Quantum information and Cosmology: the connections

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Abstract

The information or knowledge we can get from a quantum state, depends on the interaction of this state with the measurement process itself. As we know, this involves an uncertainty in the amount of information and accuracy of this knowledge. Now we ask: is there an information content intrinsic and independent of the observer, in quantum reality? Our answer is a resounding, yes. More precisely, we show that this information is encoded on surfaces, and specifically in circular compactifications. That is, there is a holograph on surfaces. In this encoding of quantum information will call as the strong holographic principle. Due to the application of this principle, it will show as the Higgs vacuum value implies a subtle correction by entropic uncertainty. The connections of quantum information, to cosmology, are clearly shown when the values of the dark energy density $\Omega_{\wedge} \approxeq \ln 2$ and matter density $\Omega_m = \Omega_c + \Omega_b \approxeq 1 - \ln 2$

It showed that the equation of the energy-momentum has five solutions by factoring by two components which appear in terms of mass and imaginary momentum. Far from being a mere mathematical artifice, we see that these states should exist, and that our interpretation of them is that every particle appears to be a mixture of two states, one of them unobservable, having an imaginary component. In other words: these involve imaginary states faster than the speed of light, without contradicting Special Relativity, as we shall see. Failure to observe Cherenkov radiation forces us to determine which are virtual states. These five states also appear to be related to the minimum number of microstates which generate the group E8.

Finally: all these results lead us to postulate a particle candidate to the dark matter, of approximately 9,2 Gev.

Acknowledgements

I am gratefull to God Almighty for letting me know of its wonders.And the Lord Jesus Christ, our Savior

1 The five basic solutions of the energy-momentum equation

In this section we show five basic solutions of the equation of energy-momentum. These five solutions imply the existence of states of energy, mass and momentum, imaginary. If these states are interpreted as coexisting, then you get three consequences: 1) the existence of imaginary mass means faster than the speed of light, these components being imaginary, virtual states. There is no contradiction with quantum mechanics and special relativity, since the same relativity equation for the four spatial coordinates, using the imaginary light speed, cti. 2) As a result of the four positive energy solutions, and as a vector sum, you get on one hand the minimum limit of the uncertainty principle. And for real particles, it seems that while the particle is not observed, measured, the particle is found in two states at once. 3) The extension of these four states of positive energy to seven dimensions, to calculate the fine structure constant to zero momentum. Using equation relativistic velocity addition, we can get imaginary speeds necessary to obtain the real energy value, to make a measurement.

$$E^2 = m^2c^4 + p^2c^2 = \begin{array}{|c|} \hline (imc^2+pc)(-imc^2+pc) = E_1^2 \\ \hline (imc^2-pc)(-imc^2-pc) = E_2^2 \\ \hline (mc^2+ipc)(mc^2-ipc) = E_3^2 \\ \hline (-mc^2+ipc)(-mc^2-ipc) = E_4^2 \\ \hline (imc^2+pc)(mc^2+ipc) = iE_5^2 \text{ negative energy state} \\ \hline \end{array} \quad (1)$$

$$\begin{pmatrix} imc^2-pc & -imc^2+pc \\ imc^2+pc & -imc^2-pc \end{pmatrix} = 0 \quad \begin{pmatrix} mc^2+ipc & mc^2-ipc \\ -mc^2+ipc & mc^2-ipc \end{pmatrix} = 0$$

$E_T = \sqrt{E_1^2+E_2^2+E_3^2+E_4^2} = 2E$ (2)

Of the equations of the table one, it is deduced immediately that the mass, energy and momentum (imaginary); they must satisfy the following equation of the special relativity. (we will make the case of the mass alone):

$\pm im = \frac{m}{\sqrt{1-\left(\frac{C\cdot\sqrt{2}}{C}\right)^2}}$ (3)

The negative energy solution let alone, as will be shown later, his correspondence with the electric charge. Then, for purely virtual particles, and since their speed can not be measured, despite having a minimum value given by equation 3; is fulfilled uncertainty principle for energy and time.

$2\triangle E\triangle t \geq \hbar \to \triangle E\triangle t \geq \hbar/2$

In the case of a real particle with its associated virtual states, we are forced to interpret the particle, while it is not observed, any measurement is not performed on it, is found in two states. And only when performing a measurement, becomes a single state. But this necessarily means that virtual components acquired a speed exceeding the speed of light by a factor $i\sqrt{3}$

$2E/\sqrt{1-\left(\frac{i\sqrt{3}C}{C}\right)^2}$; $\sqrt{1-\left(\frac{i\sqrt{3}C}{C}\right)^2} = \beta$; $E_{T'} = \sqrt{(\sum_{n=1}^{4} E/\beta)^2}$
$= E$

If an assumption is made speculatively, by which the speeds are the result of the sum of two speeds equal, following equation summation relativistic velocities, then get the following speeds complex (two solutions):

$v_1 = v_2 = [(1-i)/\sqrt{2}\ ,\ (1+i)/\sqrt{2}]$, $v_3 = (v_1+v_2)c/(1+\frac{v_1v_2}{c^2}) = c\sqrt{2}$, $v_4 = v_5 = [-3i/\sqrt{3}\ ,i/\sqrt{3}]$

$[(1-i)/\sqrt{2}]\cdot[(1+i)/\sqrt{2}]c^2 = c^2$; $(-3i/\sqrt{3})(i/\sqrt{3})c^2 = c^2$

$(v_4+v_5)c/(1+\frac{v_4v_5}{c^2}) = v_6 = ci\sqrt{3}$

Contradiction does not exist with the special relativity, but an extension of the same one to the quantum world. In the special relativity an imaginary speed is used (imaginary time), involved in four space time coordinates. Using quaternions, and taking the distance unit (Planck length, Planck length ratio) is obtained immediately imaginary speed factor $i\sqrt{3}$

$x_4 = x_1 i + x_2 j + x_3 k$, $x_1 = 1$, $x_2 = 1$, $x_3 = 1$; $\|x_4\| = \sqrt{3}$, $cti\,\|x_4\| = cti\sqrt{3}$

1.1 Possible connection of superluminal speeds with Bell inequality theorem

Going on highly speculative note, perhaps there is a connection of these states with the maximum allowed for inequality Bell's theorem.Noted only two observations:1)$4(states)/\sqrt{2} = 2\sqrt{2}$ (Tsirelson limit of inequality Bell's theorem).2) $x_1 = ...x_8 = 1$, $z = e_0x_1 + e_1x_2 + ... + e_8x_8$; $\|z\| = 2\sqrt{2} = \sqrt{8}$

2 Strong Holographic Principle. Higgs vacuum value. Higgs boson mass

The group E8 with dimension 248 complex, real dimension 496. The E8 root system is a rank 8 root system containing 240 root vectors spanning R8. 240 vectors are equivalent to the number of hyperspheres, in eight dimensions, which can touch a equivalent hypersphere without any intersections. This number, 240, forming a lattice, is the maximum quantity of particles of the vacuum, in its state of minimal energy, as we demonstrate in the essay of last year. In this paragraph, we obtain the same result by the five microstates derived from the five solutions of the equation (3). Similarly, 240 is representable by a seven-dimensional vector, with octonions, as follows:

Fibonacci numbers dividers 240: $1, 2, 3, 5, 8$, $\sum_{F_n/240} F_n^2 = 103 = \lfloor 2 \cdot \ln(m_{pk}/m_e) \rfloor$; $137 = 11^2 + 4^2 = \lfloor \alpha^{-1} \rfloor$, $x_7 = 1e_1 + 2e_2 + 3e_3 + 5e_4 + 8e_5 + 11e_6 + 4e_7$, $\|x_7\| = 240$

The Kissing number of lattice 8d, k(8d) = 240; It has the following main property:
$k(8) = \sum_{d=2, d\neq 5}^{d=7} k(d) = k(2) + k(3) + k(4) + k(6) + k(7) = 6 + 12 + 24 + 72 + 126$

Another fundamental property of this summation is: each k(d) (Kissing number), is the product of n two-dimensional planes, so that k(d) = nk(2d), ie:

$k(8) = 240 = 1 \cdot k(2) + 2 \cdot k(2) + 4 \cdot k(2) + 12 \cdot k(2) + 21 \cdot k(2)$ (4) , $1 + 2 + 4 + 12 + 21 = 40 = k(5d)$

Equality given by the expression (4) is the basis of the strong holographic principle. By this principle, the fundamental properties of space-time-mass are holograms of two-dimensional surfaces with six spheres that touch each other at center, the seventh. That is, the compactifying, circular, of the seven dimensions, is a plane holographed seven circles. The proof that this principle is correct comes from the calculation of the value of the Higgs vacuum and the Higgs boson mass. Each circle has a curvature: $1/r$

The scaling law, which is essential, is immediately obtained as the sum of all circular curvatures between two intervals.

$$\sum_{r_2}^{r_1} \frac{dr}{r} = \int_{r_2}^{r_1} \frac{dr}{r} = \ln(r_1/r_2) \quad (5)$$

This scaling law is deductible, of the uncertainty principle, considering that the vacuum is the disintegration of photon pairs (same speed c) to any particle-antiparticle pairs. $\triangle m_f$ $(photon)$, $\triangle r_1 \triangle m_{f1} c \geq \hbar/2$; $\triangle r_2 \triangle m_{f2} c \geq \hbar/2$ .Taking the minimum possible value of uncertainty: $min(\triangle r_1 \triangle m_{f1} c) = min(\triangle r_2 \triangle m_{f2} c) = \hbar/2$, $2\triangle r_1 \triangle m_{f1} = 2\triangle r_2 \triangle m_{f2} = \hbar/c$ .Changing the photon by the particle-antiparticle pair: , $2\triangle r_1 \triangle m_1 = 2\triangle r_2 \triangle m_2 \rightarrow 2(\triangle r_1 / \triangle r_2) = 2(\triangle m_2 / \triangle m_1)$ $r_1 \geq r_2$, $m_2 \leq m_1$ .Applying equation (5): $2\sum_{r_2}^{r_1} \frac{d\triangle r}{\triangle r} = 2\int_{r_2}^{r_1} \frac{d\triangle r}{\triangle r} = 2\ln(r_1/r_2) = -2\sum_{m_1}^{m_2} \frac{d\triangle m}{\triangle m} = -2\int_{m_1}^{m_2} \frac{d\triangle m}{\triangle m} = -2\ln(m_2/m_1)$

Considering the vacuum as the state of lowest mass with electric charge (electrons) stable (lifetime of the particle, infinity) and its field of bosons (photons) then we obtain k(8d), with a slight asymmetry due to the baryon density, as the sum of electron-positron pairs and the inverse of the fine structure (zero momentum) constant, as the number of photons. Scaling for the mass and radius are the Planck mass and the Planck length. $2\ln(m_{pk}/m_e) + \alpha^{-1} = 103.055683073963 + 137.035999073 = 240.091682146963$

$(240.091682146963 - 240)/2 = 0.0458410734815 \approxeq \Omega_b$

As can be seen these logarithms are amounts of information, because:

$\lfloor 2\ln(m_{pk}/m_e) + \alpha^{-1} \rfloor = 240 = \|x_7\|$

2.1 The five states obtained from table 1, the dark energy density of the vacuum Ω_Λ and the group E8

The zero point-energy: $(\hbar\omega/E) = 2$, $\hbar\omega = E_0$, $E = E_1$; $(E_0/E_1) = 2 \rightarrow 2$ states. Applying the law of the change of scale, or calculating the information quantity, it is had: $\ln 2 \approxeq \Omega_\Lambda$ .We show that this value of the dark energy density must be correct, for several reasons. Considering the five states obtained by Table 1, and taking the imaginary values for the dark energy density, it has:

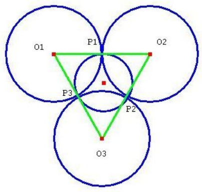
$(\sqrt{5}+i\ln 2)(\sqrt{5}-i\ln 2) = dE^2/E^2, E^2 = \exp(5+\ln^2(2)) = 239.9553835885511085$.And this slight asymmetry with respect to the exact value of 240, it can only be the density of baryons, ie: $(240 - 239.955383588551108506) = 0.0446141144889149423$ .Then the physical density of baryons is:$\Omega_{Bf} = (0.0446141144889149423)/2 = 0.02230705724445747$ .Thus the density of dark matter is: $(1 - \ln 2 - \Omega_B) = 0.26223870495113 = \Omega_c$ .Thus the total density of matter must be: $\Omega_m \approxeq 1 - \ln 2$ .Similarly, if the value of the total density of matter corresponds closely with $1 - \ln 2$;then it is possible to obtain the value of the Higgs vacuum as a function of this value, the double value of the five micro states, or their equivalents, applying scaling. i.e.: 5 microstates. $2 \cdot 5 \equiv 10d \equiv 2\sum s \equiv \left|3(\frac{4}{3})\right| + \left|3(\frac{2}{3})\right| + \left|3(\frac{-1}{3})\right| + \left|3(\frac{1}{3})\right| + |-1| + |+1|$ (electric charges). Equivalent mass Higgs vacuum as to the mass ratio of the electron: $= 481842.89379$, $[\exp(10 + \Omega_m^{-1})/\sqrt[4]{2}] - (\Omega_m + e^{-10\cdot\ln 2})^{-4} = mv(H)/m_e$ (6) .With five microstates is possible to generate the group E8 and 32 supercharges, ie: $2 \cdot 5! = 240$, $2^5 = 32$; $SU(11) = 5!$. It also gives the group SU(7): $240/5 = dim[SU(7)] = 2k(4d) = 8k(2d)$

2.2 Application of strong holographic principle. Higgs vacuum value and the Higgs boson mass. Entropic uncertainty principle extended to six dimensions.

The maximum amount of circles which touch each other at a central circle in two dimensions, $k(2d) = 6$ (7 with the central circle) is the foundation, both E8 group, five micro states ,five spins, and five different possible electrical charges. The Higgs vacuum and Higgss boson mass, are obtained by two main terms: 1) The sum of all the spins module. 2) A term of curvature dependent, Kaluza-Klein radius in seven dimensions, smaller radius. The Higgs vacuum as it generates the masses of all the particles, have to be symmetrical with respect to all spins. For this reason the model used is that of particle in a spherically symmetric potential. E8 group obtained from these six circles as the ratio of all permutations of these circles, divided by the minimum number of three mutually tangent circles which by interaction generates another circle or closed string obtained by the Descartes' theorem. Nonzero roots E8: $240 = 6!/3$

2.2.1 Descartes' theorem

For interaction chosen is the three mutually tangent circles, generating another circle that passes through three points of tangency of the above. If P_1, P_2, P_3 are the points of tangency three circles tangent externally to each other, we have to O_1P_2 equals semiperimeter of $\triangle O_1O_2O_3$, least O_1 opposite, and similarly for the other radius, and therefore P_1, P_2, P_3 are the points of contact of the inscribed circle in triangle with sides $\triangle O_1O_2O_3$



With three equal circles, the radius of the fourth circle, applying the Descartes circles theorem, is: $\frac{1}{r_4} = \sqrt{\frac{3}{r_1^2}}$, $r_4 = r_1 \cdot \cos\theta_{1T} = r_1 \cdot \cos\theta_{s=1/2}$, where: θ_{1Td} is the Angle between one side and a face of the tetrahedron. And $\theta_{s=1/2}$ is the angle of the cone of spin 1/2. $\sin\theta_{1Td} = \cos\theta_{s=2}$; $\sin^2\theta_{1Td} = (2/3)$,electric charge quantization; $\cos^2\theta_{1T}$; electric charge quantization, $|\pm 1/3|$; $(\sin^2\theta_{1Td} + \cos^2\theta_{1T})e_\pm = |\pm 1|\, e_\pm$; $(\sin^2\theta_{1Td} - \cos^2\theta_{1T})e_+ = (1/3)e_+$, $\sqrt{(2/3)_x^2 + (2/3)_y^2 + (2/3)_z^2 + (2/3)_t^2} = (4/3)$
$= 2 \cdot \sin^2\theta_{1Td}$

2.2.2 Particle in a spherically symmetric potential

The effective potential in this case, derived from the Schrodinger equation, is: $V_{eff}(r) = V(r) + \frac{\hbar^2(s+1)s}{2m_0r^2}$ .Isolating the spins, by summing over all of them (Higgs vacuum spins symmetry; for any particles of any spin acquires mass), and expressing the potential energy as it is, taking into account that for the vacuum v (r) = 0, we have: $E_S = \sum_s E \cdot (s+1)s; (E_S/E) = \sum_s (s+1)s = 12.5$.However, this potential should be modified by the curvature of space-time at the microscopic level. And this curvature is perfectly consistent with the holographic principle and with a curvature of interaction of three circles or closed strings, according to Descartes' theorem. In last year's essay, and was shown as the Higgs boson mass was obtained as the vibration of a string, on the model of a particle in a box, using the dimensionless length in seven dimensions of the model more simple and natural , Kaluza-Klein type (circles wrapped). In this case, the term used to curvature for the vacuum, is the minor radius in seven dimensions (see endnotes for the formula).

$l_7 = 3.05790095610237194 97$; $r_7 = 2.9569490582248915054$ .Adding, then, this curvature, we have: $(E_S/E) = \sum_s (s+1)s + \sqrt{3/r_7^2}$ .However, the real surprise (purely empirical) is that to get the exact value of the Higgs vacuum, it is necessary to add a corrective term negative due to entropic uncertainty to six dimensions, and the five microstates. With precision: the entropic uncertainty or Hirschman uncertainty. Thus, there is finally applying scaling: $dE/E = \sum_s (s+1)s + \sqrt{3/r_7^2} - \exp - [6 \cdot (\ln\pi + 1) - 5] = 13.085373398403896348$

$$\int_{m_e}^{mv(h)} (dE/E) = \exp(\textstyle\sum_s (s+1)s + \sqrt{3/r_7^2} - \exp - [6 \cdot (\ln\pi + 1) - 5]) = mv(H)/m_e \quad (7)$$

$\exp(13.0853733984038963 48) = mv(H)/m_e = 481842.89619778 \rightarrow 246,221202\, GeV$.
Hirschman entropic uncertainty: $H_x + H_p \geqq \ln \pi + 1$

Higgs Boson Mass A first important observation: the three-dimensional circular compactification is pratically equal to the complex dimension of the group E8, that is: $(2\pi)^3 = 248.05021344239$ .Will include the result last year essay, on the mass of the Higgs boson, as a comparison to the results that will follow. $m_h = mv(H) \cdot P(2, l_7) = mv(H) \cdot \sin^2(2\pi/l_7)(2/l_7) = 246.221202 \cdot 0.5124579179703 = 126.1778996\, Gev$ .Results with excellent agreement with the experimental data. Convert this mass as a dimensionless number, given between the ratio of the mass m_h and the mass of the electron, m_e , $(m_h/m_e) = 246924.000899$ .Several empirical results on this number:

1) $(m_h/m_e) \approxeq 4 \cdot (2\pi)^6 = 246115.633555$
$(m_h/m_e) - 4 \cdot (2\pi)^6 = \exp(\sqrt{1/\Omega_{Bf}}) = \exp(\sqrt{1/0.0223070572444574711}) =$
$= 808.706403885$

2) Indeed, the ratio of the mass of Higgs boson respect to the electron, taking the compactification of the six circles on the plane as holography, k(2d) = 6, and multiplied by the four energy states of the table 1. This result is implicit in the equation that gives the small radius for circular compactification seven dimensions, ie: $r_7^8 = (4 \cdot (2\pi)^6)/(8 \cdot 16\pi^3/15)$;where $(16\pi^3/15)$ is the factor surface of a sphere in seven dimensions. 3) The square of the uncertainty principle factor in seven dimensions, is given by: $7^2/[4 \cdot (2\pi)^6)] = \triangle^2(7d)$

Thus the mass of the Higgs boson is very approximately expressible as a function of the square of the uncertainty in seven dimensions, namely: $\frac{m_h}{m_e} \approxeq 7^2/\triangle^2(7d)$. This expression seems to correspond to 49 particles, divided by the square of uncertainty in 7d. Recalling that the amount particles of standard model, adding supersymmetry; plus four neutralinos and two charginos, gives the number: $48 = dim(SU(7)) = k(2d) \cdot 6$ .Since the Higgs boson itself, acquires mass from Higgs vacuum, by subtracting energy, taking into account the uncertainty in seven dimensions, you can put the mass of the Higgs boson is expressible by the model of spherical symmetry potential, just as: $\int_{m_e}^{m_h} dm/m = \exp(\sum_s (s+1)s - \frac{1}{7}\left\{\sqrt{3/r_7^2} - \exp -[6 \cdot (\ln \pi + 1) - 5]\right\}) = \frac{m_h}{m_e} = 246810.281516 \rightarrow 126.119789\, Gev$ (8)

The Higgs boson mass is also expressed as a function of the natural radius, π , and the dark energy density with the scaling law:
$\ln 2 = \Omega_\Lambda$; $2 \cdot \Omega_\Lambda + 6 \int_1^{2\pi} \frac{dm}{m} = \ln(m_h/m_e) \rightarrow \frac{m_h}{m_e} \approxeq 4 \cdot (2\pi)^6$

3 Extension to seven dimensions of the five basic solutions of the equation of energy-momentum. Connecting to the holographic principle

To the five basic solutions of the energy-momentum equation, it is necessary to add the corresponding seven dimensions. This way you will have twenty-eight positive energy states and seven negative energy states. The difference, between the twenty-eight states of positive energy and the seven states of negative energy, is the maximum value of the inverse of the baryon density, ie: $28 - 7 = max(1/\Omega_b) = 21$

Here is where the holographic principle manifests itself decisively. Four planes (four dimensions), each of which contain seven circles, $4 \cdot 7 = dim[SO(8)]$ .Three planes (three dimensions), each containing seven circles, $3 \cdot 7 = dim[SO(7)]$ .The holographic principle encodes information in two directions: as circles in the plane, and in the reverse direction, as compactifications of $(2\pi)^{7n}$. This is not a pure mathematical speculation, but it goes to show in a very clear and obvious. First, twenty-eight positive energy states allow us to calculate the fine structure constant. Secondly, these same twenty-eight states giving the ratio of the mass of planck respect to the electron as a function of $(2\pi)^{7\cdot 4}$ .Third, obtaining the electric charge as a function of $(2\pi)^{7\cdot 3}$; m_e , G_N

3.0.3 Fine structure constant at zero momentum

Since one has seen in the section 2, the 240 non-zero roots of E8 group, which are K(8d): $x_7 = 1e_1+2e_2+3e_3+5e_4+8e_5+11e_6+4e_7$, $\|x_7\| = 240 = 103+(2^7+2^3+2^0 = 137)$.It can be considered that 137 is the sum of all possible states of polarization of the photon in seven, three and zero dimensions. In other words: 137 is the sum of all states of 7,3 and zero qubits. Being, the whole part, the inverse of the probability that an electron emits or absorbs a photon. In this whole part, of this reverse, you must add the probability of positive energy twenty-eight states plus the contribution due to the other two electrically charged leptons.The fine structure constant, zero momentum can be expressed in several ways. In the treatment in question, Will be scheduled three, which very roughly, are equivalent.

1. $\alpha^{-1} = 137+\frac{1}{28}+[1/(\frac{m_\tau}{m_e}+\frac{m_\mu}{m_e}+\frac{m_e}{m_e}-\sin^{-28}(2\pi/r_7)\sqrt{\sum_q q^2})] = 137.03599907449309527$ (9)

$\sum_q q^2 = [(\frac{2}{3})^2 + (\frac{-1}{3})^2 + (\frac{1}{3})^2 + (\frac{4}{3})^2 + (-1)^2]$ 2.) $\alpha^{-1} = 137 + \frac{1}{28} + [1/(\frac{m_\tau}{m_e} + \frac{m_\mu}{m_e} + \frac{m_e}{m_e} - \ln^2(mv(H)/m_e) - e^{\sqrt{\ln 2}}] = 137.03599907296750035$ (10) 3.)$\alpha^{-1} = 137 + \frac{1}{28} + [1/(\frac{m_\tau}{m_e} + \frac{m_\mu}{m_e} + \frac{m_e}{m_e} - 240 + \ln^2(\frac{m_\tau}{m_e})] = 137.03599907188193476$ (11)

3.0.4 The mass of the electron and the holographic principle

$m_{pk} = [(2\pi)^{28}(1 + \frac{3\alpha\cdot\ln(\hbar c/k\cdot e^2\pm)}{\pi})^2 \cdot m_e]/[1 + 1/2(\frac{m_\tau}{m_e} + \frac{m_\mu}{m_e} + \frac{m_e}{m_e})\frac{r_7}{l_7}]$ (12)

3.0.5 The electric charge and the holographic principle

Being, the dimensions of the electric charge: $\sqrt{M}\sqrt[2]{L^3}T^{-1} = \pm e$.If we accept the hypothesis, that the length and time are real, then necessarily, the mass must be imaginary, in the case of negative electric charge. Since that imaginary masses as solutions in Table 1, and their extension to seven dimensions must exist, can generate three basic solutions to three dimensions, and twenty-one, for seven dimensions (with octonions) for root mass: $\{(-\sqrt{m}, -\sqrt{m})$; $(\sqrt{m}, \sqrt{m})$; $(i\sqrt{m}, -i\sqrt{m})\}$ The above solutions imply the inexistence of real negative masses, as for example, the negative solution of the Planck mass, but mass virtual imaginary, and true roots imaginary mass (negative electric charge). For a mass given, m, and its root $\sqrt{m}$ .The quantization of electric charge is obtained as the integral of the root mass divided by the mass, a kind of density. Immediately, you get, also the scaling law.

$\sqrt{m} = x$; $2dx = x^{-1}$; $\frac{1}{m}\int\sqrt{m}dm = \frac{2}{3}\sqrt{m}$; $\frac{1}{m}\int -\sqrt{m}dm = -\frac{2}{3}\sqrt{m}$; $\frac{1}{m}\int\sqrt{m}dm - \sqrt{m} = -\frac{1}{3}\sqrt{m}$, $\sqrt{m} - \frac{1}{m}\int\sqrt{m}dm = \frac{1}{3}\sqrt{m}$

$\pm\sqrt{\sum_{d=1}^{4}(\frac{1}{3})^2} = \pm\frac{2}{3}$; $\pm\sqrt{\sum_{d=1}^{4}(\frac{2}{3})^2} = \pm\frac{4}{3}$ .Scaling law, sum of curvatures of circles: $\int_{m_1}^{m_2}\frac{2dx}{x} = \int_{m_1}^{m_2}\frac{dm}{m}$

- $\pm\sqrt{[(2\pi)^{21}\cdot m_e]^2\cdot G_N}\Big/(\sum_s \cos\theta_s)(28/2\cdot\sum_s 2s+1) = \pm e$; $s = spin$, $G_N = 6.67428\cdot 10^{-11}\frac{N\cdot m^2}{Kg^2}$

$\cos\theta_s = \frac{s}{\sqrt{s(s+1)}}$

- $(\hbar c/\pm e^2) = (2\pi)^{14}\cdot[\ln(\frac{m_\tau}{m_e}+\frac{m_\mu}{m_e}+\frac{m_e}{m_e})+\frac{1}{28+7}+\frac{1}{137^2\cdot[7+P^2(2,l_\gamma)]}]$; $P^2(2,l_\gamma) = [\sin^2(2\pi/l_\gamma)(2/l_\gamma)]^2$

$l_\gamma = \sqrt{\frac{\alpha^{-1}}{4\pi}}$; $14 = 2[3(4/3)+3(2/3)+3(1/3)+3(-1/3)+1]$; 3) $b = \sqrt{\ln(\alpha^{-1}-3+\ln 2)/2}$
$\ln\left(\frac{m_{pk}}{\sqrt{(\pm e/b)^2/G_N}}\right) = c$; $\frac{(2\pi)^{28}}{c}+(2\pi)^{28} = \frac{m_{pk}}{m_e}$

4 The value of the vacuum, cosmological inflation and the Hubble constant

The cosmological constant or its equivalent, as a negative energy density of the vacuum, negative pressure, is directly related to the Hubble constant. We show that the Hubble constant is really twice the frequency of the vacuum energy.This vacuum energy with negative pressure, is approximately half the value, who took the dimensionless exponential factor in the time of inflation.This value exponential inflation, must meet several requirements: a) the infinitesimal change of acceleration is equal to the infinitesimal change of speed. This is logical, since in inflation, speed and acceleration are equivalent. b) Must have a value greater than or equal to the fine structure constant at zero momentum. This ensures the decoupling of radiation from matter, ending the period of inflation. c) Must include a term of curvature of space-time. d) Must be consistent with quantum mechanics and general relativity.In the section, for calculating the Higgs vacuum, introduced a curvature. This same curvature, this time, the scalar curvature three closed strings and its associated surface, three circular surfaces that interact as in the case of Higgs vacuum.

4.0.6 The term of curvature

This scalar curvature, so defined, should include all possible radii, ie scalar curvature due to the values of the radii of all possible oscillators, a sum of infinite terms, such that: $k = 3\sum_{r=1}^{\infty}\frac{1}{r^2} = \frac{3\pi^2}{6} = \frac{\pi^2}{2} = V(4d)$

$\psi(x,t) = A\cos(kx-\omega t) \equiv x\cos(nx)dx$; $k = \int_0^\pi x\cos(nx)dx = \frac{\pi^2}{2}$; $n = 0$

$zdz - \frac{dy}{y} = 0 \rightarrow y = \exp(z^2/2)$; $z = radius\ dimensionless = \pi$ .You need a coordinate that meets special relativity, but with an imaginary time and speed; coordinate normalized dimensionless form, the radius associated with light.

$x' = l_\gamma\cosh(y) - (-l_y\sinh(y)) = l_\gamma\cosh(y) + l_y\sinh(y)$; $citi \rightarrow -l_y$; Planck time $= t_p$; $t_p\cdot l_y\cdot\exp(\exp(\pi^2/2)) = 5.3912381\cdot 10^{-44}s\cdot l_y\cdot\exp(\exp(\pi^2/2)) = 4.337641476\cdot 10^{17}s \rightarrow 13754.57089\cdot 10^6$ "$years$"

And this is where appearances are deceiving. The Hubble constant does not accurately represent the age of the universe, but it is twice the frequency value of the energy of the vacuum. After the inflation, this same value is turned into a linear acceleration factor, not exponential, since the vacuum had emptied all his energy possible, due to the curvature, of all the infinite scalar curvature oscillators.The solution for the value of the vacuum, and Hubble constant, can also be obtained by solving a string, depending on the model of a particle in a box of dimension two, with a length of the box with an imaginary value $\pm\pi i$ .Obtaining a negative probability, greater than one, which is really the logarithm of the ratio of the equivalent mass of the vacuum, in relation to the Planck mass.

$2\ln(m_v/m_{pk}) = [\sin^2(2\pi/\pi i)(2/\pi i)]^2 - \Omega_\Lambda + [\sin^2(2\pi/-\pi i)(2/-\pi i)]^2 - \Omega_\Lambda$

$2\ln(m_v/m_{pk}) = -70.12673323336675 - \ln 2 + -70.12673323336675 - \ln 2 \rightarrow E_v = \exp(-70.12673323336675 - \ln 2)m_{pk}c^2$

$E_v = 2.13793235 \cdot 10^{-3}eV$; $-\{[\sin^2(2\pi/\pi i)(2/\pi i)]^2 + [\sin^2(2\pi/-\pi i)(2/-\pi i)]^2\} - \exp -(\sin^{-2}\hat{\theta}(M_z)(\overline{MS})) = \exp(\pi^2/2) + \ln l_\gamma$

$140.2534664667335 - \exp -(1/0.23116) = 140.2402462488 \approxeq 140.240246366(\exp(\pi^2/2) + \ln l_\gamma)$

1) $zdz - \frac{dy}{y} - \ln\ln l_\gamma = 0 \rightarrow y = \ln l_\gamma + \exp(z^2/2) = t\,, z = \pi$ 2) $\frac{d^2x}{dt^2} = \frac{dx}{dt}\,, \frac{d}{dt}(\frac{dx}{dt}) = \frac{dx}{dt} \rightarrow d(\frac{dx}{dt}) = dx \rightarrow \int d(\frac{dx}{dt}) = \int dx \rightarrow \frac{dx}{dt} = x \rightarrow \frac{dx}{x} = dt \rightarrow \int \frac{dx}{x} = \int dt \rightarrow x = \exp t\,; x = \exp(\ln l_\gamma + \exp(z^2/2)) = l_\gamma \cdot \exp(\exp(\pi^2/2))$

Holographic Principle: eleven planes, which are the eleven dimensions.Seven circles by plane: $11{\cdot}7 = dim(E6) - 1\,; \ln[(2\pi)^{11\cdot 7}] - \sin^{-2}(2\pi/l_7) = 140.240245971 \approxeq \ln l_\gamma + \exp(\pi^2/2)$

5 Proposal for particle dark matter candidate

Considering the four energy states of of the table one, and performs an oscillation, subtracting the energy density of the vacuum, we obtain a dimensionless length. Using the same method as for the calculation of the vacuum, we have: $\ln(m_{D1}/m_{pk}) = [\sin^2(2\pi/[4-\ln 2]i)(2/[4-\ln 2]i)]^2 = -41.73838746259 \rightarrow m_{D1}(Gev) = [m_{pk}c^2{\cdot}\exp(-41.73838746259)]/e\pm = 9.1141GeV$; $\left(\sqrt{240-\ln^2(mv(H)/m_e)}\right)\left(\ln(\ln(mv(H)\sqrt[4]{2}/m_e) - 10)\right) \approxeq \ln(m_{D1}/m_e) \approxeq \left(\sqrt{240-\ln^2(mv(H)/m_e)}\right) \cdot \ln\ln 26$

6 Conclusion

We think that the surfaces are sufficient to encode the information, since any d dimensional sphere is expressible as the sum of squares of d radius. At the same time, with five qubits, is sufficient to represent the two solutions of an equation of second degree (surfaces), counting all symbols. This would be the fastest and most efficient algorithmic; would use the upper complex of matter systems, biological systems. Thus It from Bit = Bit from It. Different sides of the same coin.

7 Endnotes

$$l_d = \left(2(2\pi)^d \Big/ \left[2\pi^{d/2}/\Gamma(d/2)\right]\right)^{\frac{1}{d+2}}\ ,\ r_d = \left(4(2\pi)^d \Big/ \left[(d+1)2\pi^{d/2}/\Gamma(d/2)\right]\right)^{\frac{1}{d+1}}$$

$$l_7 = \left(2(2\pi)^7 \Big/ \left[2\pi^{7/2}/\Gamma(7/2)\right]\right)^{\frac{1}{7+2}} = \left(2(2\pi)^7 \Big/ \left[16\pi^3/15\right]\right)^{\frac{1}{7+2}}$$

$$r_7 = \left(4(2\pi)^7 \Big/ \left[(7+1)2\pi^{7/2}/\Gamma(7/2)\right]\right)^{\frac{1}{7+1}} = \left(4(2\pi)^7 \Big/ \left[(7+1)(16\pi^3)/15\right]\right)^{\frac{1}{7+1}}$$

Conjeture: two particles more for dark matter

1. $\ln(m_{D2}/m_e) \approxeq \sum_s s(s+1) - (1 - \ln 2 - \Omega_b) = \sum_s s(s+1) - \Omega_d \rightarrow m_{D2}(GeV) \approxeq 105\, GeV$
2. $\ln(m_{D3}/m_e) \approxeq \sum_s s(s+1) + \sqrt{3 \cdot P^2(2, l_7)} \rightarrow m_{D3}(GeV) \approxeq 333\, GeV$

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