional states generated by the sum of all possible states of the spine projections; this is: $26d - \sum_s 2s + 1 = 11d$

In turn, the permutations of the five spines generates the SU (11) group = 5!. And, $2 \cdot SU(11) \equiv 240$

3) The value of the vacuum energy, defined as the maximum entropy established by the natural logarithm of the Planck energy / vacuum energy; Would also be the consequence of the so-called Brocard problem; That is: The problem of Brocard is a mathematical problem that asks to find integer values of n and m for which $n! + 1 = m^2$

The conjecture, still unproven, states that the maximum n = 7, so the maximum possible value for the entropy of the vacuum energy would be: $\sqrt{7!+1} = 71 \; max\left[H\left(v\right)\right] = 71 = \ln\left(E_{PK}/E_v\right)$

The double multifunctionality (functional equivalence), is summarized in: $max\left[H\left(v\right)\right] = \sqrt{7!+1} = \sqrt{\sum_{n=1}^{4!} n^2 + 1} = 70 + 1$

10) Strong holographic principle.

The 8 dimensions packed in circles are equivalent to the number of circles mutually tangent to a central one in two dimensions. Being the eighth dimension that would confine by external tangency, the 7 holographic dimensions in the 2d plane.

There is a functional equivalence between the number of permutations of the 3 non-compacted dimensions and the number of circles that are mutually tangent to a seventh central circle in a 2-dimensional space. $3! = 6$

Likewise, the permutations of the 4 dimensions are functionally equivalent to the 24 spheres mutually tangent to a central, in a space of 4 dimensions.

The osculation number is the maximum number of spheres of radius 1 that can simultaneously touch the unit sphere in an n-dimensional Euclidean space. The problem of osculation number is to obtain the number of spheres as a function of n (space dimension). Writing the notation for the number of osculation as a function of the number of dimensions, d, by $k(d)$, we obtain the following functional equivalences:

$k(2d) = 6 \equiv 3!$; $k(3d) = 12 \equiv 2 \cdot k(2d)$; $k(4d) = 24 \equiv 4! \equiv 4 \cdot k(2d)$

$k(8d) = 240 \equiv 10d \cdot k(4d) \equiv k(1d) \cdot 5! \equiv k(1d) \cdot SU(11)$

11) The chosen non-time-dependent models derived from the Schrödinger equation will be: a) Particle in a box. B) Particle in a potential of spherical symmetry.

The model of a particle in a box will allow us to obtain important probabilities related to the quantum vacuum.

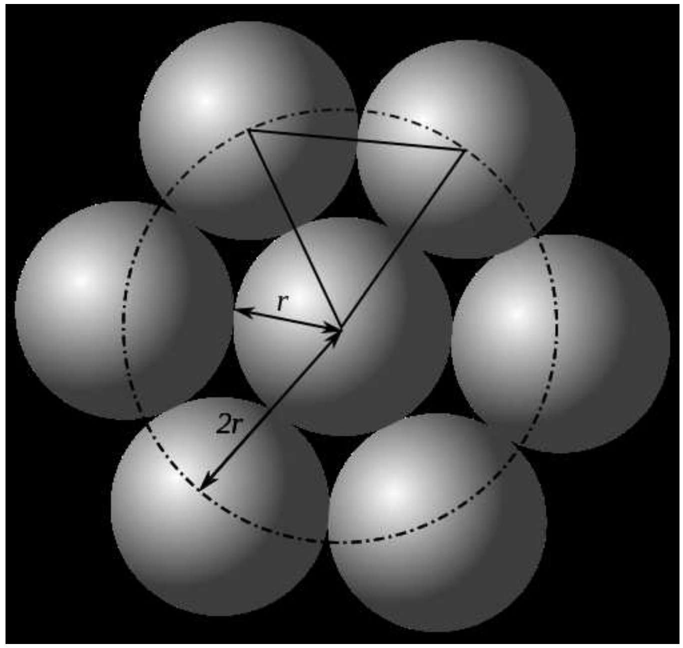


FIGURE 0.4.1.

The model of a particle in a potential of spherical symmetry will allow to obtain the value of the Higgs vacuum.

12) There are two privileged reference masses: One is the maximum possible mass, or mass of Planck. The other is the minimum possible mass, absolutely stable and with electric charge; The electron, fundamental in the beginning of the universe by its connection with the bosons of exchange of the electromagnetic field, the photons.

13) There are two main types of entropy to break the entropy defined by the 240 pairs of vacuum, which represents the lattice R8.

a) The entropy of equiprobable quantum states: $\ln n$

b) The entropy defined for non-equiprobable states for particle-antiparticle pairs: $\int_1^n \frac{2 \cdot \ln n \cdot dn}{n} = \ln^2 n$

The sum of both entropies would correspond to the two fundamental states of the quantum vacuum: The Higgs vacuum would correspond to non-equiprobable states (different particle-antiparticle pairs, different elementary particles). The other state of the quantum vacuum would correspond to the pure state of the quantum vacuum of maximum entropy possible; And would therefore be that of the entropy of equiprobable states, corresponding to the natural logarithm of the ratio of Planck energy / vacuum energy. This mathematical definition, about 240 pairs representing non vacuum broken symmetry, be expressed by:

$$\ln\left(E_{PK}/E_V\right) + \ln^2\left(V_H/E_e\right) + E_F\left(c\right) = 240$$

Where a corrective effect can be expected $E_F\left(c\right)$, which at the moment we do not know, but which hypothetically would be very small, comparatively to the main entropic terms of the rupture of the vacuum: $\ln\left(E_{PK}/E_V\right)$, $\ln^2\left(V_H/E_e\right)$

14) The value of the Hubble constant will be derived with great precision starting from the premise that the growth rate of acceleration and velocity were equal at the beginning of the universe. This means solving the following differential equation $\dfrac{dx}{d^2t} = \dfrac{dx}{dt}$ with two initial hypotheses. Relativistic hyperbolic coordinates. Contour condition bounded to constant $\dfrac{\pi^2}{2}$, which is equivalent to the volume factor of a sphere in 4 dimensions, or its functional equivalence given by the integral of a circle of radius π ; $\dfrac{\pi^2}{2} = \displaystyle\int_0^{\pi} x dx$

Proposition 1. *By hypotheses 7 and 8*

240 particle-antiparticle pairs representing the void are the sum of the entropies defined by the inverse of the fine structure constant for zero momentum and entropy of the electron-positron pairs defined by $2 \cdot \ln\left(m_{PK}/m_e\right)$ *.The very slight asymmetry corresponds exactly to the density of baryons* Ω_b

Proof. The inverse of $\alpha\left(0\right) = \alpha^{-1}\left(0\right)$ represents the number of photons in the vacuum. Since a photon is generated by electrically charged particle pairs, and assuming that the vacuum represents particle-antiparticle virtual pairs; Then the state of least possible energy, absolutely stable (life of the particle with electric charge) and with non-zero mass at rest, must necessarily correspond to the electron. The integer part of $\alpha^{-1}\left(0\right) = \left\lfloor \alpha^{-1}\left(0\right) \right\rfloor = 137$ Is in fact the sum of all possible polarization states of a photon, for 7 dimensions, 3 dimensions, and 0 dimensions (time dimension = 0): $\left\lfloor \alpha^{-1}\left(0\right) \right\rfloor = 2^7 + 2^3 + 2^0$

$7d + 3d + 0d = 11d - 1d(t)$

$$2 \cdot \ln\left(m_{PK}/m_e\right) + \alpha^{-1}\left(0\right) = 103.055712575 + 137.0359991730 = 240.091711748$$

So the density of baryons is:

$$\Omega_b = \frac{2 \cdot \ln\left(m_{PK}/m_e\right) + \alpha^{-1}\left(0\right) - 240}{2} = 0.045855874\left(20\right)$$

□

The previous result is in extraordinary agreement with the empirical value and is in fact the proof of the starting proposition. Therefore, this experimental data demonstrates the validity of at least the hypotheses 1,3,4,7 and 8. It must be taken into account that this empirical data is subject to future revisions, and that it is not at all definitive.

The empirical data used is the most up-to-date and reliable, due to the results of Planck 2015 (Pág. 32, TT,TE,EE+lowP+lensing+e) : $\Omega_b = \dfrac{\Omega_b h^2 = 0.0223 \pm 0.00014}{\left(h = 67.74\, Km\, s^{-1} Mpc^{-1}/100\, Km\, s^{-1} Mpc^{-1}\right)^2} = 0.0485975615 \pm 0.0010$

Planck 2015 results. XIII. Cosmological parameters

The numerical functional equivalence shows that the density of baryons is also a direct function of the fine structure constant for zero momentum, if taken in particle-antiparticle pairs and the additional assumption is made that the maximum mass density is $\Omega_m = \pi^{-1}$

Equivalently: the number of photons represented by $\alpha^{-1}(0)$ divided by the number of particle-antiparticle pairs and with a dimensionless wavelength (quantum radius) given by π

$$\Omega_b \simeq\equiv \frac{\alpha(0)\cdot 2}{\Omega_m} = 0.0458506184149\ (21)$$

$\dfrac{\alpha(0)\cdot 2}{\Omega_m} \simeq\equiv \dfrac{2\cdot\ln(m_{PK}/m_e) + \alpha^{-1}(0) - 240}{2}$; $0.0458506184149 \simeq 0.045855874$

$\Omega_m = 0.318309886184$

Proposition 1 meets the cosmological hypothesis of the early universe of creation-annihilation of pairs by photons.

Proposition 2. *Baryon-antibaryon asymmetry with respect to the number of photons is a direct function of the inverse of the density of baryons and of the equation that determines the average of bosons, in this case, photons that disintegrate in particle-antiparticle pairs, or The average function of bosonic particles of the Bose-Einstein statistic. A correction factor must be included due to the quantum probability of a photon with dimensionless radius* $R_\gamma = \sqrt{\dfrac{\alpha^{-1}(0)}{4\pi}}$ *; following the non-time dependent model of a particle in a box. This model is modified for a dimensionless string or circle of radius unit,* 2π

An adjoining condition, derived from Proposition 1, is that the inverse of the entropy representing the density of baryons, or the difference in the number of baryons minus the number of antibaryons, is the least possible due to the assumption that at the beginning Of the universe there was the minimum possible entropy or minimum degree of disorder. This implies the following differential equation: $\dfrac{d\left(nb - n\bar{b}\right)}{\left(nb - n\bar{b}\right)} = \Omega_b^{-1}$

The test consists in checking if the hypothesis of proposition 2, allows to calculate with good accuracy this asymmetry (baryon-antibaryon) / photons, or the cosmological parameter $\eta = (6.19 \pm 0.14) \cdot 10^{-10}$

PROOF. Let be the equation of the bosonic average of the Bose-Einstein statistic, for the mean number of particles for the substate of a single particle; And making the change of variable $\frac{E}{k_B \cdot T} = \Omega_b^{-1}$: $\langle N \rangle = \frac{1}{\exp\left(\Omega_b^{-1}\right) - 1}$

Including the probability of a photon of the aforementioned modified model of a particle in a box in the basic quantum state (n = 1), and which is expressed by the probability:

$P\left(2, R_\gamma\right) = \frac{2 \cdot \sin^2\left(2\pi / R_\gamma\right)}{R_\gamma} = 0.541345283550078$

The final equation is given by:

$$\eta = \frac{1}{\left[\exp\left(\Omega_b^{-1}\right) - 1\right] \cdot P\left(2, R_\gamma\right)} \quad (22)$$

The numerical calculation of (22) gives us the value:

$$\eta = \frac{1}{\left[\exp\left(21.8073504400348\right) - 1\right] \cdot 0.541345283550078} = 6.24760669675 \cdot 10^{-10}$$

And the experimental value demonstrates the great precision of proposition 2, since: $(6.19 \pm 0.14) \cdot 10^{-10} \simeq 6.24760669675 \cdot 10^{-10}$ □

PROPOSITION 3. *The photon probability obtained by the modified model of a particle in a box is a numerical equivalent function, squared of the density that determines the inverse of the entropic uncertainty for the Planck constant (non-barred) h* $.(2/e)^2 = \frac{1}{\left(H_x \cdot H_p\right)^2}$

Proposition 3 is based on the physical foundation derived from the quantum oscillator in its basic state,$2E = \hbar\omega$ *(Particle-antiparticle pairs generated by a photon is an exact qualitative equivalence); Or equivalently to the one-dimensional state of a photon self-related by the two possible states of polarization H and V,* $2^1 = 2$

These two states, which represent the quantum minimum binary operation, are divided between the infinite sum of the possible permutations of an infinite space of states, quantised to natural numbers; That is, the density thus defined would be:

$$\psi(2,n!)=\sum_{n=0}^{\infty}\frac{2}{n!}=\frac{2}{e}\rightarrow\psi^{2}(2,n!)=P\left(2,n!\right)=\frac{1}{\left(H_{x}\cdot H_{p}\right)^{2}}$$

The empirical test of Proposition 3, including a correction due to the mass ratio of electron / mass of the Higgs boson mh1:

PROOF.

$$P\left(2,R_{\gamma}\right)-\frac{m_{e}}{m_{h1}}\simeq\equiv P\left(2,n!\right)=\left(2/e\right)^{2}\ (23)$$

$$0.541345283550078-\frac{1}{244795.221034068}=0.54134119850301$$

$$0.54134119850301\simeq\left(2/e\right)^{2}=0.541341132946451$$

□

PROPOSITION 4. *The two entropies that break the symmetry of the 240 pairs of the vacuum of R8, and which determine by equation (20) the density of baryons, must fulfill that their integer part is a prime number; this is:* $\lfloor 2\cdot\ln\left(m_{PK}/m_{e}\right)\rfloor=p_{1}$; $\lfloor\alpha^{-1}\left(0\right)\rfloor=p_{2}$

The physical idea of this proposition is based on the following simultaneous physical facts that must be met: a) Being originated the universe by an inflationary expansion, and thus exceeding the speed of light, the state of the particles would not be Distinguishable from virtual particles. This condition of equivalence of virtual states is equivalent to a mixture of simultaneously existing states (t = 0 for observers with finite speed limit); That is, quantum entangled as corresponds to the undisturbed wave function by measurement or observation.b) By the hypothesis 8), the photons have to be quantum entangled. c) If the integer part of the entropy of the photons $\lfloor\alpha^{-1}\left(0\right)\rfloor$ *was not a prime number, then this entropy could be factorizable in several entropies-factor, for example* $135=5\cdot3^{3}$ *,and this contradicts the fact that photons are entangled, and would also allow lower states of lower entropy (the entropic quantum number factors). c) The entire part of the entropy of the electron-positron pairs, also has to be a prime number, for the same reason b) adduced for the photons. The electron being the particle with electric charge and nonzero mass lighter, is absolutely stable in time; There being no possibility of decay in particle states with non-null or non-zero rest mass under conditions of non-interaction.*

d) The high isotropy and homogeneity demonstrated by the microwave radiation background (CMB) would not only be due to inflation, but would also depend on the primality (not factorization) of the whole part of the dimensionless value of inflation. This should be so that there were no separable (non-local) regions of the universe during the whole rhythm of inflation, and therefore could have triggered important inhomogeneities that are not observed in the CMB. In the section corresponding to inflation, it will be verified that the whole part of the inflation factor is the prime number 139.

The empirical finding, indeed, seems to confirm this proposition, and there seems to be a clear nexus also with the twin prime numbers.

FACT. $\lfloor 2 \cdot \ln(m_{PK}/m_e) \rfloor = p_1 = 103\ ;\ (101, 103)\ \ \lfloor \alpha^{-1}(0) \rfloor = 137 = p_2\ ;\ (137, 139)\ \ (239, 241)$

$101 + 103 + 137 + 139 = 239 + 241 = 480$

And the number 480, is a highly significant number in the context of E8 group, octonions, and the quantum vacuum. This number, as is well known, is the possible number of different multiplication tables (binary multiplication) of the imaginary values of the octonions, which define the group E8, and the lattice R8.

But the number of pairs of the void, 240, as well as 480; Also define the force of the Casimir effect and its pressure, given by the equations:

$F_c = -\dfrac{\pi \cdot hc}{480 \cdot d^4} \cdot A\ ;\ P_c = -\dfrac{\pi^2 \cdot \hbar c}{240 \cdot d^4}$ *$d =$ distance between the two conductive plates; $A =$ Area of the two conductive plates.*

As in the case of the fine structure constant for zero momentum (equation 3); the entropy of the electron-positron pairs $2 \cdot \ln(m_{PK}/m_e)$ Seems to be a direct function of the prime number 103, plus the unequibrobable entropy for the single state dependent on the prime number 103, that is: $2 \cdot \ln(m_{PK}/m_e) \sim 103 + \dfrac{\ln 103}{103} = 103.044997368818$

If an additional term is included depending on the energy density of the vacuum, $\mathit{\Omega}_\Lambda = (1 - \pi^{-1})$,and by $\alpha(0)$; a result that is very close to the experimental value is obtained.

$$2 \cdot \ln(m_{PK}/m_e) \simeq\equiv 103 + \frac{\ln 103}{103} + \frac{\alpha(0)}{\mathit{\Omega}_\Lambda} = 103.055702163294$$

$$2 \cdot \ln(m_{PK}/m_e) \simeq\equiv 103 + \frac{\ln 103}{103} + \frac{\alpha(0)}{\mathit{\Omega}_\Lambda} + \frac{\alpha(0)}{2\pi \cdot \left(103 + \frac{\ln 103}{103}\right)} = 103.055713434193 \quad (24)$$

Principal properties of the 240 pairs representing the quantum vacuum by R8 / E8.

1) 240 is the product of the first six Fibonacci numbers: $240 = 1 \cdot 1 \cdot 2 \cdot 3 \cdot 5 \cdot 8$

2) The sum of the squares of these consecutive Fibonacci numbers and divisors of 240, without the repeated 1, is equal to the prime number 103; Or the entire part of the quantum entropy of electron-positron pairs:

$$\sum_{F_n/240} F_n^2 = 1^2 + 2^2 + 3^2 + 5^2 + 8^2 = 103 = \lfloor 2 \cdot \ln (m_{PK}/m_e) \rfloor$$

3) The original 26 dimensions of the bosonic string theories are functionally equivalent to the difference of squares of all divisor Fibonacci numbers of 240, except for unity, forming a 4-dimensional coordinate system with the number 8, the fourth coordinate:

$$8^2 - 5^2 - 3^2 - 2^2 = 26 \longrightarrow 8^2 = 5^2 + 3^2 + 2^2 + 26$$

These 26 dimensions are functionally equivalent to the total amount of particles of the standard model up to the limit of the Higgs vacuum:

$$26 \equiv 6\, quarks + 6\, leptones + 8\, gluones + 1W^{\pm} + 1Z + 1\gamma + 1\, gravitón + 1\, bosón\, h_1 + 1\, axión$$

The maximum entropy of the Higgs vacuum (relative to the maximum mass, or mass of Planck); Meets the following significant numerical functional equivalence:

$$\ln (E_{PK}/V_H) \simeq\equiv \left(8^2 - 26\right) + \frac{\exp \gamma + 1}{2\pi} \; ; \; \gamma = \text{Euler–Mascheroni constant} = 0.57721566490153286060 \cdots$$

$$\left(8^2 - 26\right) + \frac{\exp \gamma + 1}{2\pi} = 38 + 0.44262142241967 = 38.44262142241967 \simeq\equiv \ln (E_{PK}/V_H)$$

$$\ln (E_{PK}/V_H) = 38.4424894547404$$

$$\left(8^2 - 26\right) + \frac{\exp \gamma + 1}{2\pi} - \left[26 \cdot \left(\frac{7}{e}\right)^7\right]^{-1} = 38.4424895344134 \simeq \ln (E_{PK}/V_H) = 38.4424894547404$$

4) The 11 dimensions are functionally equivalent to the sum of the first four Fibonacci numbers, divisors of 240.

The 10 spatial dimensions being the simultaneity of the 4 dimensions, as sum of the 4 dimensions.

$$11d \equiv 1d + 2d + 3d + 5d \; ; \; 10 \equiv 1d + 2d + 3d + 4d$$

These sums are functionally equivalent to the dimensional mixing or simultaneous dimensional existence (cancellation of the time), generated by the dimensional vector obtained by the sum of the binary vector scalar products; In which it is fulfilled: $d \cdot 1 \cdot \cos 0 = d$

$$10d = 1d \cdot 1d \cos 0 + 2d \cdot 1d \cos 0 + 3d \cdot 1d \cos 0 + 4d \cdot 1d \cos 0$$

The previous equality generates a sum of vectors that are in the same geometric line. An exact physical representation of simultaneity of states-dimensions that imply instantaneity, and therefore the annulment of time for the virtual vacuum.

5) The value of the equiprobable entropy of the least massive Higgs / electron mass mass (mh1 = 125.0901 GeV) is functionally equivalent to the sum of the 10 dimensions, or twice the sum of the spins (particle-antiparticle pairs); Plus the sum of the spherical quantum curvatures of the Fibonacci divisor numbers of 240, that is:

$$\ln\left(m_{h1}/m_e\right) \simeq\equiv 10 + \sum_{F_n/240} F_n^{-2}$$

$$10d \equiv 2 \cdot \sum_s s \;;\; 10 + \sum_{F_n/240} F_n^{-2} = 12.4167361111111$$

$$m_{h1} \simeq \exp\left(10 + \sum_{F_n/240} F_n^{-2}\right) \cdot m_e = 126.1653163174\, GeV$$

$$\exp\left(10 + \sum_{F_n/240} F_n^{-2}\right) \cdot m_e - \frac{g\left(0^{++}\right)}{\ln\left(\sum_s s\right)} = 125.09040688\, GeV = m_{h1} \;;\; g\left(0^{++}\right) = \text{Glue ball -mass gap} = 1.73 \text{ GeV}$$

6) Although we advance to the deduction of the adimensional quantum radius for compactification in 7-dimensional circles; For following a thematic order (properties derived from the vacuum pairs, 240); We will expose a functional equivalent equation giving the value of the Higgs vacuum (V_H); as a direct function of the matrix generated by the sum of the divisors of 240.

Greater dimensionless quantum radius for 7 dimensions packed in circles and function of gravity extended to d dimensions: R_7

$$R_7 = \left[\frac{2 \cdot (2\pi)^7}{S_T(7)}\right]^{\frac{1}{7+2}} = 3.05790095610234 \;;\; S_T(7) = \frac{2\pi^{\frac{7}{2}}}{\Gamma\left(\frac{7}{2}\right)} = \frac{16\pi^3}{15}$$ (Surface of a sphere in d dimensions, d = 7, or its equivalent: the volume of a torus in d dimensions).

The dimensionless radius of a black hole in d dimensions, or smaller radius, in this case with d = 7:

$$r_7 = \left[\frac{4 \cdot (2\pi)^7}{(7+1) \cdot S_T(7)}\right]^{\frac{1}{7+1}} = 2.95694905822489 \;;\; r_7^8 = \pi^4 \cdot 60 \;;\; \pi^4 \cdot 240 = R_7^9$$

$$\frac{\sigma^2(240)\cdot\left(1+\frac{\alpha(0)\cdot 7}{\lfloor\ln(m_{PK}/m_e)\rfloor}\right)\cdot\left(\frac{R_7}{r_7}\right)}{\sqrt[4]{2}}=\frac{V_H}{m_e\,(GeV)}\ ;\ \sigma(240)=744\ ;\ \lfloor\ln(m_{PK}/m_e)\rfloor=51=17\cdot 3\ ;\ \sigma(51)=71=\sqrt{7!+1}$$

$$\frac{\sigma^2(240)\cdot\left(1+\frac{\alpha(0)\cdot 7}{\lfloor\ln(m_{PK}/m_e)\rfloor}\right)\cdot\left(\frac{R_7}{r_7}\right)\cdot m_e\,(GeV)}{\sqrt[4]{2}}=246.21965551835\,GeV\simeq 246.21965079413\,GeV$$

7) The number of independent components of the 4-dimensional Riemann tensor, a key element in Einstein's theory of general relativity; Is functionally equivalent to the 240 vacuum pairs, divided by the maximum number of spheres mutually tangent to a central (13) in a space of 3 dimensions, and equivalent to the sum of all divisor Fibonacci numbers of 240; this is:

$$C_{d=4}(Riemann\ Tensor)=C_4\,(RT)=\frac{4^2\left(4^2-1\right)}{12}=20\equiv\frac{240}{k(3d)=12}\equiv\sum_{F_n/240}F_n=1+1+2+3+5+8$$

8) The maximum entropy, Planck mass / electron mass $\ln(m_{PK}/m_e)$ Is functionally equivalent to a function which depends directly on the inverse of the maximum density of mutually tangent spheres in an 8-dimensional space, determined by the lattice at R8. With corrections due to fine structure constant for zero momentum $\alpha(0)$;The photonic quantum probability $P(2,R_\gamma)$; And the sum of the ratios of the masses of leptons with electric charge τ,μ,e , respect to the mass of the electron $\sum_{l-}(m_{l-}/m_e)$

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$$\triangle_8^{-1}=\frac{384}{\pi^4}$$

$$\ln(m_{PK}/m_e)\equiv\exp\left(\triangle_8^{-1}\right)-\frac{\alpha(0)}{2\pi\cdot(1+P(2,R_\gamma))}-\left[\left(\frac{103}{137}\right)\cdot\left(\sum_{l-}(m_{l-}/m_e)\right)^2\right]^{-1}=51.5278565115972\simeq 51.5278565115505$$

9) The 240 pairs representing the quantum vacuum is functionally equivalent to the eighth coordinate of an 8-dimensional sphere expressed in Cartesian coordinates; this is:

$$240=\left(1^2+2^2+3^2+5^2+8^2=103\right)+\left(11^2+4^2=137\right)$$

10) The sum of the Fibonacci numbers divisors of 240, except for the repeated 1, is functionally equivalent to the sum of all the elementary particles up to the limit of the Higgs vacuum, not counting the multiplicity of color of the gluons; this is:

$$6\,leptones+6\,quarks+3B(W,Z,\gamma)+1\,gluón+1\,Gravitón+1\,bosón\,h_1+1\,axión\equiv 1+2+3+5+8$$

0.4.1. Dimensional adimensional quantum radii: 7-dimensional extended gravity. Planck limit. Hypotheses 1), 2), 6) and 10) require the existence of 7 holographic dimensions as circles in the plane, and which are the result of the maximum number of circles mutually tangent to one center in the plane. And the hypothesized need to obtain an independent model of the space-time background requires us to obtain dimensionless quantum radii, which, as will be shown, allow us to obtain precise empirical results, such as the Higgs vacuum value, the mass of the less massive Higgs boson (h1), the fine structure constant for zero momentum, among others. These dimensionless 7-dimensional quantum radii are analogous to the photonic quantum radius (R_γ).

A compacting model compatible and consistent with all these hypotheses (1,2,6 and 10), consists of toroidal compactification in circles. Black holes and the existence of extra dimensions (Page 13, equation 32. page 14, equation 39. page 15, equation 40. page 18, equation 54. And page 24, equation 74 for the equation of the radius of a black hole).

To obtain these dimensionless radii we will simply divide the radius d dimensionally by the length or radius of Planck and extract the corresponding root.

Using equation (54) :

$$\frac{l_p^{d+2}(d)}{l_p} = \frac{\dfrac{\hbar \cdot G_{N\,4+d}}{c^3}}{\dfrac{\hbar \cdot G_N}{c^3}} \rightarrow \frac{l_p(d)}{l_p} = \left(\frac{\dfrac{\hbar \cdot G_N \cdot 2\left(2\pi\right)^d}{c^3 \cdot \dfrac{2\pi^{\frac{d}{2}}}{\Gamma\left(\frac{d}{2}\right)}}}{\dfrac{\hbar \cdot G_N}{c^3}} \right)^{\frac{1}{d+2}} = \left(\frac{2\left(2\pi\right)^d}{\dfrac{2\pi^{\frac{d}{2}}}{\Gamma\left(\frac{d}{2}\right)}} \right)^{\frac{1}{d+2}} = R_d \quad (25)$$

Where R_d Is the dimensionless quantum radius in d dimensions.

For the radius of the black hole limit in d dimensions, we will use the same dimensionless method, this time using equation (74):

$$\frac{R_{BH}(d)}{l_p} = \left(\frac{\dfrac{2 \cdot G_{N\,4+d} \cdot M_{PK}}{(d+1) \cdot c^2}}{\dfrac{M_{PK} \cdot G_N}{c^2}} \right)^{\dfrac{1}{d+1}} = \left(\frac{4\,(2\pi)^d}{(d+1) \cdot \dfrac{2\pi^{\frac{d}{2}}}{\Gamma\left(\dfrac{d}{2}\right)}} \right)^{\dfrac{1}{d+1}} = r_d \; (26)$$

Automatically fulfilling that: $R_d > r_d$

We are now in a position to use these dimensionless 7-dimensional quantum radii to calculate two quantum probabilities, using the time-independent modified model of the particle in a box.

Quantum probabilities dependent on dimensionless quantum radii in 7 dimensions R_7, r_7

With the calculation that was anticipated, we have:

$$r_7 = \left[\frac{4 \cdot (2\pi)^7}{(7+1) \cdot S_T(7)} \right]^{\dfrac{1}{7+1}} = 2.95694905822489 \; ; \; R_7 = \left[\frac{2 \cdot (2\pi)^7}{S_T(7)} \right]^{\dfrac{1}{7+2}} = 3.05790095610234$$

The two quantum probabilities dependent on the radiis R_7, r_7 , are:

$$P(2, R_7) = \frac{2 \cdot \sin^2(2\pi / R_7)}{R_7} = 0.512457491797025$$
$$P(2, r_7) = \frac{2 \cdot \sin^2(2\pi / r_7)}{r_7} = 0.489114992243762$$

Proposition 5. *The least massive Higgs boson mass (m_{h1}) is a direct and simple function of the product of the lowest quantum probability (state of lower energy-mass of the vacuum), dependent on the quantum radii R7 and r7. If the lowest probability is less than the minimum uncertainty factor 1/2; Then the opposite probability will be taken.*

Proof. By simple observation it is found that $P(2, r_7) < P(2, R_7)$;pero como $P(2, r_7) < 1/2 \rightarrow m_{h1} \simeq V_H \cdot (1 - P(2, r_7))$

$$m_{h1} \simeq V_H \cdot (1 - P(2, r_7)) \rightarrow m_{h1} \simeq 246.21965079413\, GeV \cdot (1 - P(2, r_7)) = 125.789928205701\, GeV$$

But the pleasant surprise is to verify that the previous result is an excess of mass due to the mass-gap of glue ball g (0 ++), with a correction dependent of the sine of the electroweak angle. This corrective functional equivalence gives the exact experimental value of the mass of the h1 boson; It is exactly expressed by:

$$V_H \cdot (1 - P(2, r_7)) - \frac{g(0^{++})}{2 + \sin\theta_W} = m_{h1} \; (27)$$

$$246.21965079413\, GeV \cdot (1 - P(2, r_7)) - \frac{1.73\, GeV}{2 + \sin\theta_W} = 125.0901285\, GeV$$ □

Fact 6. *If the dependent quantum probability of radius R7 is used (greater than the minimum uncertainty 1/2), similar to the function of equation (27) is obtained, but dependent, with very good approximation, of mass density* $\Omega_m = \pi^{-1}$ *; and the sum of all the spines (up to the graviton)* $\sum_s s = 5$

$$V_H \cdot P(2, R_7) - \frac{g(0^{++})}{\Omega_m \cdot 5} = m_{h1}$$

$$246.21965079413\, GeV \cdot P(2, R_7) - \frac{g(0^{++})}{\Omega_m \cdot 5} = 125.090113618961\, GeV$$

Remark. **Notable properties, by functional equivalence, of quantum probabilities, dependent on probabilities** $P(2, R_7), P(2, r_7), P(2, R_\gamma)$

1) The average probability of the sum of the probabilities $P(2, R_7)$ **y** $P(2, r_7)$**:**

$$\left[\frac{P(2, R_7) + P(2, r_7)}{2}\right] \cdot V_H(GeV) + \frac{g(0^{++}) \cdot R_7}{r_7} = 125.0924768\, GeV \simeq m_{h1} = 125.0901\, GeV$$

$$P(2, R_7) + P(2, r_7) = 0.500786242020393 > 1/2$$

2) The difference of simultaneous quantum probabilities due to the 7 circles or strings ($P^7(2, R_7) - P^7(2, r_7)$**) And its relation to the Higgs vacuum, the mass gap-glue ball g (0 ++), and the entropic uncertainty (Planck's non-barred constant):**

$$H_p \cdot H_x = e/2 \,;\; g(0^{++}) = 1.73\, GeV \,;\; V_H(GeV) = 246.21965079413\, GeV$$

$$2 \cdot (H_p \cdot H_x) \cdot \left[P^7(2, R_7) - P^7(2, r_7)\right] \cdot V_H(GeV) = 1.729637825\, GeV \simeq 1.73\, Gev = g(0^{++})$$

3) The average probability sum of the simultaneous probabilities for the 7 circles or strings, dependent on $P^7(2, R_7), P^7(2, r_7), P^7(2, R_\gamma)$ **;and its direct relation with the maximum entropy electron-positron pairs (** $2 \cdot \ln(m_{PK}/m_e)$**) and entropic uncertainty. Correction due to the mass of the lepton muon and the fine structure constant for zero momentum** $\alpha(0)$**:**

$$\left[\frac{P^7(2,R_7)+P^7(2,r_7)+P^7(2,R_\gamma)}{3}\right]^{-1}+2\cdot(H_p\cdot H_x)-\frac{m_e}{m_\mu}+\frac{\alpha^2(0)}{2}=103.055712392422$$

$$103.055712392422\simeq 2\cdot\ln\left(m_{PK}/m_e\right)$$

$$\left[\frac{P^7(2,R_7)+P^7(2,r_7)+P^7(2,R_\gamma)}{3}\right]^{-1}=101.342240269987\,;\ \frac{m_e}{m_\mu}=(206.7682826)^{-1}$$

4) The value of the Higgs vacuum as ratio, VH / electron energy: direct product function of the quantum probabilities $P^7(2,R_7), P^7(2,r_7), P^7(2,R_\gamma)$ and the equiprobable entropy due to the mass of the Higgs boson h1 / mass of the electron:

$$\frac{m_e(GeV)\cdot\left[P^7(2,R_7)\cdot P^7(2,r_7)\cdot P^7(2,R_\gamma)\right]^{-1}\cdot\left(\ln\left(m_{h1}/m_e\right)-12\right)}{\left(1+\dfrac{\alpha(0)}{2\Omega_b\cdot 240}\right)}=246.219619584926\simeq V_H(GeV)$$

$$\left[P^7(2,R_7)\cdot P^7(2,r_7)\cdot P^7(2,R_\gamma)\right]^{-1}=1180858.19450994$$

$$\frac{7\pi}{240}+\frac{1}{R_7^9}=0.0458576677909124\simeq\equiv\Omega_b$$

Note that 12 is equivalent to the amount of particles that are fermions (6 leptons + 6 quarks), up to the limit of the Higgs vacuum. While 7, it is equivalent to the amount of bosons up to the limit of the Higgs vacuum (1 h1, 1Z, 1W, 1 photon, 1 gluon, 1 graviton and one axion).

0.4.2. Particle at a spherical symmetry potential. Derivation of the Higgs vacuum value and the mass of the less massive Higgs boson (mh1 = 125.0901 GeV). As is well known, the solution derived from the time-independent Schrödinger equation gives an effective potential:

$$V_{eff}(r)=V(r)+\frac{\hbar^2\cdot(l+1)\,l}{2m\cdot r^2}\ (28a)$$

The above equation defines an energy. We must find an equation that gives us the maximum entropy defined as the natural logarithm of the energy ratio of the Higgs vacuum / electron energy.

0.4.2.1. *Derivation of the Higgs vacuum value.* To obtain this entropy, the following hypotheses will be established: 1) The Higgs vacuum contains all the possible spins. This hypothesis implies that in the equation of potential or effective energy, the angular momentum will correspond to all possible spins; Which implies to make a summation in relation to all the spines, that is to say:

$$V_{eff}(r)=V(r)+\sum_s\frac{\hbar^2\cdot(s+1)\,s}{2m\cdot r^2}\ (28b)$$

2) The second hypothesis is that the Higgs vacuum has its direct origin as a function of the maximum possible mass, or mass of Planck. So the origin of the Higgs vacuum is directly related to the gravitational field. As a consequence of this premise, the radius of the potential will correspond to the Planck length. The term corresponding to the particle-antiparticle pairs must be included. From this second hypothesis, equation (28b) is transformed as:

$$V_{eff}(r) = V(r) + \sum_{s} \frac{2 \cdot \hbar^2 \cdot (s+1)\, s}{2 \cdot m_{PK} \cdot l_{PK}^2} \; (28c)$$

$$m_{PK} = \sqrt{\frac{\hbar c}{G_N}}$$

The above equation, (28c), must be transformed into a dimensionless equation which is also independent of space, or distance r. For this, we will simply divide the main part (dependent on the spins, Planck mass, Planck length and Planck constant) by the Planck energy; With which you will obtain:

$$\frac{\sum_{s} \frac{2 \cdot \hbar^2 \cdot (s+1)\, s}{2 \cdot m_{PK} \cdot l_{PK}^2}}{E_{PK}} = \sum_{s} \frac{2 \cdot \hbar^2 \cdot (s+1)\, s}{2 \cdot m_{PK} \cdot l_{PK}^2 \cdot m_{PK} \cdot c^2} = \sum_{s} (s+1)\, s \; (28d)$$

Equation (28d) should be the main part of the entropy sought. The entropy or part corresponding to the additional term is missing $V(r)$, which must also become dimensionless or independent of r.

3) To define the term V (r), the hypothesis that this term is a function of gravitational potential energy, and equating it to the equation of the total energy or energy-momentum relation, will be postulated. In addition it will be required to be consistent with the minimum Feymann diagram, defined by bosons interactions; that is to say:

$$\gamma \to e^+ + e^- \equiv G \to \gamma + \gamma \equiv h \to \gamma + \gamma \equiv h \to p + \overline{p} \equiv \cdots \; ; \; p = partícula \; , \; \overline{p} = antipartícula$$

Likewise, this gravitational potential energy will be a function of the Planck mass and the Planck length. From this third hypothesis we obtain the transformation of the term V (r), as:

$$V^2(r) = 3 \cdot \left(\frac{m_{PK}^2 \cdot G_N}{l_{PK}} \right)^2 = (p_1 \cdot c)^2 + (p_2 \cdot c)^2 + (p_3 \cdot c)^2 + \left(m_0 c^2 \right) \; (29a)$$

To transform the equation (29a) into an entropy dimensionless term, we again divide by the Planck energy, with which we get:

$$\frac{V^2(r)}{E_{PK}^2} = 3 \cdot \left(\frac{m_{PK}^2 \cdot G_N}{l_{PK} \cdot m_{PK} \cdot c^2} \right)^2 = 3 \; (29b)$$

4) Now, if there really exist the 7 dimensions compacted in circles representing the 7 Higgs bosons; And if this compactification complies with the geometry of the strong holographic principle (principal hypothesis 10), by which there are 6 circles mutually

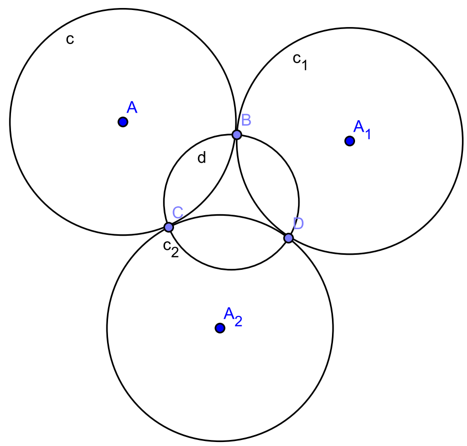


FIGURE 0.4.2.

tangent to a seventh central; Then necessarily the Planck length should be multiplied by one of the two dimensionless quantum radii in 7 dimensions r_7 , R_7 . With this modification, the dimensionless equation (29b) is transformed by:

$$\frac{V^2(r)}{E_{PK}^2} = 3 \cdot \left(\frac{m_{PK}^2 \cdot G_N}{r_7 \cdot l_{PK} \cdot m_{PK} \cdot c^2} \right)^2 = \frac{3}{r_7^2} \ (29c)$$

We have chosen r7, to obtain the maximum of entropy; Since it follows: $\left(3/r_7^2\right) > \left(3/R_7^2\right)$

5) It can be easily demonstrated that the geometrodynamics of the interaction of 3 bosonic strings (representing a minimum Feymann diagram of 3 bosons) mutually tangent with a dimensionless quantum radius in 7 dimensions r_7 , Generate a fourth closed circular string passing through the 3 points of tangency of these 3 mutually tangent strings, and whose radius is an exact function of the dimensionless equation (29c). Graphically, three circles of the same radius that are mutually tangent, generate a fourth circle that passes through its 3 points of tangency and with a radius given by:

$$r_2^{-1} = \sqrt{\frac{3}{r_1^2}} \rightarrow \frac{V(r)}{E_{PK}} = \sqrt{\frac{3}{r_7^2}} \ (29d)$$

Finally, once the dimensionless entropy for the term V(r) is established, the final entropy is obtained by the sum of the dimensionless equations (28d) and (29d):

$$\ln\left(V_H/E_e\right) = \sum_s (s+1)\,s + \sqrt{\frac{3}{r_7^2}}\ (30)$$

$\sum_s (s+1)\,s = 12.5\,;\ \sqrt{\frac{3}{r_7^2}} = 0.585756052425421$
$V_H = E_e \cdot \exp\left(12.5 + 0.585756052425421\right) = 246.315447789782\,GeV$

The above result is in very good agreement with the experimental value for the Higgs vacuum value, although it seems necessary to introduce corrective terms if an exact value is to be obtained. Being the presented model, a basic model; It is logical to think that it must contain additional terms. These terms, for the moment, can be obtained in heuristic form and are consistent with the 7 dimensions, 7 Higgs vacuum bosons.

A first heuristic approximation (first negative term) depends on the factorial of the 7 dimensions, the empty ratio Higgs / mass of the mh1 boson. And a positive term dependent on the mass ratio of the electron / mass of the Higgs boson mh1, and the 7 dimensions. This heuristic correction to equation (30) would be expressed by:

$\ln\left(V_H/E_e\right) = \sum_s (s+1)\,s + \sqrt{\frac{3}{r_7^2}} - \frac{\left(V_H/m_{h1}\left(GeV\right)\right)}{7!} + \frac{m_e}{\sqrt{7}\cdot m_{h1}}$ (31)

$V_H = E_e \cdot \exp\left(12.5 + 0.585756052425421 - \frac{\left(V_H/m_{h1}\left(GeV\right)\right)}{7!} + \frac{m_e}{\sqrt{7}\cdot m_{h1}}\right) = 246.219649877966\,GeV$

The value obtained by equation (31) is already very close to the empirical value of the Higgs vacuum:

$V_H = E_e \cdot \exp\left(12.5 + 0.585756052425421 - \frac{\left(V_H/m_{h1}\left(GeV\right)\right)}{7!} + \frac{m_e}{\sqrt{7}\cdot m_{h1}}\right) \simeq 246.21965079413\,GeV$

Remark. **Numerical functional equivalence between the entropic term $\sqrt{\frac{3}{r_7^2}}$, and a dimensionless V(r) potential dependent on the spin of the photon.**

$\frac{V\left(r\right)}{E} = \frac{2\cdot\hbar^2\cdot(s+1)\,s_{=1}}{2m\cdot r^2\cdot E} - \frac{\hbar\sqrt{(s+1)\,s_{=1}}\cdot c}{p\cdot c\cdot r} = 2-\sqrt{2}\,;\ p = \text{momentum}$

$$\sqrt{\frac{3}{r_7^2}} \sim\equiv 2-\sqrt{2}$$

$\left(\sqrt{\frac{3}{r_7^2}} = 0.585756052425421\right) \sim \left(2-\sqrt{2} = 0.585786437626905\right)$

$$\ln\left(V_H/E_e\right) \simeq\equiv \sum_s \left(s+1\right)s + \left(2-\sqrt{2}\right) - \frac{\left(V_H/m_{h1}\left(GeV\right)\right)}{7!} - \frac{\alpha^2\left(0\right)}{2} = 13.085369270283$$

0.4.2.2. *Derivation of the mass value of the less massive Higgs boson (mh1 = 125.0901 GeV).* Exactly the same as for the Higgs vacuum, the main entropy will be the sum for the spines: $\sum_s \left(s+1\right)s$

For the entropic part dependent on the term of the potential V(r); The following hypotheses shall be adopted: (a) The value of the mass of the less massive Higgs boson or the minimum energy state of the 7 Higgs bosons shall be less than the Higgs vacuum value. This hypothesis is a consequence of the simplest and logical principle: The mass of the Higgs boson, h1, is the consequence of subtracting to the vacuum of Higgs energy; Becoming a non-virtual or real state, with non-zero mass at rest.

b) The second hypothesis is based on the fact that the term for the potential V(r) must depend on the electric charges (fermions: leptons and quarks, Boson W); Since the Higgs boson, h1, is responsible for generating masses of all particles. And it must depend on the electric charges, assuming an unification of the electromagnetic and gravitational field that derives from equation (1):

$$\pi^2 \cdot (\pm e) \cdot \left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right] = \pm\sqrt{m_{PK} \cdot m_e \cdot G_N}$$

c) The potential V(r), dependent on the electric charge ($\pm e$); Will also depend on Planck's mass and a repulsive constant acceleration of the vacuum a_0. The latter condition implies a constant force F = $m_{PK} \cdot a_0$. This repulsive vacuum acceleration would be a direct and simple function of the Hubble constant, that is: $a_0 = c \cdot H$

d) This potential V(r) will have a variable dependent on the radius r, or distance.

By hypothesis a), b), c) and d) the potential form will be:

$$V\left(r\right) = \frac{(-e)\cdot(+e)}{r^2} = m_{PK} \cdot a_0 \; (32a)$$

The above equation implies directly that the potential V (r) has a negative value, since the two multiplicative factors for two opposite electric charges give the sign (-): (-1)(+1) = (-1).

Equation (32a) becomes dimensionless, dividing by the constant force $m_{PK} \cdot a_0$:

$$\frac{V\left(r\right)}{m_{PK} \cdot a_0} = \frac{(-e)\cdot(+e)}{r^2 \cdot m_{PK} \cdot a_0} \; (32b)$$

It should be noted that equation (32b) is dimensionally equivalent to the denominator of equation (29b):

$r^2 \cdot m_{PK} \cdot a_0 \equiv l_{PK} \cdot m_{PK} \cdot c^2 \equiv ML^3T^{-2}$

The above dimensional functional equivalence implies the dimensional equivalence of Enegía x radius = mass x acceleration x radius x radius: $E \cdot r \equiv m \cdot a \cdot r^2$

Since the potential V(r) is only variable with respect to r, it is only necessary to consider the dimensionless factor of the photonic radius, equating the equation (32b) with the dimensionless value unit:

$$\frac{V(r)}{m_{PK} \cdot a_0 \cdot R_\gamma^2} = \frac{(-e) \cdot (+e)}{r^2 \cdot m_{PK} \cdot a_0 \cdot R_\gamma^2} = -\frac{1}{R_\gamma^2} \ (32c)$$

$$\frac{1}{R_\gamma^2} = \alpha(0) \cdot 4\pi$$

Therefore, having established the dimensionless entropic potential of V(r) (equation (32c)); The entropy of the mass ratio of the Higgs boson h1 / mass of the electron, will be the sum of the entropy due to the spines and the entropy of the term dependent on V(r):

$$\ln(m_{h1}/m_e) = \sum_s (s+1)\, s - \frac{1}{R_\gamma^2} \ (33)$$

$$\sum_s (s+1)\, s = 12.5 \ ; \ \frac{1}{R_\gamma^2} = 0.0917012368297097$$

$$m_{h1}(GeV) = m_e(GeV) \cdot \exp\left(\sum_s (s+1)\, s - \frac{1}{R_\gamma^2}\right) = 125.10529382335\, GeV$$

The result obtained is in extraordinary agreement with the best known empirical value for the Higgs boson mass h1 = 125.0901 GeV. As in the case of the value of the vacuum of the Higgs, it seems necessary the existence of corrective terms of second order.

A heuristic-empirical approximation seems to indicate a first negative corrective term that would depend on the sum ratio of the masses of leptons with electric charge (tau, muon and electron) / mass of the electron:

$$m_{h1}(GeV) = m_e(GeV) \cdot \exp\left(\sum_s (s+1)\, s - \frac{1}{R_\gamma^2} - \frac{1}{\left(\sum_{l^-} m_{l^-}/m_e\right)\sqrt{5}}\right) = 125.090111565919\, GeV$$

At the end of this work, when the equation (1) is derived theoretically and its implications are deduced, the equation (32a) can be justified more accurately and as it has a direct relation with the Bohr radius.

0.4.3. The Heisenberg uncertainty principle extended to d dimensions: Higgs boson mass mh1. To determine the Heisenberg uncertainty principle to extend it to d dimensions, purely mathematical origin will be searched.

Heisenberg's well-known uncertainty principle says that for any function $f \in L^2\left(R^d\right)$ con $|f|_2 = 1$, you have:

$$\int_{R^n} |xf(x)|^2 dx \cdot \int_{R^n} |\gamma \widehat{f}(\gamma)|^2 d\gamma \geq \frac{d^2}{4 \cdot (2\pi)^{d-1}} \quad (34)$$

Where $\widehat{f}$ Is the Fourier transform of f .As $\lim_{d\to\infty} \frac{d^2}{4 \cdot (2\pi)^{d-1}} = 0$, It seems that there is no such uncertainty principle for the case of infinite dimension.

Now, if the main hypothesis 4) is correct, then the previous limit (= 0) is true. Recall the main hypothesis 4): In the virtual universe time acquires the value zero, t = 0; So that several states can simultaneously exist at the same time. The disappearance of time in the virtual universe can amount to its conversion into a space-like dimension. There are, then, infinite speeds of pure space, with t = 0 and energy = 0

This hypothesis implies that for infinite dimension-states, with a t = 0, these dimension-states are transformed instantaneously; And with an uncertainty 0. Transforming it into the uncertainty principle extended to d dimensions would be expressed as:

$$\left(\frac{\triangle E \triangle t}{\hbar}\right)_d^2 \geq \frac{d^2}{4 \cdot (2\pi)^{d-1}} \quad (35)$$

By the main hypothesis 4) energy and time are 0, then it is automatically fulfilled:

$$\lim_{d\to\infty} \left(\frac{\triangle E \triangle t}{\hbar}\right)_d^2 = 0 = \lim_{d\to\infty} \frac{d^2}{4 \cdot (2\pi)^{d-1}}$$

For the case of a dimension, d = 1, we get the well-known Heisenberg uncertainty principle:

$$\left(\frac{\triangle E \triangle t}{\hbar}\right)_{d=1}^2 \geq \frac{1^2}{4 \cdot (2\pi)^{1-1}} = \frac{1}{4} \to \triangle x \triangle p \geq \frac{1}{2}\hbar$$

Consider the functional and dimensional equivalence of the model of a particle in a potential of spherical symmetry; With the square of the constant ratio of Planck / uncertainty of energy x temporary uncertainty:

$$\frac{\hbar^2}{2m\cdot r^2\cdot E}\equiv\frac{\hbar^2}{(\triangle E\cdot\triangle t)^2}\equiv\frac{\hbar^2}{(\triangle x\cdot\triangle p)^2}\ (36)$$

The equation (36) extended to d dimensions using equation (35), with the least uncertainty:

$$\frac{\hbar^2}{2m\cdot r^2\cdot E}\equiv\frac{\hbar^2}{(\triangle E\cdot\triangle t)_d^2}\equiv\frac{\hbar^2}{(\triangle x\cdot\triangle p)_d^2}\equiv\frac{4\cdot(2\pi)^{d-1}}{d^2}\ (37)$$

Proposition 7. *The mass of the Higgs boson mh1 is derived from the Heisenberg uncertainty principle extended to 7 dimensions, according to equation (37) and counting the multiplicative factor given by the matrix of the 7 dimensions or Higgs bosons. These 49 states represent all particle-antiparticle pairs up to the limit of the Higgs vacuum. The reference mass will be the mass of the electron.*

Proof. By functional equivalence the equations defined in (37) can be extended to:

$$\frac{\hbar^2}{2m\cdot r^2\cdot E}\equiv\frac{\hbar^2}{(\triangle E\cdot\triangle t)_d^2}\equiv\frac{\hbar^2}{(\triangle x\cdot\triangle p)_d^2}\equiv\frac{4\cdot(2\pi)^{d-1}}{d^2}\equiv\frac{E_1}{E_0}=\frac{m_1\cancel{c^2}}{m_0\cancel{c^2}}=\frac{m_1}{m_0}\ (38)$$

The number of particle-antiparticle pairs up to the limit of the Higgs vacuum: 2 (6 leptons + 6 quarks + 1W + 1Z + 1 photon + 8 gluons + 1 axion + 1 graviton) = 50. Higgs boson (h1) itself is not counted ; Since it gets its mass from the Higgs vacuum itself. To these 50 pairs we will subtract the state of the Higgs boson itself, h1; Which will have 7 ^ 2 = 49 final states.

Applying the equation (35), and the functional equivalents (37) and (38), we obtain the mass ratio of the Higgs boson h1 / mass of the electron:

$$7^2\cdot\left(\frac{4\cdot(2\pi)^{7-1}}{7^2}\right)=4\cdot(2\pi)^6=\frac{m_{h1}}{m_e}\ (39)$$

$m_{h1}\,(GeV)=m_e\,(GeV)\cdot 4\cdot(2\pi)^6=125.764829406979\,GeV$

The previous result is in excellent agreement with the experimental value of 125.0901 GeV. □

CONJECTURE 8. *The exact value of the mass of the Higgs boson is determined by equation (39) and the multiplicative factor given by the sine of the supersymmetry angle* β *; Which is in turn determined by the adimensional quantum radiis* r_7 , R_γ

$$\cos\beta = \frac{R_\gamma - r_7}{R_\gamma}\ ;\ \sin\beta = \sqrt{1-\left(\frac{R_\gamma - r_7}{R_\gamma}\right)^2}\ ;\ \arccos(\beta) \simeq 84^{o}$$

$$m_{h1}\,(GeV) = m_e\,(GeV)\cdot 4\cdot (2\pi)^6 \cdot \sin\beta = 125.075321862288\,GeV \simeq m_{h1}$$

$$m_{h1}\,(GeV) = m_e\,(GeV)\cdot 4\cdot (2\pi)^6 \cdot \sin\beta + g\left(0^{++}\right)\cdot P^7\,(2,R_7) = 125.091378367679\,GeV$$

0.4.3.1. *Predictive test of uncertainty principle extended to d dimensions: quark mass stop.* So far, experiments in the LHC in the search for supersymmetric particles have been null. Perhaps this is because there are hidden decay modes in which, for example, certain masses of the particles involved are very close. We think that this is the case that has not allowed us to discover the quark stop.

This assumption is based on the corpus of the main hypotheses. 1) The stop quark being a spin boson 1; Which plays an essential role in the radiative correction of the mass of the Higgs boson h1, one could expect that the ratio of its mass to that of the electron could be described by equation (37) with d = 8. 2) Choice of d = 8 would not be random or ad hoc, but it would be based on 8 being the force-mediating gluons between the quarks, this would correspond to an equivalence with the 8 dimensions. This equivalence could imply that the stop quark mass should be related to the fusion of gluons in the form of the lower energy glue ball (g (0 ++) = 1.73) by the coupling of the photons; Or said in a mathematical way: with a simple and direct dependence of $\alpha(0)$

With these hypotheses we expose the following conjecture:

CONJECTURE 9. *The quark stop mass is a direct function of equation (37) for d = 8, from the sine of the beta angle (84 °) and the cosine of the principal angle of Cabibbo (13.04 °). Being 64 the matrix of the 8 Gluons.*

$$m_{\tilde{t}}\,(GeV) = m_e\,(GeV)\cdot 4\cdot (2\pi)^{8-1}\cdot \sin\beta\cdot \cos^2\theta_{c12} = 745.866445764087\,GeV\ (40)$$

The conjectured mass for the stop manifests the following remarkable properties:

a) stop mass-mass g(0++) :

$$m_{\widetilde{t}}\left(GeV\right)\cdot\frac{\alpha\left(0\right)}{\pi}=g\left(0^{++}\right)=1.73251309\,GeV$$

b) Mass stop- sum masses leptons + quarks + W + Z + g (0 ++):

$$\frac{m_{\widetilde{t}}\left(GeV\right)\cdot\cos^{2}2\beta}{2}=\sum_{q}m_{q}+\sum_{l}m_{l}+m_{W}+m_{Z}+g\left(0^{++}\right)=356.812337324975$$

c) Higgs boson h1-stop mass mass:

$$\frac{m_{\widetilde{t}}\left(GeV\right)}{6\cdot\sin\beta\cdot\cos\theta_{c23}}=125.1037306\,GeV\simeq m_{h1}\;;\;\theta_{c23}=\text{ ángulo de Cabibbo }=2.38^{\text{o}}\pm 0.06^{\text{o}}$$

REMARK 10. **The relation between the parity R of the supersymmetric particles and the equation (37) for d = 8. Sum of the masses of the neutrinos.**

The parity R of a sparticula (sp) is always -1; And a non-supersymmetric (p) particle is always +1. Depending on the baryonic number B, the lepton number L and the spin s:

$$P_{R}=\left(-1\right)^{3B+L+2s}\;;\;P_{R}(p)=1\;;\;P_{R}\left(sp\right)=-1$$

$$\left[4\cdot\left(2\pi\right)^{8-1}\right]^{P_{R}(sp)}\cdot m_{e}\left(GeV\right)\cdot 10^{-9}=\sum_{\nu}m_{\nu}\left(eV\right)=0.330446331419791\,eV$$

Suma de las masas de los neutrinos.

0.4.3.2. *Sum of the masses of neutrinos: function of the rupture of the photonic entropy as a function of* $\alpha^{-1}\left(0\right)$. As has been shown for the calculation of the density of baryons, this density depends on the rupture of the vacuum pairs, 240, in the entropic photonic part ($\alpha^{-1}\left(0\right)$) And in the entropic part of the electron-positron pairs ($2\cdot\ln\left(m_{PK}/m_{e}\right)$).

If only particles with no electric charge generated by photons are considered; Then following the same logical scheme; The rupture for neutrino-antineutrino pairs would only depend on $\alpha^{-1}\left(0\right)$ And the number of oscillating neutrinos (3). A first approach is to break the photon entropy into neutrino-antineutrino pairs, which in fact also represent a type oscillation $\nu\rightarrow\overline{\nu}$; So the main entropy for the mass ratio Planck / sum neutrino masses, would be:

$$\ln\left(m_{PK}/\sum_{\nu}m_{\nu}\right)\sim\frac{\alpha^{-1}\left(0\right)}{2}$$

The dependent entropy of the 3 neutrinos oscillating in the vacuum, would correspond to the following scheme of possible oscillations:

$\nu_e \to \nu_e$
$\nu_e \to \nu_\mu$
$\nu_e \to \nu_\tau$
$\nu_\mu \to \nu_\mu$
$\nu_\mu \to \nu_\tau$
$\nu_\tau \to \nu_\tau$

We know that the entropic uncertainty for the pair position and momentum, with respect to the unbarred Planck constant, satisfies:

$H_x \cdot H_p = \dfrac{e}{2}$ .Knowing the relation of this entropic uncertainty to the photon probability density dependent on the photonic quantum radius, R_γ ; $\psi\left(2., R_\gamma\right) = \dfrac{\sqrt{2} \cdot \sin\left(2\pi/R_\gamma\right)}{\sqrt{R_\gamma}} \simeq \dfrac{e}{2}$;It can be deduced that for a real (non-virtual) oscillation process $\nu_x \to \nu_y$, which is a pair, the entropy to subtract from the main entropy $\dfrac{\alpha^{-1}(0)}{2}$;would $2 \cdot \left(\dfrac{e}{2}\right) = e$

In this way, the final entropy would be expressed by the following entropic equation:

$$\ln\left(m_{PK}/\sum_{\nu} m_\nu\right) = \frac{\alpha^{-1}(0)}{2} - e$$

It is possible to theorize a maximum, given by the 3 neutrinos (as entropy of oscillating states):

$$max\left(\ln\left(m_{PK}/\sum_{\nu} m_\nu\right)\right) = \frac{\alpha^{-1}(0)}{2} - 3$$

If we adopt the first equation, we have that the sum of the masses of neutrinos gives us a value:

$$\sum_{\nu} m_\nu\,(eV) = m_{PK} \cdot \exp - \left(\frac{\alpha^{-1}(0)}{2} - e\right) \cdot c^2/\pm e\,(\,elementary\ electric\ charge) = 0.32376464243153\,eV$$

And this value obtained is in perfect agreement with the empirical value that we have already mentioned previously.

Definition 11. Test of radiative correction of the mass of the Higgs h1 boson, using the conjectured mass of the stop (745.866 GeV). Model MSSM.

$$m_{h1}^2 \simeq m_Z^2 \cdot \cos^2 2\beta + \frac{N_c \cdot G_F \cdot m_t^4}{\sqrt{2}\pi^2 \cdot \sin^2\beta} \cdot \ln\left(\frac{m_{\tilde{t}}^2}{m_t}\right) \quad (41)$$

$\beta \simeq 84^{\text{o}}$; $m_{\tilde{t}} = 745.866\,GeV$; $m_t = 173.7\,GeV$; $N_c = 3$

$$m_{h1}^2 \simeq 91.1876^2\,G^2eV \cdot \cos^2 168^{\text{o}} + \frac{3 \cdot G_F \cdot 173.7^4\,G^4eV}{\sqrt{2}\pi^2 \cdot \sin^2 84^{\text{o}}} \cdot \ln\left(\frac{745.866^2\,G^2eV}{173.7^2\,G^2eV}\right) = 14680.40407^2\,G^2eV$$

$$m_{h1} \simeq 121.16271733\,GeV$$

$$\sqrt{m_Z^2 \cdot \cos^2 2\beta + \frac{N_c \cdot G_F \cdot m_t^4}{\sqrt{2}\pi^2 \cdot \sin^2 \beta} \cdot \ln\left(\frac{m_{\tilde{t}}^2}{m_t}\right)} + \left(\frac{4}{\pi} + 1\right) \cdot g\left(0^{++}\right) = 125.095421\,GeV$$

0.4.4. The existence of additional solutions to the total energy equation or energy-momentum equation. If an equation has several solutions, it is logical to ask if they also have a real existential physical correspondence. In this section it will be shown that the equation of the energy-momentum, scrutinized in mathematical form with more precision, has four solutions and 7, if they extend of logical form to the 7 dimensions, by means of the imaginary values of the octonions.

And these 7 solutions have a direct relationship both to the calculation of the fine structure constant for zero momentum; As well as with the Planck mass ratio / mass of the electron.

The two minimum solutions of the energy-momentum equation are given, as is well known, by:

$$E_T = \pm\sqrt{\left(m_0c^2\right)^2 + (pc)^2}$$

But a deeper examination of the above equation allows us to obtain four solutions by differentiated factorization of addition:

$$\left(m_0c^2\right)^2 + (pc)^2$$

By factorization in imaginary masses and imaginary momentums, the following solutions are obtained:

$\left(im_0c^2 - pc\right) \cdot \left(-im_0c^2 - pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(im_0c^2 + pc\right) \cdot \left(-im_0c^2 + pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(m_0c^2 - ipc\right) \cdot \left(m_0c^2 + ipc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(-m_0c^2 - ipc\right) \cdot \left(-m_0c^2 + ipc\right) = \left(m_0c^2\right)^2 + (pc)^2$

These four solutions have the common feature that the sum of the factors of the four solutions, all energies, are zero:

$\left(im_0c^2 - pc\right) + \left(-im_0c^2 - pc\right) + \cdots$
$\cdots + \left(im_0c^2 + pc\right) + \left(-im_0c^2 + pc\right) + \cdots$
$\cdots + \left(m_0c^2 - ipc\right) \cdot \left(m_0c^2 + ipc\right) + \cdots$
$\cdots + \left(-m_0c^2 - ipc\right) \cdot \left(-m_0c^2 + ipc\right) = 0$

Why are they not perceived in the so-called real universe? For the simple reason that they are tachyon states with velocities greater than light.

That the sum of the impulses of all simultaneously existing states is zero, would corroborate the zero energy hypothesis, with time zero and infinite velocity of pure space (pure geometry). But the question of infinite velocity, equivalent to zero velocity; From the point of view of an observer with finite velocity (eg c) that receives no energy or signal (zero energy condition), will be discussed in the section on the extension of special relativity.

As has already been demonstrated by the calculation of the Higgs vacuum and the mass of the Higgs boson; The space has 7 dimensions compacted in circles and holographic in 2 dimensions.

Therefore, it is logical to extend the 4 solutions found (equivalence with the 4 dimensions); To the domain of the 7 dimensions. In this case the imaginary factors will be those corresponding to octonions: $\{e_1, e_2, \cdots, e_7\}$

$\left(e_1m_0c^2 - pc\right) \cdot \left(-e_1m_0c^2 - pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(e_1m_0c^2 + pc\right) \cdot \left(-e_1m_0c^2 + pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(m_0c^2 - e_1pc\right) \cdot \left(m_0c^2 + e_1pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(-m_0c^2 - e_1pc\right) \cdot \left(-m_0c^2 + e_1pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(e_2m_0c^2 - pc\right) \cdot \left(-e_2m_0c^2 - pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(e_2m_0c^2 + pc\right) \cdot \left(-e_2m_0c^2 + pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(m_0c^2 - e_2pc\right) \cdot \left(m_0c^2 + e_2pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(-m_0c^2 - e_2pc\right) \cdot \left(-m_0c^2 + e_2pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\vdots$
$\left(e_7m_0c^2 - pc\right) \cdot \left(-e_7m_0c^2 - pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(e_7m_0c^2 + pc\right) \cdot \left(-e_7m_0c^2 + pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(m_0c^2 - e_7pc\right) \cdot \left(m_0c^2 + e_7pc\right) = \left(m_0c^2\right)^2 + (pc)^2$
$\left(-m_0c^2 - e_7pc\right) \cdot \left(-m_0c^2 + e_7pc\right) = \left(m_0c^2\right)^2 + (pc)^2$

The above solutions consist of a total of 28 different solutions, 4 four-dimensional solutions for the same value of the corresponding imaginary octonion. This total quantity of solutions is equivalent to the size of the SO (8) group; Or the coexisting sum-mixture of 7 particle states: $\sum_{n=1}^{7} n = 28$

The total amount of energies, dependent on m_0c , pc , is exactly: $4^2 \cdot 7 = 112$

As is well known, 112 are the amount of roots of group E8 with whole entries obtained from $(\pm1, \pm1, 0, 0, 0, 0, 0, 0)$ tTaking an arbitrary combination of signs and an arbitrary permutation of coordinates.

These 28 solutions are functionally equivalent to 4 planes, each of which consists of the 7 circles of the maximum density of mutually tangent spheres in dimension 2 (6 + 1 center circle). Strong holographic principle.

As in the four-dimensional case, it is true that for each set of 4 solutions with the same value of the corresponding octonion imaginary; The sum of all energy factors is zero:

$(e_1 m_0 c^2 - pc) + (-e_1 m_0 c^2 - pc) + \cdots$
$\cdots + (e_1 m_0 c^2 + pc) + (-e_1 m_0 c^2 + pc) + \cdots$
$\cdots + (m_0 c^2 - e_1 pc) + (m_0 c^2 + e_1 pc) + \cdots$
$\cdots + (-m_0 c^2 - e_1 pc) + (-m_0 c^2 + e_1 pc) = 0$
$(e_2 m_0 c^2 - pc) + (-e_2 m_0 c^2 - pc) + \cdots$
$\cdots + (e_2 m_0 c^2 + pc) + (-e_2 m_0 c^2 + pc) + \cdots$
$\cdots + (m_0 c^2 - e_2 pc) + (m_0 c^2 + e_2 pc) + \cdots$
$\cdots + (-m_0 c^2 - e_2 pc) + (-m_0 c^2 + e_2 pc) = 0$
$\vdots$
$(e_7 m_0 c^2 - pc) + (-e_7 m_0 c^2 - pc) + \cdots$
$\cdots + (e_7 m_0 c^2 + pc) + (-e_7 m_0 c^2 + pc) + \cdots$
$\cdots + (m_0 c^2 - e_7 pc) + (m_0 c^2 + e_7 pc) + \cdots$
$\cdots + (-m_0 c^2 - e_7 pc) + (-m_0 c^2 + e_7 pc) = 0$

However, if the total sum is made according to the octonion norm; Then the total non-dimensional energy would be: $\sqrt{112}$

And for particle-antiparticle pairs: $2\sqrt{112} = 21.1660104885168$

And the density of baryons seems to be able to express, by numerical functional equivalence, as:

$$\frac{1}{2\sqrt{112}} - \frac{1}{7 \cdot 2 \cdot \ln\left(m_{PK}/m_e\right)} = 0.0458593463809646 \simeq \Omega_b$$

The sum of the total quantities of energy factor-states for the four four-dimensional solutions plus the energy-factor-states for the 28 solutions by the 7-dimensional extension; gives us: $4^2 + 4 \cdot 28 = 128$. And 128 are exactly the number of roots of the group E8 (R8) with half entrance, and given by:

$\left(\pm\frac{1}{2}, \pm\frac{1}{2}, \pm\frac{1}{2}, \pm\frac{1}{2}, \pm\frac{1}{2}, \pm\frac{1}{2}, \pm\frac{1}{2}, \pm\frac{1}{2}\right)$ .Taking an even number of minus signs (or, equivalently, requiring the sum of all eight coordinates to be even).

By functional equivalence, it can be seen that the number of state-energy factors of the four-dimensional solutions is equivalent to the total sum of particles with non-zero mass at rest up to the limit of the Higgs vacuum; That is: 6 leptons + 6 quarks + 1 W + 1 Z + 1 Higgs boson h1 + 1 axion = 16 = 4 ^ 2

0.4.4.1. *The vector sum of the masses of all particles with non-zero mass at rest up to the limit of the Higgs vacuum and their fulfillment with the energy-momentum equation: equality with mass-energy equivalent to the value of the Higgs vacuum(246.21965079413 GeV).* The 4 solutions for the energy-impulse equation; without extension to 7 dimensions:

$\left(im_0c^2 - pc\right) \cdot \left(-im_0c^2 - pc\right) = \left(m_0c^2\right)^2 + \left(pc\right)^2 = E_1^2$
$\left(im_0c^2 + pc\right) \cdot \left(-im_0c^2 + pc\right) = \left(m_0c^2\right)^2 + \left(pc\right)^2 = E_2^2$
$\left(m_0c^2 - ipc\right) \cdot \left(m_0c^2 + ipc\right) = \left(m_0c^2\right)^2 + \left(pc\right)^2 = E_3^2$
$\left(-m_0c^2 - ipc\right) \cdot \left(-m_0c^2 + ipc\right) = \left(m_0c^2\right)^2 + \left(pc\right)^2 = E_4^2$

The total energy for these 4 energy states will be:

$E_0 = \sqrt{E_1^2 + E_2^2 + E_3^2 + E_4^2}$; . Since the 4 energy states are equal, we have: $E_0 = \sqrt{4E_1^2} \rightarrow E_0 = 2E_1$

If we express this energy dependent on the mass at rest and the speed of light c, or with momentum = 0: $E_0 = m_0c^2 = 2m_1c^2$

Imaginary masses can be derived as:

$$m' = \frac{m}{\pm\sqrt{1 - \frac{2E_1}{E_0}}} \ , \ m_1 = m_0 \ ; \ m' = \frac{m}{\pm\sqrt{1 - \frac{2m_0c^2}{m_0c^2}}} = \frac{m}{\pm\sqrt{1 - \frac{2c^2 = v^2}{c^2}}} = \frac{m}{\pm\sqrt{1-2}} = \pm im' = \pm im$$

Desarrollemos la forma extendida, por sumas, de las 4 soluciones:

$E_1^2 = m_0^2c^4 - im_0c^2pc + im_0c^2pc + p^2c^2$; $E_2^2 = m_0^2c^4 + im_0c^2pc - im_0c^2pc + p^2c^2$

$E_3^2 = m_0^2c^4 + m_0c^2ipc - m_0c^2ipc + p^2c^2$; $E_4^2 = m_0^2c^4 - m_0c^2ipc + m_0c^2ipc + p^2c^2$

If in the previous 4 equations is substituted in the imaginary terms, the amount of movement by the conjugate imaginary mass (with respect to the adjacent imaginary mass$\pm im_0$) and equivalent to the two possible solutions $\frac{m_0}{\pm\sqrt{1-\frac{2c^2=v^2}{c^2}}} = \pm im_0$;Making the speed of the amount of movement dependent on the speed of light; is obtained:

$$E_1^2 = m_0^2c^4 - m_0c^2i\left(im_0c\right)c + m_0c^2i\left(-imc\right)c + \left(im_0\cdot -im_0c\right)^2c^2 = \sum_4 m_0^2c^4$$
$$E_2^2 = m_0^2c^4 + im_0c^2\left(-im_0c\right)c - im_0c^2\left(im_0c\right)c + \left(im_0\cdot -im_0c\right)^2c^2 = \sum_4 m_0^2c^4$$
$$E_3^2 = m_0^2c^4 + m_0c^2i\left(-im_0c\right)c - m_0c^2i\left(im_0c\right)c + \left(im_0\cdot -im_0c\right)^2c^2 = \sum_4 m_0^2c^4$$
$$E_4^2 = m_0^2c^4 - m_0c^2i\left(im_0c\right)c + m_0c^2i\left(-im_0c\right)c + \left(im_0\cdot -im_0c\right)^2c^2 = \sum_4 m_0^2c^4$$

And the total energy will be, now:

$$E_0^2 = \sum_{16} m_0^2c^4$$

The above equation, dividing it by the common factor c^4 , It becomes an equation of vector sum dependent only on the masses:

$$\frac{E_0^2}{c^4} = \sum_{16} m_0^2$$

PROPOSITION 12. *The vector sum of the masses of all elementary particles with non-zero mass at rest up to the limit of the Higgs vacuum is practically equal to the value of the Higgs vacuum; Being functionally equivalent to equation* $\sum_{16} m_0^2$. *And there is a very slight difference of about* $\simeq 4.8236128\,G^2eV$ *; which could be attributed as the maximum possible value for axion mass.*

PROOF. The empirical demonstration:

$\sum_{\nu} m_{\nu} = 0.323 \cdot 10^{-10}\ GeV$; $m_e = 5.1099894626811 \cdot 10^{-4}\,GeV$; $m_\mu = 0.10565837453037\,GeV$; $m_\tau = 1.7768205\,GeV$; $m_u = 0.0216\,GeV$; $m_d = 0.046\,GeV$; $m_s = 0.935\,GeV$; $m_c = 1.275\,GeV$; $m_b = 4.18\,GeV$; $m_t = 173.7\,GeV$; $m_W = 80.385\,GeV$; $m_Z = 91.1876\,GeV$; $m_{h1} = 125.0901\,GeV$; $m_a = ?$; $V_H = 246.21965079413\,GeV$

$\left(\sum_{\nu} m_{\nu}\right)^2 + m_e^2 + m_\mu^2 + m_\tau^2 + m_u^2 + m_d^2 + m_s^2 + m_c^2 + m_b^2 + m_t^2 + m_W^2 + m_Z^2 + m_{h1}^2 - V_H^2 = 4.823612803\,G^2eV \to max\,(m_a) = \sqrt{4.823612803\,G^2eV} = 2.196272479\,GeV$ □

Now, if the mass gap is considered to be glue ball g (0 ++) = 1.73 GeV; Then the maximum possible for the mass of the axion would be reduced to: $\sqrt{(4.823612803 - 1.73^2)} = 1.35303836\,GeV$

But the latter value seems to be a function of the Higgs vacuum itself, the fine-structure constant for zero momentum, the ratio Vh / mh1, and the entropy In (Vh / mh1):

$$\frac{1.35303836\,GeV \cdot \left(\frac{V_H}{m_{h1}}\right) \cdot \ln\left[\left(\frac{V_H}{m_{h1}}\right)\right]}{\alpha\,(0)} = 247.14414229\,GeV \simeq V_H$$

All of the above would seem to indicate that the mass of the axion is very small, perhaps of the order of about 5 micro-EVs, as suggested by some QCD calculations.

Proposition 13. *The inverse value of the fine structure constant for zero momentum* $\alpha^{-1}(0)$ *Is a sum function, dependent on 137, the inverse (probability) of the 28 possible states that represent the solutions of the energy-momentum equation in 7 dimensions; Minus the sum of the spherical quantum curvatures dependent on the non-dimensional quantum radiis* R_7, r_7 *,Plus the inverse of the sum of the masses of electrically charged leptons (electron, muon and tau) with respect to the mass of the electron.*

Proof.

$$\alpha^{-1}(0) = 137 + \frac{1}{28 - \left[\left(R_7^{-2} + r_7^{-2}\right) + \left(\sum_{l-} m_{l-}/m_e\right)^{-1}\right]} = 137.0359991736945623\ (42)$$

□

Proposition 14. *The mass of the electron is a direct function of the Planck mass multiplied by the squared ratio of the dimensionless quantum radiis in 7 dimensions,* $\left(r_7^2/R_7^2\right)$ *; all it divided by a dimensionless dependent compactification circles of* *the 28 states-solutions energy-momentum extended to 7 dimensions* $(2\pi)^{28}$. *With a correction due to the ratio of the sum of the masses of leptons with electric charge (electron, muon and tau), with respect to the mass of the electron.*

PROOF.

$$m_e = \frac{m_{PK} \cdot \left(\frac{r_7^2}{R_7^2}\right)}{(2\pi)^{28} \cdot \left(1 + \frac{1}{\left(\sum_{l-} m_{l-}/m_e\right) \cdot \left(1 + \frac{1}{2} + \ln\sqrt{\frac{\pi}{2}}\right)}\right)} \quad (43)$$

□

REMARK 15. The decays of the muon and tau leptons and their possible relation to the number of solutions of the energy-momentum extended to 7 dimensions, 28; Equivalent to the size of the SO(8) group.

The main and simplest mode of decay of the muon is produced by: $\mu^- \to e^- + \overline{\nu_e} + \nu_\mu$. As can be seen, the product of the decay of the muon is composed of 3 particle states.

The lepton tau has purely leptonic decays, but also hadronics. Always starting from the principle of the states with the lowest possible mass at rest of the final particles of the decay process; Then its main modes of decay are:

a) Leptons

$\tau^- \to e^- + \nu_\tau + \overline{\nu_e}$	3 particles
$\tau^- \to +\mu^- + \nu_\tau + \overline{\nu_\mu}$	3 particles

As can be seen, the total number of fundamental particle states of the decays are 6.

b) Hadrones. With the Pion as a hadron of minimal mass at rest, as opposed to the Kaon with greater mass at rest. Positive pion composed of quarks $u\overline{d}$. The negative pion composed of the quarks $\overline{u}d$ .Neutral pion composed of quarks $u\overline{u}$, $d\overline{d}$.

$\tau^- \to \overline{u}d + u\overline{u} + \nu_\tau$	5 particles
$\tau^- \to \overline{u}d + \nu_\tau$	3 particles
$\tau^- \to \overline{u}d + u\overline{u} + u\overline{u} + \nu_\tau$	7 particles
$\tau^- \to \overline{u}d + \overline{u}d + u\overline{d} + \nu_\tau$	7 particles
$\tau^- \to \overline{u}d + u\overline{u} + u\overline{u} + u\overline{u} + \nu_\tau$	9 particles
$\tau^- \to \overline{u}d + \overline{u}d + u\overline{d} + u\overline{u} + \nu_\tau$	9 particles

The total final particle states of the hadronic decay of tau are 40.

The total sum of final particle states of the muon and tau decays are: Tau (40 + 6) + Muon (3) = 49 = 7^2

For particle-antiparticle pairs we would have: $2 \cdot 7^2$. If the previous number is subtracted the number of particle-antiparticle pairs origin or producers of the final states of the decays (6 tau particles for hadrons, 2 tau particles for the decay in leptons, and 1 muon particle for decay in leptons); You have: $2 \cdot 7^2 - 2 \cdot (6+2+1) = 80 \equiv SU(9)$

Being able to express the entropy electron-positron (ratio Planck mass / mass of the electron) $2 \cdot \ln\left(m_{PK}/m_e\right) \simeq\equiv 112 - \sqrt{80}$

The operation subtracts the final particle states for tau and muon, minus 3 photons that produce 3 pairs of particle-antiparticle tau, muon and electron: 40-6-3-3 = 28

0.4.4.2. *El ratio* $\left(V_H/m_{h1}\left(GeV\right)\right)$ *and its relation by numerical functional equivalence with the sum of non-equiprobable entropies for 7 dimensions-states.* $\sum_{n=1}^{7}\frac{\ln n}{n} = 1.957852601624903$; $\frac{V_H}{\sum_{n=1}^{7}\frac{\ln n}{n}} = 125.7600549\,GeV \simeq m_{h1}\left(GeV\right)$

$$\frac{V_H}{\sum_{n=1}^{7}\frac{\ln n}{n}} - \frac{g\left(0^{++}\right) = 1.732\,GeV}{2+\sqrt{3/r_7^2}} = 125.0902315\,GeV = m_{h1}\left(GeV\right)$$

0.4.5. Of the dimensionless entropy of black holes and their relationship with the Higgs boson h1. The dimensionless entropy of a black hole is defined by the factor of the surface of a sphere in three dimensions; this is: 4π

The radiation of a black hole is supposed to come from the decay of gravitons in photons: $G \to \gamma + \gamma$. And for graviton-antigraviton pairs (same particle-antiparticle) $G + G \to (\gamma+\gamma) + (\gamma+\gamma)$ Two gravitons of origin converted into 2 pairs of photons (4). The sum probability of this process would be defined by the photon probability dependent on R_γ

$$P\left(G+G \to (\gamma+\gamma)+(\gamma+\gamma)\right) = 4 \cdot P^2\left(2, R_\gamma\right) = 4 \cdot \left[\frac{2\cdot\sin^2\left(2\pi/R_\gamma\right)}{R_\gamma}\right]^2 = 4\cdot(0.541345283550078)^2 = 1.17221886408766$$

$$\frac{m_{h1}}{m_e} = 244795.221034067$$

$$\ln\left(\frac{m_{h1}}{m_e}\cdot 4\cdot P^2\left(2, R_\gamma\right)\right) = 12.5670757253325 \simeq 4\pi \;(44)$$

It seems, therefore, that the process of radiation of a black hole could involve the decay of some of the photons (4) in other particles; Which could solve the so-called paradox of information loss of black holes.

0.4.6. The energy of the vacuum. From the union of quantum mechanics and general relativity comes the value of the energy of vacuum. Using the critical density of general relativity, we obtain the energy of the vacuum by:

$$E_v = \sqrt[4]{(\hbar c)^3 \cdot c^2 \cdot \rho_c} \ (45)$$

$$\rho_c = \frac{3H^2}{8\pi \cdot G_N} \ (46)$$

$$E_v = \sqrt[4]{(\hbar c)^3 \cdot c^2 \cdot \frac{3H^2}{8\pi \cdot G_N}} \ (47)$$

For the Hubble constant H, a time-dependent value of Planck will be given (this function will be justified later) as an inflationary function given by:

$$H = \left[t_{PK} \cdot R_\gamma \cdot \exp\left(\exp\left(\frac{\pi^2}{2}\right)\right)\right]^{-1} = 2.30543470604539 \cdot 10^{-18} s^{-1} \ (48)$$

$$t_{PK} = \sqrt{\frac{\hbar \cdot G_N}{c^5}}$$

The value obtained by equation (48) translated to (Km / s) / Megaparsec, becomes 71.1382818803641 (Km / s) / Mpc.

The main hypothesis 9) states that the entropy given by the natural logarithm of the Planck energy ratio / vacuum energy can not exceed the prime number 71 (maximum); Establishing its dependence on the permutations of the compacted 7 dimensions:

$$max\left[H\left(v\right)\right] = \sqrt{7! + 1} = \sqrt{\sum_{n=1}^{4!} n^2 + 1} = 70 + 1 \ ; \ max\left[H\left(v\right)\right] = max\left[\ln\left(E_{PK}/E_v\right)\right]$$

FACT 16. *The empirical calculation using equation (47), with a value of the Hubble constant, given by equation (48); Gives a value to the entropy of the vacuum, defined as the natural logarithm of the ratio of Planck energy / vacuum energy:*

$$\ln\left(\frac{E_{PK}}{E_v}\right) = 70.6515129680463 \ (49)$$

The value obtained by equation (49) confirms the main hypothesis 9)

The main hypothesis 13) establishes the following final equation for the sum of the entropy of the vacuum (equation (49) and the square of the entropy of the Higgs vacuum:

$$\ln\left(E_{PK}/E_V\right) + \ln^2\left(V_H/E_e\right) + E_F\left(c\right) = 240$$

Using the principle of Occam's razor: On equal terms, the simplest explanation is often the most likely.

The simplest and most logical would be to assume that the density of the baryons forms part of the correcting factor $E_F\left(c\right)$, For the simple reason that at the end of the inflation the two types of vacuum are separated and in turn the final density of baryons appears.

Therefore, by this assumption we express this corrective factor as: $E_F\left(c\right) = x + 2\Omega_b$

The calculation of the sum of the two types of entropy mentioned, minus the 240 pairs representing the unbroken vacuum, gives a value:

$$\ln\left(E_{PK}/E_V\right) + \ln^2\left(V_H/E_e\right) - 240 = -E_F\left(c\right) = --1.87834397949899$$

The previous value, surprisingly, relates the value of the Higgs vacuum ratio / boson mass h1, with the density of baryons, by:

$$-E_F\left(c\right) \sim \frac{V_H}{m_{h1}\left(GeV\right)} - 2\Omega_b = 1.96833842801419 - 0.091716196101014 = 1.87662223191318$$

The sum entropy of non-equiprobable states of the Higgs vacuum ratio / h1 boson mass, for particle-antiparticle pairs seems to be strongly related to the density of baryons and the sum of the spines-total amount of dimensions (t = 0), or Equivalently with the amount of electric charges for particle-antiparticle pairs, if the existence of the X, Y bosons of the great unification GUT theories is allowed.

Cardinal $2\cdot\left\{\frac{4}{3},\frac{1}{3},\frac{2}{3},-\frac{1}{3},-1\right\} = 10 \equiv 2\cdot\sum_s s \equiv 10d$

$$\frac{\ln^2\left[\frac{V_H}{m_{h1}\left(GeV\right)}\right]}{10} = 0.0458585956557082 \simeq \Omega_b$$

FACT 17. *The entropy of the vacuum energy defined by equation (49), is related to the principle of uncertainty extended to 7 dimensions; By the following numerical functional equivalence:*

$$\sqrt{\frac{4\cdot(2\pi)^{7-1}}{7^2}}-\frac{1}{\pi\cdot\ln\ln 70}+\frac{\alpha(0)}{2\cdot\ln(m_{PK}/m_e)}-\frac{E_e}{V_H}=70.6515129287515\simeq\ln\left(\frac{E_{PK}}{E_v}\right)$$

0.4.6.1. *Higgs Maximum Vacuum Equiprobable Entropy* $\ln(E_{PK}/VH)$ *and their relation to the relative maximum equiprobable entropy (boson Z mass) of the GUT unification scale* $\ln(M_{X,Y}/m_Z)$ *: Maximum entropy of the repulsive vacuum* $\ln(E_{PK}/E_v)$. Again the principle of Occam's razor gives us the simplest and most logical answer to the question of what relationship should exist with the GUT unification scale, if it really exists ?: On the other hand, the simplest explanation is usually Most likely.

Simply consider that the entropy of the repulsive vacuum $\ln(E_{PK}/E_v)$ should be expressed as the sum of the entropies $\ln(E_{PK}/VH)+\ln(M_{X,Y}/m_Z)$:

$$\ln(E_{PK}/E_v)\simeq\ln(E_{PK}/VH)+\ln(M_{X,Y}/m_Z)\ \ (50)$$

The reason that the previous equation has to be fulfilled is due to the fact that from the beginning of inflation until its conclusion the three entropies are invariant and in fact; entropies Higgs vacuum and relative entropy (Z boson) break turn the repulsive vacuum leading to the baryonic matter.

Therefore, it is expected that twice the entropy of the repulsive vacuum has a direct relation to the inflation factor (particle-antiparticle pairs involves doubling the entropy of the Higgs vacuum and the relative entropy of the GUT unification scale).

From equation (50) and with the values already obtained for the maximum entropy of the Higgs vacuum and the entropy of the repulsive vacuum, we obtain for the mass of the X, Y bosons:

$$\ln(M_{X,Y}/m_Z)\simeq\ln(E_{PK}/E_v)-\ln(E_{PK}/VH)=32.2090235133059$$

$$\exp(32.2090235133059)\cdot m_Z=m_{X,Y}=1.58199812643\cdot 10^{-11}\ Kg\rightarrow m_{X,Y}=8.8743587343769\cdot 10^{15}\ GeV$$

FACT 18. *Significant operational relationships between* $\ln^2\left(\frac{V_H}{E_e}\right)$ *y* $\ln\left(\frac{E_{PK}}{E_v}\right)$

1) $$\frac{\ln^2\left(\frac{V_H}{E_e}\right)}{\ln\left(\frac{E_{PK}}{E_v}\right)}\simeq\frac{V_H}{m_{h1}(GeV)}+\ln^2\left(\frac{V_H}{m_{h1}(GeV)}\right)$$

FACT. *2)* $\ln^2\left(\frac{V_H}{E_e}\right) - \ln\left(\frac{E_{PK}}{E_v}\right) \simeq 2\cdot 7^2 + \frac{7}{e} = \sqrt{\sum_{n=1}^{4!} n^2 + SO(8)} + \frac{7}{e}$

FACT 19. *The inflationary entropy given by equation (48) and the entropy of the repulsive vacuum.*

$$\exp\left(\frac{\pi^2}{2}\right) + \ln R_\gamma \simeq 2\cdot\ln\left(\frac{E_{PK}}{E_v}\right) + \ln\left(R_\gamma - r_7\right)$$

0.4.6.2. *The repulsive acceleration of the vacuum.* The equation that initiates this work and unifies gravitation with electromagnetism implies an intrinsic repulsive acceleration that can be deduced from the equation (47).

This equation (1)

$$\pi^2\cdot(\pm e)\cdot\left[\sum_{n=1}^{\infty}\exp\left(-t_n\right)\right] = \pm\sqrt{m_{PK}\cdot m_e\cdot G_N}$$

It must be developed under the principle of simultaneity of states; Which implies admitting the following possible combinations:

a) $\pi^4\cdot(-e)\cdot(-e)\cdot\left[\sum_{n=1}^{\infty}\exp\left(-t_n\right)\right]^2 = m_{PK}\cdot m_e\cdot G_N = A_1$

b) $\pi^4\cdot(+e)\cdot(+e)\cdot\left[\sum_{n=1}^{\infty}\exp\left(-t_n\right)\right]^2 = m_{PK}\cdot m_e\cdot G_N = A_2$

c) $\pi^4\cdot(+e)\cdot(-e)\cdot\left[\sum_{n=1}^{\infty}\exp\left(-t_n\right)\right]^2 = -m_{PK}\cdot m_e\cdot G_N = A_3$

The sum of all three preceding states, a), b) and c), would give us an equal distance r, a repulsive force; Since:

$$\frac{A_1 + A_2 + A_3}{r^2} = \frac{m_{PK}\cdot m_e\cdot G_N}{r^2}$$

Since this repulsive acceleration must exist, logically its origin could be assumed to be due to vacuum. Properly developing equation (47); As a function of the mass of Planck and the constant of universal gravitation, we obtain the following restatement of equation (47):

$(\hbar c)^3 = m_{PK}^3\cdot G_N^3$; $c\cdot H = a_0$ (Constant and repulsive vacuum acceleration)

$$E_v^4 = \left(\frac{m_{PK}^3\cdot G_N^3\cdot a_0^2\cdot 3}{8\pi\cdot G_N}\right)^4$$

$$E_v = m_{PK}\cdot\sqrt{\frac{m_{PK}\cdot a_0\cdot G_N\cdot 3}{8\pi}} \quad (51)$$

0.4.6.3. *The velocities of rotation within galaxies. Diameters of galaxies.*

Equation (51) will be interpreted as a velocity dependent on the constant repulsive acceleration, and mass.

This equation (51) would be responsible for the galaxies, the rotation velocities would be rigged by this equation, with perhaps a correction due to the quantum entropy of the galaxy, that is: $\ln\left(M_G/m_{PK}\right)$. It is expected, including some type of additional correction that depends on the type of galaxy (spiral, dwarf, etc, etc). An important factor seems to be that the local density should also be.

Although it is quite daring to test equation (51) without having a quantum theory of gravity; Notwithstanding its application to the galaxies of the Milky Way and Andromeda, counting the quantum entropy as a correcting factor divisor in equation (51) and adding a factor, which in this case, being a spiral type, we conjecture equal to the golden number φ , we would have the following test equation:

$$v_r \simeq \varphi \cdot \sqrt[4]{\frac{M_G \cdot a_0 \cdot G_N}{2 \cdot \ln\left(M_G/m_{PK}\right)}} \; ; \; a_0 = 6.911519372842 \cdot 10^{-10} \; m/s^2$$

The above equation can be deduced from the hyperbolic motion of special relativity, including quantum entropy according to the entropy of black holes:

$$S_{BH} = \frac{c^3 \cdot A}{4 \cdot \hbar \cdot G_N} \; ; \; \frac{c^3}{\hbar \cdot G_N} = l_{PK}^{-2} \; ; \; \ln\left(S_{BH}\right) = \ln\left(\frac{r_0^2}{l_{PK}^2}\right) = \ln\left(4\pi\right) \; ; \; \ln\left(4\pi\right) \cdot e - \frac{1}{\ln\left(E_{PK}/V_H\right)} \simeq \varphi^4$$

$$\ln\left(S_{BH}\right) = \ln\left(\frac{r_0^2}{l_{PK}^2}\right) = \left(\frac{m_{PK}^2}{m_0^2}\right) \; ; \; m_0 = \frac{\hbar}{c \cdot r_0} \; ; \; \frac{4\pi}{\ln\left(2\pi\right)} - \frac{4}{240} \simeq \varphi^4 \quad ; \; 2 \cdot \ln\left(m/m_{PK}\right) = \ln\left(m^2/m_{PK}^2\right)$$

$$\overline{v_r} = \left(\frac{\varphi^4 \cdot M_G \cdot a_0 \cdot G_N}{2 \cdot \ln\left(M_G/m_{PK}\right)}\right)^{\frac{1}{4}}$$

Proper acceleration of a particle is defined as the acceleration that a particle "feels" as it accelerates from one inertial frame of reference to another. This can be derived mathematically as:

$$a_0 = \frac{1}{\left(1 - v^2/c^2\right)^{3/2}} \cdot \frac{dv}{dt}$$

Solving the equation of motion results in:

$$x^2 - c^2 t^2 = \frac{c^4}{a_0^2} \rightarrow \left(x^2 - c^2 t^2\right) a_0^2 = c^4$$

Where v is the instantaneous velocity of the particle, c is the speed of light and t is the time. What is a hyperbola in time and the spatial location variable x

The above equation, its right part, is fulfilled by the repulsive acceleration and mass of the universe, by the equation:

$$x^2 \cdot a_0^2 - c^2t^2 \cdot a_0^2 = M_U \cdot a_0 \cdot G_N = c^4$$
$$M_U = m_{PK} \cdot R_\gamma \cdot \exp\left(\exp\left(\pi^2/2\right)\right)\ ;\ a_0 = c \cdot H = c \cdot \left(t_{PK} \cdot R_\gamma \cdot \exp\left(\exp\left(\pi^2/2\right)\right)\right)^{-1}$$

The equation $x^2 \cdot a_0^2 - c^2t^2 \cdot a_0^2 = M_U \cdot a_0 \cdot G_N = c^4$ can be converted to a local velocity, dependent on the mass of the galaxy, repulsive acceleration and quantum gravitational corrections:

$$\overline{v_r}^4 \cdot 2 \cdot \ln\left(M_G/m_{PK}\right) = \varphi^4 \cdot M_G \cdot a_0 \cdot G_N \to \overline{v_r} = \left(\frac{\varphi^4 \cdot M_G \cdot a_0 \cdot G_N}{2 \cdot \ln\left(M_G/m_{PK}\right)}\right)^{\frac{1}{4}}\ ;\ x^2 \cdot a_0^2 - c^2t^2 \cdot a_0^2 = \overline{v_r}^4 \cdot 2 \cdot \ln\left(M_G/m_{PK}\right) > 0$$

Test 1: Milky Way Galaxy.

$M_G(MW) = 8.5 \cdot 10^{11} \cdot M_\odot\ Kg\ ;\ M_\odot = 1.98855 \cdot 10^{30}\ Kg$

$$\overline{v_r}\left(M_G(MW)\right) \simeq \varphi \cdot \sqrt[4]{\frac{M_G\left(MW\right) \cdot a_0 \cdot G_N}{2 \cdot \ln\left(M_G\left(MW\right)/m_{PK}\right)}} = 219.610\ Km/s$$

Test 2: Andromeda Galaxy.

$M_G(M31) = 1.5 \cdot 10^{12} \cdot M_\odot\ Kg$

$$\overline{v_r}\left(M_G\left(M31\right)\right) \simeq \varphi \cdot \sqrt[4]{\frac{M_G\left(M31\right) \cdot a_0 \cdot G_N}{2 \cdot \ln\left(M_G\left(M31\right)/m_{PK}\right)}} = 250.804\ Km/s$$

The radius or diameter of a galaxy would depend on the speed $\overline{v_r}$ and the attractive gravitational component of the galaxy. Therefore, it should be deduced from the equation: $x^2 \cdot a_0^2 - c^2t^2 \cdot a_0^2 = M_G \cdot a_0 \cdot G_N$

Replacing $x^2 - c^2t^2 = R_G^2$ (Radius of the galaxy), the equation is rewritten as:

$R_G^2 \cdot a_0^2 = M_G \cdot a_0 \cdot G_N$ To eliminate repulsive acceleration a_0 From the right side of the equation; And therefore to convert it into an equation dependent on the attractive gravitational forces, a partial derivative of both members of the equation can be realized, with respect to the repulsive acceleration a_0 , that is:

$\left[\frac{\partial\left(R_G^2\cdot a_0^2\right)}{\partial a_0}=\frac{\partial\left(M_G\cdot a_0\cdot G_N\right)}{\partial a_0}\right]=\left[2R_G^2 a_0=M_G\cdot G_N\right]$ .Transformed $2R_G^2 a_0$ To be dependent on the radius of the galaxy and the speed $\overline{v_r}$,the final equation is obtained: $2R_G\cdot\overline{v_r}^2=M_G\cdot G_N$

And finally, you get the diameter of the galaxy by:

$$2R_G=\frac{M_G\cdot G_N}{\overline{v_r}^2}$$

Applying the tests for the galaxies of the Milky Way and Andromeda, with the speeds already obtained (219,610 Km / s, 250,804 Km / s); The following diameters are obtained:

Diameter Milky Way.

$$2R_G\left(MW\right)\simeq\frac{M_G\left(MW\right)\cdot G_N}{\overline{v_r}^2\left(M_G(MW)\right)}=2.3390668\cdot10^{21}\,m\rightarrow2.3390668\cdot10^{21}\,m/3.0856776\cdot10^{16}\,m=75.803\,Kpc$$

Diameter galaxy Andromeda.

$$2R_G\left(M31\right)\simeq\frac{M_G\left(M31\right)\cdot G_N}{\overline{v_r}^2\left(M_G(M31)\right)}=3.16482911\cdot10^{21}\,m=102.565\,Kpc$$

The equations deduced for the diameter of the galaxies and for the velocity seem to behave very well, too, for clusters of galaxies. For the Virgo cluster, which has typical speeds for the galaxies that make up about 1500 Km / s, and with a mass of $1.2\cdot10^{15}\cdot M_\odot$,we obtain the following average speed for the galaxies and diameter of the cluster:

$$\overline{v_{rC}}\left(Virgo\right)=\left[\frac{\varphi^4\cdot M_C\left(Virgo\right)\cdot a_0\cdot G_N}{2\cdot\ln\left(M_C\left(Virgo\right)/m_{PK}\right)}\right]^{\frac{1}{4}}=1325.702\,Km/s$$

$$2R_C\left(Virgo\right)\simeq\frac{M_C\left(Virgo\right)\cdot G_N}{\overline{v_r}^2\left(M_C(Virgo)\right)}=9.06185265\cdot10^{22}\,m=2.9367\,Mpc$$

And the empirical diameter for the Virgo cluster is: $2.2\,Mpc$ .Value that is in extraordinary agreement with the diameter deduced by the previous equation.

These velocities are, perhaps, average velocities. In each differentiated zone of the galaxy, by its structure and density, this equation should be modified according to a quantum theory of gravity and the internal dynamics of the galaxy itself, etc. That is: really a complex effort.

We think in all honesty that the possibility of this effect on rotational speeds within galaxies should be taken as very likely. An equivalent physical effect where a fictitious gravitational mass is manifested, not real; Is to consider the experiment we have already carried out, and consisting of using two powerful neodymium magnets.

The experiment involves placing a magnet (circular disc shape) centered on an electronic scale and properly secured. Then another magnet of the same size, material (neodymium), and magnetic power with the same polarity as the face of the magnet placed on top of the balance; Move it downwards along the perpendicular axis that joins the centers of both disc type magnets. It can be seen, of course, that the repulsion pressure between the two magnets causes a dummy mass increase in the weighing scale. This experiment extrapolated to the repulsive vacuum pressure is completely equivalent; Giving the physical impression that there must be more mass, when in fact it does not exist; Since the effect is due to the gravitational repulsion of the vacuum.

Moreover, certain gravitational anomalies within the solar system may well be explained by this repulsion vacuum. We refer to two outstanding anomalies that no theory of gravity, including general relativity, can explain. These two anomalies are: The annual increase of about 15 cm / year of the Earth-Sun distance. The anomalous increase of the Earth-Moon distance of about 3.82 cm / year.

But we must be very cautious, because the big surprises can be on the other side of the door. It is even possible to consider the possibility that there is a mixed phenomenon that would depend, on the one hand, on this repulsive acceleration of the vacuum and its coupling to the axion, as a modulating and modifying effect of this repulsive vacuum effect. That the axion is a boson, that the Higgs boson generates the masses of the particles; And therefore its secure connection with gravitation, would indicate that there could be this mixed effect: repulsive acceleration of vacuum-coupling with axion. Axion being the elementary particle with no electric charge of lower mass, not null at rest, possible.

0.4.7. Derivation of the inflation factor according to the main hypotheses 14) and 10): consistency with equation (1). Hypothesis 14) states that the rate of differential change in acceleration and velocity must be the same as the initial condition for inflationary acceleration-expansion; that is: $\frac{dx}{d^2t} = \frac{dx}{dt}$

a) The reason that this equality must be produced is based on the fundamental fact that at the origin of the universe there was only one frame of reference: that of the repulsive acceleration of the vacuum generated by equation (1). If there is only one frame of reference, then there is only one time increment. For the same frame of reference, the speed increase will depend on a single time frame: the unit frame itself.

b) Consistency with strong holographic principle (hypothesis 10), spatial three-dimensionality and consistency with equation (1):

The equation that initiates this work and unifies gravitation with electromagnetism implies an intrinsic repulsive acceleration that can be deduced from the equation (47).

This equation (1)

$$\pi^2 \cdot (\pm e) \cdot \left[\sum_{n=1}^{\infty} \exp(-t_n)\right] = \pm\sqrt{m_{PK} \cdot m_e \cdot G_N}$$

It must be developed under the principle of simultaneity of states; Which implies admitting the following possible combinations for electron / positron charge:

$$\text{a)}\ \pi^4 \cdot (-e) \cdot (-e) \cdot \left[\sum_{n=1}^{\infty} \exp(-t_n)\right]^2 = m_{PK} \cdot m_e \cdot G_N = A_1$$

$$\text{b)}\ \pi^4 \cdot (+e) \cdot (+e) \cdot \left[\sum_{n=1}^{\infty} \exp(-t_n)\right]^2 = m_{PK} \cdot m_e \cdot G_N = A_2$$

$$\text{c)}\ \pi^4 \cdot (+e) \cdot (-e) \cdot \left[\sum_{n=1}^{\infty} \exp(-t_n)\right]^2 = -m_{PK} \cdot m_e \cdot G_N = A_3$$

The sum of the above three states, a), b) and c), would give us an equal distance r, a repulsive force; Since:

$$\frac{A_1 + A_2 + A_3}{r^2} = \frac{m_{PK} \cdot m_e \cdot G_N}{r^2}$$

c) Independence of the space-time background: dimensionlessness of the equation:

$$\frac{|A_1| + |A_2| + |A_3|}{r^2} = \frac{3 \cdot (m_{PK} \cdot m_e \cdot G_N)}{r^2} \equiv \frac{3 \cdot A_4}{r^2}\ ;\ 3 \cdot A_4 = |A_1| + |A_2| + |A_3|$$

The transformation of the previous equation, dependent on the spherical curvatures, into a quantum dimensionless equation; Will depend on the application of the interaction of three strings that generate a fourth string that intersects the three points of tangency according to the rule applied for the calculation of the energy of the Higgs vacuum: $\frac{3}{r^2}$ And consistent with the strong holographic principle for minimum three-string interaction or Feymann minimum diagram for a boson $B \rightarrow p + \overline{p}$ (Boson -> particle + antiparticle). The total spherical curvature would be the sum of the adimensional quantum spherical curvatures, and quantized to whole states of the natural numbers, in infinite number and consistent with the intersection of three strings; that is to say:

$$3 \cdot \sum_{n=1}^{\infty} \frac{1}{n^2} = 3 \cdot \left(\frac{\pi^2}{6}\right) = \frac{\pi^2}{2} \; (52)$$

Equation (52) is functionally equivalent and by change of variable, to the dimensionless equation of the infinite sum of time quanta derived from the hypothesis 14) with dependence of the acceleration: $\frac{dx}{d^2t} = \frac{dx}{dt}$

The above equation can be converted into quanta of dimensionless spherical curvatures of the space type, by the transformation:

$$\frac{dx}{(dt)^2 c^2} = \frac{dx}{(dx_1)^2} \to \frac{dx}{(dx_1)^2 dx} = \frac{1}{(dx_1)^2} = \frac{1}{n^2} \; ; \; (dt)^2 c^2 = (dx_1)^2 \; ; \; (dx_1)^2 = n^2$$

The dimensionless equation (52) is in fact the boundary condition of the differential equation $\frac{dx}{d^2t} = \frac{dx}{dt}$; or more specifically:

$$\frac{dx}{d^2t} = \frac{dx}{dt} \; ; \; t = \frac{\pi^2}{2} \; (53)$$

The other condition imposed by hypothesis 14) is that there is a hyperbolic coordinate type relativistic transformation. This condition would be applied to the solution of equation $\frac{dx}{d^2t} = \frac{dx}{dt}$,as a later step.

Therefore: 1) resolution of the equation $\frac{dx}{d^2t} = \frac{dx}{dt}$. 2) Application of hyperbolic coordinate transformation to the solution of the equation of step 1). The relativistic hyperbolic coordinate transformation would be the dimensionless form (spatio-temporal independence):

$$\boxed{x' = -ct \cdot \sinh \theta_{n^2} + x_0 \cdot \cosh \cdot \theta_{n^2}} \atop \boxed{ct' = ct \cdot \cosh \theta_{n^2} - x_0 \cdot \sinh \theta_{n^2}} \; ; \; ct \equiv R_\gamma \; ; \; x_0 \equiv R_\gamma$$

Since the previous transformation of coordinates, the symmetric. We will choose the inverse transformation to maximize the inflationary entropy, and therefore maximize the final size of the universe.

Inverse transformation:

$$\boxed{x_0 = ct' \cdot \sinh \theta_{n^2} + x' \cdot \cosh \cdot \theta_{n^2}} \atop \boxed{ct = ct' \cdot \cosh \theta_{n^2} + x' \cdot \sinh \theta_{n^2}} \; ; \; ct' \equiv R_\gamma \; ; \; x' \equiv R_\gamma$$

$x_0 = R_\gamma \cdot (\sinh\theta_{n^2} + \cosh\theta_{n^2})$; being the hyperbolic angle θ_{n^2} , The dimensionless solution of the equation (53) and dependent on the boundary condition established by the sums of adimensional quantum spherical curvatures, derived from equation (52). The photonic quantum dimensionless radius R_γ Represents the spatial growth factor due to the photons (particle-antiparticle pairs). Exponential growth of the photonic radius R_γ , as an inverse entropy function.

The solution of equation (53):

$$\frac{dx}{d^2t} = \frac{dx}{dt} \to \frac{d}{dt}\left(\frac{dx}{dt}\right) = \frac{dx}{dt} \to d\left(\frac{dx}{dt}\right) = dx \ ; \ \left(\int d\left(\frac{dx}{dt}\right) = \int dx\right) = \left(\frac{dx}{dt} = dx\right) \ ; \ \frac{dx}{x} = dt \ ; \ \int \frac{dx}{x} = \int dt$$

$$\int \frac{dx}{x} = \ln x + C = \int dt = t \ ; \ C = 0 \ ; \ x = \exp t \ ; \ t = \frac{\pi^2}{2} \ ; \ x = \exp\left(\frac{\pi^2}{2}\right) = \theta_{n^2}$$

The final inflation factor, applying the inverse hyperbolic relativistic coordinate transformation, will be:

$$R_\gamma \cdot (\sinh\theta_{n^2} + \cosh\theta_{n^2}) = R_\gamma \cdot \left[\sinh\left(\exp\left(\frac{\pi^2}{2}\right)\right) + \cosh\left(\exp\left(\frac{\pi^2}{2}\right)\right)\right] \quad (54)$$

For the final size of the observable universe as a function of the Planck length:

$$R_U = l_{PK} \cdot R_\gamma \cdot \exp\left(\exp\left(\frac{\pi^2}{2}\right)\right)$$

For the final mass of the universe as a function of Planck's mass:

$$M_U = m_{PK} \cdot R_\gamma \cdot \exp\left(\exp\left(\frac{\pi^2}{2}\right)\right)$$

For the Hubble constant as a function of the Planck time:

$$H = \left[t_{PK} \cdot R_\gamma \cdot \exp\left(\exp\left(\frac{\pi^2}{2}\right)\right)\right]^{-1}$$

The entropy of the inflation factor of equation (54) is easily derived from the entropy of the vacuum energy, using equation (51):

$$\ln\left[R_\gamma \cdot \exp\left(\exp\left(\frac{\pi^2}{2}\right)\right)\right] = 2\cdot\ln\left(\frac{E_{PK}}{E_v}\right) - 2\cdot\ln\left(\left[\frac{8\pi}{3}\right]^{\frac{1}{4}}\right)$$

By numerical functional equivalence it is observed that the entropy of the inflation factor $\exp\left(\exp\left(\frac{\pi^2}{2}\right)\right)$ is a function of the inverse of the fine structure constant for zero momentum $\alpha^{-1}(0)$, The electron-positron pair entropy $2\cdot\ln(m_{Pk}/m_e)$, the ratio of the sums of the masses of leptons with electric charge (electron, muon and tau); With respect to electron mass, the entropy of this ratio and the quadratic arithmetic mean of fractional electric charges (particle-antiparticle pairs), if we include the fractional electric charges of the X, Y bosons of the GUT theories (4/3, 1/3); that is:

electric charges (0, 2/3, -1/3, 4/3, 1/3) $3c = 3\ colores\ QCD$; $5 \equiv 5\ cargas\ eléctricas$

$$q_{rms}(3c) = 2\cdot\sqrt{\frac{\left(\frac{4}{3}\right)^2+\left(\frac{1}{3}\right)^2+\left(\frac{2}{3}\right)^2+\left(\frac{-1}{3}\right)^2+0^2}{3\cdot 5}} = 2\cdot\sqrt{\frac{22}{9\cdot 3\cdot 5}}$$

$$\ln\left[\exp\left(\exp\left(\frac{\pi^2}{2}\right)\right)\right] = \alpha^{-1}(0) + 2 + \frac{1}{2\cdot\ln(m_{Pk}/m_e)} - \frac{2}{\ln\left[\sum_{l-} m_{l-}/m_e\right]\cdot\left(\sum_{l-} m_{l-}/m_e\right)} + \cdots$$

$$\cdots + \frac{1}{\left(\sum_{l-} m_{l-}/m_e\right)^{2\cdot q_{rms}(3c)}} = 139.045636660831 \simeq 139.045636660649 = \exp\left(\frac{\pi^2}{2}\right)$$

0.5. Physical-mathematical derivation of the equation (1) that unifies the electromagnetism and the gravitation.

Up to this point, all the main hypotheses have been empirically corroborated by the demonstration of their validity and consistency with the fundamental data such as the value of the Higgs vacuum, matter-antimatter asymmetry, baryon density, mass of the Higgs boson h1, the value of the repulsive quantum vacuum, the necessary existence of the GUT unification scale; among others.

In this section we will rigorously derive equation (1) which implies, by itself, the inclusion of the initial conditions of the very beginning of the universe. The reason is based, in that depending on this equation (1) of the masses of Planck (maximum) and the mass of the electron (minimum), establishes the last possible scale of the maximum mass (Planck mass); So it must correspond to the fundamental energy state. This fundamental state translated at spatial scales would be the smallest possible length or scale of a quantized space-time (Planck's length); with a fundamental minimal geometrical structure consisting of a sheet hyperboloid. For this single-sheet hyperboloid to exist, equation (1) can be precisely converted to a hyperboloid of a sheet, or quantum worm hole, if the entropy of the quantum vacuum is added (natural logarithm of Planck energy / energy ratio). empty). And this entropy is surprisingly a function of the partition function of the non-trivial zeros of the Riemann zeta function that is used in equation (1), as will be demonstrated without any doubt.

0.5.1. Initial conditions of the universe. These conditions are the simplest and most obvious. 1) The existence of a t = 0. 2) The existence of E = 0 (zero energy). 3) The existence of a length L = 0. Condition 1) is of a total obviousness: the universe started from an initial moment t = 0. The second condition is also necessary and obligatory: A zero energy directly implies both A minimum zero entropy, as well as homogeneity and maximum isotropy (L = 0). But it also implies a thermodynamic equilibrium. The origin of the enormous isotropy and homogeneity observed in the universe would derive from these initial conditions (triple zero conditions); but also the very existence of a net zero energy-force that directly involves the equation (1) and was maintained throughout inflation.

Equation (1) and another fundamental one that will be derived, in fact, would be the fundamental geometrodynamic structure that would form the quantum structure of space-time. But this geometrodynamics minimum core structure (quantum worm hole = hyperboloid of one sheet) should also contain within itself all the fundamental characteristics; Ie all possible spines, electric charges, supersymmetry operations, etc .; They correspond to geometric-topological invariants of operational hyperboloid of one sheet. The hyperboloid of one sheet exactly involves a hyperbolic De Sitter space.

A hyperboloid of one sheet can be derived from a torus which is cut horizontally symmetrically by the larger circle. It is then deformed to the desired outer negative curvature of the hyperboloid of a sheet. This transformation evidently involves a repulsive force that first breaks the torus and then stabilizes by equalizing forces-energies (thermodynamic equilibrium).

And a hyperboloid of one sheet is exactly equivalent to a cone of relativistic light.

The tridimensional torus, specifically its surface factor $4\pi^2$,With two equal unit dimensional radiuses (space-time independence, pure entropy or quantum information measurement); would represent the entropy given by $\ln\left(E_{PK}/V_H\right)$. Ie the hyperboloid of one sheet under the action of purely attractive forces would be closed on itself and become a three-dimensional torus (mass Higgs vacuum No electrical charges.). The equivalence between the Higgs vacuum entropy ($4\pi^2$) and the factor

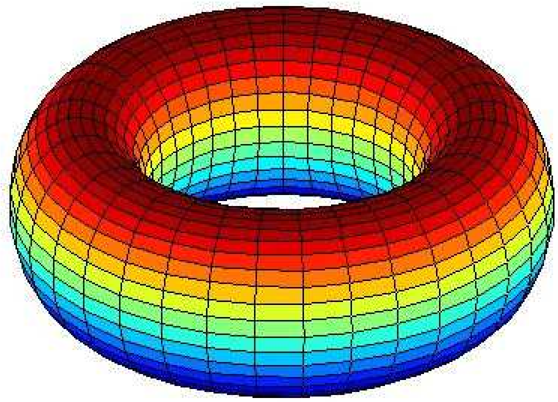


FIGURE 0.5.1.

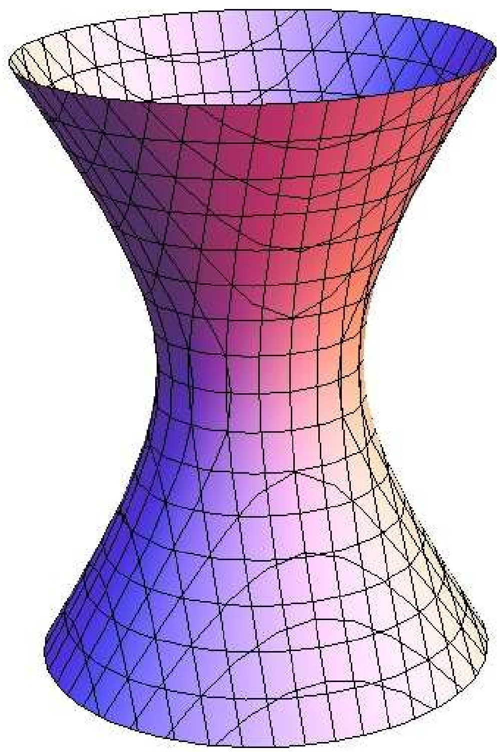


FIGURE 0.5.2.

of the equation (52), or sum of quantum curvatures $\frac{\pi^2}{2}$, it could be understood as the sum of extended quantum curvatures simultaneous multi-state of the 4 dimensions, or permutations thereof; that is to say: $4\pi^2 \equiv 4! \cdot \sum_{n=1}^{\infty} \frac{1}{n^2}$

This same Higgs vacuum entropy $4\pi^2$, should be divided or averaged if there were 4 fundamental electric charges (not counting the zero electric charge = 0) by including the 4 possible states due to the quarks and the X, Y bosons; That is: (4/3), (1/3), (2/3), (-1/3). This way you have the factor $\pi^2 = \frac{4\pi^2}{4}$. And this factor is the one that must be considered for quantum states that share the same energy, or degenerate states. Therefore the factor π^2 ,would also be the degeneracy factor that appears in equation (1).

But by applying the unifying character of Eq. (1) (But this fundamental minimal geometrodynamic structure (quantum worm hole = hyperboloid of a sheet) should also contain within it all the fundamental characteristics: ie all possible spins, electric charges , Operations of supersymmetry, etc., would correspond to geometric-topological operational invariants of the hyperboloid of a sheet.); It can be shown that the factor $\frac{\pi^2}{2}$, Is a function of entropy; of the inverse of the fine structure constant for zero momentum $\ln\left[\alpha^{-1}(0)\right]$. This is an outstanding fact that can not be ignored.

PROPOSITION 20. *The Higgs vacuum entropy* $\ln(E_{PK}V_H)$ *Is a direct function of the surface factor of a three-dimensional torus* $4\pi^2$ *, with the entropy correction for a single non-equiprobale dependent state of 137, or the inverse integer of the fine structure constant for zero momentum.*

PROOF. $\ln(E_{PK}V_H) = 38.4424894547404 \simeq 4\pi^2 - 1 - \frac{\ln 137}{137} = 38.4425053348258$ □

FACT 21. $\ln(E_{PK}V_H) \simeq 4\pi^2 - 1 - \frac{\ln 137}{137} - \frac{(V_H/m_{h1})^2}{(m_{h1}/m_e)} = 38.4424895078985$

The factor $\frac{\pi^2}{2}$ direct function of entropy $\ln\left[\alpha^{-1}(0)\right]$ y de $\left\lfloor \alpha^{-1}(0) = 137 \right\rfloor$

FACT 22. $\frac{\pi^2}{2} = 4.93480220054468 \simeq \ln\left[\alpha^{-1}(0)\right] + \frac{2}{137 - 1 + \tan(3\pi/10)} = 4.93480220226349$

$$\frac{\pi^2}{2} \simeq \ln\left[\alpha^{-1}(0)\right] + \frac{2}{137 - 1 + \tan(3\pi/10)} - \frac{\alpha^2(0)}{4 \cdot \left[(2+\pi^{-2}) \cdot \sum_{l-} m_{l-}/m_e\right]} = 4.93480220054419$$

$$\arccos\left(\sqrt{(s+1)\,s_{=1/2}}\right) = 30^{\circ} = \arccos\left(\sqrt{\left(\frac{1}{2}+1\right)\cdot\frac{1}{2}}\right) \ ; \ s = spin \ ; \ 30^{\circ} + \left(54^{\circ} \equiv 3\pi/10\ rad\right) = \beta = 84^{\circ}$$

0.5.1.1. *Conditions to be fulfilled by the two equations that unify gravity and electromagnetism.*

(1) Space-time independence. With the universe start condition at t = 0; Or equivalently with the disappearance of time in the virtual universe that would correspond to the quantum wormholes (hyperboloids of a sheet <-> De Sitter space).

(2) Net power-energy = 0.

(3) Minimum entropy = 0

(4) Existence of infinite speeds with net energy condition = 0

(5) From the previous condition, the simultaneous coexistence of infinite potential states (disappearance of time, t = 0) is automatically deduced, which can be instantaneously transformed into one another.

(6) Net energy = 0 implies thermodynamic equilibrium and homogeneity, as well as isotropy due to space-time independence by condition 1.

(7) Equalization to 0 of the 1st equation: $(-e) \cdot a \cdot b = -\sqrt{m_{PK} \cdot m_e \cdot G_N} \rightarrow (-e) \cdot a \cdot b + \sqrt{m_{PK} \cdot m_e \cdot G_N} = 0$; Where $a = \pi^2$ Is the fourth part of the surface of a three-dimensional torus with the two equal radii. Being b, the partition function as the sum of all energy states. $b = S(n)$ .With n representing the energy-temperature n state of the equilibrium thermodynamic partition function. The electric charge will be the negative and corresponding to the electron, present in the equation of the net sum (= 0). Complying that: $(-e) > -\sqrt{m_{PK} \cdot m_e \cdot G_N}$.

(8) The second equation will equal 0 by: $(-e)^2 - \hbar c \cdot d = 0$. Where d must also be a sum-type partition function of all energy states; Also implying thermodynamic equilibrium (equalization to 0 by the net sum). $\hbar c = m_{PK}^2 \cdot G_N \rightarrow (-e)^2 - m_{PK}^2 \cdot G_N \cdot d = 0$. Complying that: $(-e)^2 < \hbar c$

0.5.2. Special and unique properties of commutation of the non-trivial zeros of the Riemann zeta function for values of s $= \frac{1}{2} + i \cdot t_n$ .Where t_n represents the imaginary part of the t_n zero oh the function $\zeta\left(\frac{1}{2} + i \cdot t_n\right) = 0$.

Be any variable, for example, x . Be the complex number $s = \frac{1}{2} + it_n$, which generates a zero for the Riemann zeta function: $\zeta(s) = 0 = \zeta(\overline{s})$ .Being t_n the real value of nth zero Riemann's function $\zeta(s)$.

Let be the derivatives of the functions with equal variable, x^s , $x^{\overline{s}}$:

$$dx^s = \frac{s}{x^{\overline{s}}} \rightarrow dx^s \cdot x^{\overline{s}} = s$$

$$dx^{\overline{s}} = \frac{\overline{s}}{x^s} \rightarrow dx^{\overline{s}} \cdot x^s = \overline{s}$$

THEOREM 23. *Only fors con* $\Re e\,(s)=\dfrac{1}{2}$ *,the following two commutation conditions are simultaneously fulfilled:* $\boxed{dx^{s}\cdot x^{\overline{s}}+dx^{\overline{s}}\cdot x}$ $\boxed{dx^{\overline{s}}\cdot x^{s}-dx^{s}\cdot x^{\overline{s}}=}$

Commutation occurs for complex exponents s , $\overline{s}$ *of the variable* x

PROOF. If $\Re e\,(s)\neq\dfrac{1}{2}\rightarrow dx^{s}\cdot x^{\overline{s}}+dx^{\overline{s}}\cdot x^{s}\neq 1$ .Since one of the two conditions is not fulfilled, the theorem is proved. □

Application of functional equivalence to derive the basic value of the quantum harmonic oscillator, the minimum value of the uncertainty principle and the canonical commutation relation for the momentum and position $[\hat{x},\hat{p}]=i\hbar$; as simple and direct functions, derived from the two commutation conditions of Theorem 23. $\left(\dfrac{dx^{s}\cdot x^{\overline{s}}+dx^{\overline{s}}\cdot x^{s}}{2}\right)\cdot\hbar\omega\equiv\left[E_{v}=\hbar\omega\left(v+\dfrac{1}{2}\right)\right]$, $v=0$

$$\left(\frac{dx^{s}\cdot x^{\overline{s}}+dx^{\overline{s}}\cdot x^{s}}{2}\right)\cdot\hbar\equiv\left[min\left(\triangle x\cdot\triangle p\right)=\frac{\hbar}{2}\right]$$

$$\left(\frac{dx^{\overline{s}}\cdot x^{s}-dx^{s}\cdot x^{\overline{s}}}{-2\cdot t_{n}}\right)\cdot\hbar\equiv\left[[\hat{x},\hat{p}]=i\hbar\right]$$

By the condition to be fulfilled, 7; You have: $(-e)\cdot a\cdot b=-\sqrt{m_{PK}\cdot m_{e}\cdot G_{N}}\rightarrow\dfrac{-\sqrt{m_{PK}\cdot m_{e}\cdot G_{N}}}{(-e)\cdot a\cdot b}=\dfrac{(-e)\cdot a\cdot b}{-\sqrt{m_{PK}\cdot m_{e}\cdot G_{N}}}=$ $d\left(x^{s}\cdot x^{\overline{s}}\right)=dx^{s}\cdot x^{\overline{s}}+dx^{\overline{s}}\cdot x^{s}=1$

And the entropy (equiprobable states-thermodynamic equilibrium) is exactly zero, that is: $\ln\left(\dfrac{(-e)\cdot a\cdot b}{-\sqrt{m_{PK}\cdot m_{e}\cdot G_{N}}}\right)=0$

The net force, net energy and the annulated time coordinate, (t = 0) can be expressed directly by the zeros of the Riemann zeta function. Moreover, the neutrality of the vacuum with respect to the electric charges (the zero value or no electric charge of the quantum vacuum) can be expressed by the zeros of the Riemann zeta function, assuming that nontrivial zeros are all of the form $s=\dfrac{1}{2}+it_{n}$.

$s=\frac{1}{2}+it_{n}$; $0=\displaystyle\sum_{n=1}^{\infty}\frac{(-e)\cdot a\cdot b\cdot(-1)^{n-1}}{-\left(m_{PK}\cdot m_{e}\cdot G_{N}\right)^{s-it_{n}}\cdot n^{s}}$;. The factor $(-1)^{n-1}$ Implies the existence of particle-antiparticle pairs with opposite electrical charges (+1, -1)

For the time coordinate t: $t'=t\cdot\sqrt{1-\dfrac{2\cdot m_{PK}\cdot G_{N}}{r_{s}\left(m_{PK}\right)\cdot c^{2}}}=t\cdot\sqrt{1-1}=0=t\cdot\displaystyle\sum_{n=1}^{\infty}\frac{(-1)^{n-1}}{n^{s}}$

Where the eta function of Dirichlet $\displaystyle\sum_{n=1}^{\infty}\frac{(-1)^{n-1}}{n^{s}}=\eta\,(s)$, is derived from the function ζ of Riemann: $\eta\,(s)=\left(1-2^{1-s}\right)\cdot\zeta\,(s)$

In this way, zeros can be established for net-energy-forces, entropy, and the temporal coordinate; Using the zeta function of Riemann and conjecture that all its nontrivial zeros are of the form $s = \frac{1}{2} + it_n$

1) If $\zeta(s) = 0 \rightarrow \eta(s) = \left(1 - 2^{1-s}\right) \cdot \zeta(s) = 0$

2) $\left((-e) \cdot a \cdot b + \sqrt{m_{PK} \cdot m_e \cdot G_N}\right) = 0 = \zeta(s)$

3) $t' = t \cdot \sqrt{1 - \frac{2 \cdot m_{PK} \cdot G_N}{r_s(m_{PK}) \cdot c^2}} = t \cdot \zeta(s) = 0$

4) $\ln\left(\frac{(-e) \cdot a \cdot b}{-\sqrt{m_{PK} \cdot m_e \cdot G_N}}\right) = \zeta(s) = 0$

The dependence of the mass of Planck, length of Planck and the time of Planck; Respect to the non-trivial zeros of Riemann's zeta function, with $s = \frac{1}{2} + it_n$:

$$m_{PK} = \left(\frac{\hbar c}{G_N}\right)^{s-it_n} ; \; l_{PK} = \left(\frac{\hbar \cdot G_N}{c^3}\right)^{s-it_n} ; \; t_{PK} = \left(\frac{\hbar \cdot G_N}{c^5}\right)^{s-it_n}$$

Sea una variable cualquiera, por ejemplo x. Si esta variable toma el valor mínimo cuantizado de la unidad; se obtiene la siguiente equivalencia funcional estricta:

$$\frac{d\left(x^s \cdot x^{\overline{s}}\right)}{x^s \cdot x^{\overline{s}}} = \frac{dx^s \cdot x^{\overline{s}} + dx^{\overline{s}} \cdot x^s}{x^s \cdot x^{\overline{s}}} = \frac{(-e) \cdot a \cdot b}{-\sqrt{m_{PK} \cdot m_e \cdot G_N}} = 1$$

Making a change of variable, such that $x^s \cdot x^{\overline{s}} = y$;the restatement is obtained: $\frac{dy}{y} = 1 = \frac{(-e) \cdot a \cdot b}{-\sqrt{m_{PK} \cdot m_e \cdot G_N}}$

Now it is time to take up the equation (32c) used to calculate the mass of the Higgs boson mh1, and assuming the existence of a repulsive acceleration.

$$\frac{V(r)}{m_{PK} \cdot a_0 \cdot R_\gamma^2} = \frac{(-e) \cdot (+e)}{r^2 \cdot m_{PK} \cdot a_0 \cdot R_\gamma^2} = -\frac{1}{R_\gamma^2}$$

The previous equation will become unitary and dependent on a maximum distance or radius, that is:

$$\frac{(-e) \cdot (+e)}{r^2 \cdot m_{PK} \cdot a_0} = 1 \; (55)$$

By functional equivalence, the following equations can be equated: $\frac{(-e) \cdot (-e)}{r^2 \cdot m_{PK} \cdot a_0} = 1 = \frac{dy}{y} = \frac{(-e) \cdot a \cdot b}{-\sqrt{m_{PK} \cdot m_e \cdot G_N}}$

Where the repulsive acceleration of the quantum vacuum $a_0 = c \cdot H$

What maximum radius is the one that makes equation (55)?: The answer is determined by theorizing that this radius must correspond to the radius of stabilization of the fundamental state of the hydrogen atom. That is, the radius would be very close to the Bohr radius.This implies that the electrostatic attraction, purely dependent on the electric charges of the electron and the proton (without the dielectric constant of the vacuum) would be compensated by the repulsion of the vacuum acceleration, with a force dependent on the Planck mass. In fact, it is an inescapable consequence of equation (1) of unification of electromagnetism and gravity. Specifically, there would be two mutually coexistent states, defined by the electron mass and the Planck mass. The concept that the electron is a Planck mass observed at the boundary of the Bohr radius could be made equivalent. Since postulated the existence of bosons X, Y (GUT theories) that change the flavors of quarks (u, d) proton nucleus of the hydrogen atom; Then this radius (equation 55) must have the factor of the quadratic mean of quantized electric charges ($q_{rms}\left(3c\right)$). Indeed, equation (55) becomes unitary if we consider an additional factor dependent on the ratio of dimensionless quantum radiis in 7 dimensions: $\dfrac{R_7}{r_7}$

Therefore, the Bohr radius of the hydrogen atom can be expressed by equation (55) by adding the dependent factors of the electric charges and the adimensional quantum radiis in 7 diemensions.

$$r_B = \frac{\left(R_7/r_7\right)}{q_{rms}\left(3c\right)}\cdot\sqrt{\frac{\left(-e\right)^2}{m_{PK}\cdot a_0}} \quad (56)$$

The empirical calculation of equation (56) confirms, in a spectacular way, its accuracy:

$$r_B = \left[\frac{(3.05790095610234/2.95694905822489)}{2\cdot\sqrt{\dfrac{22}{9\cdot 3\cdot 5}}}\right]\cdot\sqrt{\frac{\left(-1.6021766208\cdot 10^{-19}\right)^2 N\cdot m^2}{(2.17647025475893\cdot 10^{-8}\,Kg)\cdot 6.911519372842\cdot 10^{-11}\,m/s^2}}$$

$r_B = 5.2911780689325795\cdot 10^{-11}\,m$

And Bohr's radius, according to CODATA, is: $5.2917721067\cdot 10^{-11}\,m$

Bohr radius.CODATA

0.5.2.1. *The spin of the photon and the electron: its direct relation* ζ *the Riemann's function.* Guessing that the nontrivial zeros of the Riemann zeta function are all the way $s = \dfrac{1}{2} + it_n$; By functional equivalence, spines 1 and 1/2 can be derived by:
$spin\ 1 = d\left(x^s\cdot x^{\overline{s}}\right) = x^s\cdot dx^{\overline{s}} + x^{\overline{s}}\cdot dx^s = 1 \quad ; \quad spin\ 1/2 = \Re e\left(s = \dfrac{1}{2} + it_n\right) = -\zeta\left(0\right)$

The angle defined by the cosine of the spin, 1/2, has the following outstanding trigonometric properties:

$$\arccos\left(\frac{1/2}{\sqrt{\left(\frac{1}{2}+1\right)\cdot\frac{1}{2}}}\right)=\theta_{s=1/2}\ ;\ \sin\left(\theta_{s=1/2}\right)=\cos\left(spin\ 2\right)\ ;\ \tan\left(\theta_{s=1/2}\right)=\frac{1}{\cos\left(spin\ 1\right)}=\sqrt{\left(s+1\right)s}_{=1}$$

By numerical functional equivalence, the relationship between the angles$\theta_{s=1/2}$ y θ_W Allow to derive the following outstanding properties:

1) $\sin\left(\theta_{s=1/2}\right)\cdot\sin\theta_W+\cos\left(\theta_{s=1/2}\right)\cdot\cos\theta_w+1\simeq\tan\left(3\pi/10\right)\ ;\ \theta_W=\arcsin\left(\frac{2}{\varphi^3}\right)$

2) $\left(\theta_{s=1/2}+\theta_W\right)+\left(\theta_{s=1/2}+\theta_W\right)\cdot\frac{\alpha\left(M_Z\right)}{\cos\left(3\pi/10\right)}=84.002399174^{\circ}\simeq\beta=84^{\circ}$

3) $\cos\left(\theta_{s=1/2}\right)\cdot\cos\theta_w\cdot V_H=m_{h1}\left(GeV\right)+\frac{g\left(0^{++}\right)\cdot\cos^4\left(\frac{2\pi}{dim\left(SO(8)\right)}\right)}{7}\ ;\ \cos\left(\frac{2\pi}{dim\left(SO(8)\right)}\right)\simeq\cos\theta_{c13}\ ;\ \theta_{c13}=13.04^{\circ}$

4) $\cos\left(\theta_{s=1/2}\right)+\cos\beta=0.68187873245728\simeq\Omega_{\Lambda}=1-\pi^{-1}$

And the cosine of the spin, 3/2, is directly related to the Weinberg angle to the GUT scale:

$$\arcsin\left(\sqrt{3/8}\right)=\theta_W\left(GUT\right)\ ;\ \tan\theta_W\left(GUT\right)=\cos\left(spin\ 3/2\right)$$

0.5.2.2. *The value of the Higgs vacuum and its direct connection with the imaginary parts of the zeros of the Riemann zeta function.*

PROPOSITION 24. *The Higgs vacuum value is a direct function of both the imaginary and real part of the first non-trivial zero of Riemann's zeta function; As well as the partition function derived from the imaginary and real parts of the non-trivial zeros of Riemann's zeta function, with* $\overline{s}=\frac{1}{2}-it_n$. *And the main correcting factor is precisely the cosine of the spin, 1/2.*

Empirical demonstration.

PROOF. $\overline{s}_1=\frac{1}{2}-i\cdot 14.1347251417347$

$$\frac{E_e}{V_H}=\frac{\exp\left[Im\left(\overline{s}_1\right)+\Re e\left(\overline{s}_1\right)\right]\cdot\left(1-\alpha^2\left(0\right)\cdot\sin\left(\pi^2/2\right)\right)}{\cos\left(spin\ 1/2\right)}\ (57)$$

$$\frac{E_e\cdot\cos\left(spin\ 1/2\right)}{\exp\left[Im\left(\overline{s}_1\right)+\Re e\left(\overline{s}_1\right)\right]\cdot\left(1-\alpha^2\left(0\right)\cdot\sin\left(\pi^2/2\right)\right)}=V_H=246.219651353969\,GeV\simeq V_H$$

$$\frac{\pi}{\sin(\pi^2/2)} - \frac{\cos(2\pi/15)}{4 \cdot (2\pi)^6} = 3.30226866217364 \simeq R_\gamma = \sqrt{\frac{\alpha^{-1}(0)}{4\pi}} \qquad \square$$

As can be observed, the empirical calculation indicates that the Higgs vacuum behaves like a quantum harmonic oscillator; But with the modification given by the real and imaginary parts of the first non-trivial zero of Riemann's zeta function. It is an analog of the quantum oscillator described by the equation: $E_n = \hbar\omega \cdot \left(n + \frac{1}{2}\right)$; $E_{n(s)} = \hbar\omega \cdot (\Re e(\overline{s}) + Im(\overline{s}))$

And the quantum entropy dependent on the non-trivial zeros of Riemann's zeta function for $\overline{s} = \frac{1}{2} - it_n$, Is described by the entropic differential equation of scale change: $\int_{E_1}^{E_0} \frac{dE}{E} = \Re e(\overline{s}) + Im(\overline{s}) = \int_{E_1}^{E_0} \frac{dE \cdot d\left(E^s \cdot E^{\overline{s}}\right)}{E^s \cdot E^{\overline{s}}}$; $E_0 < E_1$

For the sum of all energy levels, dependent on all non-trivial zeros of the form $\overline{s} = \frac{1}{2} - it_n$, The final partition function adopts the following value obtained by the calculation performed with the mathematical program on the first 1000 non-trivial zeros of Riemann's zeta function:

$$\frac{1}{\sum_{n=1}^{1000} e^{-(N[\Im(\rho_n),20]-0.5)}} = 833747.631541816$$

$$\frac{1}{\sum_{n=1}^{\infty} \exp\left(\Re e(\overline{s_n}) + Im(\overline{s_n})\right)} = \left(\sum_{n=1}^{\infty} \exp - (-\Re e(s) + Im(s))\right)^{-1} \simeq 833747.631541816$$

$$\frac{V_H}{E_e} = \cos(spin\ 1/2) \cdot \left(\sum_{n=1}^{\infty} \exp - (-\Re e(s) + Im(s))\right)^{-1} \cdot \left(1 - \frac{\sum_{n=1}^{\infty} \exp(-t_n)}{\ln\left[\sum_{n=1}^{\infty} \exp(-t_n)\right] \cdot q_{rms}(3c)}\right) \cdot \left(1 + \frac{\alpha(0)}{e^2}\right) \to \cdots$$

$$\cdots V_H = 246.219650798124\, GeV$$

0.5.3. Partition function of the imaginary parts of non-trivial zeros for $s = \frac{1}{2} + it_n$. By the functional equivalence previously obtained: $\frac{(-e)\cdot(-e)}{r^2 \cdot m_{PK} \cdot a_0} = 1 = \frac{dy}{y} = \frac{(-e)\cdot a \cdot b}{-\sqrt{m_{PK} \cdot m_e \cdot G_N}} = \frac{-\sqrt{m_{PK} \cdot m_e \cdot G_N}}{(-e)\cdot a \cdot b}$

We hypothesize that both radius and acceleration are constant and invariant. This implies that the possible variation corresponds to the mass scaling. Rewriting the above equation in differential form and eliminating the acceleration and radius of numerator and denominator, we get:

$$\frac{dy}{y} = \frac{dm}{m} \; ; \; \frac{(-e)\cdot(-e)}{r^2 \cdot m_{PK} \cdot a_0} \equiv \frac{m_0 \cdot r^2 \cdot a_0}{m_{PK} \cdot r^2 \cdot a_0}$$

Now, it simply remains to equate the imaginary parts of the non-trivial zeros of Riemann's zeta function; To obtain the coefficient $b = \sum_{n=1}^{\infty} \exp(-t_n)$, as the sum of entropy levels given by the imaginary parts of the non-trivial zeros of Riemann's zeta function.

$$\left(\frac{dx^{\overline{s}} \cdot x^s - dx^s \cdot x^{\overline{s}}}{2i}\right) = -t_n = \int \frac{dm_n}{m_n} \to \sum_{n=1}^{\infty} \exp(-t_n) = \sum_{n=1}^{\infty} \exp\left(\int \frac{dm_n}{m_n}\right)$$

$a = \pi^2$

$$\frac{-\sqrt{m_{Pk} \cdot m_e \cdot G_N}}{(-e)\cdot \pi^2} = \sum_{n=1}^{\infty} \exp(-t_n) = \sum_{n=1}^{\infty} \exp\left(\int \frac{dm_n}{m_n}\right)$$

$$(-e)\cdot \pi^2 \cdot \sum_{n=1}^{\infty} \exp(-t_n) = -\sqrt{m_{Pk} \cdot m_e \cdot G_N} \; (58) \; (1)$$

$$(-e)\cdot \pi^2 \cdot \sum_{n=1}^{\infty} \exp(-t_n) + \sqrt{m_{Pk} \cdot m_e \cdot G_N} = 0 \; (59)$$

0.5.3.1. *Derivation of the partition function of the imaginary parts of the non-trivial zeros of the Riemann zeta function directly from Eq.* $\frac{\sqrt{m_{Pk} \cdot m_e \cdot G_N}}{(-e)\cdot \pi^2}$. In this section, a derivation will be made mathematically and physically more purist. In the first place two masses will be considered: 1) A dependent of $m_0 = \sqrt{m_{PK} \cdot m_e}$. 2) A second, dependent on the electric charge and the universal gravitation constant: $m_1 = \sqrt{\frac{(\pm e^2)}{G_N}}$

With these two masses we obtain equation (58) restated by:

$$m_0 < m_1 \; ; \; \frac{m_0 \cdot \sqrt{G_N}}{\pi^2 \cdot m_1 \cdot \sqrt{G_N}} = \sum_{n=1}^{\infty} \exp(-t_n)$$

As can be seen in the above equation, the square root of the gravitational constant disappears. Now, if one considers the negative sign of the attractive character of gravity; Then the equation transforms as:

$$\frac{m_0 \cdot \sqrt{-G_N}}{\pi^2 \cdot m_1 \cdot \sqrt{-G_N}} = \sum_{n=1}^{\infty} \exp(-t_n) \to \pm\sqrt{-G_N} = \pm i \cdot \sqrt{G_N} \ ; \ \frac{m_0 \cdot \sqrt{-G_N}}{\pi^2 \cdot m_1 \cdot \sqrt{-G_N}} = \frac{\pm i \cdot m_0}{\pm i \cdot m_1 \cdot \pi^2} = \sum_{n=1}^{\infty} \exp(-t_n)$$

Since the partition function is real; And considering the two solutions given by $\pm i \cdot \sqrt{G_N}$; We can establish the following equation that preserves the real character of the partition function and as a function of the two solutions:

$$\frac{im_0}{im_1 \cdot \pi^2} + \frac{-im_0}{-im_1 \cdot \pi^2} = 2 \cdot \sum_{n=1}^{\infty} \exp(-t_n)$$

The second step is to transform these imaginary mass regularization operation for exponentiation of nontrivial zeros of the form $s = \frac{1}{2} + it_n$; $\overline{s} = \frac{1}{2} - it_n$. The transformations are obtained as:

$im_0 \to im^s$; $-im_0 = -im^{\overline{s}}$; $im_1 \to im^s$; $-im_1 \to -im^{\overline{s}}$. With these transformations we obtain the zero value for the sum of the masses: $im^s - im^{\overline{s}} - im^s + im^{\overline{s}} = 0$

The transformation of masses obtained allows us to obtain the transform-regularized equation:

$$\left(\frac{im_0}{im_1 \cdot \pi^2} + \frac{-im_0}{-im_1 \cdot \pi^2}\right) \to \left(\frac{im^s}{im^s \cdot \pi^2} + \frac{-im^{\overline{s}}}{-im^{\overline{s}} \cdot \pi^2}\right) = \frac{(im^s) \cdot \left(-im^{\overline{s}}\right) + \left(-im^{\overline{s}}\right) \cdot (im^s)}{\pi^2 \cdot (im^s) \cdot \left(-im^{\overline{s}}\right)} = \frac{(im^s) \cdot \left(-im^{\overline{s}}\right) + \left(-im^{\overline{s}}\right) \cdot (im^s)}{\pi^2 \cdot m}$$

The derivative of the above equation is exactly equal to 1; that is:

$$\left(\frac{(im^s) \cdot \left(-im^{\overline{s}}\right) + \left(-im^{\overline{s}}\right) \cdot (im^s)}{\pi^2 \cdot m}\right)' = 1 \equiv \left(\frac{(-e) \cdot (-e)}{r^2 \cdot m_{PK} \cdot a_0} = 1 = \frac{dy}{y} = \frac{(-e) \cdot a \cdot b}{-\sqrt{m_{PK} \cdot m_e \cdot G_N}} = \frac{-\sqrt{m_{PK} \cdot m_e \cdot G_N}}{(-e) \cdot a \cdot b}\right)$$

In the previous equation we make a partial derivation of the two product-sums of the numerator:

$\frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (im^s)} + \frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (-im^s)} = s + \overline{s}$. We transform the above equation by commutation sign:

$\frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (im^s)} - \frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (-im^s)} = s - \overline{s} = 2i \cdot t_n$. Dividing again by $\pi^2 \cdot m$:

$$\frac{\frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (im^s)} - \frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (-im^s)}}{\pi^2 \cdot m}$$

The above equation must be divided by the sum of all the electric charges dependent on the X, Y bosons; And quarks: $\sum_q q = \frac{4}{3} + \frac{2}{3} +$

Finally eliminating, the imaginary part and taking the dimensionless mass m = 1, the final entropic function is obtained:

$$\frac{\frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (im^s)} - \frac{\partial\left((im^s) \cdot \left(-im^{\overline{s}}\right)\right)}{\partial (-im^s)}}{2i \cdot \pi^2 \cdot m} = \frac{t_n}{\pi^2 \cdot (m = 1)} = -\frac{\int \frac{dm_n}{m_n}}{\pi^2} \to \sum_{n=1}^{\infty} \exp(-t_n) = \sum_{n=1}^{\infty} \exp\left(\int \frac{dm_n}{m_n}\right)$$

0.5.3.2. *Derivation of the Planck constant by the partition function of the non-trivial zeros of the Riemann zeta function, the elementary electric charge, the speed of light and the mean square of the electric charges.* Being the product of Planck's constant barred by the speed of light, equal to the square of Planck's mass multiplied by the constant of universal gravitation; that is: $\hbar c = m_{PK}^2 \cdot G_N$

The previous equation is dependent only on the Planck mass, so we assume that the electric charge must correspond to the quadratic mean of the electric charges dependent on the bosons (X, Y) and the quarks; that is: $q_{rms}(3c)$

PROPOSITION 25. *By condition 8) of subsection 0.5.1.1: The second equation will equal 0 by:* $(-e)^2 - \hbar c \cdot d = 0$ *. Where* d *must also be a sum-type partition function of all energy states; Also implying thermodynamic equilibrium (equalization to 0 by the net sum).* $\hbar c = m_{PK}^2 \cdot G_N \rightarrow (-e)^2 - m_{PK}^2 \cdot G_N \cdot d = 0$ *. Complying that:* $(-e)^2 < \hbar c$

In this case $d = \dfrac{\left[\sum_{n=1}^{\infty} \exp(-t_n)\right]^2}{(q_{rms}(3c))^2}$

Empirical demonstration:

PROOF.

$$\frac{(-e)^2 \cdot (q_{rms}(3c))^2}{\left[\sum_{n=1}^{\infty} \exp(-t_n)\right]^2 \cdot c} = \hbar \quad (60)$$

$$\frac{(-e)^2 \cdot (q_{rms}(3c))^2}{\left[\sum_{n=1}^{\infty} \exp(-t_n)\right]^2 \cdot c} = 1.0546605208790399 \cdot 10^{-34} J \cdot s^{-1}$$ □

Taking into account that the uncertainty is due to the most inaccurate value of the universal gravitational constant; A test of equation (60) can be performed to test the empirical value of the universal gravitation constant; that is:

$$G_N = \frac{(-e)^2 \cdot (q_{rms}(3c))^2}{\left[\sum_{n=1}^{\infty} \exp(-t_n)\right]^2 \cdot m_{PK}^2} = 6.674641125271 \cdot 10^{-11} N \cdot m^2/Kg^2$$

0.5.3.3. *Direct Implications of Equation (59).* The most direct and obvious physical implication of equation (59) is the existence at very short distances of a gravitational repulsive force that would exactly cancel the attractive force of two opposing electric charges.

$$(-e)\cdot\pi^2\cdot\sum_{n=1}^{\infty}\exp(-t_n)+\sqrt{m_{Pk}\cdot m_e\cdot G_N}=0\rightarrow(-e)\cdot(+e)\cdot\pi^4\cdot\left[\sum_{n=1}^{\infty}\exp(-t_n)\right]^2+m_{Pk}\cdot m_e\cdot G_N=0$$

$$+m_{Pk}\cdot m_e\cdot G_N=\sqrt{m_0^2}\cdot G_N\ ;\ m_0=\sqrt{m_{PK}\cdot m_e}$$

The most likely possibility is that this mass corresponds to the mass of gravitino. Being a fermion with spin 3/2 obeys the Fermi-Dirac statistic; Which implies a repulsive force due to the application of Pauli's exclusion principle. This would be in line with the repulsion that gravitino acquire in certain theories of quantum supergravity. Therefore, we conjecture that the mass of the gravitino must be very close to: $m_{3/2}\simeq\sqrt{m_{PK}\cdot m_e}$

The second important physical implication is that for the wormhole represented by:

$$\left(-\pi^2\cdot e\cdot\left[\sum_{n=1}^{\infty}\exp(-t_n)\right]\right)^2=x^2\ ;\ \left(\pi^2\cdot e\cdot\left[\sum_{n=1}^{\infty}\exp(-t_n)\right]\right)^2=y^2\ ;\ z^2=\left(\sqrt{2\cdot m_{PK}\cdot m_e\cdot G_N}\right)^2$$

$$x^2+y^2-z^2=0$$

It becomes a wormhole with an open throat (passable), it is necessary to count the entropy value of the energy of the quantum vacuum. And this entropy must also come from the entropy of the partition function of the non-trivial zeros of Riemann's zeta function. Specifically the energy of the vacuum should be very close and dependent on the 5 possible states of the electric charges and / or the maximum possible number of spines (5); that is to say: $card\left\{\frac{4}{3},\frac{1}{3},\frac{2}{3},-\frac{1}{3},0\right\}=card\left\{spin\ 0, spin\ \frac{1}{2}, spin\ 1, spin\ \frac{3}{2}, spin\ 2\right\}=5$

Since the entropy of the partition function of the non-trivial zeros of the Riemann zeta function is equal to: $\ln\left[\sum_{n=1}^{\infty}\exp(-t_n)\right]$

We have, that the energy of the quantum vacuum that would allow a wormhole with open throat, would finally be:

$$\ln(E_{PK}/E_v)\simeq-5\cdot\ln\left[\sum_{n=1}^{\infty}\exp(-t_n)\right]=70.6684301773924\ (61)$$

$$-5 \cdot \ln\left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right] \simeq \ln\left(E_{PK}/E_v\right) = 70.6515129680463$$

$$-5 \cdot \ln\left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right] - \alpha\left(0\right) \cdot \left(2 + \Omega_m = \pi^{-1}\right) = 70.651512652799 \simeq \ln\left(E_{PK}/E_v\right)$$

$$x^2 + y^2 - z^2 = -5 \cdot \ln\left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right]$$

0.5.3.4. *Possible implications of equation (59): the non-singularity of black holes by repulsive forces and the irreducible Planck length. Derivation of the dimensionless entropy factor of black holes* 4π. To this day no one knows what kind of material composes the interior of black holes. We know that for certain masses, the previous collapse in a black hole is avoided with the formation of neutron stars and possibly with the existence of stars composed of a plasma of quarks and gluons. But the alleged existence of a singularity, which in fact implies a point nucleus in the black hole with infinite curvature, does not seem possible for several reasons. First: The infinities in physics always imply that the limit of the applicability of a theory is not applicable; Being replaced by a theory that eliminates or does not imply the singularity of the infinities.

Second: The quantization of space to a minimum non-reducible length (impossibility of existence of smaller Planck lengths) avoids the existence of point singularity. This fact is derived from equations (58, 1). These equations imply that, ultimately, time space is quantized in wormholes described by equation (61). Its repulsive character implies a repulsive force at short distances by exchange, quite possibly of gravitino.

The partition function of the non-trivial zeros of Riemann's zeta function implies the existence of the thermodynamic equilibrium of the surface temperature of the black hole; Ie the difference in temperature or gravity between two points on this surface is zero, $T\left(x_0 - x_1\right) = 0 = \zeta\left(s\right) = 0$

At this point we must hypothesize that the factor of the non-dimensional entropy of black holes, 4π , must depend on the entropy of $-\ln\left[\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right] = \ln\left[\left(\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right)^{-1}\right]$

The above entropy must be reduced by two main terms: 1) A unit term due to the repulsive acceleration of the vacuum, dependent on equation $\frac{(-e) \cdot (-e)}{r^2 \cdot m_{PK} \cdot a_0} = 1 = \frac{r^2 \cdot m_{PK} \cdot a_0}{r^2 \cdot m_{PK} \cdot a_0} = 1$

2) A term dependent on the non-dimensional quantum uncertainty of the ratio $\frac{\triangle x \cdot \triangle p}{\hbar} = \frac{1}{2} \cdot \sqrt{\frac{1^2 \cdot \pi^2}{3} - 2}$, Derived from the time-independent Schrödinger equation. Independence of time, because for observers outside the black hole, time is canceled.

These two terms are consistent if one considers that the emission of the Hawking radiation implies the existence of soft photons and soft gravitons with zero energy, and therefore with zero mass.

Indeed, with the existence of zero-mass energies and the disappearance of time (for the outer observer); The two terms of reduction satisfy these two requirements, leaving the terms only dependent on the square of ratios of lengths. And precisely the entropy of black holes reduced to the dependence of lengths, is a ratio of ratios of lengths squared, as is well known.

For the first term for null mass-energy: $\frac{r^2 \cdot \cancel{m_{PK}} \cdot a_0}{r^2 \cdot \cancel{m_{PK}} \cdot a_0} = 1$

For the second term with zero mass and time cancellation: $\frac{\triangle x \cdot \triangle p}{\hbar} = \frac{1}{2} \cdot \sqrt{\frac{1^2 \cdot \pi^2}{3} - 2} = \frac{\cancel{\triangle m} \cdot \triangle r_1^2 \cdot \cancel{\triangle t}}{\cancel{\triangle m} \cdot \triangle r_2^2 \cdot \cancel{\triangle t}} = \frac{\triangle r_1^2}{\triangle r_2^2}$

Finally, the dimensionless factor of the entropy of a black hole, 4π :

$$4\pi \simeq \ln \left[\left(\sum_{n=1}^{\infty} \exp(-t_n) \right)^{-1} \right] - 1 - \frac{1}{2} \cdot \sqrt{\frac{1^2 \cdot \pi^2}{3} - 2} \; (62)$$

$$(4\pi = 12.5663706143592) \simeq \left(\ln \left[\left(\sum_{n=1}^{\infty} \exp(-t_n) \right)^{-1} \right] - 1 - \frac{1}{2} \cdot \sqrt{\frac{1^2 \cdot \pi^2}{3} - 2} = 12.5658242270919 \right)$$

Therefore, it seems that the paradox of information loss of black holes would be solved by the existence of soft photons and soft gravitons.

0.5.4. The inverse effect of Casimir, or repulsive (spherical shell) and spherical shell of the observable universe. Quantum vacuum energy. En esta sección insertaremos directamente el artículo que escribimos en inglés, y que demuestra que la energía del vacío cuántico es derivable de una modificación del efecto inverso de Casimir para un radio que corresponde con el radio del universo observable.

De nuevo, la función de partición de los ceros no triviales de la función zeta de Riemann aparece como factor de regularización en el cálculo de la energía del vacío y que coincide con la calculada en este trabajo.

Experiments with powerful neodymium magnets: Magnetic repulsion.Phenomenological equivalences: The reverse Casimir effect, or repulsive (spherical shell) and the spherical shell of the macroscopic Universe (obsevable sphere of the Universe). The quantum-mechanical origin of the repulsive acceleration, or cosmological constant.Vacuum value.

28/03/2016

angel1056510@gmail.com

Abstract

The experiments, conducted by the author; demonstrate the physical equivalence between the repulsion between two powerful Neodymium magnets and reverse Casimir effect (nanoscale) and macroscopic scale (The spherical shell of actual observable Universe); and as measuring weight on an electronic balance of this repulsive force, it causes the appearance of a fictitious mass; dependent on the repulsive force between the two magnets. One of these magnets is positioned above the balance; while the other slowly magnet is positioned right in the perpendicular axis that would link the centers of both circular magnets. (Circular disks). There is no difference between this experiment and the physical results of the experiments carried out at the microscopic level and measured experimentally: The reverse Casimir effect of a conducting spherical shell. The actual comportment of the Universe to macroscopic scales; with the manifestation of an accelerated expansion and the emergence of a fictitious mass, which does not exist; the so-called dark matter. The three physical phenomena with identical results are equivalent; so they could have a common physical origin. In the article, we have inserted links to videos uploaded to youtube that let you see the whole experimental process and its results. The last experiment is made with other balance; more shielded against interference magnetism and the magnet placed over the balance.

The videos are explained in Spanish. They are welcome English subtitles.

Acknowledgements.

I thank Almighty God and our Lord Jesus Christ, our Savior; for allowing me this little knowledge of its infinitude

1 Introduction.

https://en.wikipedia.org/wiki/Casimir_effect

1.1 Casimir effect

"Dutch physicists Hendrik Casimir and Dirk Polder at Philips Research Labs proposed the existence of a force between two polarizable atoms and between such an atom and a conducting plate in 1947, and, after a conversation with Niels Bohr who suggested it had something to do with zero-point energy, Casimir alone formulated the theory predicting a force between neutral conducting plates in 1948; the former is called the Casimir–Polder force while the latter is the Casimir effect in the narrow sense. Predictions of the force were later extended to finite-conductivity metals and dielectrics by Lifshitz and his students, and recent calculations have considered more general geometries. It was not until 1997, however, that a direct experiment, by S. Lamoreaux, described above, quantitatively measured the force (to within 15% of the value predicted by the theory),[6] although previous work [e.g. van Blockland and Overbeek (1978)] had observed the force qualitatively, and indirect validation of the predicted Casimir energy had been made by measuring the thickness of liquid helium films by Sabisky and Anderson in 1972. Subsequent experiments approach an accuracy of a few percent.

Because the strength of the force falls off rapidly with distance, it is measurable only when the distance between the objects is extremely small. On a submicron scale, this force becomes so strong that it becomes the dominant force between uncharged conductors. In fact, at separations of 10 nm—about 100 times the typical size of an atom—the Casimir effect produces the equivalent of about 1 atmosphere of pressure (the precise value depending on surface geometry and other factors).[7]

In modern theoretical physics, the Casimir effect plays an important role in the chiral bag model of the nucleon; in applied physics, it is significant in some aspects of emerging microtechnologies and nanotechnologies.[8]"

Casimir force: two conductive plates separated by a distance, d:

$$\frac{F_c}{A} = -\frac{\hbar \cdot c \cdot \pi^2}{240 \cdot d^4} \ (1)$$

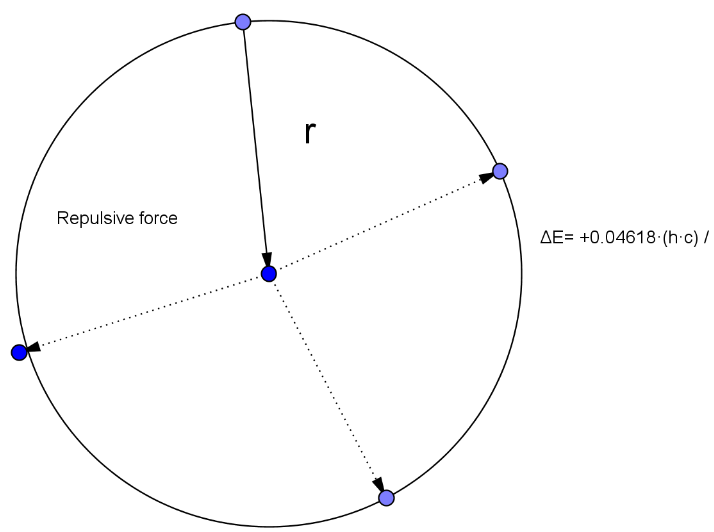
1.2 Reverse Casimir effect: repulsion.

https://en.wikipedia.org/wiki/Casimir_effect

Repulsive forces.

"There are few instances wherein the Casimir effect can give rise to repulsive forces between uncharged objects. Evgeny Lifshitz showed (theoretically) that in certain circumstances (most commonly involving liquids), repulsive forces can arise.[37] This has sparked interest in applications of the Casimir effect toward the development of levitating devices. An experimental demonstration of the Casimir-based repulsion predicted by Lifshitz was recently carried out by Munday et al.[38] Other scientists have also suggested the use of gain media to achieve a similar levitation effect,[39] though this is controversial because these materials seem to violate fundamental causality constraints and the requirement of thermodynamic equilibrium (Kramers-Kronig relations). Casimir and Casimir-Polder repulsion can in fact occur for sufficiently anisotropic electrical bodies; for a review of the issues involved with repulsion see Milton et al.[40]"

1.2.1 *Quantum Electromagnetic Zero-Point Energy of a Conducting Spherical Shell.T.H Boyer*



$$\triangle E(r) = +0.04618 \cdot \frac{\hbar \cdot c}{r} \ (2)$$

2 **Kimball A Milton, E K Abalo, Prachi Parashar and Nima Pourtolami, Repulsive Casimir and Casimir-Polder Forces, http://arxiv.org/abs/1202.6415v2**

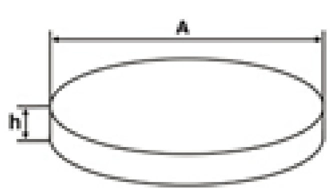
2 Features and photographs of the elements involved in the experiments.

Two discs: Neodymium magnets, 30 mm in diameter and a thickness of 5 mm (N35D305 30 mm
5 mm).

Neodymium magnets are made of rare earth alloy Ne.Fe.B. They are magnets with a strong tendency to corrosion so they need a protective coating, Nickel-Zinc-Silver or silver usually.

They are powerful magnets, about 6 times the Anisotropic Ferrite. They are specially designed to reduce size and increase power.

http://laboutiquedeliman.com/neodimio.html



2.1 Balances

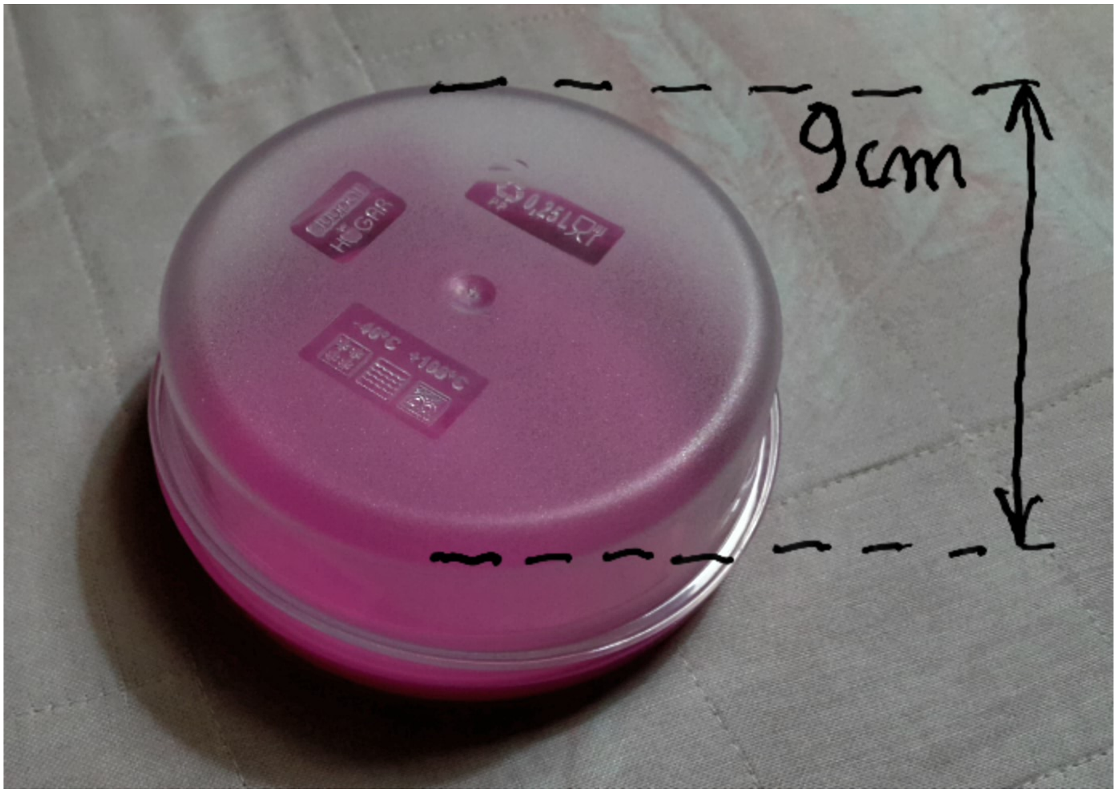
Electronic and maximum weight of 5 Kg, two electronic balances. One with a support for the weight, glass; to increase protection against magnetic fields.


UNIT
TARE
ON
93.032 MAX 5kg/d=1g

2.2 Magnets

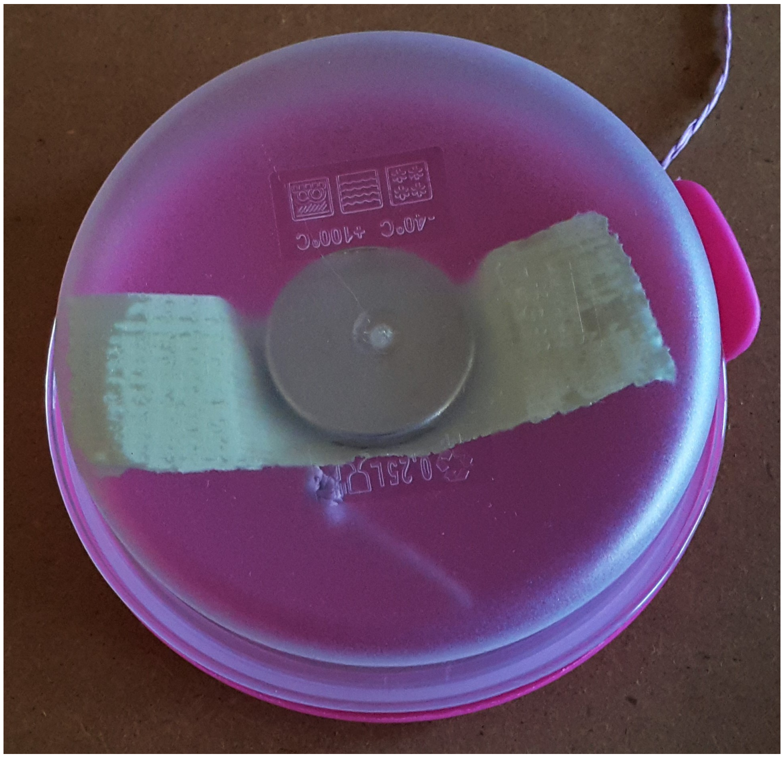
2.3 Circular box with hermetic cover.

Inside is placed in the center, one of the magnets; duct taped together.The polarity of the lower surface of this magnet is equal to the polarity of the other magnet attached in the middle of a CD case.



2.4 Plastic box disassembled.

2.5 Circular box with one of the magnets attached in its center



3 First experiment of repulsion of the two Neodymium magnets.

The balance increases its fictitious mass; caused by increased repulsion between the two magnets; and the consequent increased pressure on the balance; which detects a weight gain and therefore a non-real fictitious mass.


Tefal
94
g
tara


127 g
tara


129
g
tara


tefal
96 g
tara

4 Second experiment with the same configuration of the magnets. Balance with glass support. Increased magnetic insulator.

In this second experiment the balance is set to tare; such that the weight gain (fictitious mass, not real) is a measure of the pressure of repulsion between the two neodymium magnets. What is shown is the equivalence between this fictitious mass, and (not real, called dark matter) fictitious mass that generates repulsion energy of vacuum to the macroscopic scale of the Universe. It is the same physical effect. Repulsion, which produces the continuous expansion of the Universe.


UNIT
TARE
ON
93.032 MAX.5kg/d=1g

4.1 Videos of experiments: youtube links

0. Experimento de repulsión entre imanes de Neodimio.Parte I
   https://www.youtube.com/watch?v=Dk5sMXQRrC8

1. Experimento Parte II. Experimento de repulsión entre imanes de Neodimio.
   https://www.youtube.com/watch?v=xHIUQAkHB_g

2. Experimento Parte III. Experimento de repulsión entre imanes de Neodimio.
   https://www.youtube.com/watch?v=HmBEBzM7ZUY

3. Experimento Parte IV. Experimento de repulsión entre imanes de Neodimo.
   https://www.youtube.com/watch?v=WJXvnlfjQ-k

4. Experimento Parte V. Experimento de repulsión entre imanes de Neodimio.
   https://www.youtube.com/watch?v=Y9oYiVDvL9Q

5. Experimento Parte VI. Experimento de repulsión entre imanes de Neodimio.
   https://www.youtube.com/watch?v=lf58CKpuzdg

6. Experimento Parte VII. Experimento de repulsión entre imanes de Neodimio.

7. https://www.youtube.com/watch?v=ejiuv1r5egM

8. Experimento repulsión diferente balanza.Imanes de Neodimio.

https://www.youtube.com/watch?v=_ldw9C6aOaI

5 Results and interpretation of experiments with the two weighing scales.

5.1 Pros and cons of these home made experiments.

5.1.1 Cons of these home made experiments.

1) As shown in the photographs inserted in this article; and youtube videos; It is very evident the lack of full subjection magnet balance.

2) Lack of an automatism that go approaching the magnet inserted into the plastic box, so that there is perfect alignment between the two centers of the magnetic disks (with the same polarity on the facing surfaces). And the lack of fixed vertical stabilizing allow far more accurate final result (without swinging plastic magnet box).

3) That the approach is manual, involves measurements that vary in different samples, or performances of experiments.

5.1.2 Pros of these home made experiments.

1) The high power Neodymium magnets, supply the defects of stabilization. Although the approach of magnet box plastic, either manually.

2) We can observe gains; in the balances, very clear, fictitious mass; which they are not dependent on magnetic influence on the electronic elements of the balances.

3) Different measurement values of the fictitious mass depends only on the imaginary axis perpendicular alignment connecting the centers of the two magnetic disks, and the approach distance; without the magnet placed on the scale moves. These different values; which are correct, obey the hand pulse, which slowly approaches box plastic magnet, to the magnet Cd plastic box, placed above the balance.

With an automated system, both in the perpendicular alignment of the two magnets, as in the sujeccion of the magnet placed on the balances; be observed, fictitious gains equal mass; to the same vertical heights.

5.1.3 General numerical results fictitious gain mass, in grams, with two different balances.

With both types of weighing (two different balances). 1) the first counting the weight of the magnet system Cd box (undiscounted, then tare); fictitious gravitational mass differences are obtained; ranging from - 127g-129g least 94 g Cd magnet = fictitious gravitational mass gain of 33g-35g. In the videos, gains gravitational mass ranging from 135 g-131 g less than 94 g Cd magnet = fictitious gravitational mass gain observed 35 g-41 g.

2) With the use of the second balance with plastic insulating support and discounting the weight of Cd box iman (tare zero) system; in photography inserted in this article, a gain of fictitious gravitational mass of 62 g it is observed.

5.1.4 Interpretation.

The same evidence of the results obtained with two different balances; It implies that the pressure of repulsion between the two powerful Neodymium magnets, produced a gain of fictitious gravitational mass; in measurements in the balances.

5.2 Equivalents of the experiments: the reverse Casimir effect (spherical shell) and the repulsion effect of macroscopic spherical shell of the observable Universe. Equivalences between the cosmological constant and the repulsive energy of the quantum vacuum.

5.2.1 Opposite Casimir effect: 1) Model spherical shell. Boyer T.H, and other physicists.

By results already achieved in some of our work; the neutrality of the quantum vacuum to the virtual electrical charges; It is due to the unification of gravity and electromagnetism by the fundamental equation, in which the partition function obtained by the nontrivial zeros of the Riemann zeta function plays an essential role. This equation is as follows (see the relevant articles):

$$4\pi^2 \cdot (\pm e)^2 \cdot \left(\sum_{Z_n}^{\infty} \exp\left(-Z_n\right) \right)^2 = 4 \cdot m_{Pk} \cdot m_e \cdot G_N \ (3)$$

$\pm e = quantized\ electric\ charge = 1.6021765656 \cdot 10^{-19} C$
$m_{Pk} = Planck\ mass = \sqrt{\frac{\hbar c}{G_N}}$
$m_e = electron\ mass = 9.10938921 \cdot 10^{-31} Kg$
$G_N = 6.67384 \cdot 10^{-11} N \cdot m^2/Kg^2 = universal\ gravitational\ constant$
$Z_n = imaginary\ part\ of\ the\ nontrivial\ zeros\ of\ the\ Riemann\ zeta\ function$
$\zeta(s) = 0\ ;\ s = \frac{1}{2} + i \cdot Z_n$

Articles on request:

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

2) Y Dios,También Está en la Ciencia Part I

3) Y Dios,También Está en la Ciencia Part II

Equation (3) can be written as a zero energy:

$$4\pi^2 \cdot (\pm e)^2 \cdot \left(\sum_{Z_n}^{\infty} \exp(-Z_n) \right)^2 - 4 \cdot m_{Pk} \cdot m_e \cdot G_N = 0 \ (4)$$

Equation (4) it can be interpreted as a zero energy; and therefore equivalent to an annihilation of a particle-antiparticle pair.

For there to be a finite value; not zero; will be necessary, then there is a matter antimatter asymmetry, also at the level of virtual particles, and therefore the quantum vacuum itself

As we have shown in previous work, matter-antimatter asymmetry can be computed as a function dependent; of total vacuum pairs (R8 lattice, 240 non-zero roots of E8 group. Octonions); the inverse of the fine structure constant (zero momentum), and the amount of electron positron pairs, or microstates. Equal to the sum of quantum wave curvatures, or circular strings (natural logarithm ratio Planck mass, electron mass, in this case). At the same time; these sums of quantum curvatures circular wave-strings are also the sums of probabilities; since it is true:

$$\sum_p \frac{1}{p} = \int \frac{dp}{p} = \ln(p) + C \ (5)$$

Making change, p, by the uncertainty radius of string and/or mass.Consult previous works.

$$\sum_{p(+)} \frac{1}{p(+)} + \sum_{p(-)} \frac{1}{p(-)} = \ln[p(+)] + \ln[p(-)] = 2 \cdot \ln(p) \to \cdots \equiv$$

$$n(pairs\ electron\ positron) = 2 \cdot \ln(m_{PK}/m_e) \ (6) \ ; \ p(+) \equiv matter \ ; \ p(-) \equiv antimatter$$

5.2.2 Asymmetry factor calculation; matter antimatter.

$$n(b) = number\ of\ barions \quad ; \quad n(\bar{b}) = number\ of\ antibarions$$

$$\Omega_b = \frac{n(b) - n(\bar{b})}{n(b)} = \frac{\left[2 \cdot \ln(m_{PK}/m_e) + \alpha^{-1}(0)\right] - 240}{2} = 0.045874149734999 \ (7)$$

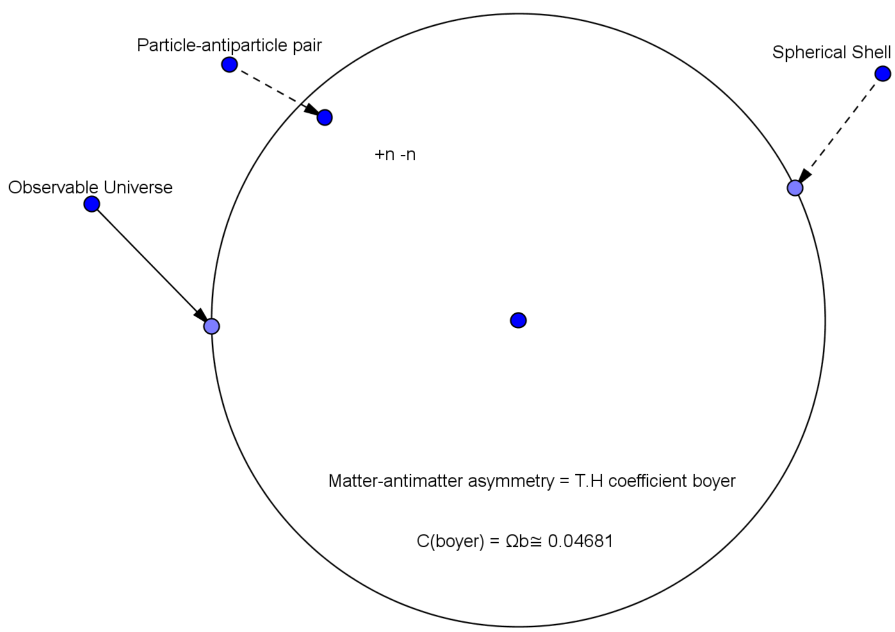
$$\alpha^{-1}(0) = 137.035999173$$

5.2.3 Equivalence factor calculation T.H Boyer and matter antimatter asymmetry factor.

Being; the observable Universe, equivalent to a huge spherical shell; in which there is the quantum vacuum of virtual particles; more matter-energy of the universe; then there must be a repulsion; and therefore a repulsive acceleration. In previous work it has already been shown that this repulsive acceleration is exactly the product of the speed of light in vacuum, multiplied by the hubble constant.

The amount of fermionic baryons or baryon density has to be almost equal, so, to the factor obtained by the complex calculation of regularization of infinite, performed masterfully by T.H Boyer.

Recall that the fermions, involve repulsion for calculating the energies of the quantum vacuum zero point. Conversely; bosons, involving forces of attraction.



$a_r = repulsive\ acceleration = c \cdot H_0$

$$C_{boyer} = +0.04681 \cong \Omega_b = 0.045874149734999 \ (8)$$

$$\triangle E_{Sp}(r) \cong +\Omega_b \cdot \frac{\hbar \cdot c}{r} \equiv \triangle E_{Sp}(r) \cong +C_{boyer} \cdot \frac{\hbar \cdot c}{r} \ (9)$$

5.2.4 The energy of the vacuum: function of the partition function of the nontrivial zeros of the Riemann zeta function, the coupling of Higgs vacuum (ratio Planck energy / Higgs vacuum energy), the 240 pairs of vacuum, the coefficient of TH Boyera and the vacuum energy density .The radius shall be that of observable Universe: c / H

Although the vacuum energy can be calculated in various ways; in this case the equation (3), which unifies electromagnetism and gravity by the partition function of the nontrivial zeros of the Riemann zeta function is used. Must be added the Higgs vacuum coupling with maximum energy term; It ie the Planck energy. With two coficientes: T.H coefficient Boyer, and 240 non-zero roots of E8 group representing R8 lattice for the quantization of vacuum pairs.

By equation (3) or (4):

$$4\pi^2 \cdot (\pm e)^2 \cdot \left(\sum_{Z_n}^{\infty} \exp\left(-Z_n\right) \right)^2 = 4 \cdot m_{Pk} \cdot m_e \cdot G_N \rightarrow \frac{4 \cdot m_{Pk} \cdot m_e \cdot G_N}{4\pi^2 \cdot (\pm e)^2} = \left(\sum_{Z_n}^{\infty} \exp\left(-Z_n\right) \right)^2$$

$$\left(\sum_{Z_n}^{\infty} \exp\left(-Z_n\right) \right) = (1374617.4545188)^{-1}$$

Coupling Planck energy, vacuum Higgs energy :

$$\frac{E_{PK}}{E_{VH}} \ ; \ E_{PK}(GeV) = 1.2209322789090701 \cdot 10^{19} GeV \ ; \ E_{VH} = 246.219650867759 \ GeV$$

Radio observable Universe:

$$R_U = \frac{c}{H_0} \ ; \ H_0 = 2.30547615889492 \cdot 10^{-18} s^{-1}$$

$$\Omega_\Lambda = 1 - \frac{1}{\pi}$$

Finally, the vacuum energy of the spherical shell, the observable universe will:

$$\triangle E_{Sp}(R_U) \approxeq +0.04681 \cdot \frac{\hbar \cdot c \cdot 240 \cdot \left(\frac{E_{PK}}{E_{VH}} \right)}{\Omega_\Lambda \cdot R_U \cdot \left(\sum_{Z_n}^{\infty} \exp\left(-Z_n\right) \right)^2} \approxeq E_{Vacuum} \ (10)$$

$$E_{Vacuum} \approxeq 2.34326765567304 \cdot 10^{-3} eV$$

The result obtained for the vacuum energy perfectly matches on experimental value and that obtained in our previous works.

This same value of vacuum can be obtained by a direct function of the repulsive acceleration, which in this article mentioned, and which can be found in our articles:

2) Y Dios,También Está en la Ciencia Part I

3) Y Dios,También Está en la Ciencia Part II

Conclusions.

Repulsion experiments, performed with Neodymium magnets are a useful and macroscopic equivalents to the reality of the value of the vacuum model; obtained by adaptation of the conductive spherical shell model T.H Boyer for the spherical shell of the observable Universe. The first, and most important consequence: it does not exist, the so-called dark matter. This matter is fictitious and not real; effect of the pressure of the quantum vacuum repulsion. And as has already been shown in our works; this same repulsive acceleration of the quantum vacuum is the one that perfectly explains the anomaly of the rotation curves within galaxies.

References

[1] Timothy H. Boyer, Quantum Electromagnetic Zero-Point Energy of a Conducting Spherical Shell and the Casimir Model for a Charged Particle, Phys. Rev. 174, 1764 – Published 25 October 1968

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Equation (10) of the previous article, which gives the value of the energy of the quantum vacuum, can be converted more accurately with the inclusion of a correcting factor directly dependent on the dimensionless factor of the entropy of a black hole 4π :

$$E_v = +\frac{\hbar c \cdot c\,(Boyer) \cdot 240 \cdot \left(\frac{E_{PK}}{V_H}\right) \cdot \left(1+\frac{1}{4\pi}\right)}{R_U \cdot \left(\sum_{n=1}^{\infty} \exp\left(-t_n\right)\right)^2} \quad (63)$$

And surprisingly, the T.H Boyer coefficient is very close (numerical functional equivalence) to the next known function dependent on the imaginary and real parts of the non-trivial zeros of the Riemann zeta function:

$s = \sigma_n + it_n$

$$Z\,(1) = \sum_{n=1}^{\infty} \left[\left(\sigma_n + it_n\right)^{-1} + \left(1-\sigma_n - it_n\right)^{-1}\right] = \frac{1}{2} \cdot \left[2+\gamma - \ln\left(4\pi\right)\right]$$

$$c\,(Boyer) = 0.04681 \sim 2 \cdot Z\,(1) = 0.046191417932242$$

0.6. Extension of special relativity for infinite velocities: zero energy and zero time

Equation (51) for the energy of the quantum vacuum: $E_v = m_{PK} \cdot \sqrt{\frac{m_{PK} \cdot a_0 \cdot G_N \cdot 3}{8\pi}}$ .By simple algebraic manipulation it can be reduced to:

$$E_v = \frac{m_{PK} \cdot c^2}{\left(\frac{8\pi}{3}\right)^{1/4} \cdot \sqrt{\exp\left(z\right)}} \ ; \ z = \left(\exp\left(\pi^2/2\right) + \ln\left(R_\gamma\right)\right)$$

The above equation is clearly a decrease of Planck's energy, dependent on a relativistic equation; that is to say:

$$\frac{1}{\sqrt{\exp\left(z\right)}} \equiv \frac{1}{\sqrt{\left(\frac{v^2}{c^2}-1\right) = \exp\left(z\right)}}$$

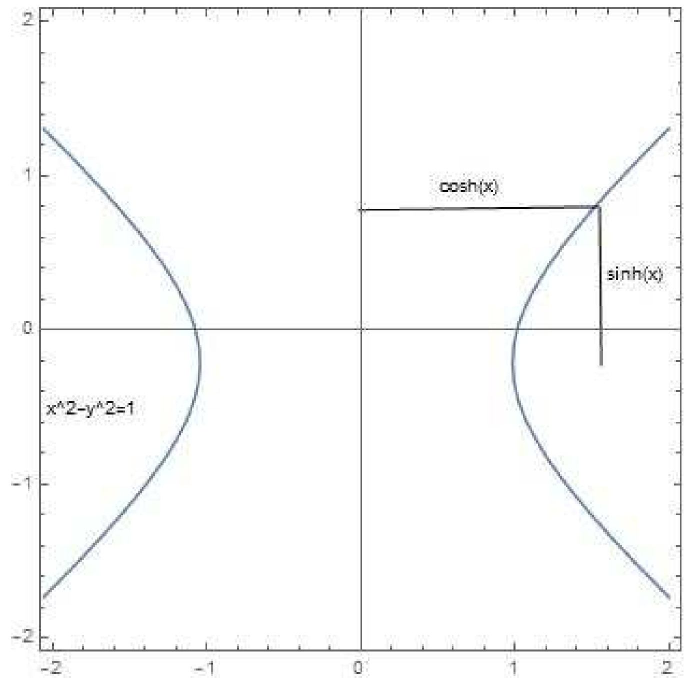

FIGURE 0.6.1.

For a wormhole represented by a hyperboloid of a sheet, the relativistic equation for the transformation coefficient $\gamma = \cosh(x)$,Which is nothing more than a trigonometric function of a hyperbolic space and consistent with the hyperbolic geometry of a leaf-like hyperboloid wormhole. Where $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$

In a hyperbolic space with compact dimensions in circles the path corresponds to: $\arccos h\,(x)$

An equation must be found that for the limit of the speed of light both transformations are equal; that is to say:

$$\frac{1}{\sqrt{1-\frac{c^2}{c^2}}} = f_1(c) = f_2(c) = \infty$$

This is achieved with the derivative of the hyperbolic path: $(\arccos h\,(x))' = \frac{1}{\sqrt{\frac{c^2}{c^2}-1}} = f_2(c)$ (64) ; $x = \frac{c}{c}$

It should be noted that the path is inside the wormhole, since $\gamma = \cosh(x)$ Is inside the wormhole and is also perpendicular to the walls of the wormhole.

To obtain the zero time described by: $t' = t \cdot \sqrt{1 - \frac{2 \cdot m_{PK} \cdot G_N}{r_s\left(m_{PK}\right) \cdot c^2}} = t \cdot \sqrt{1-1} = 0$; As a transformation dependent on Eq. (64), infinite speeds must necessarily exist; that is:

$$t' = 0 = \lim_{v \to \infty} \left(\frac{t_0}{\sqrt{\frac{v^2}{c^2} - 1}} \right) = t \cdot \sqrt{1 - \frac{2 \cdot m_{PK} \cdot G_N}{r_s\left(m_{PK}\right) \cdot c^2}}$$

And for energy, and therefore for mass, you get:

$$E' = 0 = \lim_{v \to \infty} \left(\frac{E_0}{\sqrt{\frac{v^2}{c^2} - 1}} \right)$$

For a circle of circumference length $L = 2\pi r$:

$$L' = \infty = \lim_{v \to \infty} \left(L_0 \cdot \sqrt{\frac{v^2}{c^2} - 1} \right)$$

The above equation seems to pose a paradox that seems to contradict the assertion that when in a physical theory the infinities appear; Then the limit of applicability of the theory ends, is not consistent, etc: How can there be an infinite length ?. Its possible solution may be simple: 1) If the virtual wormhole rotates at an infinite speed, then the number of circles with finite radius rotating at an infinite speed is equivalent to an infinite number of circles of length L.

For an observer with a limit of the speed of light, you will not be able to distinguish or know (energy = 0, t = 0. No possible transmission of energy to the observer with speed limit v = c) if the circle is rotating to a Infinite speed or is at rest. Both descriptions are equivalent.

For the observer with limit of the speed of light c:

$$t' = \lim_{v \to \infty} \left(\frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}} \right) = 0 \text{ ; } E' = \lim_{v \to \infty} \left(\frac{E_0}{\sqrt{1 - \frac{v^2}{c^2}}} \right) = 0 \text{ ; } L' = \lim_{v \to \infty} \left(L_0 \cdot \sqrt{1 - \frac{v^2}{c^2}} \right)$$

2) In a hyperbolic space there are ideal triangles, which have exactly the area 4π , or dimensionless factor of the entropy of a black hole. The perimeter length of these ideal triangles is infinite. An ideal triangle appears, for example, by the tangency of three mutually tangent circles.

Therefore, when the infinities do have physical meaning and do not lead to paradoxes or inconsistencies; Should be admitted as possible solutions.

The zero energy condition corresponds to the net energy derived from equation$(-e)\cdot\pi^2\cdot\sum_{n=1}^{\infty}\exp\left(-t_n\right)+\sqrt{m_{Pk}\cdot m_e\cdot G_N}=0$; Making it dependent on distance; that is:

$$\frac{(-e)\cdot(+e)\cdot\pi^4\cdot\left[\sum_{n=1}^{\infty}\exp\left(-t_n\right)\right]^2}{d}+\frac{m_{PK}\cdot m_e\cdot G_N}{d}=0\ (65)$$

This is when the existence of soft photons and soft zero energy gravitons begins to make sense within black holes; In which interior and for the outer observer the time is canceled, t = 0

If there is a spinning motion of the virtual wormholes that make up the quantum vacuum; Then it is logical to argue that there may be a speed of rotation of the whole universe as a whole. Again and speculatively; This rotational speed would be dependent on the partitioning function of the imaginary parts of the non-trivial zeros of the Riemann zeta function and the velocity of light in the vacuum; that is:

$$v_G(U)\sim c\cdot\left(\sum_{n=1}^{\infty}\exp\left(-t_n\right)\right)$$

0.6.1. Density of mass: Ω_m. The mass density corresponds to the inverse of the integral of the dimensionless mass, between the intervals of the curvatures +1 and -1; Of the outer and inner surfaces of the wormhole, with the relativistic transformation factor $\frac{1}{\sqrt{1-x^2}}$; $x^2=\frac{v^2}{c^2}$

$$\Omega_m=\left(\int_{-1}^{1}\frac{dx}{\sqrt{1-x^2}}\right)^{-1}=\frac{1}{\pi}\ (66)$$

And automatically the energy density of the vacuum $\Omega_\Lambda:\ 1-\pi^{-1}$

0.6.2. The mass-energy equivalence for the mass of the Universe. The energy equivalent of the rest mass of the universe, according to the equation of mass-energy equivalence of Einstein, is related to the repulsive acceleration of the quantum vacuum by the following equation:

$$M_U\cdot c^2=M_U\cdot a_0\cdot R_U\ (67)$$

$M_U =$ Mass of the universe; $R_U =$ Observable universe radius

$$a_0 = \frac{c}{t_{PK} \cdot R_\gamma \cdot \exp(y)} \; ; \; y = \exp\left(\pi^2/2\right) \; , \; R_U = l_{PK} \cdot R_\gamma \cdot \exp(y)$$

$$a_0 \cdot R_U = c \cdot \left(\frac{l_{PK}}{t_{Pk}} = c\right) = c^2$$

CONCLUSIONS

In this work, the fundamental importance of the partition function of the imaginary parts of the nontrivial zeros of Riemann's zeta function in the union of gravitation with quantum mechanics has been conclusively demonstrated. This function has allowed to establish two fundamental equations that allow to unify and to derive the Planck constant and the elemental quantum charge.

It is deduced from these equations automatically; That the fundamental constants as the gravitational constant, the elementary electric charge, the Planck constant, the mass of the electron; Are at their basic level invariants or constants.

The annulment of time for the virtual vacuum is a fact, which we think, is well founded. Time would then be an emergent property for the so-called real part of the universe with boundary velocities equal to the speed of light in the vacuum.

The existence of infinitely many states that are transformed into each other instantly in the virtual vacuum would be an unobservable reality for observers with finite speed limit. The probabilistic nature of quantum mechanics would be the inevitable consequence of the existence of this reality of states not dependent on time ($t = 0$) of the virtual vacuum unobservable (not virtual observers, or finite speed limit).

The interlaced particles, when one of them is observed and, therefore, is disturbed by communicating energy; They would instantly change their correlated states as a consequence of pure space movement with zero energy and zero time conditions. This change of the correlated states would be produced by the change of curvatures +1, -1; Of the virtual wormholes that would join or connect these entangled particles. The energy used in the measurement would be completely absorbed by the particle or the observed-disturbed system; So the virtual vacuum would absorb zero energy.

The R parity of supersymmetric theories that transform fermions into bosons and vice versa seems to be linked to the +1 and -1 curvatures of the inner and outer surfaces of these virtual quantum wormholes.

It has been well established the existence of a repulsive acceleration of the quantum vacuum that would be fundamentally responsible for the anomaly of the rotation speed within the galaxies. It remains to be determined whether any particles such as axion could modulate this repulsive acceleration.

The existence of a reality not apprehensible by observers with finite speed limit and independent of these observers is a physical fact that, we think, is well founded. Renormalization, for example, in quantum electrodynamics would not be a mere mathematical artifact to obtain finite results; but it would be a true reflection of this unobservable reality of infinite multi-state virtual vacuum, in which time disappears, or is canceled.

All the main hypotheses have been corroborated by the obtaining of relevant and highly accurate empirical data. Therefore, we are forced to admit that space-time is formed by seven dimensions compacted in circles and holographied in two dimensions. The other four extended dimensions correspond to the classic ones.

In short, we think, that has opened an important door to deepen a unification of gravitation with the rest of the fundamental forces.

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