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INTERVALIC THEORY IN PHYSICS

Abstract

The Intervalic Theory is the major paradigm shift that has occurred in the history of mankind, affecting all disciplines. It was originally postulated by Sydney d'Agvilo in 1987 in the field of Music, in 2005 in Physics, and in 2016 in the Economy, disciplines that respectively represent the bastions of the three major branches of knowledge: the arts, the hard sciences and social sciences.

From a historical standpoint the Intervalic Theory closes, in the most unexpected way, the long gap existing between relativity and quantum mechanics, two theories of Nature that are mutually incompatible: the first one, of *geometric* nature; the second one, *probabilistic*. Most physicists have been working for decades on trying to discover a theory of everything which includes relativity in the quantum paradigm. On the contrary, the Intervalic Theory has surprisingly formulated a theory of everything absorbing the correct parts of quantum mechanics within the relativistic paradigm, which from now on is also encompassed in a theory of everything more general: the Intervalic Theory, which converts all Physics in geometry. This means the failure of the probabilistic conception of knowledge and of the world, and the triumph of the geometric vision; or in other words, the failure of pseudo scientific *empirical-inductive* method, and the triumph of true scientific method *par excellence*, the *logical-deductive* one.

Intervalic Theory, in any medium, is based on a single axiom: the *intervalic axiom*, which simply states: "an interval exists". In physics, branch that enjoys precedence over all others for obvious reasons, because it is what explains the generation of the Universe, the intervalic axiom means that a one-dimensional space line —an interval—, is the only thing whose existence is postulated before the creation of the Universe, when there was absolutely nothing, that is, neither matter nor energy, time or three-dimensional space, much less the so-called "quantum vacuum". The existence of a linear space interval necessarily implies the existence of mathematics. Well, from the mathematical logic and a space interval of any length there will necessarily generate time, energy, matter and all the Universe we know. That interval is the *intervalic length*, $\hbar$, very similar to the Planck's length value, although it could have taken any other value and

the Universe thus created would be identical and indistinguishable to the current one because all physics constants —including the elementary charge— are not fundamental indeed, but they are logically derived from the only two fundamental constants of Nature, which compose the *intervalic dimensional basis* of the intervalic system of physical quantities (and because you can not measure anything from "outside" the Universe).

The interval axiom determines an *intervalic dimensional basis*, which is different and *not equivalent* to the traditional ones (comprising length, mass, time, etc.), being composed exclusively of length, L, and the imaginary number $i = \sqrt{-1}$, both derived from the intervalic axiom. Alternatively, the intervalic dimensional basis can also be deduced logically and necessarily from the definition of *time* as *imaginary space* ($T = iL$), which is the definition of time that was originally postulated in the Intervalic Theory in Music.

The *intervalic dimensional basis* shows the astonishing fact that the equation of dimensions of the two fundamental constants of Nature, namely Planck's constant, and the speed of light, *c*, respectively coincide with the two elements comprising the intervalic dimensional basis (L, *i*), being L the dimension of $\hbar$, and *i* the dimension of *c* (or i^{-1}, which produces an identical dimensional system). The systematic combination of L and *i* generates logically the intervalic group of all existing physical quantities, which are exactly 40. As each and every one of the physical quantities thus generated is a certain combination of $\hbar$ —the *quantum* of length— and c —the *limit* of speed and of energy at subatomic scale—, we have got the remarkable result that all physical quantities are simple combinations of the two fundamental constants of Nature, $\hbar$ and c, and therefore all of them are geometrically delimited by a lower mark —*quantum*— or a higher mark —*limit*—. This means that *there can not be infinite values for any physical quantity*, and not only for speed or action, as believed by quantum mechanics. This means, for example, that there are no infinite masses or energies, which implies that singularities can not exist (black holes) as they are described by some science fantasy tales that make an improper use of relativity. In fact, the intervalic cosmology, closely linked to the particle physics theory, shows what is the intervalic structure of very massive stars, which are described using some equations common to subatomic particles, being this study a fascinating branch of the Intervalic Theory which explains a lot of astronomical phenomena in a completely unattainable way for quantum mechanics.

Traditional systems of physical quantities and units do lack of epistemological range, meaning that two *distinct* physical quantities can have the *same* equation of dimensions, that is to say, the equation of dimensions of a physical quantity is not significant except formally. By contrast, the

INTERVALIC UNITS, INTERVALIC QUANTA, INTERVALIC LIMITS

Inter. dim.	*Physical quantity*	*Definition*	*Rank **	*Value showing the equivalence between intervalic units and SI units*
1	Permitivity	$\boldsymbol{\varepsilon_I} = c^{\pm 2}\mu_0^{-1}$	c.f.	$1/4\pi\ (1) = 8.85418781\cdot 10^{-12}$ (F m^{-1})
	Molar gas constant	R	c.f.	1 (1) = 8.314510 (J mol^{-1} K^{-1})
	Boltzmann constant	$k_B = R/N_A$	c.f.	$1\ (1) = 1.380658 \cdot 10^{-23}$ (J K^{-1})
	Momentum	$\mathbf{p_I} = \mathbf{m_I}\,\mathbf{v_I} = = c^{-1}c$	s.l.	1 (1) = 1 (kg m s^{-1})
-1	Permeability	$\boldsymbol{\mu_I} = \mu_0$	c.f.	$4\pi\ (-1) = 4\pi \cdot 10^{-7}$ (H m^{-1})
	Gravitational potential	$\boldsymbol{\Phi_I} = c^{\pm 2}$	s.l.	$1\ (-1) = 8.98755179 \cdot 10^{16}$ (m^2 s^{-2})
	Antimomentum	$\mathbf{-p_I} = c^{\pm 2}$	c.f.	$1(-1) = 8.98755179 \cdot 10^{16}$ (-kg m s^{-1})
i	**Mass**	$\mathbf{m_I} = c^{-1}$	s.l.	$1\ (i) = 3.335640952 \cdot 10^{-9}$ (kg)
i^{-1}	**Velenergy:** Velocity	$\mathbf{v_I} = c$	a.l.	$1\ (i^{-1}) = 2.99792458 \cdot 10^{8}$ (m s^{-1})
	Energy	$\mathbf{E_I} = c$	s.l.	$1\ (i^{-1}) = 2.99792458 \cdot 10^{8}$ (J)
	Temperature	$\boldsymbol{\Theta_I} = c\ k_B^{-1}$	a.l.	$1\ \Theta_I\ (i^{-1}) = 2.17138589 \cdot 10^{31}$ (K)
L	**Length** (real space)	$\mathbf{l_I} = \hbar$	q.	$1\ (L) = 1.0556363 \cdot 10^{-34}$ (m)
	Action	$\mathbf{S_I} = \hbar$	q.	$1\ (L) = 1.0556363 \cdot 10^{-34}$ (J s)
	Capacitance	$\mathbf{C_I} = \hbar$	q.	$1\ (L) = 1.0556363 \cdot 10^{-34}$ (F)
-L	Antilength	$\mathbf{L_I} = c^{\pm 2}\hbar$	c.f.	$1\ (-L) = 9.487585915 \cdot 10^{-18}$ (m)
i L	**Time** (imagin. space)	$\mathbf{t_I} = c^{-1}\hbar$	q.	$1\ (iL) = 3.521223673 \cdot 10^{-43}$ (s)
i^{-1} L	Antitime	$\mathbf{-t_I} = c\,\hbar$	c.f.	$1\ (i^{-1}\,L) = 3.164718011 \cdot 10^{-26}$ (-s)
L^{-1}	Wavevector	$\mathbf{k_I} = \hbar^{-1}$	a.l.	$1\ (L^{-1}) = 9.47295958 \cdot 10^{33}$ (m^{-1})
$-L^{-1}$	**Gravitational field- -Poweration:** Acceleration	$\mathbf{g_I} = c^{\pm 2}\hbar^{-1}$	a.l.	$1\ (-L^{-1}) = 8.51387148 \cdot 10^{50}$ (m s^{-2})
	Power	$\mathbf{a_I} = c^{\pm 2}\hbar^{-1}$	a.l.	$1\ (-L^{-1}) = 8.51387148 \cdot 10^{50}$ (m s^{-2})
		$\mathbf{W_I} = c^{\pm 2}\hbar^{-1}$	a.l.	$1\ (-L^{-1}) = 8.51387148 \cdot 10^{50}$ (W)
$i\,L^{-1}$	Linear density	$\boldsymbol{\Delta^1_I} = c^{-1}\hbar^{-1}$	a.l.	$1\ (i\,L^{-1}) = 3.15983919 \cdot 10^{25}$ (kg m^{-1})
$i^{-1}\,L^{-1}$	**Frequorce, φ:** Frequency	$\mathbf{v_I} = c\,\hbar^{-1}$	a.l.	$1\ (i^{-1}\,L^{-1}) = 2.839921837 \cdot 10^{42}$ (s^{-1})
	Force	$\mathbf{F_I} = c\,\hbar^{-1}$	a.l.	$1\ (i^{-1}\,L^{-1}) = 2.839921837 \cdot 10^{42}$ (N)
	Conductivity	$\boldsymbol{\sigma_I} = c\,\hbar^{-1}$	a.l.	$1\ (i^{-1}\,L^{-1}) = 2.839921837 \cdot 10^{42}$ (S m^{-1})
L^2	Area	$\mathbf{S_I} = \hbar^2$	q.	$1\ (L^2) = 1.114367998 \cdot 10^{-68}$ (m^2)
$-L^2$	Antiarea	$\mathbf{-S_I} = c^{\pm 2}\hbar^2$	c.f.	$1\ (-L^2) = 1.001544009 \cdot 10^{-51}$ (-m^2)
$i\,L^2$	Inertia area momentum	$\mathbf{I^2_I} = c^{-1}\hbar^2$	q.	$1\ (i\,L^2) = 3.717131529 \cdot 10^{-77}$ (kg m^2)
$i^{-1}L^2$	?	$c\,\hbar^2$	q.	$1\ (i^{-1}L^2) = 3.340791212 \cdot 10^{-60}$ (J m^2)
L^{-2}	Viscosity (dynamic)	$\boldsymbol{\eta_I} = \hbar^{-2}$	a.l.	$1\ (L^{-2}) = 8.973696318 \cdot 10^{67}$ (Pa s)
$-L^{-2}$	Area power	$\mathbf{W^2_I} = c^{\pm 2}\hbar^{-2}$	a.l.	$1\ (-L^{-2}) = 8.065156039 \cdot 10^{84}$ (-m^{-2})

Inter. dim.	*Physical quantity*	*Definition*	*Rank **	*Value showing the equivalence between intervalic units and SI units*
$i\,L^{-2}$	Area density	$\mathbf{\Delta^2_I} = c^{-1}\hbar^{-2}$	a.l.	$1\ (i\,L^{-2}) = 2.993302893 \cdot 10^{59}$ (kg m^{-2})
	Inflexion	$\mathbf{i_I} = c^{-1}\hbar^{-2}$	a.l.	$1\ (i\,L^{-2}) = 2.993302893 \cdot 10^{59}$ (m s^{-3})
$i^{-1}L^{-2}$	Surface Tension	$\boldsymbol{\sigma_I} = c\,\hbar^{-2}$	a.l.	$1\ (i^{-1}L^{-2}) = 2.690246477 \cdot 10^{76}$ (N m^{-1})
L^3	Volume	$\mathbf{V_I} = \hbar^3$	q.	$1\ (L^3) = 1.17636731 \cdot 10^{-102}$ (m^3)
$-L^3$	Antivolume	$\mathbf{-V_I} = c^{\pm 2}\hbar^3$	c.f.	$1\ (-L^3) = 1.057266212 \cdot 10^{-85}$ (-m^3)
$i\,L^3$	Inertia volume momentum	$\mathbf{I^3_I} = c^{-1}\hbar^3$	q.	$1\ (iL^3) = 3.923938974 \cdot 10^{-111}$ (kg m^3)
$i^{-1}L^3$	Fermi constant physical quantity	$c\,\hbar^3$	q.	$1\ (i^{-1}L^3) = 3.526660474 \cdot 10^{-94}$ (kg m^3)
L^{-3}	Fluctuation	$\mathbf{f_I} = \hbar^{-3}$	a.l.	$1\ (L^{-3}) = 8.50074625 \cdot 10^{101}$ (m s^{-4})
$-L^{-3}$	Volume power	$\mathbf{W^3_I} = c^{\pm 2}\hbar^{-3}$	a.l.	$1\ (-L^{-3}) = 7.640089715 \cdot 10^{117}$ (-m^{-3})
	Irradiance	$\mathbf{E_{eI}} = c^{\pm 2}\hbar^{-3}$	a.l.	$1\ (-L^{-3}) = 7.640089715 \cdot 10^{117}$ (W m^{-2})
$i\,L^{-3}$	Volume density	$\boldsymbol{\rho_I} = c^{-1}\hbar^{-3}$	a.l.	$1\ (i\,L^{-3}) = 2.835543731 \cdot 10^{93}$ (kg m^{-3})
$i^{-1}L^{-3}$	Pressure	$\mathbf{P_I} = c\,\hbar^{-3}$	a.l.	$1\ (i^{-1}L^{-3}) = 2.548459613 \cdot 10^{110}$ (Pa)
	Energy-tension density	$\mathbf{u_I} = c\,\hbar^{-3}$	a.l.	$1\ (i^{-1}L^{-3}) = 2.548459613 \cdot 10^{110}$ (J m^{-3})
$i^{1/2}L^{1/2}$	**Magnetic charge**	$\boldsymbol{\theta_I} = \sqrt{-}(c\,\hbar)$	s.l.	$1\ (i^{1/2}L^{1/2}) = 1.778965433 \cdot 10^{-13}$ (Wb)
	Magnetic flux	$\boldsymbol{\Phi_I} = \sqrt{-}(c\,\hbar)$	s.l.	$1\ (i^{1/2}L^{1/2}) = 1.778965433 \cdot 10^{-13}$ (Wb)
$i^{-1/2}L^{1/2}$	**Electric charge**	$\mathbf{q_I} = \sqrt{-}(c^{-1}\hbar)$	q.	$1\ (i^{-1/2}L^{1/2}) = 5.93398995 \cdot 10^{-22}$ (C)
$i^{1/2}L^{-1/2}$	Current	$\mathbf{I_I} = \sqrt{-}(c\,\hbar^{-1})$	a.l.	$1\ (i^{1/2}L^{-1/2}) = 1.685206764 \cdot 10^{21}$ (A)
	Electric potential	$\mathbf{V_I} = \sqrt{-}(c\,\hbar^{-1})$	a.l.	$1\ (i^{1/2}L^{-1/2}) = 1.685206764 \cdot 10^{21}$ (V)
	Magnetic vector potential	$\mathbf{A_I} = \sqrt{-}(c\,\hbar^{-1})$	a.l.	$1\ (i^{1/2}L^{-1/2}) = 1.685206764 \cdot 10^{21}$ (Wb m^{-1})
$i^{-1/2}L^{-1/2}$	Magnetic inverflux	$\mathbf{\Phi^{-1}_I} = \sqrt{-}(c^{-1}\hbar^{-1})$	s.l.	$1\ (i^{-1/2}L^{-1/2}) = 5.621244694 \cdot 10^{12}$ (Wb^{-1})
$i^{1/2}L^{3/2}$	Bohr magneton physical quantity	$\boldsymbol{\mu_{BI}} = \sqrt{-}(c\,\hbar^3)$	q.	$1\ (i^{1/2}L^{3/2}) = 1.877940487 \cdot 10^{-47}$ (J T^{-1})
$i^{-1/2}L^{3/2}$	?	$\sqrt{-}(c^{-1}\hbar^3)$	q.	$1\ (i^{-1/2}L^{3/2}) = 6.264135195 \cdot 10^{-56}$ (T^{-1})
$i^{1/2}L^{-3/2}$	Electric field strength	$\boldsymbol{\epsilon_I} = \sqrt{-}(c\,\hbar^{-3})$	a.l.	$1\ (i^{1/2}L^{-3/2}) = 1.596389556 \cdot 10^{55}$ (V m^{-1})
	Magnetic field strength	$\mathbf{H_I} = \sqrt{-}(c\,\hbar^{-3})$	a.l.	$1\ (i^{1/2}L^{-3/2}) = 1.596389556 \cdot 10^{55}$ (A m^{-1})
	Magnetic flux density	$\mathbf{B_I} = \sqrt{-}(c\,\hbar^{-3})$	a.l.	$1\ (i^{1/2}L^{-3/2}) = 1.596389556 \cdot 10^{55}$ (T)
$i^{-1/2}L^{-3/2}$	Electric polarisation	$\mathbf{P_I} = \sqrt{-}(c^{-1}\hbar^{-3})$	a.l.	$1\ (i^{-1/2}L^{-3/2}) = 5.324982377 \cdot 10^{46}$ (C m^{-2})
$i^{1/2}L^{5/2}$	?	$\sqrt{-}(c\,\hbar^5)$	q.	$1\ (i^{1/2}L^{5/2}) = 1.982422148 \cdot 10^{-81}$ ( )
$i^{-1/2}L^{5/2}$	?	$\sqrt{-}(c^{-1}\hbar^5)$	q.	$1\ (i^{-1/2}L^{5/2}) = 6.612648501 \cdot 10^{-90}$ (C^{-1} m^3)
$i^{1/2}L^{-5/2}$	Charge density	$\boldsymbol{\rho_I} = \sqrt{-}(c\,\hbar^{-5})$	a.l.	$1\ (i^{1/2}L^{-5/2}) = 1.512253373 \cdot 10^{89}$ (C m^{-3})
	Current density	$\mathbf{J_I} = \sqrt{-}(c\,\hbar^{-5})$	a.l.	$1\ (i^{1/2}L^{-5/2}) = 1.512253373 \cdot 10^{89}$ (A m^{-2})
$i^{-1/2}L^{-5/2}$	?	$\sqrt{-}(c^{-1}\hbar^{-5})$	a.l.	$1\ (i^{-1/2}L^{-5/2}) = 5.044334281 \cdot 10^{80}$ ( )

Main differences between the INTERVALIC SYSTEM of PHYSICAL QUANTITIES and all other systems of units and dimensions

- It is the unique dimensional system whose **dimensional basis —(L, *i*)—** is just composed by the single intervalic dimensions of the **last fundamental constants of Nature, ħ and c**: dim ħ = (L), dim c (i^{-1}). Of course, the system has two formulations: dim c = (i^{-1}) or dim c = (*i*), which are absolutely equivalent.
- Existing physical quantities are *generated* by all algebraic combinations between the two dimensional basis —L and *i*— which makes a *finite* and *ordered* set of **40 physical quantities**. The *number of physical quantities* is given by the formula: 4 + 12*n*, being *n* the number of actual dimensions of space.
- There are no physical quantities whose equation of dimensions have more than the *actual dimensions* of space (3) and time (1), as in other systems, which is absolutely a nonsense or, at least, an inconsistency.
- There are neither different physical quantities with the same equation of dimensions (as in traditional units), nor different dimensions with the same physical quantity (as in the misleading called "geometrized" units, which is the poorest system of units ever made, not even being consistent).
- The intervalic dimensions of all physical quantities can *operate algebraically* with the signs of its corresponding magnitudes in any equation.
- The own definition of all existing physical quantities as an algebraic combination of c (i^{-1}) and ħ (L) yields unavoidably a *geometric height* for every physical quantity, making the full set of INTERVALIC QUANTA and INTERVALIC LIMITS, which form not only the Intervalic Units, but above all, the foundations of the **underlying fundamental geometry of Nature**, from which are derived the genuine **intervalic symmetries of Nature**, long time searched by Physics.
- Therefore, every physical quantity can not acquire any value, as each of them is *geometrically* closed by its corresponding height: an intervalic quanta or limit, which is another great difference between the intervalic system of units and the remaining systems, which like to play with infinites and singularities.
- Being the intervalic dimensions the truthful units of Nature, the intervalic physical quantities have got an *epistemological rank* by means

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of their equations of dimensions have got an *heuristic value*, which is lacked in other systems. The most important example is the merging of two traditional physical quantities into a new one because their intervalic dimensions are identical. That is the case of: velenergy (velocity-energy), frequorce (frequency-force) and poweration (power-acceleration)-gravitational field strength. The merged physical quantities means that they are really the same underlying physical quantity, although in phenomenology there may appear as different in incomplete or false dimensional systems. All this allow to unify intervalic dimensions, physical quantities and units in a unique concept, if desired.

- When applying basic geometry to the intervalic dimensions inside the Argand-like Intervalic Dimensional Space, a full set of invariant **Intervalic Transformations** of physical quantities is *geometrically* derived. The Intervalic Transformations comprise the former Lorentz-Einstein transformations of Special Relativity, which stays as a specific case inside a much wider geometry.
- Contrarily to supposed, the Intervalic System of Dimensions is the unique system which is **not equivalent** to all the remaining dimensional systems of units (which are, from now on, irrelevant in Physics research).
- All results yielded in the Intervalic Theory of Particle Physics are *geometric statements* logical and unavoidably deduced from the *intervalic quanta and limits* of the **Intervalic System of Units** *without using any mathematical formalism.*
- The Intervalic Theory is the unique Physics theory ever postulated which has *no one arbitrary constant*.
- Inasmuch as c and ħ are universal constants, the *intervalic quanta and limits* are reliable physical quantities of *universal validity*. The Intervalic System of Units is not an arbitrary one but the genuine **system of units of Nature**. It must be noted that the *intervalic symmetries of Nature* can not be deduced by means of any other dimensional system, but only from the intervalic one. Thus its knowledge might be viewed as a clue of the scientific degree of development of a civilization, and so it is also apparent that the Intervalic Units are the unique which could be shared with hypothetical advanced extraterrestrial intelligences.
- Any value expressed in *intervalic units* can be interpreted as a *dimensionless interval or ratio* and Physics really becomes truthful Geometry. Hence the name of the Intervalic Theory.

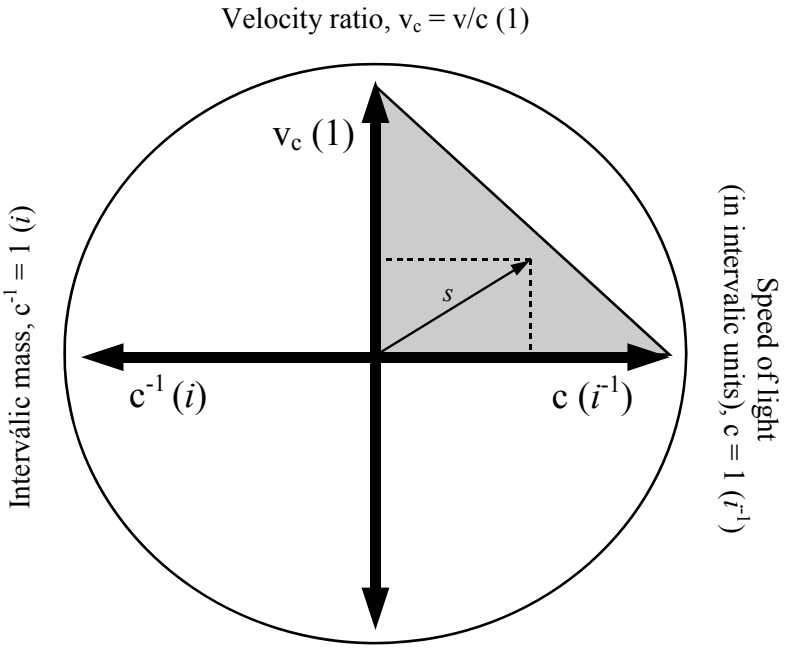
intervalic system of physical quantities has got an epistemological range, which means that if two physical quantities have the *same* equation of dimensions equation, that means that they are the *same* magnitude, although we have misinterpreted them as different in the past. This happens, for example, with speed and energy, which are actually a single physical quantity, or equally with acceleration and gravitational field, whose discovery was, in words of Albert Einstein, "the happiest thought in my life", which led him to postulate the general relativity theory.

Algebraic operations between different physical quantities can't be performed on a single axis as in traditional systems, but as a result of the introduction of the imaginary number i in the intervalic dimensional basis, two axes are needed: a real one (representing the real component, L) and an imaginary one (representing the imaginary component, i) —in mathematical terms, an Argand space—. Because of the peculiar properties of the i number, each successive integer powers of the speed of light, c, whose intervalic dimension is i^{-1}, represents a turn of ±90° on the dimensional axes of coordinates:

THE GROUP OF GEOMETRIC *TRANSFORMERS* IN THE INTERVALIC DIMENSIONAL SYSTEM		
Value	*Intervalic dimension*	*Rotation*
c^{-1}	i	+90º
c^{1}	i^{-1}	-90º
$c^{\pm 2}$	$i^{\pm 2} = -1$	±180º
c^{-3}	$i^{3} = i^{-1}$	+270º = -90º
c^{3}	$i^{-3} = i$	-270º = +90º
$c^{\pm 4}$	$i^{\pm 4} = 1$	±360º

The geometric representation of any physical quantity on these dimensional coordinates gives automatically an *invariant* geometric measurement, which is to say that the transformations of Lorentz-Einstein of special relativity are already included in the properties of the intervalic dimensional space, being inherent to the intervalic metric itself, so it affects to all physical quantities, standing out for its simplicity the intervalic transformations of space, time, energy, mass or time *regarding temperature*, as can be seen in the graph.

INTERVALIC TRANSFORMATIONS OF VELOCITY IN THE INTERVALIC SYSTEM OF PHYSICAL QUANTITIES



From the figure (which is a simple Argand space composed by two axes: a real one and an imaginary one), we have:

$s^2 = c^2 + v_c^2$, that is to say, $s = \sqrt{(c^2 + v_c^2)}$

To make a formulation which looks like the relativistic one, it can be introduced the *intervalic factor xi*, ξ, defined as the inverse of the invariant interval, s:

$\xi \equiv 1/s = 1/\sqrt{(c^2 + v_c^2)}$
$\xi^{-1} \equiv s = \sqrt{(c^2 + v_c^2)}$

The intervalic dimension of ξ is $1/\sqrt{(-1)} = (i^{-1})$. Taking the value of c in intervalic units ($v_c = v/c$ is already an intervalic dimensionless ratio):

$\xi \equiv 1/s = 1/\sqrt{[1(-1) + v_c^2]} = 1/\sqrt{[-1 + v_c^2]}$

And thus the Intervalic Transformations of time, space, mass and momentum *regarding* VELOCITY are:

$L \cdot \xi\ (i^{-1}) = T\ (i\ L)$, time $m \cdot \xi^{-1}\ (i) = p\ (1)$, momentum
$T \cdot \xi^{-1}\ (i) = L\ (L)$, space $p \cdot \xi\ (i^{-1}) = m\ (i)$, mass

For converting $\xi\ (i^{-1})$ into the dimensionless relativistic gamma factor, $\gamma = 1/\sqrt{(1 - v_c^2)}$, it only have to be multiplied dimensionally by *i*: $\xi\ (i^{-1}) \cdot (i) = \gamma\ (1)$.

Hence multiplying *dimensionally* by (*i*) or (i^{-1}) the above equations in the intervalic dimensional space are obtained the classic Lorentz-Einstein transformations.

The **Intervalic Transformations** of space, time, energy, mass and momentum *regarding* TEMPERATURE are, already written in the traditional relativistic mode:

$L = L_0\ \gamma^{-1}(\Theta)$ $T = \gamma(\Theta)\ T_0$ $E = \gamma(\Theta)\ E_0$ $m = \gamma(\Theta)\ m_0$ $p = \gamma(\Theta)\ p_0$

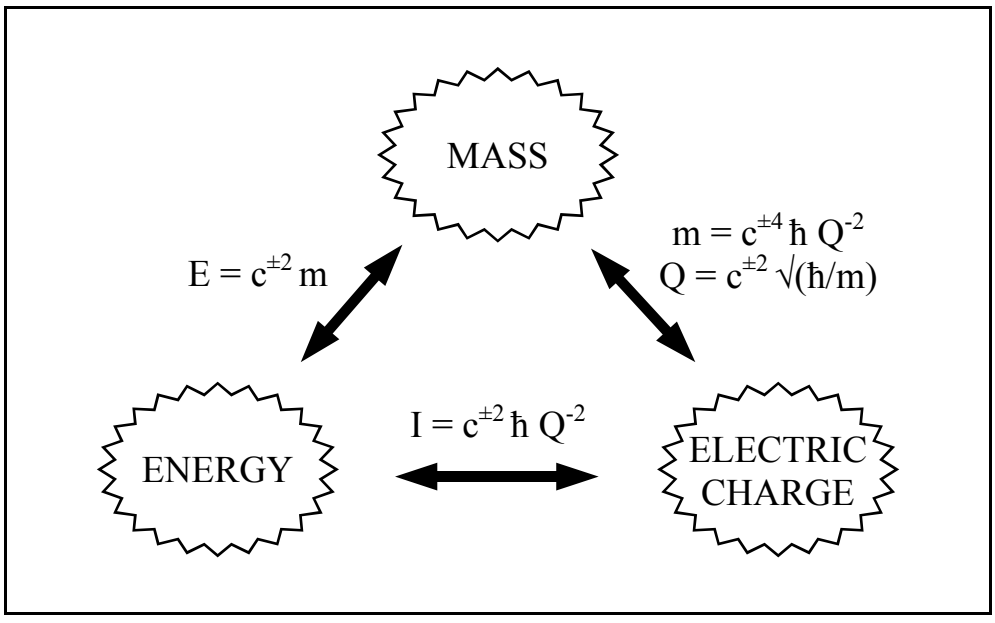
where $\gamma(\Theta)$ is the corresponding new gamma factor regarding temperature: $\gamma(\Theta) = 1/\sqrt{(1 - \Theta_c^2)}$, where it can be seen the dimensionless ratio $\Theta_c = \Theta/\boldsymbol{\Theta_I}$, being $\boldsymbol{\Theta_I}$ the intervalic limit of temperature: $\boldsymbol{\Theta_I} = c\ k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K). This geometric limit of temperature plays an important role in the phenomenon of "bounce" of the Universe, between the Big Crunch and the next Big Bang.

Some of the most important equations of physics, such as all of special relativity, are derived in an independent way by the Intervalic Theory as mere *geometric statements* of its intervalic equation of dimensions, since in the Intervalic Theory *all equations are relativistic*, so there is no a non-relativistic mechanics as in quantum mechanics. Among these geometric statements it must be stand out what is possibly the most important formula of Physics, the equation of *intervalic energy*, I, which establishes the *equivalence* between *electric charge*, Q, and *energy*:

$$I = c^{\pm 2} \hbar Q^{-2}$$

This equation, painfully unknown by quantum mechanics, plays a role analogous to: $E = c^{\pm 2} m$, which establishes the *equivalence* between *mass* and *energy*, Einstein's famous equation now also deduced in an independent way to relativity, as a simple *geometric statement* by the Intervalic Theory (please note that the geometric constant c is always written ahead of the variables, and their power is ±2 instead of +2, as the -2 power produces an identical rotation (in single intervalic units where the value of c and $\hbar$ is set to the unit).

Similarly is deduced geometrically the equation of the photon momentum, which until now was only an empirical result: $E = c\,p$. It should be noted that these important physical equations are always *invariant* because they are mere *geometric statements* which describe the *dimensional equivalence between two physical quantities*, which does not depend on the frame of reference chosen.



	Mass	Electric charge
Equivalent energy	$E = c^{\pm 2}\, m$	$I = c^{\pm 2}\, \hbar\, Q^{-2}$
Field energy	$U = G\, m^2 / r$	$U = (1/4\pi\varepsilon)\, Q^2 / r$

Furthermore, when comparing the equivalent energy of mass and electric charge is further exposed the initial gross mistake on which the standard model is based, whose complex Lagrangian formalism can not hide its serious inconsistency of misapplying the formula of the electromagnetic potential energy to a particle which, according to the standard model itself, is a mysterious "energy density" lacking of structure. But if this particle is not composed by other sub particles, then, it can not possess electromagnetic energy, since, by definition, this energy only makes sense applied to a particle or to a body *with structure*, as it is well known by any high school student. Clumsy inconsistencies like that, among several others as the unwarranted use of about 20 arbitrary constants set *ad hoc*, were what led Albert Einstein to never accept the validity of the standard model, who always regarded it as merely provisional and baseless. It has been now confirmed with overwhelming logic by the Intervalic Theory.

The systems of physical quantities and units have no physical meaning (beyond the formal one), nor have any logical link with the equations of physics. On the contrary, the entire corpus of physics and all the results derived by the Intervalic Theory —which has not a single arbitrary constant—, are *geometric and logical statements* necessarily deduced from the intervalic *quanta* and *limits* of the *intervalic system of physical quantities and units,* without the mediation of any complex mathematical formalism. This is an outstanding feature of the strong logic economy with what has been deduced the theory. This implies that the intervalic structure of subatomic particles and the fundamental symmetries of Nature will never be able to be discovered by quantum mechanics or any other theory that does not use the *intervalic —or natural— system of physical quantities*, which differs essentially from the rest ones because it includes the imaginary number $i = \sqrt{-1}$ in its dimensional basis, which makes sense when you consider that the *i* number *i* appears in most physics equations. Therefore, any dimensional basis that does not contain the *i* number will not be able to have any logical bond with physical equations (except symbolically), nor to

deduct any of them. Hence, quantum mechanics is by his reason in an impasse which impedes it to make further progress, as its last foundations are incomplete and inconsistent.

The theoretical definition and the exact geometry value of the elementary charge, *e*, and of the fine structure constant, α, are straightforwardly deduced starting from the intervalic system of physical quantities. Indeed, the definition and the geometric value of the *intervalic quantum of electric charge*, $\mathbf{q_I}$, which is automatically deduced by simple dimensional analysis, is:

$$\mathbf{q_I} = \sqrt{-}(c^{-1}\hbar) = 1\ (i^{-1/2}L^{1/2}) = 5.93398995 \cdot 10^{-22}\ (C)$$

As it is usually explained in textbooks, the fine structure constant, α, is a measure of the squared value of the elementary charge *in natural units*. This value implies that the value of *e* is 270 in natural units, which coincides exactly with the value of the elementary charge *in intervalic units*, so we can say that the intervalic units are the genuine natural units, hitherto unknown:

$$e = 270\ \mathbf{q_I} = 270\ \sqrt{-}(c^{-1}\hbar) = 1.60217733 \cdot 10^{-19}\ (C)$$
$$\alpha = 270^2 \cdot 10^{-7} = 1/137.1742112\ (1)\ \text{—valor exacto—}$$

This result, as final as obvious, had not been accepted by quantum mechanics as a result of its absurd prejudice that subatomic particles lack of structure, a quasi religious dogma, completely wrong, on which the standard model is based, that has prevented significant progress in theoretical physics for decades.

From here we can get the exact geometric values of fundamental constants, rather than the traditional empirical values, of which *c* was set by hand, *e* was empirically set, and *ħ* was derived indirectly from the previous one. Now we know that there is a deviation of about 5/10,000 somewhere in all these traditional empirical values gathered. Since the value of *c* is taken by definition and *e* is quite reliable, we conclude that this small deviation is on *ħ*, which can now be corrected and thus to define the exact geometric values of the two fundamental constants of Nature (expressed in arbitrary traditional units) from the exact theoretical value of the fine structure constant:

$$c = 270^2\ \hbar\ e^{-2} = 2.9979246 \cdot 10^{8}\ (m/s)$$
$$\hbar = 270^{-2}\ c\ e^{2} = 1.0556363 \cdot 10^{-34}\ (m)$$

The fact that the value of the elementary charge is 270 in intervalic or natural units *necessarily implies* that the elementary charge is not the *quantum of electric charge*, as previously thought, but that subatomic particles have got *structure*, i.e., they are composed by other sub particles even more fundamental. This result bankrupts the root paradigm of quantum mechanics, which conceives subatomic particles as "energy densities without structure", while according to the Intervalic Theory they are composite particles, which have an *intervalic structure* —of extraordinary logical economy and mathematical beauty—, of which all their physical properties and also all fundamental interactions of physics are deduced, whose origins were unknown to quantum mechanics.

In this way, subatomic particles are *states of minimum energy* that have become very deep wells of electromagnetic potential energy, which is the reason why they are all *identical*, and not because they obey certain quantum, mysterious and inexplicable numbers, as postulated by the standard model, or because there is an essential difference between the physical nature of the subatomic world and the other one of the macroscopic or cosmological world.

In fact, the results of the Intervalic Theory show that there is not such difference, even between the organic and the inorganic world, as it is shown, for example, by means of the ratio of the constituent energies —intervalic and electromagnetic— of nucleon, which are ruled by the *golden mean* or the Φ number, which also determines the pattern of so-called *harmonious growth* of living beings. Well, it has been found that the Φ number also rules the primordial intervalic synthesis of subatomic particles:

Structural energy ratios of nucleon

$\langle I(N)/U(N)\rangle = 1.618829402 \sim \Phi$

$\langle I(N)/E(N)_{mass}\rangle = 0.618143766 \sim \Phi^{-1}$

$\langle U(N)/E(N)_{mass}\rangle = 0.381855365 \sim 1 - \Phi^{-1}$

Deviation from the golden mean, Φ

$\Delta[\langle I(N)/U(N)\rangle] = +0.0491593\%$

$\Delta[\langle I(N)/E(N)_{mass}\rangle] = +0.0177623\%$

$\Delta[\langle U(N)/E(N)_{mass}\rangle] = -0.0289759\%$

Among the thousand first natural numbers, 270 is what most classes or symmetries possesses, each one of them indicates the existence of a well of electromagnetic potential energy under the *principle of minimum energy* and also under the *intervalic principle of minimum information*, being the former one a simple corollary. From the point of view of chaos theory, the number 270 would be the principal attractor at subatomic scale, and its divisors the

secondary attractors. These 16 classes are natural dividers of 270, which determine the values of the electrical charges of subatomic particles allowed by the intervalic symmetries of the elementary charge, and are as follows (expressed in natural units: $e = 270$):

1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270.

Of these, half are unstable below its threshold temperature of synthesis, being stable: 2, 3, 5, 6, 18, 30, 45 and 270. Although these intervalic symmetries has been uncovered by the logical-deductive way, which is the scientific method *par excellence*, the truth is that it could have also been discovered via empirical-inductive, as far as it is an empirical evidence that massive subatomic particles detected till today have got masses whose values are proportional to the inverse square of 270, 45, 30, 18, 6 and 5, as anyone can easily check. If this incontrovertible empirical data has not led to the discovery of the Intervalic Theory previously, this is due to the absurd prejudice of quantum mechanics to believe that subatomic particles are punctual entities *without structure*, childish dogma, comparable to medieval believing about the Earth as the centre of the Universe, which have prevented the advance of Physics for decades. Certainly, in the annals of Physics, after the missed belief in a flat Earth, the standard model of particles without structure will be history as the most ridiculous mistake in Physics.

The synthesis of subatomic particles is always made obeying one of the most fundamental principles of Nature: the *spin-statistics theorem*, of mathematical origin, which states that any identical particles have a degree of freedom, what means that the *constituent* particles of a subatomic particle can only be in a *symmetric or antisymmetric state under interchange*, being also generated both states in accordance with the general principle of *intervalicity*, which allows only logical and necessary relationships between the elements of the theory (or under the so-called *universality assumption* of quantum mechanics, which would be a corollary of the above).

The fundamental law that rules the intervalic structure and the physical properties of all subatomic particles is the *intervalic principle of energy balance*, which states that the total energy or *structural energy*, A, of all subatomic particles is composed by three factors: intervalic energy, I, electromagnetic energy, $U \approx I^{-1}$ —whose magnitude is in inverse proportion to the above—, and the spin energy, E_J —being the latter the only one not manifested as mass but as kinetic energy—, according to the following basic equation, also written in developed form below:

$$I - I^{-1} - E_J = 0$$

$$c^{\pm 2}\, \hbar\, Q^{-2} - [\, \tfrac{1}{2}(1/4\pi\varepsilon_0) Q^2 / r\,] - m\, r^2 \omega_J^{\,2} = 0$$

The intervalic energy, I, represents half of the structural energy, A, of the subatomic particle, which coincides precisely with the Schwarzschild's mass for the particle:

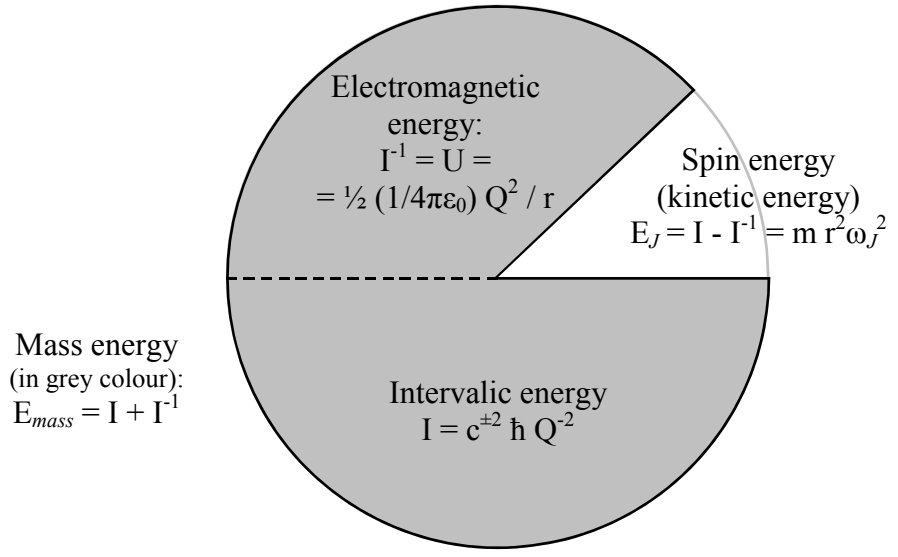
$$A = 2\, I$$

$$A = I + I^{-1} + E_J = c^{\pm 2}\, m_{Schw}$$

If all the structural energy was manifested as mass, all particles would have got exactly the minimum mass to be black holes. This never happens because the spin energy does not contribute to the mass but it is manifested as kinetic energy, being able to define the spin energy according to these values:

$$E_J = c^{\pm 2}\, (m_{Schw} - m)$$

ARCHITECTURE OF THE STRUCTURAL ENERGY OF SUBATOMIC PARTICLES



Intervalic principle of energy balance for subatomic particles: $I - I^{-1} - E_J = 0$
Structural energy (or Schwarschild's mass): $A = c^{\pm 2}\, m_{Schw} = I + I^{-1} + E_J$

This further gives us a new definition of the Schwarzschild's mass for subatomic particles, since its magnitude is simply twice the intervalic energy:

$$I = ½\ c^{\pm 2}\ m_{Schw}$$

This is the energy balance that determines the fundamental underlying architecture that forms the intervalic structure of all subatomic particles with extraordinary beauty and logical simplicity.

Well, from here, it follows logically and inevitably the synthesis of all subatomic particles that make the energy and matter in the universe, both *visible* and *dark*, totalizing 108 *visible* particles (without including baryons and mesons, which are monteverdinos) and 39 *dark* particles, whose intervalic structures and physical properties have been described with full geometric precision by the Intervalic Theory. The way that Nature has made this, starting exclusively from the existence of an interval, is a way plenty of logical elegance and disarming economy. Although the description of the *primordial intervalic synthesis of subatomic particles* can not be condensed into a short essay, we will try to offer some tables that show graphically the intervalic structure of the most important subatomic particles.

The primordial intervalic synthesis of intervalic structures, which originated from nothing all subatomic particles and fundamental interactions of physics, has seven consecutive phases. In each phase it is synthesized an intervalic structure in both symmetric and antisymmetric state under interchange, being one of them *visible* matter or energy —particles which in turn are the constituent sub particles of the next phase, which is still synthesizing a new type of intervalic structure in symmetric and antisymmetric state under interchange—, and other one *dark* matter or energy —which does not continue with the process of synthesis, causing a symmetry breaking, so that at each stage only one of the two states continues the process of synthesis that leads to the next phase—.

Along with singularities (black holes), antimatter universes and parallel universes, another one of the misleading myths that the Intervalic Theory invalidates is that one of the Big Bang considered as a haphazard and random explanation of the origin of the Universe. On the contrary, the Intervalic Theory shows what the origin of the Big Bang, which was a huge release of energy that came in the 4th phase of the primordial intervalic synthesis: the dalino-synthesis —where dalinos were synthetized, which are the first particles with electromagnetic energy—, a phase that began between $1.521843955 \cdot 10^{-10}$ and $1.979589614 \cdot$ and 10^{-9} seconds *after the beginning*

INTERVALIC PRIMORDIAL ASSEMBLY OF INTERVALIC STRUCTURES

WHICH ORIGINATED ALL DEGREES OF FREEDOM AND INTERACTIONS

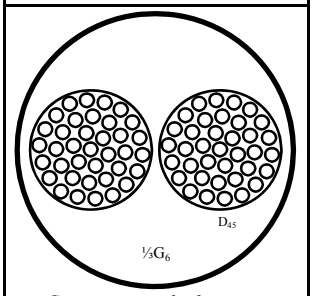
Tree level	1	2	3	4	5	6	7	8
Assemblies are made in symmetric and antisymmetric states under interchange, with identical shares. The appearance of each new *intervalic structure* assembled makes automatically the introduction of a new degree of freedom with its corresponding *fundamental interaction* in the Universe. When some intervalic structures do not make further assemblies, there is a *symmetry breaking* in the tree and that branch of the Intervalic Primordial Assembly ends.	INTERVALIC STRING —quantum of space— (Share = 1) *Intervalic string state* $S = \{\uparrow, \downarrow\}$ *Intervalic string radius* $r_S = ½\ \hbar$ *Intervalic string spin* $J_S = ½\ \hbar$ *Intervalic string length* $l_S = \pi\ \mathbf{l}_I = \pi\ \hbar$ *Number of intervalic strings* $n(S) = 4\ n(\gamma) = 4\ ¼\ c^8 = c^8$ ***Neutrino*** Neutrino is defined as *an intervalic string came to light.* The majority of neutrinos have been made at the Intervalic Primordial Assembly of gaudinos and dalinos, which began between $1.521843955 \cdot 10^{-10}$ (s) and $1.979589614 \cdot 10^{-9}$ (s) after the intervalic structure level No. 2 (synthesis of photon and chi) which marked the *beginning of time.*	PHOTON —quantum of light— (Share = 1/2) = Symmetric assembly of Intervalic Strings: $\gamma = \{\ |\uparrow\uparrow|,\ 2^{-½}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ),\ |\downarrow\downarrow|\ \}$ *Photon radius* $r_\gamma = \hbar = 1.0556363 \cdot 10^{-34}$ (m) *Frequorce of primordial photon* $\varphi_\gamma = \boldsymbol{\varphi}_\mathbf{I} = c\ \hbar^{-1} = 2.839921837 \cdot 10^{42}$ (s^{-1}) *Temperature of primordial photon* $\Theta_\gamma = \boldsymbol{\Theta}_\mathbf{I} = c\ k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K) *Intervalic-relativistic transformations of time regarding temperature* $t = t_0 / \sqrt{(1-[\Theta/\boldsymbol{\Theta}_\mathbf{I}]^2)}$ *Total energy of primordial photons* $\Sigma E(\gamma) = ¼\ c^7\ \hbar^2\ \boldsymbol{\varphi}_\mathbf{I}^2 = ¼\ c^9 = 4.890196776 \cdot 10^{75}$ (J) Since the energy of primordial photons was exactly the intervalic velenergy, $c = 2.99792458 \cdot 10^8$ (J), we can surprisingly know with astonishing simplicity the *number of primordial photons* assembled from intervalic strings at the beginning of the Universe: $n(\gamma) = \Sigma E(\gamma) / c = ¼\ c^8 = 1.631194063 \cdot 10^{67}$	INTERVALINO —quantum of matter— (Share = 1/4) = Antisymmetric assembly of Photons *Intervalino state* $\mathbf{I} = 2^{-½}\ (\ |\gamma\gamma| - |\chi\chi|\ )$ *Intervalino radius* $r(\mathbf{I}) = c / \omega(\mathbf{I}) = 2\ \hbar = 2.1112726 \cdot 10^{-34}$ (m) *Intervalino spin:* $J(\mathbf{I}) = 0$ *Intervalino charge* $\mathbf{q}_\mathbf{I} = \sqrt{-}(c^{-1}\hbar) = 1\ (i^{-1/2}L^{1/2}) = 5.93398995 \cdot 10^{-22}$ (C) *Intervalino intervalic energy* $I(\mathbf{I}) = c^{\pm 2}\ \hbar\ \mathbf{q}_\mathbf{I}^{-2} = c^{-1} = 20{,}819.42423$ (MeV/c^2) *Intervalino electromagnetic potential energy:* $U(\mathbf{I}) = 0$ *Intervalino mass:* $m(\mathbf{I}) = I(\mathbf{I})$ *Intervalino spin energy* $E_s(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} = 20{,}819.42423$ (MeV/c^2) *Intervalino linear velocity on surface:* $v(\mathbf{I}) = c$ *Total energy of primordial intervalinos and gravitons* $\Sigma E(\mathbf{I}) \equiv \Sigma E(g) = ½\ \Sigma E(\gamma) = (1/8)\ c^9 = 2.445098388 \cdot 10^{75}$ (J) *Number of primordial intervalinos* assembled at the IPA $n(\mathbf{I}) = \Sigma E(\mathbf{I}) / I(\mathbf{I}) = (1/8)\ c^{10} = 7.330220558 \cdot 10^{83}$ *Threshold temperature* of annihilation-materialization of intervalinos, $\gamma\gamma \leftrightarrow \mathbf{I}$ $\Theta_I(\mathbf{I}) \geq c^{\pm 2} m(\mathbf{I}) / k_B = 4\pi\ \Theta_m = 2.415992632 \cdot 10^{14}$ (K) *Threshold frequorce* of photons at the annihilation-materialization of intervalinos, φ_t $\varphi_t = 4\pi\ \varphi_m = 1/(\text{ch}) = 3.159839191 \cdot 10^{25}$ (s^{-1})	DALINOS —quanta of electric charge— (Share = 1/8) = Symmetric assembly of Intervalinos $D^{(\pm 1/1, 2, 3, 5, 6, 9, 10, 15, 18, 27, 30, 45, 54, 90, 135, 270)}$ —16 electric charged dalinos geometrically allowed by the intervalic symmetries of Nature— ***Electron*** $e = G_1 = D_{270} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$ *Electron charge* $e = 270\ \mathbf{q}_\mathbf{I} = 270\ \sqrt{-}(c^{-1}\hbar)$ *Structural energy balance* $I - I^{-1} - E(J) = [\ c^{\pm 2}\ \hbar\ (270\ \mathbf{q}_\mathbf{I})^{-2}\ ] - [\ ½\ (1/4\pi\varepsilon_0)\ e^2 / r_e\ ] - m_e\ \omega_s(e)^2\ r_e^2 = 0$ *Total energy of primordial dalinos:* $\Sigma E(D^{\pm}) \equiv \Sigma E(D^0) = ½\ \Sigma E(\mathbf{I}) = (1/16)\ c^9 = 1.222549194 \cdot 10^{75}$ (J) (Big Bang origin)	GAUDINOS (Share = 1/16) = Symmetric assembly of Dalinos $G^{(\pm 1/3, \pm 2/3)}$: ***Nucleonic gaudinos*** $G^{(\pm)}$: ***Leptons-Charged Massive Bosons*** —16 elementary charged gaudinos geometrically allowed by the intervalic symmetries of Nature— ***Muon, Tau, $Z^{\pm}$, $W^{\pm}$, $Y^{\pm}$, $X^{\pm}$***	LISZTINOS$^{(\pm 1/3, \pm 2/3)}$ (Share = 1/32) = Symmetric assembly of gaudinos ***Quarks*** (49 quarks = 7 lisztinian families × × 7 dalinar symmetries) Inasmuch as the vast majority of ZCMB decayed into quarks, and as the vast majority of primordial quarks decayed finally into the isoquark $L_3G_6 18 D_{8}^{(1/3, 2/3)}$—former *quarks up* and *down*—, we can deduce the *maximum number of nucleonic isoquarks* generated at the primordial Universe (taking roughly $m(q) \sim 313$ MeV/c^2): $n(q) \leq \Sigma m(L^{\pm 1/3, \pm 2/3}) / \Sigma m(q) = 1.218937472 \cdot 10^{85}$	MONTEVERDINOS = Assembly of 3 lisztinos$^{(\pm 1/3, \pm 2/3)}$ ***Baryons***	PALESTRINOS ***Nuclei***: $1 < A \leq 3$
								PSEUDO-PALESTRINOS ***Nuclei***: $A > 3$
							MONTEVERDINOS = Assembly of 2 Lisztinos$^{(\pm 1/3, \pm 2/3)}$ ***Mesons***	7th. symmetry breaking
						LISZTINOS$^{(0)}$ = Antisymmetric assembly of Gaudinos ***Bileptons-Z.C.M.Bosons*: Z^0, W^0, Y^0, X^0**	6th. symmetry breaking	
					ZERO CHARGED GAUDINOS (Share = 1/16) = Antisymmetric assembly of **D** —25 zero charged gaudinos — *Dark matter*	ELEMENTARY CHARGE ATTRACTOR 5th. symmetry breaking		
				ZERO CHARGED DALINOS (Share = 1/8) = Antisymmetric assembly of **I** —8 zero charged dalinos — D_{270}^0, D_{90}^0, D_{54}^0, D_{30}^0, D_{18}^0, D_{10}^0, D_6^0, D_2^0 *Dark matter*	INTERVALIC CHANGEFUL INTERACTION (formerly weak interaction). 4th. symmetry breaking		
			GRAVITON (Share = 1/4) = Symmetric assembly of γ $g = \|\gamma\gamma\|_s = [\ \|\gamma\gamma\|,\ 2^{-½}\ \|\gamma\chi\|+\|\chi\gamma\|),\ \|\chi\chi\|\ ]$ *Dark energy*	Degree of freedom: **ELECTRIC CHARGE** → ELECTROMAGNETIC INTERACTION. 3rd. symmetry breaking			
		CHI (Share = 1/2) = Antisym. assembly of S $\phi = 2^{-½}\ (\ |\uparrow\downarrow| - |\downarrow\uparrow|\ )$ *Dark energy*	Degree of freedom: **MASS** → GRAVITATIONAL INTERACTION. DARK MATTER UNIVERSE. 2nd. symmetry breaking					
	INTERVALIC LENGTH	Degree of freedom: **SPIN** → INTERVALIC CHANGELESS INTERACTION (formerly strong interaction). LIGHT UNIVERSE. 1st. symmetry breaking						
	Degree of freedom: **INFORMATION** → INFORMATIONAL INTERACTION. INFORMATION UNIVERSE (TIMELESS). Zero symmetry breaking							

INTERVALIC STRUCTURES OF SUBATOMIC PARTICLES ALLOWED BY THE INTERVALIC SYMMETRIES

(mass in MeV)

SIMETRÍA DALINAR	LEPTONES-BOSONES MASIVOS Y NEUTRINOS	QUARKS (LISZTINOS FRACCIONARIOS)
{D270}	$G_1D_{270}^{(\pm)}$ (0.5) = $e^{\pm}$ *electron* $v_{D270} = v_e$ *neutrino* ($1.1833119 \cdot 10^{-14}$)	-
{D135}	-	-
{D90}	-	-
{D54}	-	-
{D45}	$G_6D_{45}^{(\pm)}$ (106) = $\mu^{\pm}$ *muon* $v_{D45} = v_\mu$ *neutrino* ($2.0005108 \cdot 10^{-7}$)	$L_{1/5}1/3G_62D_{45}^{(1/5)}$ (35) *last radiant decay quark* $L_{2/5}2/3G_64D_{45}^{(1/5,\ 2/5)}$ (69) *constituent quark of π meson* $L_11G_66D_{45}^{(1/5,\ 2/5)}$ (104) $L_22G_612D_{45}^{(1/5,\ 2/5)}$ (207) **$L_33G_618D_{45}^{(1/5,\ 2/5)}$ (311)** *former quarks up, down* $L_44G_624D_{45}^{(1/5,\ 2/5)}$ (414) $L_55G_630D_{45}^{(1/5,\ 2/5)}$ (518) *former quark strange*
{D30}	$G_9D_{30}^{(\pm)}$ (373) - v_{D30} -	$L_{1/3}1/3G_93D_{30}^{(1/3)}$ (117) $L_{2/3}2/3G_96D_{30}^{(2/3)}$ (233) $L_11G_99D_{30}^{(1/3)}$ (350) $L_22G_918D_{30}^{(2/3)}$ (699) $L_33G_927D_{30}^{(1/3)}$ (1,049) **$L_44G_936D_{30}^{(2/3)}$ (1,399)** *former quark charm* $L_55G_945D_{30}^{(1/3)}$ (1,748)
{D27}	-	-
{D18}	$G_{15}D_{18}^{(\pm)}$ (1,777) = $\tau^{\pm}$ *tau* $v_{D18} = v_\tau$ *neutrino* ($2.6777745 \cdot 10^{-4}$)	$L_{1/3}1/3G_{15}5D_{18}^{(1/3)}$ (540) $L_{2/3}2/3G_{15}10D_{18}^{(2/3)}$ (1,079) $L_11G_{15}15D_{18}^{(1/3)}$ (1,619) $L_22G_{15}30D_{18}^{(2/3)}$ (3,238) **$L_33G_{15}45D_{18}^{(1/3)}$ (4,857)** *former quark bottom* $L_44G_{15}60D_{18}^{(2/3)}$ (6,476) $L_55G_{15}75D_{18}^{(1/3)}$ (8,095)
{D15}	-	-
{D10}	-	-
{D9}	-	-
{D6}	$G_{45}45D_6^{(\pm)}$ (46,565) $Z^{\pm}$ *massive boson* $L_22G_{45}90D_6^{(0)}$ (91,188) **Z^0 *massive boson*** v_{D6} *neutrino*	$L_{1/3}1/3G_{45}15D_6^{(1/3)}$ (14,571) $L_{2/3}2/3G_{45}30D_6^{(2/3)}$ (29,141) $L_11G_{45}45D_6^{(1/3)}$ (43,712) $L_22G_{45}90D_6^{(2/3)}$ (87,426) $L_33G_{45}135D_6^{(1/3)}$ (131,135) **$L_44G_{45}180D_6^{(2/3)}$ (174,846)** *former quark top* $L_55G_{45}225D_6^{(1/3)}$ (218,558)
{D5}	$G_{54}54D_5^{(\pm)}$ (80,423) **$W^{\pm}$ *massive boson*** $L_22G_{54}108D_5^{(0)}$(160,928) W^0 *massive boson* v_{D5} *neutrino*	$L_{1/5}1/3G_{54}18D_5^{(1/5)}$ (25,178) $L_{2/5}2/3G_{54}36D_5^{(1/5,\ 2/5)}$ (50,356) $L_11G_{54}54D_5^{(1/5,\ 2/5)}$ (75,534) $L_22G_{54}108D_5^{(1/5,\ 2/5)}$ (151,068) **$L_33G_{54}162D_5^{(1/5,\ 2/5)}$ (226,601)** $L_44G_{54}216D_5^{(1/5,\ 2/5)}$ (302,134) $L_55G_{54}270D_5^{(1/5,\ 2/5)}$ (377,668)
{D3}	$G_{90}90D_3^{(\pm)}$ (372,518) $Y^{\pm}$ *massive boson* $L_22G_{90}180D_3^{(0)}$ (745,037) **Y^0 *massive boson*** v_{D3} *neutrino*	$L_{1/3}1/3G_{90}30D_3^{(1/3)}$ (116,564) $L_{2/3}2/3G_{90}60D_3^{(1/3,\ 2/3)}$ (233,128) $L_11G_{90}90D_3^{(1/3,\ 2/3)}$ (349,693) $L_22G_{90}180D_3^{(1/3,\ 2/3)}$ (699,384) $L_33G_{90}270D_3^{(1/3,\ 2/3)}$ (1,049,078) **$L_44G_{90}360D_3^{(1/3,\ 2/3)}$ (1,398,771)** $L_55G_{90}450D_3^{(1/3,\ 2/3)}$ (1,748,463)
{D2}	$G_{135}135D_2^{(\pm)}$ (1,257,249) **$X^{\pm}$ *massive boson*** $L_22G_{135}270D_2^{(0)}$ (2,514,499) X^0 *massive boson* v_{D2} *neutrino*	$L_{1/3}1/3G_{135}45D_2^{(1/3)}$ (393,404) $L_{2/3}2/3G_{135}90D_2^{(1/3,\ 2/3)}$ (786,808) $L_11G_{135}135D_2^{(1/3,\ 2/3)}$ (1,180,213) $L_22G_{135}270D_2^{(1/3,\ 2/3)}$ (2,360,424) $L_33G_{135}405D_2^{(1/3,\ 2/3)}$ (3,540,638) $L_44G_{135}540D_2^{(1/3,\ 2/3)}$ (4,720,850) $L_55G_{135}675D_2^{(1/3,\ 2/3)}$ (5,901,063)
{D1}	-	-

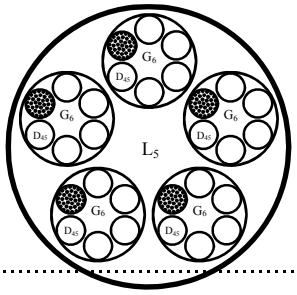
Lisztinian structure $L_{1/5}$
(quarks composed by 90 intervalinos)



Constituent quark of π meson.
Last radiant decay quark

(35) Quark $L_{1/5}1/3G_62D_{45}^{(1/5)}$
= 90 **I** = 180 γ = 360 S

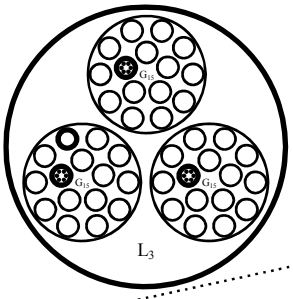
Lisztinian structure L_5
(quarks composed by 1350 intervalinos)



Former quark strange

(518) Quark $L_55G_630D_{45}^{(1/5,\ 2/5)}$
= 1350 **I** = 2700 γ = 5400 S

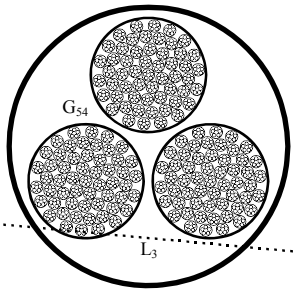
Lisztinian structure L_3
(quarks composed by 810 intervalinos)



Former quark bottom

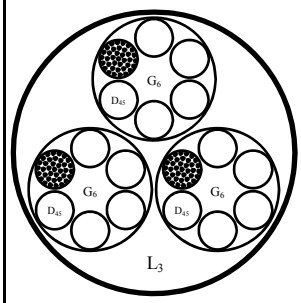
(4,857) Quark $L_33G_{15}45D_{18}^{(1/3)}$
= 810 **I** = 1620 γ = 3240 S

Lisztinian structure L_3
(quarks composed by 810 intervalinos)



(226,601) Quark $L_33G_{54}162D_5^{(1/5,\ 2/5)}$
= 810 **I** = 1620 γ = 3240 S

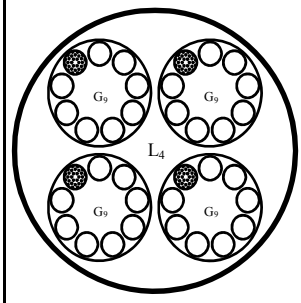
Lisztinian structure L_3
(quarks composed by 810 intervalinos)



Former quarks up, down

(311) Quark $L_33G_618D_{45}^{(1/5,\ 2/5)}$
= 810 **I** = 1620 γ = 3240 S

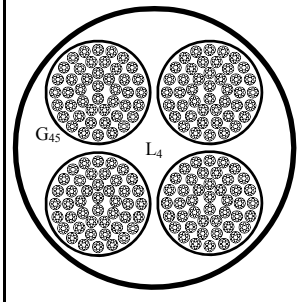
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)



Former quark charm

(1,399) Quark $L_44G_936D_{30}^{(2/3)}$
= 1080 **I** = 2160 γ = 4320 S

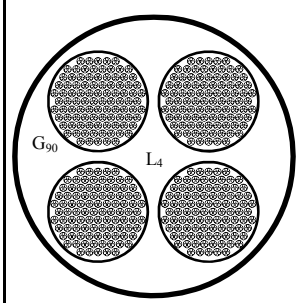
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)



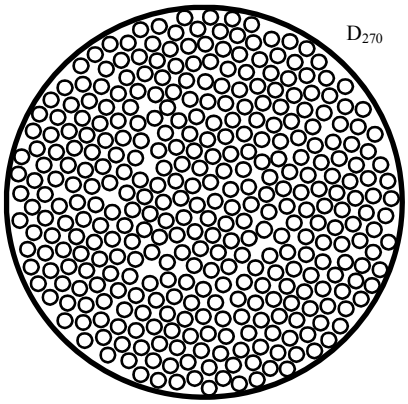
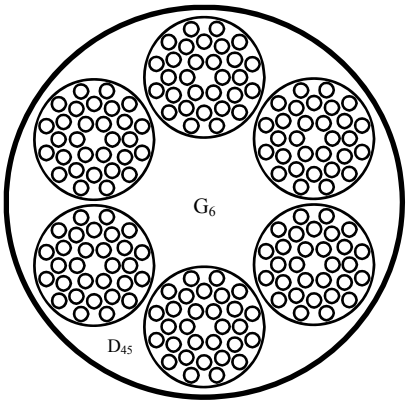
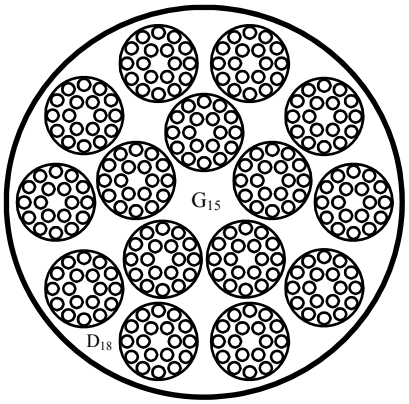
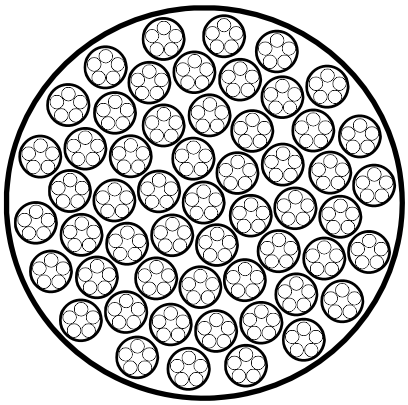
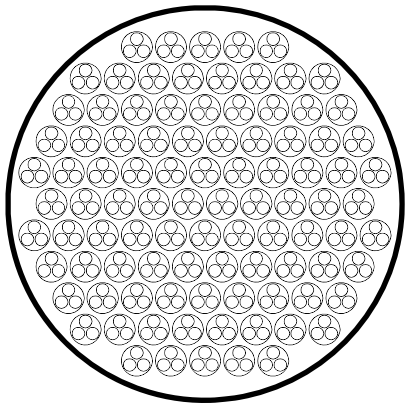
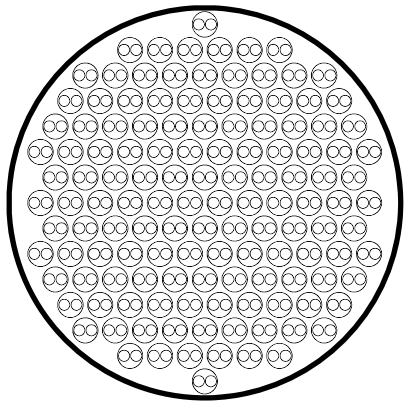
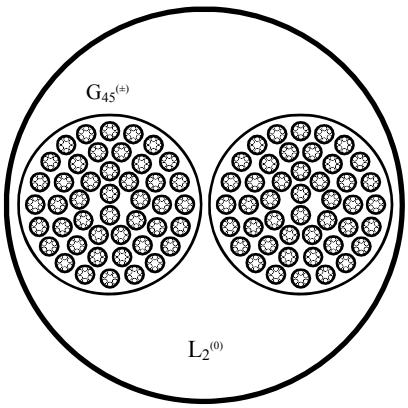
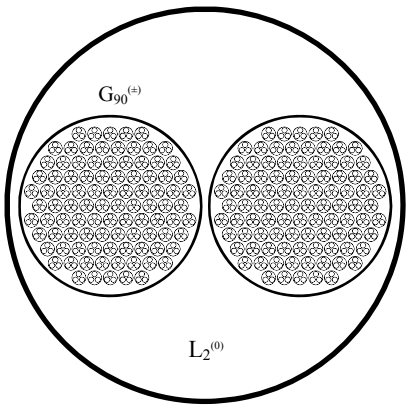
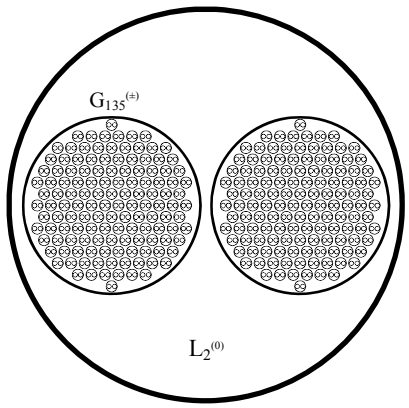
Former quark top

(174,846) Quark $L_44G_{45}180D_6^{(2/3)}$
= 1080 **I** = 2160 γ = 4320 S

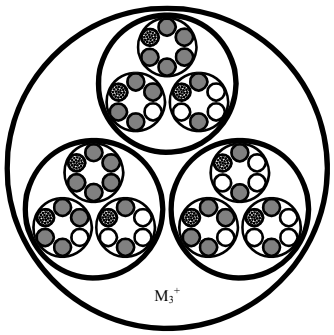
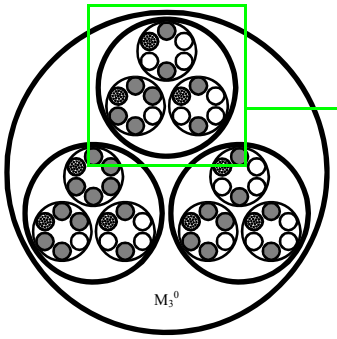
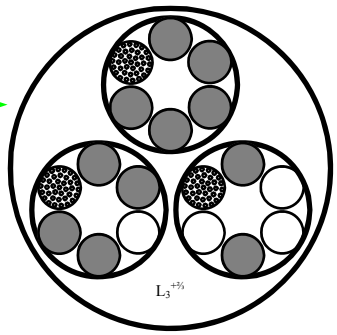
Lisztinian structure L_4
(quarks composed by 1080 intervalinos)

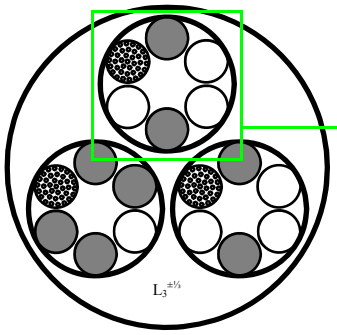
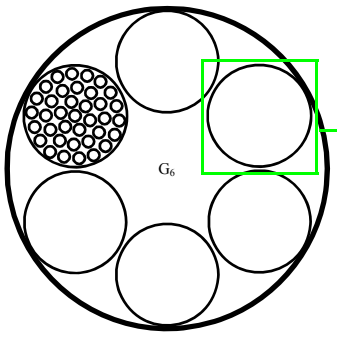
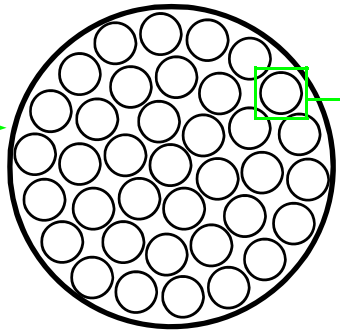


(1,398,771) Quark $L_44G_{90}360D_3^{(1/3,\ 2/3)}$
= 1080 **I** = 2160 γ = 4320 S

Dimensional Basis of the Intervalic System of Units: (L, i) dim (ħ) = L dim (c) = i^{-1}	**INTERVALIC LEPTONS-CHARGED MASSIVE BOSONS**		
	ELECTRON (0.51099906 MeV/c^2)	**MUON (105.658389 MeV/c^2)**	**TAU (1,777 MeV/c^2)**
	$e = D_{270} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$\mu = G_6 = 6\ D_{45} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$\tau = G_{15} = 15\ D_{18} = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$
Intervalic structure			
Intervalic energy, I	$I(e) = c^{\pm 2}\,\hbar\,e^{-2} = 4.575639166 \cdot 10^{-14}$ (J) = $= 0.285588809$ (MeV/c^2)	$I(\mu) = \sum(c^{\pm 2}\,\hbar\,Q^{-2}) = c^{\pm 2}\,\hbar\,e^{-2} +$ $+ 6\,(c^{\pm 2}\hbar\,(45\ \mathbf{q_I})^{-2}) = 61.9727717$ (MeV/c^2)	$I(\tau) = \sum(c^{\pm 2}\,\hbar\,Q^{-2}) = c^{\pm 2}\,\hbar\,e^{-2} +$ $+ 15\,(c^{\pm 2}\hbar\,(18\mathbf{q_I})^{-2}) = 964.1478215$ (MeV/c^2)
Electromagnetic energy, U	$U(e) = c^{\pm 2}m(e) - I(e) = 3.611471925 \cdot 10^{-14}$ (J) = $= 0.22541025$ (MeV/c^2)	$U(\mu) = c^{\pm 2}m(\mu) - I(\mu) = 6.999210568 \cdot 10^{-12}$ (J) = $= 43.6856173$ (MeV/c^2)	$U(\tau) = c^{\pm 2}m(\tau) - I(\tau) = 1.302333333 \cdot 10^{-10}$ (J) = $= 812.8521785$ (MeV/c^2)
Spin energy, E_J	$E_J(e) = I(e) - U(e) = 9.64167241 \cdot 10^{-15}$ (J)	$E_J(\mu) = I(\mu) - U(\mu) = 2.929926422 \cdot 10^{-12}$ (J)	$E_J(\tau) = I(\tau) - U(\tau) = 2.42402449 \cdot 10^{-11}$ (J)
Radius, r	$r_e = ½\ (1/4\pi\varepsilon_0)\ e^2 / U(e) = 3.194098699 \cdot 10^{-15}$ (m)	$r_\mu = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\mu) = 1.648099834 \cdot 10^{-17}$ (m)	$r_\tau = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(\tau) = 8.857484858 \cdot 10^{-19}$ (m)
Angular velocity due to spin, ω_J	$\omega_J(e) = (\ E_J(e)\ /\ m_e\ r_e^{\,2}\ )^{½} = 3.220944289 \cdot 10^{22}\ (s^{-1})$	$\omega_J(\mu) = (\ E_J(\mu)\ /\ m_\mu\ r_\mu^{\,2}\ )^{½} = 7.567601581 \cdot 10^{24}\ (s^{-1})$	$\omega_J(\tau) = (\ E_J(\tau)\ /\ m_\tau\ r_\tau^{\,2}\ )^{½} = 9.87597042 \cdot 10^{25}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_J(e) = \omega_J(e)\ r_e = 1.028801396 \cdot 10^{8}$ (m s^{-1}) = $= 0.343171206$ c	$v_J(\mu) = \omega_J(\mu)\ r_\mu = 1.247216291 \cdot 10^{8}$ (m s^{-1}) = $= 0.416026573$ c	$v_J(\tau) = \omega_J(\tau)\ r_\tau = 8.747625846 \cdot 10^{7}$ (m s^{-1}) = $= 0.29178939$ c
Intervalic quantum of charge $\mathbf{q_I} = \sqrt{-(c^{-1}\hbar)} = 1\ (i^{-1/2}L^{1/2}) =$ $5.93398995 \cdot 10^{-22}$ (C)	**W$^{\pm}$ MASSIVE BOSON (80,423 MeV/c^2)**	**Y$^{\pm}$ MASSIVE BOSON (372,518 MeV/c^2)**	**X$^{\pm}$ MASSIVE BOSON (1,257,249 MeV/c^2)**
	$W^{\pm} = G_{54} = 54\ D_5 = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$Y^{\pm} = G_{90} = 90\ D_3 = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$	$X^{\pm} = G_{135} = 135\ D_2 = 270\ \mathbf{I} = 540\ \gamma = 1080\ S$
Intervalic structure			
Intervalic energy, I	$I(W^{\pm}) = \sum(c^{\pm 2}\,\hbar\,Q^{-2}) = c^{\pm 2}\,\hbar\,e^{-2} +$ $+ 54\,(c^{\pm 2}\hbar\,(5\ \mathbf{q_I})^{-2}) = 44,970.24192$ (MeV/c^2)	$I(Y^{\pm}) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\,e^{-2} + 90\,(c^{\pm 2}\hbar\,(3\ \mathbf{q_I})^{-2}) =$ $3.335645528 \cdot 10^{-8}$ (J) = $208,194.5279$ (MeV/c^2)	$I(X^{\pm}) = \sum(c^{\pm 2}\hbar Q^{-2}) = c^{\pm 2}\hbar\,e^{-2} + 135\,(c^{\pm 2}\hbar\,(2\mathbf{q_I})^{-2}) =$ $= 1.125779279 \cdot 10^{-7}$ (J) = $702,655.8532$ (MeV/c^2)
Electromagnetic energy, U	$U(W^{\pm}) = c^{\pm 2}m(W^{\pm}) - I(W^{\pm}) = 5.6801605 \cdot 10^{-9}$ (J) = $= 35,452.76$ (MeV/c^2)	$U(Y^{\pm}) = c^{\pm 2}m(Y^{\pm}) - I(Y^{\pm}) = 2.632758703 \cdot 10^{-8}$ (J) = $= 164,323.802$ (MeV/c^2)	$U(X^{\pm}) = m(X^{\pm}) - I(X^{\pm}) = 8.88557208 \cdot 10^{-8}$ (J) = $= 554,593.547$ (MeV/c^2)
Spin energy, E_J	$E_J(W^{\pm}) = I(W^{\pm}) - U(W^{\pm}) = 1.524869713 \cdot 10^{-9}$ (J) = $= 9,517.484017$ (MeV/c^2)	$E_J(Y^{\pm}) = I(Y^{\pm}) - U(Y^{\pm}) = 7.02886825 \cdot 10^{-9}$ (J) = $= 43,870.726$ (MeV/c^2)	$E_J(X^{\pm}) = I(X^{\pm}) - U(X^{\pm}) = 2.37222071 \cdot 10^{-8}$ (J) = $= 148,062.307$ (MeV/c^2)
Radius, r	$r_W = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(W^{\pm}) = 2.0308225 \cdot 10^{-20}$ (m)	$r_Y = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(Y^{\pm}) = 4.381482156 \cdot 10^{-21}$ (m)	$r_X = ½\ (1/4\pi\varepsilon_0)\ (270\ \mathbf{q_I})^2 / U(X^{\pm}) = 1.298215261 \cdot 10^{-21}$ (m)
Angular velocity due to spin, ω_J	$\omega_J(W^{\pm}) = (\ E_J(W^{\pm})\ /\ m_W\ r_W^{\,2}\ )^{½} = 5.0783155 \cdot 10^{27}\ (s^{-1})$	$\omega_J(Y^{\pm}) = (\ E_J(Y^{\pm})\ /\ m_Y\ r_Y^{\,2}\ )^{½} = 2.34808191 \cdot 10^{28}\ (s^{-1})$	$\omega_J(X^{\pm}) = (\ E_J(X^{\pm})\ /\ m_X\ r_X^{\,2}\ )^{½} = 7.92474925 \cdot 10^{28}\ (s^{-1})$
Linear velocity due to spin on surface, v_J	$v_J(W^{\pm}) = \omega_J(W^{\pm})\ r_W = 1.03131574 \cdot 10^{8}$ (m s^{-1}) = $= 0.34400990$ c	$v_J(Y^{\pm}) = \omega_J(Y^{\pm})\ r_Y = 1.02880790 \cdot 10^{8}$ (m s^{-1}) = $= 0.343173375$ c	$v_J(X^{\pm}) = \omega_J(X^{\pm})\ r_X = 1.02880304 \cdot 10^{8}$ (m s^{-1}) = $= 0.343171755$ c
Structural energy balance for subatomic particles $I - I^{-1} - E_J = 0$ $c^{\pm 2}\,\hbar\,Q^{-2} - [\ ½(1/4\pi\varepsilon_0)Q^2 / r\ ] - m\,r^2\omega_J^{\,2} = 0$	**INTERVALIC BILEPTONS-ZERO CHARGED MASSIVE BOSONS**		
	Z^0 MASSIVE BOSON (91,188 MeV/c^2)	**Y^0 MASSIVE BOSON (745,037 MeV/c^2)**	**X^0 MASSIVE BOSON (2,514,499 MeV/c^2)**
	$Z^0 = L_2 = 2\ G_{45} = 90\ D_6 = 540\ \mathbf{I} = 1080\ \gamma = 2160\ S$	$Y^0 = L_2 = 2\ G_{90} = 180\ D_3 = 540\ \mathbf{I} = 1080\ \gamma = 2160\ S$	$X^0 = L_2 = 2\ G_{135} = 270\ D_2 = 540\ \mathbf{I} = 1080\ \gamma = 2160\ S$
Intervalic structure			

NUCLEON AND ITS CONSTITUENT ELECTROMAGNETIC PARTICLES

	PROTON	NEUTRON	QUARK UP
	$p = M_3 = 3\,L_3 = 9\,G_6 = 54\,D_{45} =$ $= 2430\,\mathbf{I} = 4860\,\gamma = 9720\,S$	$n = M_3 = 3\,L_3 = 9\,G_6 = 54\,D_{45} =$ $= 2430\,\mathbf{I} = 4860\,\gamma = 9720\,S$	$u^{+⅔} = L_3^{+⅔} = G_6^{+⅔} + G_6^{-⅓} + G_6^{+⅓} =$ $= 810\,\mathbf{I} = 1620\,\gamma = 3240\,S$
Intervalic Structure *(figured representation)*			
Intervalic energy I	$I(p)_{MLGD} = I(p)_M + I(u{+}u{+}d)_L + I[2(G_6^{\pm⅔}) + 7(G_6^{\pm⅓})]_G + 54I(D_{45})_D = 578.6029324$ (MeV/c^2)	$I(n)_{MLGD} = I(n)_M + I(u{+}d{+}d)_L + I[(G_6^{\pm⅔}) + 8(G_6^{\pm⅓})]_G + 54I(D_{45})_D = 582.1727926$ (MeV/c^2)	$I(u)_{LGD} = I(L_3^{+⅔}) + I(G_6^{+⅔}) + 2I(G_6^{\pm⅓}) + 18I(D_{45}) = 191.4872982$ (MeV/c^2)
Electromagnetic energy U	$U(p)_{MLGD} = U(p)_M + U(u{+}u{+}d)_L + U[2(G_6^{\pm⅔}) + 7(G_6^{\pm⅓})]_G + 54U(D_{45})_D = 359.6693703$ (MeV/c^2)	$U(n)_{MLGD} = U(n)_M + U(u{+}d{+}d)_L + U[(G_6^{\pm⅔}) + 8(G_6^{\pm⅓})]_G + 54U(D_{45})_D = 357.3928374$ (MeV/c^2)	$U(u)_{LGD} = U(L_3^{+⅔}) + U(G_6^{+⅔}) + 2UI(G_6^{\pm⅓}) + 18U(D_{45}) = 120.6486320$ (MeV/c^2)
Spin energy E_J	$E_J(p)_M = I(p)_M - 0 = 4.5756390 \cdot 10^{-14}$ (J) $= 0.285588809$ (MeV/c^2)	$E_J(n)_M = 0 - E_q(n)_M = 5.58841376 \cdot 10^{-14}$ (J) $= 0.34880120$ (MeV/c^2)	$E_J(u)_L = I(u)_L - E_q(u)_L = 2.573797104 \cdot 10^{-13}$ (J) $= 1.60643710$ (MeV/c^2)
Mass energy m	$m(p) = 938.2723027$ (MeV/c^2)	$m(n) = 939.5656300$ (MeV/c^2)	$m(u) = 312.1359302$ (MeV/c^2)
Radius r	$r_N \approx ½\,(r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}$ (m)	$r_N \approx ½\,(r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}$ (m)	$r_u = 6.88054386 \cdot 10^{-16}$ (m)
Angular velocity due to spin, ω_J	$\omega_J(p) = (E_J(p)_M / m_p r_p^2)^{½} = 4.252280621 \cdot 10^{21}$ (s^{-1})	$\omega_J(n) = (E_J(n)_M / m_n r_n^2)^{½} = 4.696141808 \cdot 10^{21}$ (s^{-1})	$\omega_J(u) = (E_J(u)_L / m_u r_u^2)^{½} = 3.125776462 \cdot 10^{22}$ (s^{-1})
Linear velocity due to spin on surface, v_J	$v_J(p) = \omega_J(p)\,r_N = 5.230305164 \cdot 10^6$ (m s^{-1}) $= 0.01744642$ c	$v_J(n) = \omega_J(n)\,r_N = 5.776254424 \cdot 10^6$ (m s^{-1}) $= 0.01926751$ c	$v_J(u) = \omega_J(u)\,r_u = 2.150704204 \cdot 10^7$ (m s^{-1}) $= 0.07173977$ c

	QUARK DOWN	NUCLEONIC GAUDINOS	NUCLEONIC DALINO
	$d^{-⅓} = L_3^{-⅓} = G_6^{+⅓} + G_6^{-⅓} + G_6^{-⅓} =$ $= 810\,\mathbf{I} = 1620\,\gamma = 3240\,S$	$G_6^{+⅔} = 5D_{+45} + 1D_{-45} = 270\,\mathbf{I} = 540\,\gamma$ $G_6^{-⅓} = 2D_{+45} + 4D_{-45} = 270\,\mathbf{I} = 540\,\gamma$ $G_6^{+⅓} = 4D_{+45} + 2D_{-45} = 270\,\mathbf{I} = 540\,\gamma$	$D_{\pm45} = 45\,\mathbf{I} = 90\,\gamma = 180\,S$
Intervalic Structure *(figured representation)*			
Intervalic energy I	$I(d)_{LGD} = I(L_3^{-⅓}) + I(G_6^{-⅓}) + 2I(G_6^{\pm⅓}) + 18I(D_{45}) = 195.3427472$ (MeV/c^2)	$I(G_6^{\pm⅓})_{GD} = 64.25748329$ (MeV/c^2) $I(G_6^{\pm⅔})_{GD} = 62.32975882$ (MeV/c^2)	$I(D_{45})_D = c^{\pm2}\hbar\,(45\,\mathbf{q_I})^{-2} = c^{\pm2}\hbar\,[45\sqrt{-(c^{-1}h)}]^{-2} = 1.6472301 \cdot 10^{-12}$ (J) $= 10.281197$ (MeV/c^2)
Electromagnetic energy U	$U(d)_{LGD} = U(L_3^{-⅓}) + U(G_6^{-⅓}) + 2U(G_6^{\pm⅓}) + 18U(D_{45}) = 118.3721063$ (MeV/c^2)	$U(G_6^{\pm⅓})_{GD} = 41.34633762$ (MeV/c^2) $U(G_6^{\pm⅔})_{GD} = 39.41861307$ (MeV/c^2)	$U_{G6\pm⅓}(D_{45})_D = 6.409125138$ (MeV/c^2) $U_{G6\pm⅔}(D_{45})_D = 6.24848144$ (MeV/c^2)
Spin energy E_J	$E_J(d)_L = I(d)_L - E_q(d)_L = 5.662353564 \cdot 10^{-13}$ (J) $= 3.53416158$ (MeV/c^2)	$E_J(G_6^{\pm⅓})_G = I(G_6^{\pm⅓})_G - E_q(G_6^{\pm⅓})_G = 5.133952133$ (MeV/c^2)	$E_J(_{G6\pm⅓}D_{45})_D = I(D_{45})_D - U_{G6\pm⅓}(D_{45})_D = 3.873072012$ (MeV/c^2)
Mass energy m	$m(d) = 313.7148535$ (MeV/c^2)	$m(G_6^{\pm⅓}) = 105.6038198$ (MeV/c^2)	$m_{G6\pm⅓}(D_{45}) = 16.69032229$ (MeV/c^2)
Radius r	$r_d = 6.88054386 \cdot 10^{-16}$ (m),	$r_{G6} = 8.299740193 \cdot 10^{-17}$ (m)	$r_{G6\pm⅓}(D_{45}) = 3.12047512 \cdot 10^{-18}$ (m)
Angular velocity due to spin, ω_J	$\omega_J(d) = (E_J(d)_L / m_d r_d^2)^{½} = 4.624593827 \cdot 10^{22}$ (s^{-1})	$\omega_J(G_6^{\pm⅓}) = (E_J(G_6^{\pm⅓})_G / m_{G6} r_{G6}^2)^{½} = 7.964878478 \cdot 10^{23}$ (s^{-1})	$\omega_{J\text{-}G6\pm⅓}(D_{45}) = (E_J(D_{45})_D / m_{D45} r_{D45}^2)^{½} = 4.628021876 \cdot 10^{25}$ (s^{-1})
Linear velocity due to spin on surface, v_J	$v_J(d) = \omega_J(d)\,r_d = 3.181972066 \cdot 10^7$ (m s^{-1}) $= 0.10613916$ c	$v_J(G_6^{\pm⅓}) = \omega_J(G_6^{\pm⅓})\,r_{G6} = 6.610642204 \cdot 10^7$ (m s^{-1}) $= 0.22050729$ c	$v_{J\text{-}G6\pm⅓}(D_{45}) = \omega_J(D_{45})\,r_{D45} = 1.444162712 \cdot 10^8$ (m s^{-1}) $= 0.48172083$ c

INTERVALIC STRUCTURE OF NUCLEON

$p = M_3^{+} = udu = 3\ L_3\ (L_3^{+⅔}, L_3^{-⅓}, L_3^{+⅔}) = 9\ G_6\ \{(2G_6^{+⅔}, 4G_6^{-⅓}, 3G_6^{+⅓}) = (3G_6^{-1}, 3G_6^{+1}, 2G_6^{+⅔}, 1G_6^{-⅓})\} = 54\ D_{45}\ (30D_{+45}, 24D_{-45}) = 2430\ \mathbf{I} = 4860\ \gamma = 9720\ S$

$n = M_3^{0} = dud = 3\ L_3\ (L_3^{-⅓}, L_3^{+⅔}, L_3^{-⅓}) = 9\ G_6\ \{(1G_6^{+⅔}, 5G_6^{-⅓}, 3G_6^{+⅓}) = (3G_6^{-1}, 3G_6^{+1}, 1G_6^{+⅔}, 2G_6^{-⅓})\} = 54\ D_{45}\ (27D_{+45}, 27D_{-45}) = 2430\ \mathbf{I} = 4860\ \gamma = 9720\ S$

Intervalic structure levels: 0: Point, 1: Intervalic String (S), 2: Photon (γ), 3: Intervalino (**I**), 4: Dalino (D), 5: Gaudino (G), 6: Lisztino(L), 7: Monteverdino (M), 8: Palestrino (P)

PHOTON: Light

Photon intervalic structure: $\gamma = 2\ S$

Photon state: $\gamma = |S\ \underline{S}|_{sym} = \{\ |\uparrow\uparrow|,\ 2^{-½}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ),\ |\downarrow\downarrow|\ \}$

Photon radius: $r_\gamma = \hbar = 1.0556363 \cdot 10^{-34}$ (m)

Photon spin: $J_\gamma = \hbar = 1.0556363 \cdot 10^{-34}$ (m)

Photon total length: $l_\gamma = 2\pi\ \hbar$

Frequorce of primordial photon:

$\varphi(\gamma_{pr}) = \boldsymbol{\varphi_I} = c\ \hbar^{-1} = 2.839921837 \cdot 10^{42}\ (s^{-1})$

Temperature of primordial photon:

$\Theta(\gamma_{pr}) = \boldsymbol{\Theta_I} = c\ k_B^{-1} = 2.17138589 \cdot 10^{31}$ (K)

Timeless Universe limit (Intervalic-relativistic transformations of time regarding temperature):

$t = t_0 / \sqrt{(1-[\Theta/\boldsymbol{\Theta_I}]^2)} = \infty$

INTERVALIC STRING: Consciousness

Irreducible features of the Intervalic String: Sat—Chit—Anand ≈

≈ Point: being — *Interval:* space — *Intervalic string:* consciousness

Intervalic String state: $S = \{\uparrow, \downarrow\}$

Intervalic String radius: $r_S = ½\ \hbar$

Intervalic String spin: $J_S = ½\ \hbar$

Intervalic String total length: $l_S = \pi\ \hbar$

INTERVALINO: Mass

Intervalino intervalic structure: $\mathbf{I} = 2\ \gamma = 4\ S$

Intervalino state: $\mathbf{I} = |\gamma\ \underline{\gamma}|_{ant} = 2^{-½}\ (\ |\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|\ ) =$

$= 2^{-½}\ (\ |\{\ |\uparrow\uparrow|,\ 2^{-½}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ),\ |\downarrow\downarrow|\ \}$

$\{\ |\downarrow\downarrow|,\ 2^{-½}\ (\ |\downarrow\uparrow| + |\uparrow\downarrow|\ ),\ |\uparrow\uparrow|\ \}| - |\{\ |\downarrow\downarrow|,\ 2^{-½}\ (\ |\downarrow\uparrow| + |\uparrow\downarrow|\ ),\ |\uparrow\uparrow|\ \}$

$\{\ |\uparrow\uparrow|,\ 2^{-½}\ (\ |\uparrow\downarrow| + |\downarrow\uparrow|\ ),\ |\downarrow\downarrow|\ \}|\ )$

Intervalino radius: $r_{\mathbf{I}} = c / \omega_{\mathbf{I}} = 2\ \hbar = 2.1112726 \cdot 10^{-34}$ (m)

Intervalino spin: $J_{\mathbf{I}} = 0\ \hbar$ — *Intervalino total length:* $l_{\mathbf{I}} = 4\pi\ \hbar$

Intervalino electric charge: $Q(\mathbf{I}) = \boldsymbol{q_I} = \sqrt{-(c^{-1}\hbar)} = 5.93398995 \cdot 10^{-22}$ (C)

Intervalino structural energy balance: $[\ c^{\pm2}\ \hbar\ \boldsymbol{q_I}^{-2}\ ] - m_{\mathbf{I}}\ \omega_{\mathbf{I}}^2\ r_{\mathbf{I}}^2 = 0$

Intervalino intervalic energy: $I(\mathbf{I}) = c^{\pm2}\ \hbar\ \boldsymbol{q_I}^{-2} = c^{-1} = 20{,}819.42423$ (MeV/c^2)

Intervalino electromagnetic energy: $U(\mathbf{I}) = 0$

Intervalino spin energy: $E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} = 20{,}819.42423$ (MeV/c^2)

Intervalino mass: $m(\mathbf{I}) = I(\mathbf{I}) = c^{-1} = 20{,}819.42423$ (MeV/c^2)

Intervalino linear velocity due to spin on surface: $v(\mathbf{I}) = c$

Intervalino angular velocity due to spin:

$\omega_J(\mathbf{I}) = c / r_{\mathbf{I}} = ½\ c\ \hbar^{-1} = 1.419960918 \cdot 10^{42}\ (s^{-1})$

Intervalino coupling temperature:

$\Theta_{cp} = 1/(4\pi\ c k_B) = 1.922575127 \cdot 10^{13}$ (K)

Intervalino coupling frequorce:

$\varphi_{cp} = 1/(4\pi\ c\hbar) = 2.51452013 \cdot 10^{24}\ (s^{-1})$

Intervalino structural energy ratios:

$I(\mathbf{I})/E(\mathbf{I})_{mass} = 1$

$U(\mathbf{I})/E(\mathbf{I})_{mass} = 0$

$E_J(\mathbf{I})/E(\mathbf{I})_{mass} = 1$

DALINO: Electric Charge

Energy released by the assembly of dalinos at the intervalic Primordial Assembly:

$E_B(D_{270}) = 270m(\mathbf{I}) - m(D_{270}) = 5{,}621{,}244.136$ (MeV/c^2)

$E_B(D_{45}) = 45m(\mathbf{I}) - m(D_{45}) = 936{,}855.694$ (MeV/c^2)

Assemblies of intervalinos in symmetric and antisymmetric state under interchange:

$D^{(\pm)} = |\mathbf{I}\ \underline{\mathbf{I}}|_{sym} =$

$= \{\ |\mathbf{I}\ \mathbf{I}|,\ 2^{-½}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| + |\underline{\mathbf{I}}\ \mathbf{I}|\ ),\ |\underline{\mathbf{I}}\ \underline{\mathbf{I}}|\ \}$

$D^{(0)} = |\mathbf{I}\ \underline{\mathbf{I}}|_{ant} = 2^{-½}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| - |\underline{\mathbf{I}}\ \mathbf{I}|\ )$

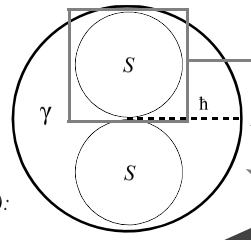
Origin of the electric charge from the primordial assembly of intervalinos:

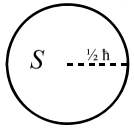
$|\mathbf{I}\ \mathbf{I}|$ = (+) charge

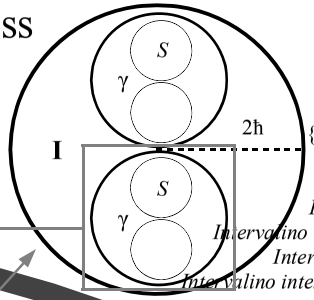
$2^{-½}\ (\ |\mathbf{I}\ \underline{\mathbf{I}}| \pm |\underline{\mathbf{I}}\ \mathbf{I}|\ ) =$

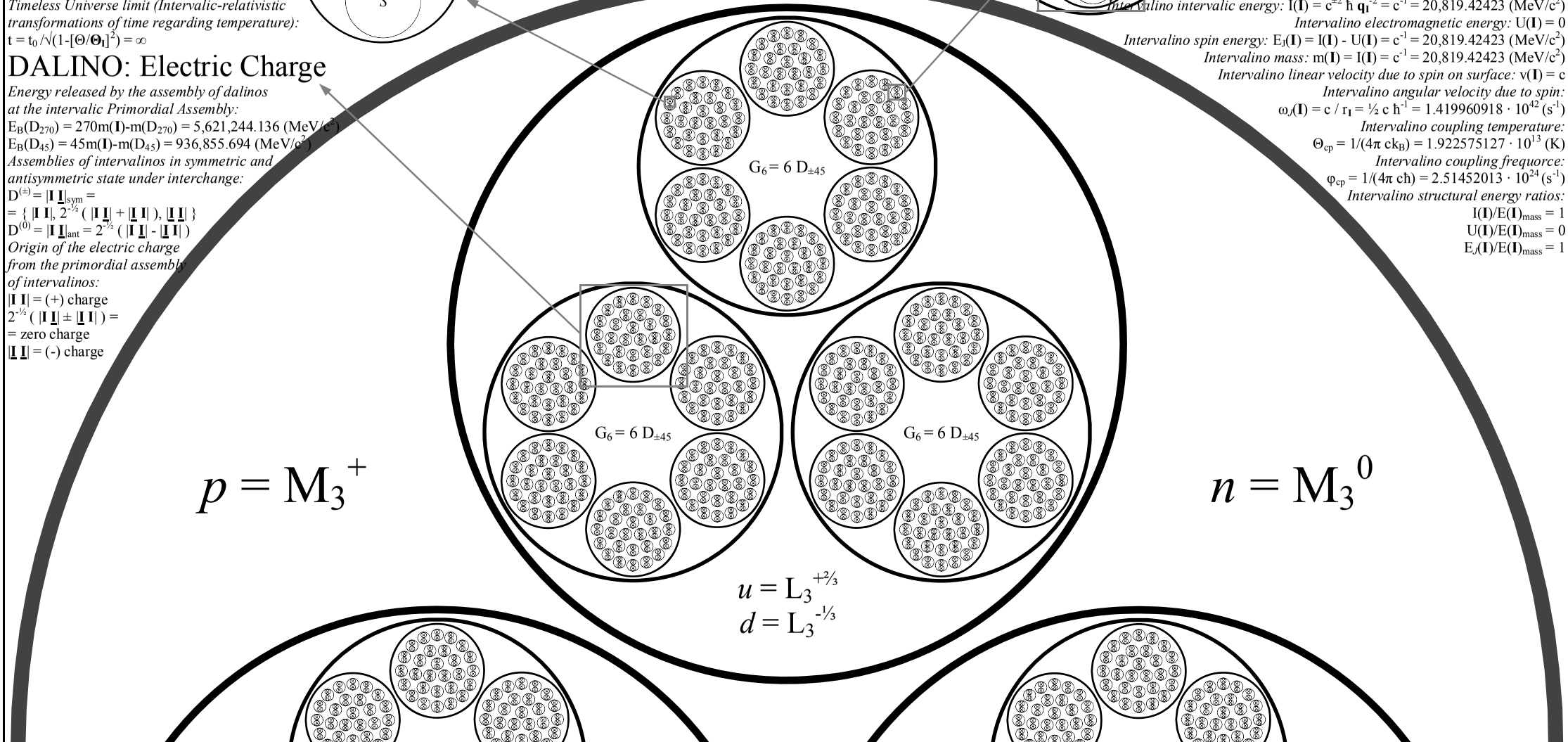
= zero charge

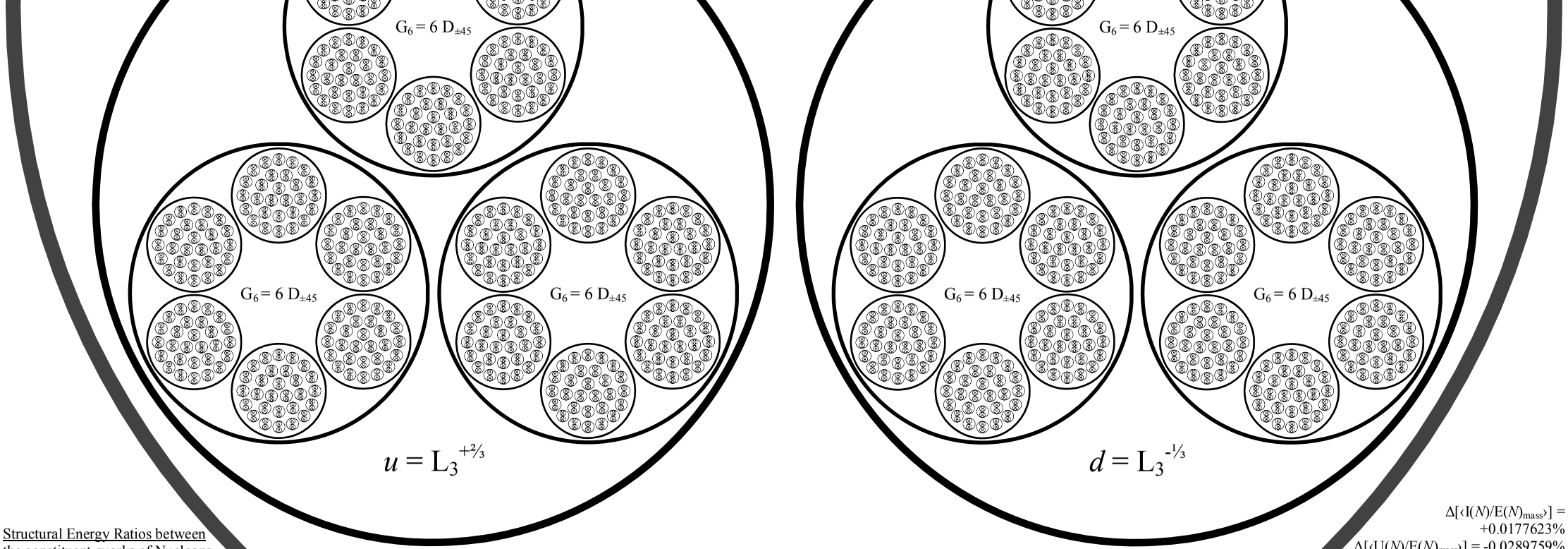
$|\underline{\mathbf{I}}\ \underline{\mathbf{I}}|$ = (-) charge











Structural Energy Ratios between the constituent quarks of Nucleons

$I(n)_L / I(p)_L = 1.5000000000$

$U(p)_L / U(n)_L = 1.5000000000$

Quark Up Structural Energy Ratios

$I(u)/U(u) = 1.587148524$

$I(u)/E(u)_{mass} = 0.613474065$

$U(u)/E(u)_{mass} = 0.386525934$

Quark Down Structural Energy Ratios

$I(d)/U(d) = 1.650243062$

$I(d)/E(d)_{mass} = 0.622676118$

$U(d)/E(d)_{mass} = 0.377323881$

Nucl. Quarks Structural Energy Ratios

$\langle I(d)/U(d)\rangle = 1.618695793 \sim \Phi$

$\langle I(d)/E(d)_{mass}\rangle = 0.618075091 \sim \Phi^{-1}$

$\langle U(d)/E(d)_{mass}\rangle = 0.381924907 \sim 1\text{-}\Phi^{-1}$

Deviation from the Golden Mean

Golden Mean, $\Phi = 1.61803398875$

$\Delta[\langle I(d)/U(d)\rangle] = +0.0409018\%$

$\Delta[\langle I(d)/E(d)_{mass}\rangle] = +0.0066505\%$

$\Delta[\langle U(d)/E(d)_{mass}\rangle] = -0.0107624\%$

DIFFERENCE OF MASS BETWEEN PROTON AND NEUTRON

Experimentally: $m(n) - m(p) = 1.29332 \pm 0.00028$ (MeV/c^2).

According to the Intervalic Theory:

$$m(n) - m(p) = [I(n)_{ML} + U(n)_{ML}] - [I(p)_{ML} + U(p)_{ML}] =$$
$$= [(I(M_3^0)+I(u)+2I(d)) + (U(M_3^0)+U(u)+2U(d))] -$$
$$- [(I(M_3^+)+2I(u)+I(d)) + (U(M_3^+)+2U(u)+U(d))] =$$
$$= [(0+0.64257483+5.14059860) + (0+0.465068250+0.232534124)] -$$
$$- [(0.28558880+1.2851497+2.5702993)+(0+0.9301365+0.116267062)]$$
$$= 5.78317343+0.697602374-4.1410378-1.046403562 = 1.293334442 \text{ (MeV/c}^2\text{)}$$

$\Delta[\langle I(N)/E(N)_{mass}\rangle] = +0.0177623\%$

$\Delta[\langle U(N)/E(N)_{mass}\rangle] = -0.0289759\%$

Proton Structural Energy Ratios

$I(p)/U(p) = 1.60871148$

$I(p)/E(p)_{mass} = 0.616668452$

$U(p)/E(p)_{mass} = 0.383330671$

$E_J(p)/E(p)_{mass} = 0.233337781$

Neutron Structural Energy Ratios

$I(n)/U(n) = 1.628947324$

$I(n)/E(n)_{mass} = 0.61961908$

$U(n)/E(n)_{mass} = 0.38038006$

$E_J(n)/E(n)_{mass} = 0.23923902$

Nucleon Structural Energy Ratios

$\langle I(N)/U(N)\rangle = 1.618829402 \sim \Phi$

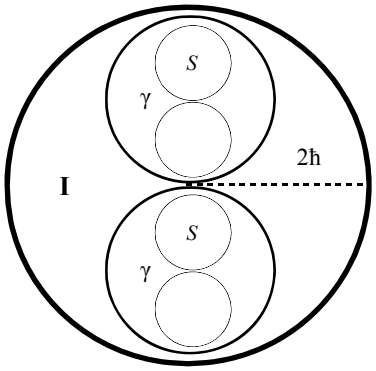
Deviation from the Golden Mean

Golden Mean, $\Phi = 1.61803398875$

$\Delta[\langle I(N)/U(N)\rangle] = +0.0491593\%$

	NUCLEONIC DALINO	NUCLEONIC GAUDINOS	QUARK UP	QUARK DOWN	PROTON	NEUTRON
Intervalic energy, I	$I(D_{45})_D = c^{\pm 2}\hbar\ (45\ \mathbf{q_I})^{-2} = c^{\pm 2}\hbar\ [45\sqrt{-(c^{-1}h)}]^{-2} =$ $= 1.6472301\cdot 10^{-12}$ (J) = 10.281197 (MeV/c^2)	$I(G_6^{\pm 1/3})_{GD} = 64.25748329$ (MeV/c^2) $I(G_6^{\pm 2/3})_{GD} = 62.32975882$ (MeV/c^2)	$I(u)_{LGD} = I(L_3^{+2/3}) + I(G_6^{+2/3}) + 2I(G_6^{\pm 1/3})$ $+ 18I(D_{45}) = 191.4872982$ (MeV/c^2)	$I(d)_{LGD} = I(L_3^{-1/3}) + I(G_6^{-1/3}) + 2I(G_6^{\pm 2/3}) +$ $+ 18I(D_{45}) = 195.3427472$ (MeV/c^2)	$I(p)_{MLGD} = I(p)_M + I(u+u+d)_L + I[2(G_6^{\pm 2/3}) +$ $+ 7(G_6^{\pm 1/3})]_G + 54I(D_{45})_D = 578.6029324$ (MeV/c^2)	$I(n)_{MLGD} = I(n)_M + I(u+d+d)_L + I[(G_6^{\pm 2/3}) +$ $+ 8(G_6^{\pm 1/3})]_G + 54I(D_{45})_D = 582.1727926$ (MeV/c^2)
Electromagnetic energy, U	$U_{G6\pm 1/3}(D_{45})_D = 6.409125138$ (MeV/c^2) $U_{G6\pm 2/3}(D_{45})_D = 6.24848144$ (MeV/c^2)	$U(G_6^{\pm 2/3})_{GD} = 41.34633762$ (MeV/c^2) $U(G_6^{\pm 1/3})_{GD} = 39.41861307$ (MeV/c^2)	$U(u)_{LGD} = U(L_3^{+2/3}) + U(G_6^{+2/3}) + 2U I(G_6^{\pm 1/3})$ $+ 18U(D_{45}) = 120.6486320$ (MeV/c^2)	$U(d)_{LGD} = U(L_3^{-1/3}) + U(G_6^{-1/3}) + 2U(G_6^{\pm 1/3})$ $+ 18U(D_{45}) = 118.3721063$ (MeV/c^2)	$U(p)_{MLGD} = U(p)_M + U(u+u+d)_L + U[2(G_6^{\pm 2/3}) +$ $+ 7(G_6^{\pm 1/3})]_G + 54U(D_{45})_D = 359.6693703$ (MeV/c^2)	$U(n)_{MLGD} = U(n)_M + U(u+d+d)_L + U[(G_6^{\pm 2/3}) +$ $+ 8(G_6^{\pm 1/3})]_G + 54U(D_{45})_D = 357.3928374$ (MeV/c^2)
Spin energy E_J	$E_J(_{G6\pm 1/3}D_{45})_D = I(D_{45})_D - U_{G6\pm 1/3}(D_{45})_D =$ $= 3.873072012$ (MeV/c^2)	$E_J(G_6^{\pm 1/3})_G = I(G_6^{\pm 1/3})_G - E_q(G_6^{\pm 1/3})_G =$ $= 5.133952133$ (MeV/c^2)	$E_J(u)_L = I(u)_L - E_q(u)_L = 2.573797104 \cdot$ $\cdot 10^{-13}$ (J) = 1.60643710 (MeV/c^2)	$E_J(d)_L = I(d)_L - E_q(d)_L = 5.662353564 \cdot$ $\cdot 10^{-13}$ (J) = 3.53416158 (MeV/c^2)	$E_J(p)_M = I(p)_M - 0 = 4.5756390 \cdot 10^{-14}$ (J) = $= 0.285588809$ (MeV/c^2)	$E_J(n)_M = 0 - E_q(n)_M = 5.58841376 \cdot 10^{-14}$ (J) = $= 0.34880120$ (MeV/c^2)
Mass energy m	$m_{G6\pm 1/3}(D_{45}) = 16.69032229$ (MeV/c^2) $m_{G6\pm 2/3}(D_{45}) = 16.52967859$ (MeV/c^2)	$m(G_6^{\pm 1/3}) = 105.6038198$ (MeV/c^2) $m(G_6^{\pm 2/3}) = 101.7483708$ (MeV/c^2)	$m(u) = 312.1359302$ (MeV/c^2)	$m(d) = 313.7148535$ (MeV/c^2)	$m(p) = 938.2723027$ (MeV/c^2)	$m(n) = 939.5656300$ (MeV/c^2)
Radius r	$r_{G6\pm 1/3}(D_{45}) = 3.12047512 \cdot 10^{-18}$ (m)	$r_{G6} = 8.299740193 \cdot 10^{-17}$ (m)	$r_u = 6.88054386 \cdot 10^{-16}$ (m)	$r_d = 6.88054386 \cdot 10^{-16}$ (m),	$r_N \approx \frac{1}{2}(r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}$ (m)	$r_N \approx \frac{1}{2}(r_{int} + r_{ext}) = 1.237448636 \cdot 10^{-15}$ (m)
Angular velocity due to spin, ω_J	$\omega_{J\text{-}G6\pm 1/3}(D_{45}) = (E_J(D_{45})_D / m_{D45}\, r_{D45}^2)^{1/2} =$ $= 4.628021876 \cdot 10^{25}$ (s^{-1})	$\omega_J(G_6^{\pm 1/3}) = (E_J(G_6^{\pm 2/3})_G / m_{G6}\, r_{G6}^2)^{1/2} =$ $= 7.964878478 \cdot 10^{23}$ (s^{-1})	$\omega_J(u) = (E_J(u)_L / m_u r_u^2)^{1/2} =$ $= 3.125776462 \cdot 10^{22}$ (s^{-1})	$\omega_J(d) = (E_J(d)_L / m_d r_d^2)^{1/2} =$ $= 4.624593827 \cdot 10^{22}$ (s^{-1})	$\omega_J(p) = (E_J(p)_M / m_p r_p^2)^{1/2} =$ $= 4.252280621 \cdot 10^{21}$ (s^{-1})	$\omega_J(n) = (E_J(n)_M / m_n r_n^2)^{1/2} =$ $= 4.696141808 \cdot 10^{21}$ (s^{-1})
Linear velocity due to spin on surface, v_J	$v_{J\text{-}G6\pm 1/3}(D_{45}) = \omega_J(D_{45})\, r_{D45} =$ $= 1.444162712 \cdot 10^8$ (m s^{-1}) = 0.48172083 c	$v_J(G_6^{\pm 1/3}) = \omega_J(G_6^{\pm 1/3})\, r_{G6} = 6.610642204 \cdot$ $\cdot 10^7$ (m s^{-1}) = 0.22050729 c	$v_J(u) = \omega_J(u)\, r_u = 2.150704204 \cdot$ $\cdot 10^7$ (m s^{-1}) = 0.07173977 c	$v_J(d) = \omega_J(d)\, r_d = 3.181972066 \cdot$ $\cdot 10^7$ (m s^{-1}) = 0.10613916 c	$v_J(p) = \omega_J(p)\, r_N =$ $= 5.230305164 \cdot 10^6$ (m s^{-1}) = 0.01744642 c	$v_J(n) = \omega_J(n)\, r_N =$ $= 5.776254424 \cdot 10^6$ (m s^{-1}) = 0.01926751 c

INTERVALINO



Intervalic structure	$\mathbf{I} = 2^{-½} (\|\gamma\gamma\| - \|\chi\gamma\|) = 2\,\gamma = 4\,S$
Intervalic energy, I	$I(\mathbf{I}) = c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2} = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Electromagnetic energy, U	$U(\mathbf{I}) = 0$
Spin energy, E_J	$E_J(\mathbf{I}) = I(\mathbf{I}) - U(\mathbf{I}) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$
Structural energy balance	$[\ c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2}\ ] - m_I\,\omega_I^2\,r_I^2 = 0$
Energy ratios	$I(\mathbf{I})/E(\mathbf{I})_{mass} = 1$ $U(\mathbf{I})/E(\mathbf{I})_{mass} = 0$ $E_J(\mathbf{I})/E(\mathbf{I})_{mass} = 1$
Radius, r	$r_I = 2\,\hbar = 2.1112726 \cdot 10^{-34}\,(m)$
Angular velocity due to spin, ω_J	$\omega_J(\mathbf{I}) = c / r_I = ½\,c\,\hbar^{-1} = 1.419960918 \cdot 10^{42}\,(s^{-1})$
Linear velocity due to spin on surface, v_J	$v_J(\mathbf{I}) = 2.99792458 \cdot 10^{8}\,(m\,s^{-1}) = c$

The intervalino is the first particle with *mass*, generated by the synthesis of two photons in antisymmetric state under interchange, whose threshold frequency —*coupling frequency of matter*— must be greater than: $\varphi_{cp} = 1 / (4\pi\,c\,\hbar) = 2.51452013 \cdot 10^{24}\ (s^{-1})$ for the synthesis may occur, so that intervalinos could eventually be synthesized artificially in the laboratory.

The physical properties of intervalino are extraordinary, because it is the only particle with an electric charge that has no electromagnetic energy — which only particles *with structure* can have, being this a basic definition of the physical laws that has forgotten the standard model—, so it is logically necessary the existence of a fundamental particle, for the electromagnetic interaction, with these extraordinary physical features: an indivisible electric charge and, by this reason, without electromagnetic potential energy.

The electric charge of the intervalino is the *intervalic quantum of electrical charge*: $\mathbf{q_I} = \sqrt{}\text{-}(c^{-1}\,\hbar) = 1\ (i^{-1/2}\,L^{1/2}) = 5.93398995 \cdot 10^{-22}\,(C)$, which is the fundamental charge of Nature, whose geometric value is exactly 1/270 of the elementary charge, *e*.

Its mass energy, which comes exclusively from the equivalent energy of the previous intervalic quantum of electric charge, $I\ (\mathbf{I}) = c^{\pm 2}\,\hbar\,\mathbf{q_I}^{-2} = c^{-1} = 20{,}819.42423\ (MeV/c^2)$, is also the *intervalic quantum of mass*: $\mathbf{m_I} = 1\ (i) = c^{-1} = 20{,}819.42423\ (MeV/c^2)$, while its spin energy is equally c^{-1}.

Its radius is twice the photon radius, i.e., twice the *intervalic quantum of length*: $\mathbf{r_I} = 2\,\mathbf{l_I} = 2\,\hbar = 2.1112726 \cdot 10^{-34}\,(m)$.

The antisymmetric state of the two constituents photons of the intervalino can be visualized as two photons traveling in opposite directions which are coupled tangentially, so that opposite ends to the coupling point of each photon —which are situated in the centre of the intervalino— continue moving at the speed of light, c, as it can not be otherwise, since all non massive particle always moves at the speed of light in intervalic space-time, hence the linear velocity on the "surface" of the intervalino is precisely c.

INTERVALIC PRIMORDIAL ASSEMBLY					
Structure Level	*Intervalic structure*	*Degree of freedom*	*Interaction introduced*	*Particles assembled*	*Symmetry breaking*
0	Point	Ø	Ø	Intervalic String	goes to next structure level
				Intervalic Length	-
1	Intervalic String	Space	Informational	Photon	goes to next structure level
				Chi	dark energy
2	Photon	Spin	Intervalic Changeless —strong—	Intervalino	goes to next structure level
				Graviton	dark energy
3	Intervalino	Mass	Gravitational	16 Dalinos: *electron*	goes to next structure level
				Bintervalino	dark matter
4	Dalino	Electric charge	Electromagnetic	40 Gaudinos: *nucl. Gs, leptons-CMBs*	goes to next structure level
				Bidalino	dark matter
5	Gaudino	Electric charge structure	Intervalic Changeful —weak—	Lisztinos: *49 quarks*	goes to next structure level
				Lisztinos: *bileptons-ZCMBs*	decay
6	Lisztino	Elementary charge	Elementary charge attractor	Monteverdinos: *baryons*	goes to next structure level
				Monteverdinos: *mesons*	decay
7	Monteverdino	ø	ø	Palestrinos: *nuclei*: $1< A \leq 3$	-
				Pseudopalestrinos: *nuclei: $A > 3$*	-

THE TOTAL ENERGY OF THE INTERVALIC UNIVERSE: SHARE OF PARTICLES AT THE INTERVALIC PRIMORDIAL ASSEMBLY

At each level of the Intervalic Primordial Assembly the two branches of particles assembled vanish between themselves (one branch is in symmetric state under interchange and the other is antisymmetric). This remarkable logical economy of the Intervalic Universe reminds the perfect Yin-Yang balance of Nature according to *Tao te King*, which traditionally was believed to ruling only on the organic world.

Particles share at the Intervalic Primordial Assembly:

- Photons: > 0
- Chis: ½ = 50%
- Intervalinos: ~ 0
- Gravitons: ¼ = 25%
- Dalinos: ~ 0
- Zero charged dalinos: < 1/8 = 12.5%
- Gaudinos: ~ 0
- Zero charged gaudinos: < 1/16 = 6.25%
- Lisztinos (quarks): < 1/16 = 6.25%

Grouping them in terms of the darkness of matter:

- Dark energy: ½ = 50%
- Dark matter: < 3/16 = 18.75%
- Visible matter: < 1/16 = 6.25%
- Gravitons: ¼ = 25%
- Photons: > 0

Please note the fine match of the relations:

- Dark matter + Visible matter = Gravitons
- Dark matter + Visible matter + Gravitons = Chis

of time —which came into existence just at the beginning of the 2nd phase or photon-synthesis. The dalino-synthesis released the fabulous amount of energy (in form of photons and neutrinos) of:

$E_B(D_{270}) = m(270\ \mathbf{I}) - m(D_{270}) = 5{,}621{,}244.136\ (MeV/c^2)$
$E_B(D_{45}) = m(45\ \mathbf{I}) - m(D_{45}) = 936{,}855.694\ (MeV/c^2)$

respectively for each electron (D_{270}) and each nucleonic dalino (D_{45}) synthesized. The dalino-synthesis began as early as the temperature of the primordial Universe fell below the threshold temperatures of synthesis for each dalino:

$\Theta_B\ (D_{270}) < E_B(D_{270}) / k_B = 6.523179514 \cdot 10^{16}\ (K)$
$\Theta_B\ (D_{45}) < E_B(D_{45}) / k_B = 1.087175336 \cdot 10^{16}\ (K),$

since above these threshold temperatures the 16 dalinos allowed by the intervalic symmetries are in a state of recombination (symmetries that will permanently last below those temperatures, but not as *real* states but as *virtual* states):

$D_{270} \leftrightarrow 2\ D_{135} \leftrightarrow 3\ D_{90} \leftrightarrow 5\ D_{54} \leftrightarrow 6\ D_{45} \leftrightarrow 9\ D_{30} \leftrightarrow 10\ D_{27} \leftrightarrow 15\ D_{18} \leftrightarrow 18\ D_{15} \leftrightarrow 27\ D_{10} \leftrightarrow 30\ D_9 \leftrightarrow 45\ D_6 \leftrightarrow 54\ D_5 \leftrightarrow 90\ D_3 \leftrightarrow 180\ D_2 \leftrightarrow 270\ D_1 \leftrightarrow$

This extraordinary release of energy in the primordial Universe is what is known as the Big Bang.

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The Intervalic Theory explains in a different way from the standard model all known experimental results to date. This is done with crushing logic, with geometric precision, and without using a single arbitrary constant. In this way are deduced all the physical properties of the 147 subatomic particles of Nature, both visible as dark. Besides this, it can be highlighted the following physical explanations, among others:

- The deduction of the annihilation ratio and the partial decay widths of all leptons-charged massive bosons (that reach up to the value 1/70) and bileptons-zero charged massive bosons (that reach up to the value 1/30), both detected to date as like as undetected yet.
- The shape of the curve of the binding energy per nucleon and its value

~ 8 (MeV/c^2), since according to the Intervalic Theory *all nuclei with mass number A > 3 are not composed by nucleons but by quarks*, being those ~ 8 (MeV/c^2) the structural energy required to synthesize or "arm" the structure of the nucleon at the last level —the monteverdic one— from three quarks to leaving the nucleus synthetized in a nucleon. This "arming" energy for synthetizing that monteverdic structure is constant regardless of the mass number. *Only nuclei with mass number A ≤ 3 are composed by nucleons*. This explains simply and clearly why deuterons release a huge amount of energy when merging to make a helium nucleus: because they lose the last level of the intervalic structure, whose energy per nucleon is ~ 8 (MeV/c^2), as the Helium is a monteverdino composed by quark, while the deuteron is a palestrino composed by nucleons. That amount of energy is what is released in fusion reactions.

- The *neutron to proton ratio* of the Universe, which is derived exclusively from the intervalic structure of nucleon in two independent ways, both yielding virtually the same result: ~ 22%.

- The *intervalic structure of stars*, whose life in the twilight go through the same phases of the primordial intervalic synthesis, only in reverse, thus having quarks stars, gaudinos stars and dalinos stars. Intervalinos star is only reached at the Big Crunch.

- The *intervalic cosmology*, which establishes a model of indefinitely oscillating Universe , that "bounces" between a Big Crunch and a Big Bang.

- The nature of the former weak and strong nuclear interactions, which are now, respectively, the *changeful* and *changeless intervalic interactions*, as well as the explanation of the intervalic structures involved in the beta decay, the exchange intervalic structure that explains the inner dynamic state of nucleon and π meson, etc.

- All the apparent paradoxes of quantum mechanics, which are but pseudo problems born of the ignorance of symmetries and of ultimate foundations of physics, including from the uncertainty principle assumption to the experiment of double slit, etc., which now have finally been revealed by the Intervalic theory.

- The nature of *vacuum* and of three-dimensional space, which is not a *continuum* at all and not even a discrete space, but simply the folding of a one-dimensional physical space —the only real physical substance— in a three-dimensional mathematical space, just as the nature of time is also virtual, mathematical: *imaginary space*. Since all massive particles is composed by intervalinos, and intervalino is composed by two photons, and photon is composed by two intervalic strings —whose volume and surface are zero (as intervalic strings are but one-dimensional space intervals in a finite number)—, we reach to the surprising conclusion that both actual total volume and actual total area of the Universe are just zero.

- The nature and intervalic symmetries of antigravity, and the theoretical way to generate an antigravity field.

- The nature of *information* and the discovery of the geometric equivalence between energy and information, which forms a further branch of the Intervalic Theory.

- Being constituted all subatomic particles, ultimately, by the synthesis of intervalic strings, its intervalic structure can alternatively be expressed as a quantum-informational state that is named the *intervalic code* of subatomic particles. For example, the intervalic code of the particles synthesized before the dalino-synthesis (which released the energy of the Big Bang) is:

THE INTERVALIC CODE of first subatomic particles

Intervalic string:
$S = \{\uparrow, \downarrow\}$

Photon = synthesis of intervalic strings in symmetric state under interchange:
$\gamma = \{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}$

Chi = synthesis of intervalic strings in antisymmetric state under interchange:
$¢ = 2^{-½} (|\uparrow\downarrow| - |\downarrow\uparrow|)$

Intervalino = synthesis of photons in antisymmetric state under interchange:
$I = 2^{-½} (|\gamma\underline{\gamma}| - |\underline{\gamma}\gamma|) = 2^{-½} (|\{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\downarrow\downarrow|, 2^{-½} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}| - |\{ |\downarrow\downarrow|, 2^{-½} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|)$

Graviton = synthesis of photons in symmetric state under interchange:
$g = |\gamma\underline{\gamma}|_s = [|\gamma\gamma|, 2^{-½} (|\gamma\underline{\gamma}| + |\underline{\gamma}\gamma|), |\underline{\gamma}\underline{\gamma}|] = [|\{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|, 2^{-½} (|\{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \} \{ |\downarrow\downarrow|, 2^{-½} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}| + |\{ |\downarrow\downarrow|, 2^{-½} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\uparrow\uparrow|, 2^{-½} (|\uparrow\downarrow| + |\downarrow\uparrow|), |\downarrow\downarrow| \}|), |\{ |\downarrow\downarrow|, 2^{-½} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \} \{ |\downarrow\downarrow|, 2^{-½} (|\downarrow\uparrow| + |\uparrow\downarrow|), |\uparrow\uparrow| \}|]$

The Intervalic Theory performs a complete reformulation of physics without introducing a single arbitrary constant, deducting all, in a logical and necessary way, from the intervalic system of physical quantities, which is the *natural* system of units, from which emerge the fundamental symmetries of physics and the underlying fundamental geometry of Nature, without whose knowledge no further progress is possible. Therefore, the heuristic key lies in the discovery of the intervalic dimensional basis of the intervalic or natural system of physical quantities (and not their units as they themselves are secondary). From an epistemological point of view it is interesting to note that the intervalic or natural dimensional basis could have been uncovered by different logical ways:

- From the definition of *time* as *imaginary space*, T = *i*L, which is the route used by the Intervalic Theory in Music, that historically led to the postulation of the Intervalic Theory.
- From the physical interpretation of the Planck's quantum of action as a pattern of length, which was warned by Lancelot Law Whyte in his *Critique of Physics:* "Planck's constant (in appropriate combinations) determines the linear scale of the structure of matter and of radiation, in terms of the selected unit of length".
- From the classic formulation of special relativity by Minkowski in 1908, where he introduces the imaginary number, *i*, in the temporal component of the equations of relativity, which in his own words, leads to define the speed of light as: $c = i$. In fact, the formulation of Einstein-Minkowski does work because it uses —although partial and unconsciously— the dimensions of the intervalic system of physical quantities.
- From the definition of the fine structure constant, since we know that is value is the square of the elementary charge *in natural units*, which necessarily implies that, in natural units, $e = 270$. From here the logical deduction of the intervalic or natural dimensional basis is immediate.
- From the empirical data showing conclusively that the masses of massive subatomic particles detected to date are proportional to the inverse square of 270, 45, 30, 18, 6 and 5.
- From the finding that the *frames of reference* used by the methodology of the classical-quantum metric (usually an *observer* external to the system), are *arbitrary* and *privileged*, which is a serious epistemological inconsistency. This methodological paradigm —subliminal and unconscious, and therefore much more difficult to detect and to correct— results in partial or erroneous measurements and interpretations, being therefore replaced by the intervalic metric, where there are no arbitrary and privileged observers, but each particle has its own reference system (in fact, the physical features

of subatomic particles can only be expressed with and from this intervalic metric). Henceforth it is understood that the Intervalic Theory could be seen as the development and logical continuation of the philosophy that emanates from relativity, so it can be said that there has been a historical progression towards intervalicity, which has gone through three progressive stages: classical mechanics, relativistic mechanics and intervalic mechanics. A somewhat surprising way, this is the route used by the Intervalic Theory in Economics, which is, likewise, the *natural* theory of economics.

Any of these six ways implies, when being developed with the blind ruthlessness of logic, the deduction of the intervalic dimensional basis and, consequently, of the Intervalic Theory, which is deduced in full from the intervalic or natural system of physical quantities. The fact that this rigorous logical deduction has not been made previously by some of these ways, indicates how difficult it is for the human mind to get out of the classical-quantum current paradigm, whose false dogmas prevent even start the developing of something as implacable as it is logic.