"And God said, Let there be light: and there was light." Genesis 1.3

GRAVITON PHYSICS

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ABSTRACT

Were established: the physically characteristics of graviton as the fundamental particle of matter and the structure of some atomic particles. The structure of the fields of fundamental forces and their correlation: field of nuclear forces, field of electric and electromagnetic forces, the photons structure, the electromagnetic waves and the gravitational field. Has been established new theoretical elements of cosmogonic and astrophysics concerning "Big-Bang" and "Black-Hole" phenomenon.

INTRODUCTION

It is known that all the matter in the Universe, whatever the form where it is: solid, liquid, gaseous, plasma, particles with or without electrical charge, photons – has a common element: gravitational interaction. There is a connection between mass and gravitation. The mass interactions generate gravitational interactions, fact already proved by observations [1][3]. This implies a "common cause" in internal structure of the matter. This "common cause" goes inside the structure of matter and can be also a form of matter present in all the listed situations, as a general factor. On the other hand, the observations on the appearance and the mode of action of gravitational force suggest its presence where there is matter and its intensity is proportional with the density of matter. Following the analogy between matter and gravitational force we can deduce that for each part of matter it corresponds a gravitational force proportional to its mass. To quantify this matter-gravity correlation, it is necessary to identify that basic mass unit which can be the force carrier for gravitational force.

The method, developed and presented in this study, propose to start from a quantity of matter with well-defined mass and volume. Using logical hypothesis and reasoning we will get to determine of the smallest unit of matter, indivisible.

With other words, we will decompose, theoretically, a known particle in a large numbers of "pieces", equal each other, small enough to achieve the smallest mass possible to generate the gravity. Thus, we can consider absolutely theoretical, that for any particle with a well-defined mass and volume, we can make the following considerations:

- we consider that the total mass and the volume occupied by any particle could be divided into an unknown number "n" of fundamental units of mass, each with its volume, respectively in "n" fundamental units of volume, that is the total mass m_p is composed of a number of n_p basic particles (BP) having each of them the mass m_φ.

- we consider a theoretically collapsed state of the particle, in which there is no more space inside of its matter, and the "n_p" mass units are merged.

Between the two states supposed above, the static normal state of the particle and the collapsed state, we develop a system of equations that allows us to start from the known initial data of the particle (mass and volume) we can determine the fundamental unit of mass, its volume and the number "n_p" of units that could form the entire mass of the considered particle.

For uniformity, all physical sizes of basic particle (BP) were noted with index "φ", rest of notations are current commonly usual notations.

A. DETERMINATION OF PHYSICAL CHARACTERISTICS OF BASIC PARTICLE (BP) – THE METHOD –

For any particle identified so far, we can write the condition that the entire mass of the particle is decomposed in an unknown number n_p of basic particles:

$$m_p = n_p\, m_\varphi, \tag{1}$$

where: m_p - is mass of any particle, m_φ - is BP mass and n_p – is the number of these BP

We consider that the mass of one particle has a certain degree of loosening like a cloud, the distances between BP decrease with particle radius decreasing, having a higher density in the middle, i.e. the BP components are not join one to each other, respective in the medium statistics value, each BP has a volume of vibration V_ϕ and a radius R_ϕ.

It can be written as:

$$V_p = n_p\, V_\phi \tag{2}$$

From that results: $$R_\phi = \frac{R_p}{\sqrt[3]{n_p}} \tag{3}$$

Inside of such micro-volume V_ϕ, can consider that BP with mass m_ϕ and radius r_ϕ, is in state of vibration with kinetic speed v, its kinetic energy being:

$$W_v \cong m_\phi v^2 \tag{4}$$

Theoretical, it can be considered a gravitational collapsed state of particle until, let say, the Schwarzschild radius, situation existing in astrophysics but adapted to apply in quantum mechanics [4][9][11]. In this situation, the radius of compressed particle becomes:

$$R_c = \frac{G m_p}{c^2} \tag{5}$$

where G is Universal constant of gravity and c the speed of light.

Proceeding similar as prior, the micro-volume vibration radius of BP becomes:

$$R_{\phi_c} = \frac{R_c}{\sqrt[3]{n_p}} \tag{6}$$

Taking account of imposed condition: $m_p = n_p\, m_\varphi$

Equation (3) becomes: $$\frac{G m_\varphi}{R_{\phi c}} = \frac{c^2}{\sqrt[3]{n_p^2}} \tag{7}$$

In this situation, the density of a micro-volume $V\varphi_c$ is equal with the density of compressed particle ρ_c.

In equation (7) the term: $\frac{c^2}{\sqrt[3]{n_p^2}} = w_{\phi_c}^2$ has the signification of square of speed vibration in this compressed state.

Therefore, the kinetic energy of vibration of a BP will be:

$$W_{\phi_c} \cong \frac{m_\varphi c^2}{\sqrt{n_p^2}} \tag{8}$$

Between two states, normally and theoretical collapsed, we can write the known relation between corresponding densities[12]:

$$\rho_p = \rho_v = \rho_{\phi_c} e^{-\frac{W_{\phi_c}}{W_v}} \quad (9)$$

i.e. $$\rho_{\phi_c} = \rho_v e^{-\frac{W_{\phi_c}}{W_v}} \quad (10)$$

after calculations, we finally obtain:

$$v^2 \sqrt[3]{n_p^2} = \frac{\log e}{log\frac{R_p^3}{R_c^3}} c^2 \quad (11)$$

Also, we can write homological equation between those two states of one BP:

$$\frac{P_{\phi v}}{\rho_v^{4/3}} = \frac{P_{\phi c}}{\rho_{\phi c}^{4/3}} \cdot a \quad (12)$$

where: $P_{\phi v}$ and $P_{\phi c}$ are the corresponding pressures of one BP in these two states and "a" is a proportionality factor[13].

The particle as a whole can be considered as an enclosure occupied by n_p BP, and the pressure of the entire enclosure is therefore proportional with sum of vibration energies of all BP, i.e.:

$$m_p v^2 = n_p m_\varphi v^2 \quad (13)$$

Therefore, vibration pressure of entire particle will be the sum of all kinetic vibration pressures of n_p BP: $P_v = n_p P_{\phi v}$, that is:

$$P_{\phi v} = \frac{P_v}{n_p} \quad (14)$$

Can write equation (12) as:

$$\frac{P_v}{n_p \rho_v^{4/3}} = \frac{P_{\phi c}}{\rho_{\phi c}^{4/3}} \cdot a \quad (15)$$

The exponents 4/3 from denominator are usual values of polytrophic factor in this case.

Because in collapsed state: $P_{\phi c} = P_c$ and $\rho_{\varphi c} = \rho_c$, that is the pressure and density in any point of particle are the same as in entire particle, can write the equation (15) as:

$$\frac{P_v}{n_p \rho_v^{4/3}} = \frac{P_c}{\rho_c^{4/3}} \cdot a \quad (16)$$

We can write the pressures P_v and P_c in well-known form:

$$P_v = \frac{1}{3} \rho_v v^2 \quad (17)$$

And: $$P_c = \frac{1}{3} \rho_c c^2 \quad (18)$$

Through substitute and simplification, equation (16) finally becomes:

$$\frac{v^2}{n_p} = c^2 \frac{R_c}{R_p} \cdot a \quad (19)$$

Where „a" is a factor of proportionality, R_p is the radius of the particle in normal state and R_c is the radius of the particle in collapsed state. This can be calculated with equation (3).

In theoretically super-collapsed state , we can consider that theoretical radius of a particle becomes : $R_x < R_c$, and the volume V_{Rx} of super-collapsed particle is the sum of all n_p volumes of merged BPs in volume V_φ:

$$V_{Rx} = n_p V_\varphi \quad (20)$$

It results: $$R_x = r_\varphi \sqrt[3]{n_p} \quad (21)$$

where r_ϕ is the radius of one BP. In this situation, the density of the particle ρ_x is equal with itself density ρ_φ of one BP:

$$\rho_x = \rho_\varphi = \frac{3}{4\pi} \frac{m_\varphi}{r_\varphi^3} \quad (22)$$

We can also write the homologic relation between those two states: the collapsed state of the particle until the equivalent of Scharzschild radius R_c and super-collapsed state of the radius R_x.

$$\frac{P_c}{P_c^{4/3}} = \frac{p_x}{P_x^{4/3}} \quad (23)$$

Where terms value are:

$$P_c = \frac{1}{3}\rho_c c^2; \quad \rho_c = \frac{3}{4\pi} \cdot \frac{m_p}{R_c^3};$$

$$\rho_x = \rho_\varphi = \frac{3}{4\pi} \cdot \frac{m_p}{R_x^3} = \frac{3}{4\pi} \cdot \frac{m_\varphi}{r_\varphi^3} \quad \text{and}$$

$$P_x = \frac{1}{3}\rho_\varphi c^2 \sqrt[3]{n_p^2} \quad (24)$$

In equation (24), the term $c^2\sqrt[3]{n_p^2}$, result simple thus:

For a BP can be written the potential equation:

$$\frac{K_\varphi m_\varphi}{r_\varphi} = c^2 \quad (25)$$

where K_φ is a constant of proportionality.

Multiplying the first member of equation with n_p and knowing that: $R_x = r_\varphi \sqrt[3]{n_p}$ from equation (21), the equation (25) can be write as:

$$\frac{K_\varphi m_\varphi n_p}{r_\varphi \sqrt[3]{n_p}} = c^2 \sqrt[3]{n_p^2} = \frac{K_\varphi m_p}{R_x} \quad (26)$$

Replacing the terms P_c and P_x in equation (23) results:

$$\frac{1}{\rho_c^{1/3}} = \frac{\sqrt[3]{n_p^2}}{\rho_x^{1/3}}, \text{ i.e. } ; \frac{1}{\sqrt[3]{n_p^2}} = \left(\frac{\rho_c}{\rho_x}\right)^{1/3} = \frac{R_x}{R_c},$$

where; $R_x = \frac{R_c}{\sqrt[3]{n_p^2}}$ (27)

or: $R_c = R_x \sqrt[3]{n_p^2} = n_p r_\varphi$ (28)

It can be observed that: $R_c > R_x$, which <u>confirms the works assumption.</u>

Using this method we can calculate the physical characteristics for the alleged base particle (BP).

We will use the model considering some atomic particles with different sizes and electric charges which have physical characteristics determined with a very good approximation [2]. If the results obtained will be relatively similar using particles with different masses and volumes, then the proposed method is correct.

A.1. THE METHOD CHECKING

<u>Case 1: Use of proton characteristics in our METHOD</u>

To calculate the mass of the BP that can be a gravity quantum, we will use in above model the characteristics of static proton, that is the mass and radius [2].

We consider the static proton with mass m_p and radius R_p,made form n_p identical BPs, each one of mass m_φ and radius r_φ. According thus above mentioned, we consider that the compound BPs are not attached one each other, respectivelly for each BP it correspond a medium volume of vibration V_ϕ and a radius R_ϕ ($R_\phi >> r_\phi$).

Using equation (11): $v^2\sqrt[3]{n_p^2} = \frac{\log e}{log\frac{R_p^3}{R_c^3}}\, c^2$

The value from second term is:

log e =0,43429448

$R_p \cong \lambda_p = \frac{c}{\nu_p} = \frac{2{,}9979\cdot 10^{10}}{2{,}2687\cdot 10^{23}} = 1{,}3214\cdot 10^{-13} cm$ $\left(\nu = \frac{m_p c^2}{h}\right)$. The term R_c is calculated using equation (4) where G =6,67428.10^{-8} cm^3/gs^2.

Result: R_c =1,2421·10^{-52}cm.

Replace and calculate, result from equation (11):

$$v^2\sqrt[3]{n_p^2} = 3{,}3338 \cdot 10^{18}\text{ , ie } v\sqrt[3]{n_p} = 1{,}8258 \cdot 10^{9} \quad (29)$$

Th calculus of medium vibration frequency of BP in volume V_ϕ is:

$$\nu_v = \frac{\upsilon}{R_\phi} = \frac{\upsilon}{\frac{R_p}{\sqrt[3]{n_p}}} = \frac{\upsilon\sqrt[3]{n_p}}{R_p} = \frac{1{,}8258\cdot 10^{9}}{1{,}3214\cdot 10^{-13}} = 1{,}3817 \cdot 10^{22} s^{-1} \quad (30)$$

Can observe that ν_v is almost equal with static proton frequency ν_p resulted from known equation:

$$\nu_v = \frac{m_p c^2}{h}\,.$$

In equation (19): $\frac{v^2}{n_p} = c^2\frac{R_c}{R_p}\cdot a$, the proportionality factor „a" has the value:

$$a = \frac{R_p}{R'_p}\left(\frac{m'_p}{m_p}\cdot\frac{v}{v'_p}\right)^2 \quad (30a)$$

Where sizes: R_p, m_p and v are radius, mass and internal vibration speed of respective particle, and: R'_p, m'_p and v' are similar sizes of proton as reference particle because the proton is a basic particle of matter in Universe with a maximum of stability.

According with equation (30a), we can observe that in case of proton: a=1. For other particles term „a" will be calculate too.

OBSERVATION: For work uniformity in present calculus will replace for proton the terms: R'_p, m'_p and v' with R_p, m_p and v.

Replacing terms values: c^2, R_c and R_p, result:

$$\frac{v^2}{n_p} = 8{,}4482 \cdot 10^{-19} \quad (31)$$

Solving algebric system of equations (29) şi (31), result:

$$n_p = 9{,}072\cdot 10^{21}\,\frac{basic-particle}{static\ proton} \text{ and} \quad (32)$$

$$v=87{,}5457 \text{ cm/s} \quad (33)$$

From equation (6): $m_p=n_p m_\varphi$, can find the mass m_φ of one BP, where m_p is static protom mass:

$$m_\varphi = \frac{m_p}{n_p} = \frac{1{,}6726\cdot 10^{-24}}{9{,}072\cdot 10^{-21}} = 1{,}8437 \cdot 10^{-46} g \quad (34)$$

The radius R_ϕ of pulsation volume of BP in proton can be calculated with equation (2):

$$R_\phi = \frac{R_p}{\sqrt[3]{n_p}} = \frac{1{,}3214\cdot 10^{-13}}{\sqrt[3]{9{,}072\cdot 10^{21}}} = 6{,}3358 \cdot 10^{-21} \text{ cm} \quad (35)$$

The medium vibrating energy of a micro-particle in volume of radius R_ϕ is:

$$W_{\omega v} = 2\pi^2 m_\varphi \nu_v^2 R_\phi^2 \quad (36)$$

Replace the values found before, result:

$$W_{\omega v} = 2{,}7893 \cdot 10^{-41} \text{erg} = 1{,}7409 \cdot 10^{-29} \text{ eV}$$

The width of the quantum well l_ϕ in which the BP vibrate can be calculate with corresponding equation from quantum mechanics:

$$l_\varphi^2 = \frac{n\pi h_v^2}{W_{\omega v} m_\varphi} \quad (37)$$

In equation (37), the term h_v, which no longer coincides with Planck's constant for BPs, can be calculate with analogous equation:

$$h_v = m_\varphi v R\phi \quad (38)$$

Replace the values of respective sizes can obtain for proton: $h_v=1{,}0226.10^{-64}$ ergs.

Replace the values in equation (37) and take quantic number n=1, can obtain:

$l_\phi = 2{,}5276.10^{-21}$cm.

Can observe that quantum well of BP vibration have a similar value with R_ϕ.

From equation (28) can calculate the BP radius r_ϕ:

$$r_\varphi = \frac{R_c}{n_p} \quad (39)$$

Replace the values can obtain: $r_\phi = 1{,}3692 \cdot 10^{-74}$cm.

Knowing the mass and radius of BP can found mass density as:

$$\rho_\varphi = \frac{3}{4\pi} \cdot \frac{m_\varphi}{r_\varphi^3} = 1{,}7149 \cdot 10^{175} \text{g/cm}^3 \quad (40)$$

Can consider that the BP have an own internal vibration:

$$\nu_\varphi = \frac{c}{r_\varphi}$$

Replace the values of c and r_φ can obtain: $\nu_\varphi = 2{,}1896 \cdot 10^{84} s^{-1}$. (41)

Internal energy of BP is; $W_\varphi = m_\varphi c^2$

Replace the terms and calculate can obtain: $W_\varphi = 1{,}657 \cdot 10^{-25}$erg $= 1{,}0342 \cdot 10^{-13}$ eV (42)

Can consider that the BP as a potential well in which the mass vibrate with frequency ν_φ .

So, will use same quantum equation to find the width of potential well as:

$$l_\varphi^2 = \frac{n\pi h_\varphi^2}{W_\varphi m_\varphi} \quad (43)$$

Because as we mention before the Planck constant „h" cannot be applied to BPs, the value of h_φ must calculate with equation:

$$W_\varphi = h_\varphi \nu_\varphi \quad (44)$$

Where: $h_\varphi = \frac{W_\varphi}{\nu_\varphi} = \frac{m_\varphi c^2}{\nu_\varphi}$

Replace the terms, result: $h_\varphi = 7{,}5677 \cdot 10^{-110}$ ergs $= 4{,}7234 \cdot 10^{98}$ eV·s

Taking n=1, and calculate equation (43), result: $l_\varphi = 2{,}4267 \cdot 10^{-74}$cm.

We found that $l_\varphi \cong 2r_\varphi$, ie the diameter of BP.

From potential equation (25) : $\frac{K_\varphi m_\varphi}{r_\varphi} = c^2$, can find the value of constant K_φ:

$$K_\varphi = c^2 \frac{r_\varphi}{m_\varphi} = 6{,}67428 \cdot 10^{-8} \frac{cm^3}{gs^2}$$

We found that constant K_φ it is indeed the universal constant of gravitation, ***so the basic particle determined is the graviton[20]****. This fact explain the gravitational interactions of proton which is a main component of matter*.

On the other hand, in case of static proton, like in case of all particles, the intern energy can be written as:

$$W_p = W_i + W_{T\omega v} \quad (45)$$

where: $W_i = n_p W_\varphi$ (46)

and $W_{T\omega v} = n_p W_{\omega v}$ (47)

Ulterior we will show that proton, as well as other particles, contain gravitons distributed that the size R_ϕ increase outwards, so also the speed v, fact which extend outward radius R_p under shape of one outward cloud of field.

Case 2: Use of neutron characteristics in our METHOD

For static neutron we use same equations as for static proton.

We will use following characteristics of neutron[2]:

Mass: $m_p = 1{,}6749 \cdot 10^{-24}$g

Radius: $R_p \cong \lambda_p = \frac{c}{\nu_p} = 1{,}3196 \cdot 10^{-13} cm.$

Density: $\rho_p = \frac{3}{4\pi}\frac{m_p}{R_p^3} = 1{,}7401 \cdot 10^{14} \frac{\mathrm{g}}{\mathrm{cm}^3}$

The frequency of pulsation: $\nu_p = \frac{m_p c^2}{h} = 2{,}2719 \cdot 10^{23} s^{-1}.$

Can calculate the radius of collapsed neutron:

$$R_c = \frac{G m_p}{c^2} = 1{,}2438 \cdot 10^{-52} cm, \text{ and}$$

Colapsed density: $\rho_c = \frac{3m_p}{4\,\pi R_c^3} = 2{,}0779.\,10^{131}$g/cm^3.

Using equation (11) can found value: $v\sqrt[3]{n_p} = 1{,}8259 \cdot 10^9$

Madium frequency of graviton vibration is determined with equation (30), resulting:

$\nu_v = 1{,}3837 \cdot 10^{22} s^{-1}$ almost equal with known value.

With equations (11), (19) and (30a) can find values: $n_p = 9{,}0572.10^{21}$ gravitons and v= 87,5948 cm/s. From same imposed condition: $m_p = n_p \cdot m_\varphi$, we find: $m_\varphi = 1{,}8492.10^{-46}$g, value almost idnetical with same value found for proton calculation, considering accuracy of values taken into calculations.

Medium radius of graviton vibration: $R_\phi = \frac{R_p}{\sqrt[3]{n_p}}$ (equation 35) give us the value for neutron:

$R_\phi = 6{,}3305 \cdot 10^{-21}$cm, and medium energy of graviton oscillation inside neutron (equation 36):

$$W_{\omega v} = 2\pi^2 m_\varphi \nu_\nu^2 R_\phi^2 = 2{,}8008 \cdot 10^{-41} \text{erg} = 1{,}7481 \cdot 10^{-29} \text{ eV}$$

Similar, the potential square well of neutron graviton oscillation calculate with equation (37) give us:

$l_\phi = 2{,}5255 \cdot 10^{-21}$cm.

With equation (41): $r_\varphi = \frac{R_c}{n_p}$, can recalculate the radius r_φ of graviton in neutron case and find:

$r_\varphi = 1{,}3733.10^{-74}$cm, value almost exact with previous from proton case, taking into consideration the values used for calculations for both particles (proton and neutron).

Calculating the density of neutronic graviton, result:

$\rho_\varphi = \frac{3}{4\pi}\frac{m_\varphi}{r_\varphi^3} = 1{,}7046.10^{175} \text{g/cm}^3$, therefore exactly as prior found at proton.

Similar, the graviton pulsating frequency in case of neutron is:

$\nu_\varphi = \frac{c}{r_\varphi} = 2{,}183 \cdot 10^{84}$ s^{-1} , so exactly too.

Similar the own width of potential square well calculated with equation (43) in neutron case, show the value:

$l_\phi = 2{,}4341 \cdot 10^{-74}$cm, therefore similar as prior.

Recalculation of constant K_φ from equation: $\frac{K_\varphi m_\varphi}{r_\varphi} = c^2$, give us in neutron case with data used in calculus: $K_\varphi = 6{,}67428.10^{-8}$ cm^3/gs^2 = G, that is the. same value of G constant.

Result that same gravitons compose the neutron too.

Case 3: Use of electron characteristics in our METHOD

In this study we will consider another atomic particle, the electron, with different electric charge and different mass. Will include in our model the characteristics of electron [2] to calculate the characteristics of BP.

The actual physics consider that electron mass being electromagnetic, fact which lead to many unexplain contradictions. We consider that the electron as well as all other existent particles are composed from gravitons too, similar with protons and neutrons.

The data used for electron are: $m_p = 9.1094 \cdot 10^{-28}$g, the radius: $R_p = 2{,}818 \cdot 10^{-13}$cm (static electron), and ratio between proton mass and electron as:

$$\frac{m_{prot.}}{m_{el.}} = 1836{,}15$$

Because: $\frac{m_{prot.}}{m_{el.}} = \frac{n_{p.prot} m_\varphi}{n_{p.el.} \cdot m_\varphi} = \frac{n_{p.prot.}}{n_{p.el.}}$

result:

$n_{p.el.} = n_p = \frac{n_{p.prot.}}{1836,15} = \frac{9.072 \cdot 10^{21}}{1836,15} = 4,9407 \cdot 10^{18}$ gravitons

Also, we can use prior methodology of calculus. Using equation (11) the size of theoretic collapsed radius R_c can be find with equation:

$R_c = \frac{Gm_p}{c^2} = 6,7647 \cdot 10^{-56}$ cm, result the value: $v\sqrt[3]{n_p} = 1,7472 \cdot 10^9$.

Using equation (19), can find the proportionality factor „a" for electron case, with equation (30a), can obtain the value: a=9,874·10^8.

Performing calculations obtained by using equation (19) the value: $\frac{v^2}{n_p} = 2,1303 \cdot 10^{-13}$

Using the value prior determinated: $v\sqrt[3]{n_p} = 1,7472 \cdot 10^9$, can find the values n_p=4,9407·10^{18} gravitons and speed

v = 1025,84 cm/s.

Can observe that the value of n_p is exact with the value prior found when were use the equation $n_p = \frac{n_{p.prot.}}{1836,15}$, fact which show that graviton characteristics are same as in all particles. Medium vibration radius of graviton: $R_\phi = \frac{R_p}{\sqrt[3]{n_p}} = 1,6545 \cdot 10^{-19}$ cm.

The medium oscilating energy of gravitons in electron is:

$\nu_v = \frac{v}{R_\phi} = 6,2002 \cdot 10^{21} s^{-1}$, a value almost equal with pulsating value of particle.

Medium oscilating energy of graviton in electron (36) is:

$W_{\omega v}=2\pi^2 m_\varphi \nu_v^2 R_\phi^2$ = 3,8298.10^{-39} erg = 2,3904·10^{-27} eV

Similar calculus of medium potential square well of graviton in electron (in volume V_ϕ) done with above equations and give as result: l_ϕ = 6,6006·10^{-20} cm, value almost equal with diameter of volume V_ϕ.

This result is similar to the one previously calculated using the method.

A.2. THE PHYSICS SIGNIFICANCE OF WAVE-PARTICLE CONCEPT AND WAVE PACKAGE FOR PARTICLES, THROUGH THEIR GRAVITONIC STRUCTURE

How is known, a moving particle has a corresponding package of waves with various amplitudes and frequencies, the result of this is a group velocity of a particle assembly and a composed unique amplitude and frequency.

It is known that the current classical physics failed to explain physical phenomena of the so-called "wave-particle dualism". By this graviton particle structuring, we managed physical explanation of this dualism.

As previously determined, the multitude of components gravitons of a particle have internal oscilations inside their vibrating volume V_ϕ with frequencies ν_v. How is shown in fig.1, through movement of a particle, the kinetic vibration movement of a graviton take an undulatory space aspect. Prior we determinated medium values of sizes: R_ϕ, ν_v,v, l_ϕ and $W_{\omega v}$.

In reality, how is prior mentioned, moving from the particle center to outward, exist a progressive variation of sizes: R_ϕ, ν_v,v, l_ϕ and $W_{\omega v}$ of the component gravitons. These variations can be found by calculus.

This thing explain not only the undulatory characteristics of a particle, but also the „wave package" compound from an undulatory radial variable ensamble of compound gravitons.

Fig. 1

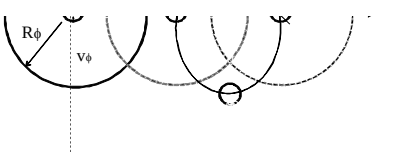
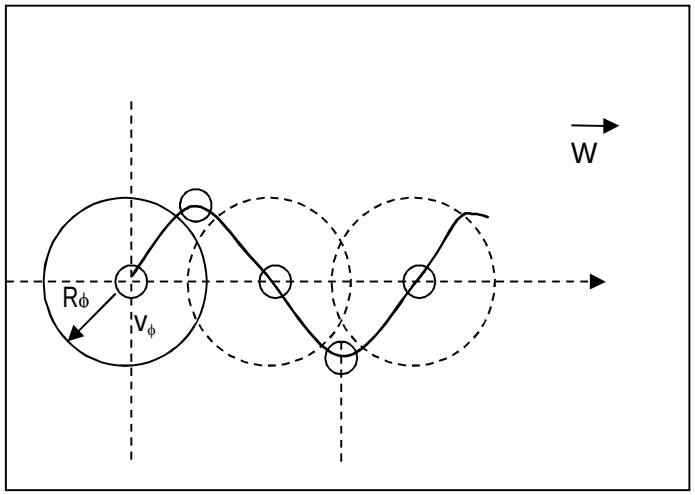


Fig.1 The spatial undulatory aspect of one component graviton through the movement of a particle with speed $\vec{W}$

Fig.1 Show only a main qualitative aspect, explanatory of wave-particle characteristics for a graviton form „the wave package" of a particle. Using the known equation from quantum undulatory mechanics corresponding to Gauss curve of probability, for a „wave package" at the moment t=0:

$$a(x,0) = Ke^{-\frac{z^2}{2b^2}} \qquad (50)$$



In this equation (50) „a" is the amplitude of wave package of particle in point of coordinate „z", „b" is the semi-breadth of wave package at moment: t = 0, and K is a constant which can be find from initial conditions.

Doing calculus for an electron, to determinate the constant K, will consider at time: t = 0, z = b for simplification.

Writing equation (50) in form:

$a(z,0)e^{\frac{z^2}{2b^2}}$ = K, for initial condition in which: z = b, result:

$K = ae^{1/2} = 1{,}649\ a.$ (51)

For an electron with radius:

$R_p = 2{,}82.10^{-13}$ cm, medium value of amplitude of a compound graviton in its potential square well prior calculated is: $a = 2R_\phi = 2 \times 1{,}6545.10^{-19} = 3{,}309.10^{-19}$cm.

Result from equation (51): $K = 5{,}4557.10^{-19}$.

From equation (50) can find the value of semi-breadth package of electron waves.

Writing equation (50) in the form: $\frac{z^2}{2b^2}\log e = \log\frac{K}{a}$, from result:

$$b = z\sqrt{\frac{\log e}{2\log\frac{K}{a}}} \qquad (52)$$

Replacing in equation (52), the values become: $z = R_p = 2{,}818 \cdot 10^{-13}$ cm, $K = 5{,}4557 \cdot 10^{-19}$ and $a = 2R_\phi = 3{,}309 \cdot 10^{19}$ cm, result: $b = 2{,}818.10^{-13}$ cm.

Also result the wave package width of electron:

$L = 2b = 5{,}636 \cdot 10^{-13}$ cm (53)

This value is according with electron diameter.

In table (1) we give the compound numbers of gravitons for some known particles:

Table 1

No.	Name	Symbol	Medium life	Electric charge	Mass (in no. of electronic mass)	No.of compounds gravitons n_p
1	photon		stabil	0	inertial mass $10^{-26} \div 10^{-37}$	$10^{20} \div 10^{9}$

2	leptosi neutrino	ν	stabil	0	$\sim 3.10^{-5}$	$\sim 1{,}9 \cdot 10^{14}$
3	neutrino miuonic	ν_μ	stabil	0	$\sim 10^{-4}$	$\sim 5 \cdot 10^{14}$
4	Electron (pozitron)	$e^-(e^+)$	stabil	$\pm e$	1	$4{,}94 \cdot 10^{18}$
5	Miu	$\mu^-(\mu^+)$	$(2{,}212 \pm 10^{-3})10^{-6}$	$\pm e$	$206{,}77 \pm 0{,}02$	$1{,}022 \cdot 10^{21}$
6	Pi$\frac{mezoni}{zero(pion)}$	π^0	$(2{,}2 \pm 0{,}8).10^{-16}$	0	$264{,}2 \pm 0{,}1$	$1{,}306 \cdot 10^{21}$
7	Pi(pion)	$\pi^+(\pi^-)$	$(2{,}55 \pm 0{,}03).10^{-8}$	$\pm e$	$273{,}2 \pm 0{,}1$	$1{,}351 \cdot 10^{21}$
8	Kplus	K^+	$(1{,}224 \pm 0{,}013).10^{-8}$	$+e$	$966{,}6 \pm 0{,}4$	$4{,}779 \cdot 10^{21}$
9	Kzero	K^0	$10^{-8} \div 10^{-10}$	0	974 ± 1	$4{,}816 \cdot 10^{21}$
10	Eta	η^0	10^{-19}	0	1072 ± 2	$5{,}3005 \cdot 10^{21}$
11	barions proton(anti-p)	p	stabil	$\pm e$	$1836{,}12 \pm 0{,}02$	$9{,}072 \cdot 10^{21}$
12	neutron(anti-n)	n	$(1{,}01 \pm 0{,}03)10^{3}$	0	$1838{,}65 \pm 0{,}02$	$9{,}057 \cdot 10^{21}$
13	lambda zero	Λ^0	$(2{,}51 \pm 0{,}09).10^{-10}$	0	$2182{,}8 \pm 0{,}3$	$1{,}079 \cdot 10^{22}$
14	sigma plus	Σ^+	$(8{,}1 \pm 0{,}6).10^{-11}$	$+e$	$2327{,}7 \pm 0{,}4$	$1{,}151 \cdot 10^{22}$
15	sigma zero	Σ^0	$<10^{-11}$	0	$2331{,}8 \pm 1$	$1{,}153 \cdot 10^{22}$
16	sigma minus	Σ^-	$(1{,}61 \pm 0{,}1).10^{-10}$	$-e$	$2340{,}5 \pm 0{,}6$	$1{,}157 \cdot 10^{22}$
17	Xi zero	Ξ^0	3.10^{-10}	0	2565 ± 8	$1{,}268 \cdot 10^{22}$
18	Xi minus	Ξ^-	$(1{,}3 \pm 0{,}4).10^{-10}$	$-e$	2580 ± 2	$1{,}276 \cdot 10^{22}$
19	omega minus	Ω^-	$\sim 10^{-10}$	$-e$	3300 ± 30	$1{,}632 \cdot 10^{22}$

A.3. THE PHYSICAL CHARACTERISTICS OF THE GRAVITON

The main physical characteristics of the graviton, theoretically determined as being almost exactly, are:

Mass of graviton	$m_\varphi = 1{,}84370815 \cdot 10^{-46}$ g
Radius of graviton	$r_\varphi = 1.36916312 \cdot 10^{-74}$ cm
Graviton density	$\rho_\varphi = 1{,}71489680 \cdot 10^{175}$ g/cm^3
Pulsating frequence of graviton	$\nu_\varphi = 2{,}18960366 \cdot 10^{84}$ s^{-1}
Graviton vibrating energy	$W_{\omega\nu} = 2{,}78928043 \cdot 10^{-41}$erg = $1{,}7409 \cdot 10^{-29}$ eV
Intern energy ($m_\varphi c^2$) of graviton	$W_\varphi = 1{,}6570422 \cdot 10^{-25}$ erg = $1{,}0342 \cdot 10^{-13}$ eV

We determine below and other important physical characteristics of the graviton..

To determine the lifetime of the graviton, we use equation lifetime of a particle in quantum mechanics. With specific notations used for graviton, this equation is:

$$\tau_\varphi = K e^{\frac{4\pi}{h_\varphi}\cdot\sqrt{2 m_\varphi W_\varphi r_\varphi}} \qquad (54)$$

where: $K = \frac{1}{\nu_\varphi} = \frac{1}{2{,}18960366.10^{84}}$; K =$4{,}56703657 \cdot 10^{-85}$ s.

Because for graviton: $h_\varphi = \frac{W_\varphi}{\nu_\varphi} = 7{,}56777233 \cdot 10^{-110}$ erg.s = $4.7234 \cdot 10^{-98}$ eV, after replace the terms and calculus result:

$\tau_\varphi = 4{,}567 \cdot 10^{10^{37}}$ s **that is the graviton it is a very stabile basic-particle.**

$(\tau_\varphi \approx 4{,}4 \cdot 10^{10^{37}}\text{s})$.

Because the gravitons are composed from a basic fundamental matter, unique, with a proper attractive capacity, the gravitons have a feature of atraction between them done by an outward attractive proper field, composed from the same constitutive matter having a „differential degree of dilution".

By analogy with electrical charges, we define the concept of „gravitonic charge", note with q_φ.

Will write the equation:

$$m_\varphi c^2 \cong \frac{q_\varphi^2}{r_\varphi} \tag{55}$$

From which:

$$q_\varphi = c\sqrt{m_\varphi r_\varphi} \tag{56}$$

Replacing corresponding values in equation (56) can find: $q_\varphi = 4{,}763 \cdot 10^{-50}$usg. ($g^{1/2}s^{-1}cm^{3/2}$). Graviton charge measurements units q_φ are „units of gravitonic charge", note with: usg in CGS (cm.g.s) system.

Because:

$$m_\varphi c^2 = \frac{Gm_\varphi^2}{r_\varphi} \tag{57}$$

result:
$$q_\varphi = c\sqrt{m_\varphi r_\varphi} = m_\varphi\sqrt{G} \tag{58}$$

Equation (58) is checked in value perfect with term q_φ obtained.

From equation (58) result the size of universal constant of gravity (G):

$$G = \frac{q_\varphi^2}{m_\varphi^2} \tag{59}$$

The only exposed in actul physics is the spin of graviton with value S=2 , i.e. it is characteristic of a statistical distribution type Bose-Einstein[5]. This spin show for graviton an own rotation motion with tangential speed v_s. If consider that centrifugal force of own rotation is:

$$F_{c\varphi} = \frac{m_\varphi v_s^2}{r_\varphi} \tag{60}$$

This is equal with internal centripetal force of attraction:

$$F_\varphi = \frac{m_\varphi c^2}{r_\varphi} \tag{61}$$

Result: v_s=c.

On the other hand, the existence oof attraction charge q_φ at graviton, allow us to consider a kind of presence like a type of gravito-magnetism, different by electric charge magnetism, the name is only analogous.

In analogous with Bohr-Procopiu magneton of electron, in this case the gravito-magneton of graviton can be written:

$$\mu_\varphi = \frac{q_\varphi h_\varphi}{4\pi c m_\varphi} \tag{62}$$

Replacing the values of sizes in second part of equation (62), result:

$\mu_\varphi = 5{,}189 \cdot 10^{-125}\ g^{1/2}\ cm^{3/2}$

Similar, can find a kinetic quantum moment at graviton in form of:

$$\mu_{c\varphi} = m_\varphi \frac{h_\varphi}{2\pi} \tag{63}$$

Which has the value: $\mu_{c\varphi} = 1{,}2 \cdot 10^{-110}$erg.s = $7{,}4898 \cdot 10^{-99}$ eV·s

Will analyze what happen when two gravitons collide axial. In this purpose will use the quantum method for similar situation according to equation:

$$R_\varphi + D_\varphi = 1 \quad (64)$$

where:

R_φ = is probability that graviton to be reflected in collision

D_φ = is probability that colliding gravitons to merge in the collision

Quantum equations for these two terms are:

$$R_\varphi = \left(\frac{k_1 - k_2}{k_1 + k_2}\right)^2 \quad (65)$$

and

$$D_\varphi = 1 - R_\varphi \quad (66)$$

From equation (64), where:

$$k_1 = \frac{2\pi}{h_\varphi} \cdot \sqrt{2 m_\varphi W_{T\varphi}} \quad (67)$$

and

$$k_2 = \frac{2\pi}{h_\varphi} \cdot \sqrt{2 m_\varphi (W_{T\varphi} - W_{pot.\varphi})} \quad (68)$$

Can apply equation (65) when, $W_{T\varphi} > W_{pot.\varphi}$, condition is satisfied in the graviton case which:

$$W_{T\varphi} = W_{pot.\varphi} + W_{\omega\varphi} \quad (69)$$

where:

$$W_{pot.\varphi} = m_\varphi c^2 = \frac{G m_\varphi^2}{r_\varphi} \quad (70)$$

and

$$W_{\omega\varphi} = 2\pi^2 m_\varphi \nu_\varphi^2 r_\varphi^2 \quad (71)$$

(vibratory pulsation energy of graviton).

According with (69): $W_{T\varphi} = W_{pot.\varphi} + W_{\omega\varphi} = 1{,}657 \cdot 10^{-25} + 2{,}789 \cdot 10^{-41} \cong 1{,}657 \cdot 10^{-25}erg=1{,}0342 \cdot 10^{-13}$ eV

Replace the values: k_1 şi k_2 in equation (65) and calculate, result: $R_\varphi = 1$, and according with (66): $D_\varphi = 0$.

So in direct collision of two gravitons a total reflection occurs them, so that can be considered as an elastic collision of their.

The results and conclusions obtained, lead us to conclude that inside and outside of particles, the complex interactions taking place between components gravitons, which explains the different physical characteristics of the particles in general.

Also, we mention that the graviton don't have antiparticle.

A.4. QUANTIFICATION OF FUNDAMENTAL PHYSICS SIZES

As noted above, the graviton is the smallest micro-particle in the universe, with practically infinite stability, entering into the composition of all particles and existing fields, that is, all matter in nature.

These findings prove the conclusion that physical characteristics of graviton are universal constants, invariable.

How is show, its internal energy: $W_\varphi = W_{pot.\varphi} = m_\varphi c^2$ (70)

Multiplying with component number of gravitons „n_p" of any other particle, result:

$n_p W_\varphi = W_p = n_p m_\varphi c^2 = m_p c^2$; m_p being the mass of any other particle (71)

W_φ is an universal constant and n_p is always a round number

Equation (71) is a form of intern energy quantification of any particle, or generalizing, of intern matter energy.

Similar, equation $m_p = n_p m_\varphi$ is a form of matter quantification, since the size m_φ is an universal constant.

Sizes: W_φ and m_φ the lowest known in nature, can be named a **quanta of internal energy and matter.**

Also, the space itself is linked to the matter contained in it, i.e. a space completely devoid of matter has no physical meaning.

Because the radius of graviton r_φ is the smallest constant related to matter, may represent a quantification of space in form:

$$L = n_p r_\varphi \quad (72)$$

Where: L is a length, n_p is a round number and r_φ can be namd as a **quanta of space**. Also, how is known, the time define some event.

The shortest known constant event is a vibration of graviton, therefore elementary time is::

$$t_\varphi = \frac{1}{\nu_\varphi} \quad (73)$$

Where: ν_φ is pulsating frequency of the graviton ($\nu_\varphi = 2{,}1896 \cdot 10^{84} s^{-1}$).

$$t_\varphi = 4{,}567 \cdot 10^{-85} \text{ s}$$

Therefore, the time of one event can be write in quantified form:

$$t = n_t t_\varphi \quad (74)$$

where n_t is a variable round number and t_φ can be named as a **quanta of time**.

B. THE FIELDS OF FUNDAMENTAL FORCES: NUCLEAR, ELECTRIC, ELECTROMAGNETIC, GRAVITATIONAL AND THEIR CORRELATION

B.1. THE FIELD OF NUCLEAR FORCES (STRONG)

Because atomic nuclei are composed from protons and neutrons, the field of nuclear forces are exerted between these two kinds of particles.

It is considered that this field of nuclear attraction is a mesons field achieved by means of virtual mesons which are transferred regularly from one nucleon to another one that is: mesons $\pi^{+(-)}$ between protons and neutrons, and mesons π^0 between protons and between neutrons.

The physical characteristics of these mesons are:

The mass: $m_{\pi^{+(-)}} = 2{,}489 \cdot 10^{-25} g$ and $m_\pi = 2{,}407 \cdot 10^{-25} g$, their calculated radius ($R \cong \lambda = \frac{h}{mc}$) are: $R_{\pi^{+(-)}} = 1.413 \cdot 10^{-13}$ cm and $R_{\pi^0} = 1{,}462 \cdot 10^{-13}$cm.

Nuclear forces, which are proximity forces, not central, with character of saturation, exerted only at small distances like 10^{-13} cm.

The nuclear interactions are complexed by the fact that under their influence appears the interaction of nucleon's spin (at a small value) and spin flip phenomenous.

For these reasons, the classical physics address the issue of nuclear forces by using some empirical equations and experimental data.

In this work, using the new graviton physics, we present a summary of some theoretical elements essential for all phenomenon that occur in nuclear connection forces and interactions between nucleons.

Because nucleons masses are lower than those of similar static free particles with equivalent differences of their mass defects, can recalculate below the mass of nucleons.

From literature, the mass defects for nuclear proton and neutron are:

For nuclear proton: $\Delta m_p = 0{,}008123$ UAM $= 1{,}3484 \cdot 10^{-26}$ g

For nuclear neutron: $\Delta m_n = 0{,}00893$ UAM $= 1{,}4823 \cdot 10^{-26}$ g

Therefore, the nucleons mass will be:

For proton: $m_{pl} = m_p - \Delta m_p = 1{,}6591 \cdot 10^{-24}$g and for neutron: $m_{nl} = m_n - \Delta m_n = 1{,}6601 \cdot 10^{-24}$g .

Using gravitonic equation: $m_p = n_p \cdot m_\varphi$, and know the value m_φ and nucleons mass values and connection mesons: $\pi^{+(-)}$ and π^0, can calculate the number of constituent gravitons:

For nuclear proton: $n_{pl} = 8{,}999 \cdot 10^{21}$ gravitons

For nuclear neutron: $n_{nl} = 9{,}004 \cdot 10^{21}$ gravitons

For meson $\pi^{+(-)}$: $n_{\pi^{+(-)}} = 1{,}349 \cdot 10^{21}$ gravitons

For meson π^0: $n_{\pi^0} = 1{,}305 \cdot 10^{21}$ gravitons

B.1.1. INTERACTIONS BETWEEN NUCLEONS IN GRAVITON PHYSICS

As is known, this coupling is achieved through a π^+ meson,ie binding energy correspond with energy of such a meson, corrected by a factor that takes into account the short distance between nucleons and direct proximity character of nucleons.

Therefore, the coupling energy proton-neutron in nucleus is:

$$W_{p-n} = W_{\pi^{+}*} e^{-\gamma} = n_{\pi^{+}*} W_\varphi e^{-\gamma} = n_{\pi^{+}*} m_\varphi c^2 e^{-\gamma} = n_{\pi^{+}*} \frac{q_\varphi^2 e^{-\gamma}}{r_\varphi} = n_{\pi^+} \cdot \frac{G m_\varphi^2 e^{-\gamma}}{r_\varphi} \quad (75)$$

Where the exponent γ represent the ratio between the circumference of a nucleon and its diameter in coupling direction, i.e.:

$$\gamma = \frac{2\pi R_p}{2R_p} = \pi$$

Then: $e^{-\gamma} = e^{-\pi} = \frac{1}{e^\pi} = 0{,}043214$

The coupling equation (75) has a very deep meaning because contain the graviton attributes and the universal constant of gravitation, so we have a direct connection with gravitational field.

This has not been achieved by the current theories of actual physics.

Replace the values in equation (75) and performing calculations, obtain the binding energy for a nucleon:

$W_{p\text{-}n} = 9{,}6669 \cdot 10^{-6}$ erg $= 6{,}0322$ MeV (1 erg $= 6{,}24 \cdot 10^5$ MeV)

This value quite accurately obtained is in accordance with experimental and empirical values from literature for a nucleon of light nuclei[6][12][13] with an indicate value between $6 \div 6{,}5$ MeV.

This indicates the correctness of theoretical elements and the values of used terms.

We mention that values over than 6 MeV for heavy nuclei are due to mutual influences between nucleons as a whole. This fact was mention in physics, but is not object for this actual work.

Because in the case of coupling interaction between two nuclear neutrons, the coupling quantum is the meson π^0, analogous the coupling energy between two neutrons is:

$$W_{n-n} = W_{\pi^0} e^{-\gamma} = n_{\pi^0} W_{\varphi} e^{-\gamma} = n_{\pi^0} m_{\varphi} c^2 e^{-\gamma} = n_{\pi^0} \frac{q_{\varphi}^2 e^{-\gamma}}{r_{\varphi}} = n_{\pi^0} \frac{G m_{\varphi}^2}{r_{\varphi}} e^{-\gamma} \qquad (76)$$

Replacing the values of seizes in equation (76) we can have: $W_{n-n} = 9{,}3469 \cdot 10^{-6}$ erg = 5,8325 MeV, ssatisfactory result compared with the data from literature[6][2]. Can observe that: $W_{n-n} < W_{p-n}$.

In case of the main coupling interaction between two nuclear protons, which is done through a meson π^0, can write:

$$W_{p-p} = W_{\pi^0} e^{-\gamma} = n_{\pi^0} m_{\varphi} c^2 e^{-\gamma} = n_{\pi^0} \frac{\rho_{\varphi}^2}{r_{\varphi}} e^{-\gamma} = n_{\pi^0} \frac{G m_{\varphi}^2}{r_{\varphi}} e^{-\gamma} \qquad (77)$$

That is: $W_{p-p} = W_{n-n}$ (78)

B.1.2. THE CONTRIBUTION OF NUCLEON SPINS INTERACTION TO NUCLEAR COUPLING

Some reminders about known notions. Thus, the neutron has the spin: s = ½, as the proton, therefore a proper rotary motion. Also, has an antiparticle (the anti-neutron). Even if the neutron doesn't have electric charge, it has his own magnetic field and its magnetic momentum is opposite to kinetic momentum.

In addition, inside of atomic nucleus the spins of nucleons couples which interact mesonis between them, can be anti-parallels (triplet state) that is opposite (noted: ↑↓) or parallel (singlet state) i.e. some of them are parallel (note: ↓↓).

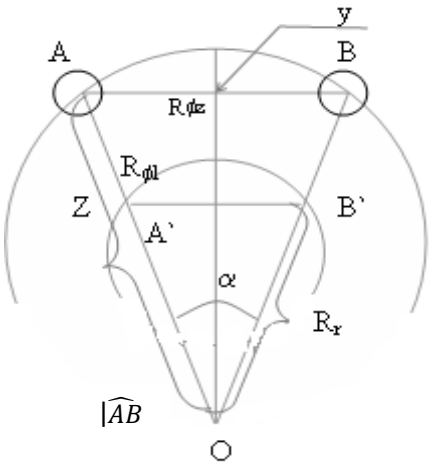
In order to theoretically calculate the contribution of nucleon interaction spins in nuclear coupling, are required prior, the determination of some proton and neutron nuclear sizes and the virtual mesons $\pi^{+(-)}$ and π^0.

We do these things using the present theory of the condensate of gravitons which compose these particles.

B.1.3. THE NUCLEAR PROTON

To calculate medium value of radius $R_{\varphi 1}$ of pulsating volume of a graviton inside nuclear proton, will use equation (35): $R_{\varphi 1} = \frac{R_p}{\sqrt[3]{n_{p1}}}$. Replace the values can obtain:

$R_{\varphi 1} = 6{,}3358 \cdot 10^{-21}$cm.



We can consider that component gravitons are placed inside the nuclear proton on spherical levels, the distance between two gravitons on same consecutive levels is equal with the sum of their vibration radius R_{ϕ}. Because this radius R_{ϕ} increase radial progressive, will use the sketch from figure 2 to calculate the number of gravitons on same level. Can suppose that the number of gravitons on each level is same, based on corresponding radial growth of size $R_{\varphi l}$.

From ΔAOB: $\frac{R_{\phi z}}{R_{\phi 1}} = \frac{Z}{R_{p1}}$ on which:

$$R_{\phi z} = \frac{R_{\phi 1}}{R_{p1}} Z \qquad (78)$$

Also: $\sin\frac{\alpha}{2} = \frac{R_{\phi 1}}{R_{p1}}$.

In this situation, the surface of the sphere of radius „z" is divided in „N_z" surface areas corresponding those N_z gravitons on level „Z".

The lengt of the arc h l_{AB} of a such elementar area is:

$$l_{AB} = \frac{\pi\alpha}{180} R_{p1} \qquad (79)$$

The surface area is:

$$S_{AB} = 2 l_{AB} R_{\phi 1} \quad \text{(at particle surface)} \qquad (80)$$

Therefore, the number of gravitons on one level is:

Figure 2

$$N = \frac{S_{Rp1}}{S_{A`B`}} \qquad (81)$$

where: $S_{Rp1} = 4\pi R_{p1}^2$ (82)

The number of levels for a particle (nucleon) is:

$$\zeta = \frac{n_p}{N} \qquad (83)$$

Using this equation and calculate for nuclear proton, result:

$< \alpha = 5{,}51 \cdot 10^{-6}$ grd; $l_{AB(p1)} = 1{,}27 \cdot 10^{-20}$ cm; $S_{AB(p1)} = 1{,}614 \cdot 10^{-40}$ cm^2; $S_{Rp1} = 2{,}19 \cdot 10^{-25}$ cm^2;

$N_{p1} = 1{,}359 \cdot 10^{15}$ gravitons/level; $\zeta = 6{,}658 \cdot 10^6$ levels.

Because in mesonic coupling π^+ between nuclear proton and neutron, the mass of meson π^+,i.e. the gravitons number of meson π^+ are detach from proton to be transfered to neutron, the number n of gravitons of meson π^+ correspond with $\zeta_{p1(\pi+)}$ levels of proton.

$$\zeta_{pl(\pi+)} = \frac{n_{\pi+}}{N_{p1}} \qquad (84)$$

Replace the values, can obtain: $\zeta_{1(\pi+)} = 9{,}947 \cdot 10^5$ levels.

To find the medium value $R_{\phi z}$ of internal vibration radius of a graviton in coupling area, will do a mediation between distances:

$R`_{pl} = 1{,}4.10^{-13}$cm and $R"_{pl} = 1{,}5.10^{-13}$ cm, almost similar with coupling distance between nucleons.

Therefore, according with (78) $R_{\phi z} = \frac{R_{\phi 1}}{R_{p1}} Z$, in this case:

$$R'_{\phi p} = \frac{R_{\phi 1}}{R_{p1}} R'_{p1} \qquad (85)$$

and

$$R"_{\phi p} = \frac{R_{\phi 1}}{R_{p1}} R"_{p1} \qquad (86)$$

Replacing the values of terms and calculate, obtain: $R`_{\phi p} = 6{,}73 \cdot 10^{-21}$ cm and

$R"_{\phi p} = 7{,}21 \cdot 10^{-21}$ cm.. The medium value $\overline{R}_{\phi z}$ at periphery of nuclear proton, can be write as:

$$\overline{R}_{\phi p} = \frac{R`_{\phi p} + R"_{\phi p}}{2} = 6{,}97 \cdot 10^{-21} \text{ cm} \qquad (87)$$

To this radius $\overline{R}_{\phi p}$ correspond a diameter: $\overline{D}_{\phi p} = 2\overline{R}_{\phi p} = 1{,}394 \cdot 10^{-20}$cm (88)

Which represent the medium distance between two levels.

The breath area from nuclear proton which contain n_{π^+} gravitons of virtual transfer meson π^+ is:

$$L_{p1(\pi^`)} = \xi_{pl(\pi^`)} \cdot \overline{D}_{\phi p} \quad (89)$$

Result: $L_{pl(\pi^`)} = 9{,}465 \cdot 10^{-15}$ cm.

Therefore, the optimal area of nuclear interaction of nuclear proton is:

$$Z_{p1(\pi^+)} = R_p'' - L_{pl(\pi^+)} \quad (90)$$

Result: $Z_{p1(\pi^+)} = 1{,}405 \cdot 10^{-13}$cm.

This result corresponds perfectly with known data, which shows the correctness of graviton theory and calculated values.

How is known, in situation of interaction between two nuclear protons, a transfer of virtual mesons π^0 is done. Using the same methodology of calculus and same equations, can find the value for breadth area from nuclear proton corresponding to meson π^0:

$L_{pl(\pi^0)} = 1{,}341 \cdot 10^{-14}$ cm, and the value for nuclear interaction area between proton –proton:

$Z_{pl(\pi^0)} = 1{,}366 \cdot 10^{-13}$ cm, result which is according with well known data.

To find theoretical influence of nucleons spin in nuclear coupling, it is a must to calculate some characteristics of own nucleons rotation.

Will start calculate for nuclear proton.

How is known, the nuclear magnetic momentum is:

$$\mu_{nucl.} = \frac{eh}{4\pi m_p c} \quad (91)$$

Moreover, its value: $\mu_{nucl} = 5{,}049 \cdot 10^{-24}$ erg.gauss^{-1}.

It is considered that magnetic momentum of nuclear proton has the value:

$$\mu_{p1} = 2{,}7896\ \mu_{nucl.} \quad (92)$$

$\mu_{p1} = 1{,}41 \cdot 10^{-23}$ erg.gauss^{-1}.

Kinetic momentum of nuclear proton spin p_{sp1} is:

$$p_{sp1} = \frac{\mu_{p1}}{g_{p1}} \cdot \frac{2m_{p1}}{e} \quad (93)$$

where g_{p1} is gyro-magnetic factor of nuclear proton. This has the value: $g_{p1} = 5{,}5791 \pm 0{,}0016$

Result: $p_{sp1} = 1{,}759 \cdot 10^{-38}$ dine cm s^{-1}. The own rotation speed of nuclear proton is:

$$v_{sp1} = \frac{2\mu_{p1}}{eR_{p1}} \quad (94)$$

That is: $v_{spl} = 0{,}4439$ cm/s.

The number of rotation per second result from:

$$n_{sp1} = \frac{v_{sp1}}{2\pi R_{p1}} \quad (95)$$

Replace the values from (95) result: $n_{sp1} = 5{,}347 \cdot 10^{11}$ rot./s.

The period of one proper rotation is:

$$T_{sp1} = \frac{2\pi R_{p1}}{v_{sp1}} \quad (96)$$

That is: $T_{sp1} = 1{,}87 \cdot 10^{-12}$ s, and angular speed of proper rotation:

$$\omega_{sp1} = \frac{v_{sp1}}{R_{p1}} \quad (97)$$

i.e.: $\omega_{sp1} = 3{,}3599 \cdot 10^{12}$ s^{-1}.

B.1.4. THE NUCLEAR NEUTRON

We will determine the appropriate characteristics for nuclear neutron, using the same analogous equations. Will indicate only the values obtained from calculus.

According equation (35), medium radius $\overline{R}_{\phi l}$ of a graviton pulsation inside a nuclear neutron is:

$R_{\phi l} = 6{,}33 \cdot 10^{-21}$cm.

The analogous values calculated with relations (78 ÷ 90) for nuclear neutron in mesonic interaction case are: $< \alpha = 5{,}507 \cdot 10^{-60}$; $l_{AB_{(nl)}} = 1{,}268 \cdot 10^{-20}$cm, $S_{AB(n1)} = 1{,}608 \cdot 10^{-40}$ cm^2; $S_{Rpl} = 2{,}187 \cdot 10^{-25}$ cm^2; $N_{nl} = 1{,}36 \cdot 10^{15}$ gravitons/level; $\zeta_{n1} = 6{,}625 \cdot 10^6$ levels; $\zeta_{n1(\pi+)} = 9{,}937 \cdot 10^5$ levels.

Taking same calculating interval for area of nuclear interaction: $R'_{nl} = 1{,}4.10^{-13}$ cm and $R''_{nl} = 1{,}5.10^{-13}$ cm, result analogue as is for nuclear proton: $R'_{\phi n} = 6{,}727 \cdot 10^{-21}$cm and $R''_{\phi n} = 7{,}208 \cdot 10^{-21}$cm,

Medium value: $\overline{R}_{\phi n} = 6{,}967 \cdot 10^{-21}$ cm, and medium diameter of graviton vibration: $\overline{D}_{\phi n} = 1{,}393 \cdot 10^{-20}$ cm. The breadth of coupling area is $Z_{n1(\pi^+)} = 1{,}361 \cdot 10^{-13}$ cm, in accordance with values from literature.

In situation of coupling interaction between two nuclear neutrons through a virtual meson π^0, using same analogous equations result for breadth coupling area:

$L_{nl(\pi^0)} = 1{,}339 \cdot 10^{-14}$ cm and for coupling area: $Z_{nl(\pi^0)} = 1{,}366 \cdot 10^{-13}$, value also in accordance with well known results.

The nuclear neutron have the spin s = ½ same as the proton, so the features of own rotation result using same analogous equation knowing that the neutron has a proper magnetic momentum. The values result from similar calculus are:

Magnetic momentum for neutron spin is:

$$\mu_{n1} = 1{,}9103\ \mu_{nucl.} \qquad (98)$$

Result: $\mu_{n1} = 9{,}63 \cdot 10^{-24}$ erg.gauss^{-1}.

Its kinetic spin momentum is: $p_{sn1} = 1{,}7545 \cdot 10^{-38}$ dine$\cdot$cm$\cdot$s^{-1}, gyro-magnetic factor of nuclear neutron is:

$g_{n1} = 3{,}83$.

Its own rotation speed result fro calculus is: $v_{sn1} = 0{,}304$ cm/s, period of own rotation:

$T_{sn1} = 2{,}727 \cdot 10^{-12}$ s, and angular rotation speed: $\omega_{sn1} = 2{,}304 \cdot 10^{12}$ s^{-1}.

Knowing between them for those two states: triplet state ($\uparrow\downarrow$) of opposite spins and singlet state ($\downarrow\downarrow$) of parallel spins.

B.1.5. THE SPIN INTERACTION BETWEEN A NUCLEAR PROTON AND NEUTRON

1) Triplet state: Attraction force between two nucleons because of opposite spins is:

$$f_{s(H_p\downarrow - Hn\uparrow)} = f_{sp1} + f_{sn1} \qquad (99)$$

where: H_p and H_n are intensities of spin magnetic field of nucleons, f_{sp1} and f_{sn1} are spin attraction forces of those two nucleons. Theoretical values of these forces are:

$$f_{sp1} = I_{sp1} \cdot l_{sp1} \cdot H_{sn1} \qquad (100)$$

for nuclear proton (H_{sn1} is magnetic filed of neutron where is nuclear proton) and

$$f_{sn1} = I_{sn1} \cdot l_{sn1} \cdot H_{sp1} \qquad (101)$$

(H_{sp1} is magnetic field of proton where is nuclear neutron).

Theoretical terms I_{sp1} şi I_{sn1} , are equivalent generator currents because of its own nucleons rotation (in neutron case , the term has only a symbolic character of analogie), and are given by equation:

$$I_s = n_{rot/s} \cdot e \qquad (102)$$

The size l_s from equation (100) represent the total circular length of proper rotation of nucleons in one second.

For proton:

$$l_{sp1} = 2\pi R_{p1} n_{rot/s} \quad (103)$$

and for neutron:

$$l_{sn1} = 2\pi R_{n1} n_{rot/s} \quad (104)$$

Spin magnetic field intensities from equation (101) are calculated with classic equation:

$$H_s = \frac{1}{c} \cdot \frac{ev_s}{R_p^2} \quad (105)$$

(as we mention the size „e" for neutron, has only a symbolic character of calculus for neutronic magnetic field).

Attraction force energy of a nucleon (proton or neutron) because of spin interraction is indicate by general equation:

$$W_s = f_s \cdot L_p \quad (106)$$

where L_p is coupling breadth area of nucleons.

Total attraction energy because of spin interactions between nuclear proton and neutron in triplet state is:

$$W_{s(p\text{-}n)} = W_{sp1} + W_{sn1} \quad (107)$$

Replace corresponding values in above equations (99 ÷ 107) and calcuate, can obtain the values for those two nucleons in coupling interaction:

$I_{sp1} = 2{,}591 \cdot 10^2$ unit. CGS of intensity; $I_{sn1} = 1{,}779 \cdot 10^2$ unit. CGS of intensity; $l_{sp1} = 0{,}448$ cm;

$l_{sn1} = 0{,}307$ cm; $H_{sp1} = 4{,}107 \cdot 10^5$ oerstezi; $H_{sn1} = 2{,}824 \cdot 10^5$ oerstezi.

Result: $f_{sp1} = 3{,}277 \cdot 10^7$ dine and $f_{sn1} = 2{,}244 \cdot 10^7$ dine, and attraction energy because of spins are:

$W_{sp1} = 4{,}545 \cdot 10^{-7}$ erg = 0,283 MeV and

$W_{sn1} = 3{,}108 \cdot 10^{-7}$ erg = 0,194 MeV

So, the attraction energies of spins are much lower than mesonic coupling energies.

Total energy of coupling interaction for a nucleon in triplet state is:

$$W_T = W_{p\text{-}n} + W_s \quad (108)$$

For nuclear proton the coupling energy is: $W_{Tp1} = 6{,}317$ MeV, and for nuclear neutron: $W_{Tn1} = 6{,}198$ MeV. These values are in accordance with well known data for light nuclei.

2. Singlet state

In parallel spin situation (↓↓) of nucleons, the coupling energy between them is lower because of spin interaction than in case of antiparallel spins.

Energetic difference:

$$\Delta W_s = \mu_s B_s \quad (109)$$

where B_s it is magnetic induction of opposite nucleon. In coupling case p – n, this energetic difference is:

$$\Delta W_s = \Delta W_{sp1} + \Delta W_{sn1} = \mu_{p1} B_{n1} + \mu_{n1} B_{p1} \quad (110)$$

where:

$$B_{p1} = \frac{H_{sp1}}{c^2} \quad (111)$$

and

$$B_{n1} = \frac{H_{snl}}{c^2} \quad (112)$$

Replace corresponding values, we have: $B_{p1} = 4{,}57 \cdot 10^{-16}$ and

$B_{n1} = 3{,}14\cdot10^{-16}$, the term: $\Delta W_s = 8{,}91\cdot10^{-39}$ erg = $5{,}561\cdot10^{-33}$ MeV.

B.1.6. THE SPIN INTERACTION BETWEEN TWO NUCLEAR PROTONS

1) Triplet state

In opposite spin case (antiparallels) of those two protons, the attraction force between those two nuclear protons is:

$$f_{s(H_p\downarrow - Hp\uparrow)} = 2f_{sp1} = 2I_{sp1}l_{sp1}H_{sp1} \quad (113)$$

Replace the values of terms: I_{spl}, l_{spl} and H_{spl} aprior found in equation (112), can have:

$f_{s(H_p\downarrow - H_p\uparrow)} = 9{,}532\cdot10^{7}$ dine.

Attraction energy between those two protons because of opposite spins is:

$$W_{s(p_1-p_1)} = f_{s(H_p\downarrow - H_p\uparrow)}L_{p_l(\pi^0)} \quad (114)$$

Replace values for sizes: $f_{s(H_p\downarrow - H_p\uparrow)}$ and $L_{pl(\pi^0)}$ can have: $W_{s(p_1-p_1)} = 1{,}278\cdot10^{-6}$ erg = 0,798 MeV, so an appropriate very small value.

Total coupling energy is:

$$W_{sT} = W_{p-p} + W_{s(p_l-p_l)} \quad (115)$$

That is: $W_{sT} = 6{,}633$ MeV.

2) Singlet state

Coupling energy between nuclear protons in singlet state (parallel spins) is lower that triplet state with different value of energy:

$$\Delta W_{s(p-p)} = 2\mu_{p_l}B_{p_l} \quad (116)$$

Replace the values and calculate, result: $\Delta W_{s(p-p)} = 1{,}298\cdot10^{-38}$ erg = $8{,}104\cdot10^{-33}$ MeV, so a very small value.

B.1.7. THE SPIN INTERACTION BETWEEN TWO NUCLEAR NEUTRONS

1) Triplet state

In opposite spin case (antiparallels) of those two nuclear neutrons, the attraction force because of opposite spins between them is:

$$f_{s(H_n\downarrow - H_n\uparrow)} = 2f_{sn1} = 2I_{sn1}.l_{sl}\cdot H_{snl} \quad (117)$$

Replace the values and calculate, result: $f_{s(H_n\downarrow - Hn\uparrow)} = 3.086\cdot10^{7}$ dine.

Attraction energy because of opposite spins between those two neutrons is:

$$W_{s(n_1-n_1)} = f_{s(H_n\downarrow - H_n\uparrow)}.L_{n_1(\pi^0)} \quad (118)$$

Calculate and replace the values, result: $W_{s(n_1-n_1)} = 4{,}216\cdot10^{-6}$ erg = 2,631 MeV.

Total coupling energy between neutrons is:

$$W_{sT} = W_{n\text{-}n} + W_{s(n_1 - n_1)} \quad (119)$$

That is: W_{sT} = 8,466 MeV.
This result it is in accordance with well known data.

2) Singlet state

The coupling energy between nuclear neutrons because of parallel spins is lower than at triplet state with difference of energy:

$$\Delta W_{s(n-n)} = 2\mu_{n_l} B_{n_l} \quad (120)$$

Calculate, result: $\Delta W_{s(n-n)}$ = 6,115·10^{-39} erg = 3,816·10^{-33} MeV, so very small.

B.1.8. THE „SPIN-FLIP" PHENOMENON AT INTERACTIONS BETWEEN NUCLEONS

How it is known, after nucleons interactions, occurs periodically a reverse of spins, that is a reverse of its own sense of rotation.
In a vector form, in case of interaction between nuclear proton and neutron in triplet state, can write: $p_1(S\downarrow H\downarrow) + n_1(S\uparrow H\downarrow) \underset{\pi^+}{\overset{\pi^+}{\rightleftarrows}} n_1(S\uparrow H\downarrow) + p_1(S\downarrow H\downarrow)$, i.e. the triplet state in this case is conserved as well as spin orientation of magnetic field (note with „S" th spin and with „H" magnetic field).

Through mesonic interaction π^+, and thorugh periodical tranformations: p→n and n→p, periodical occurs orientation change of spins.
Above equation of interaction can be written in a succesive form like:

$$p_1(S\downarrow H\downarrow) \xrightarrow{\pi^+} n_1(S\uparrow H\downarrow) \; and \; n_1(S\uparrow H\downarrow) \xrightarrow{\pi^-} p_1(S\downarrow H\downarrow)$$

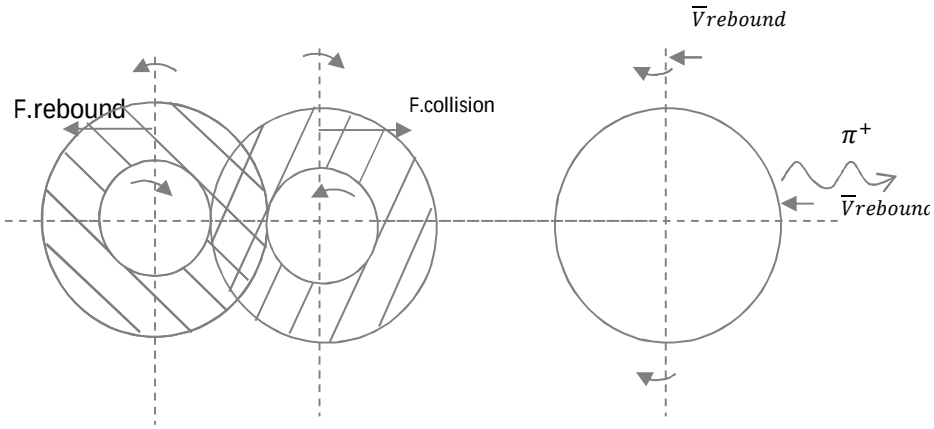
For singlet state, can write the interaction:

$$p_1(S\downarrow H\downarrow) \xrightarrow{\pi^+} n_1(S\uparrow H\downarrow) \; and \; n_1(S\uparrow H\downarrow) \xrightarrow{\pi^-} p_1(S\uparrow SH\uparrow)$$

i.e. through interaction the singlet state is preserved.

During mesonic exchange π^+ from nuclear proton to neutron, take place two phenomenon: a backdown of nuclear proton and a „collision" of incident neutron. Condition of changing for nuclear proton rotation is:

$$W_{pl(spin-flip)} = W_{p1.stop} + W_{p1.rot} = 2W_{sp1} \quad (121)$$



where: $W_{pl.stop}$ = energy to stop rotation and și $W_{pl.rot}$ = energy of rotation.

$$W_{spl} = \frac{1}{2} m_{p1} v_{sp1}^2 \quad (122)$$

Knowing the values: m_{pl} and v_{spl} prior calculated, can find:
W_{spl} =1,663·10^{-25}erg , and

Figure 3

$W_{pl(spin–flip)} = 3{,}327 \cdot 10^{-25}$ erg = $2{,}076 \cdot 10^{-19}$MeV.

To verify this backdown energy $W_{p1(spin\ –\ flip)}$ is enough to change rotation of nuclear proton. We will write for mesonic bckdown π^+ the condition of impulse preserve for nuclear proton:

$$m_{p_1} v_{bkdwn} = m_{\pi^+}(v_{\pi^+} - v_{bkdwn}) = m_{\pi^+} \cdot v_a \quad (123)$$

where v_{π^+} is coupling speed of meson π^+, v_{bkdwn} is virtual speed of backdown and v_a is absolute speed of meson π^+.

Speed of v_{π^+} cancalculate with equation:

$$v_{\pi^+} = \frac{\bar{Z}_{p_1(\pi^+)}}{t_{cupl.\pi^+}} \quad (124)$$

Time of coupling $t_{cupl.}$can be found with equation:

$$t_{cupl.\pi^+} = \frac{1}{\nu_{cupl.\pi^+}} = \frac{h}{W_{p-n}} \quad (125)$$

because:

$$W_{p-n} = h\nu_{cupl.\pi^+} \quad (126)$$

With value: $W_{p\text{-}n} = 9{,}669 \cdot 10^{-6}$ erg, prior foud, is determined: $t_{cupl.\pi^+} = 6{,}852 \cdot 10^{-22}$ s.

Because the size $\bar{Z}_{p_1(\pi^+)}$ (medium distance of nucleonic attraction) prior calculated is:

$\bar{Z}_{p_1(\pi^+)} = 1{,}405 \cdot 10^{-13}$ cm, result from equation (124):

$v_{\pi^+} = 2{,}051.10^8$ cm/s.

Form equation (123), can calculate the speed of backdown for nuclear proton:

$$v_{bkdwn} = \frac{m_{\pi^+} \cdot v_{\pi^+}}{m_{\pi^+} + m_{p_l}} \quad (127)$$

Result: $v_{bkdwn} = 2{,}676 \cdot 10^7$ cm/s.

Absolute speed of meson π^+ is:

$$v_a = v_{\pi^+} - v_{bkdwn} \quad (128)$$

Result: $v_a = 1.783 \cdot 10^8$ cm/s.

Backdown energy of nuclear proton is:

$$W_{bkdwn\ p_1} = \frac{1}{2} m_{p_1} v_{bkdwn}^2 \quad (129)$$

Result: $W_{reculp_1} = 2{,}159 \cdot 10^{-10}$ erg = $1{,}347 \cdot 10^{-4}$ MeV.

Can observe that: $W_{bkdwnp_1} > W_{p1(spin\ –\ flip)}$, it means that „spin-flip" condition of nuclear proton is accomplished. The energy difference between these values is:

$$W_r = W_{bkdwn\ p_1} - W_{p_{1(spin\ flip)}} \cong W_{bkdwn\ p_1} \quad (130)$$

Equivalent mass of this energy $W_{bkdwn\ p_1}$, represent the mass of a nuclear resonance m_r.

From equationa: $W_r = m_r c^2$, result:

$$m_r = \frac{W_r}{c^2} = \frac{2{,}159 \cdot 10^{-10}}{8{,}987 \cdot 10^{20}} = 2{,}402 \cdot 10^{-31}\ \text{g} \quad (131)$$

The frequence of this resonance will be:

$$\nu_r = \frac{W_r}{h} = 3{,}258 \cdot 10^{16} s^{-1} \quad (132)$$

And time of this resonance is:

$$t_r = \frac{1}{\nu_r} \quad (133)$$

therefore: $t_r = 3{,}069 \cdot 10^{-17}$s.

During coupling: $p_1 - n_1$, connection meson π^+ after its emission from nuclear proton (which push his backdown energy above calculated), it is captured by coupling nuclear neutron and causes him at capture a kind of collision energy:

$$W_{collis(\pi^+ - n_1)} = \frac{m_{\pi^+} \cdot v^2_{collis}}{2} \quad (134)$$

Because $v_{collis.} \cong v_a$ result: $W_{collis(\pi^+ - n_1)} = 3{,}958 \cdot 10^{-9}$erg $= 2{,}47 \cdot 10^{-3}$ MeV.

The own rotation energy of nuclear neutron is:

$$W_{sn1} = \frac{1}{2} m_{n1} v^2_{sn1} \quad (135)$$

Because $m_{nl} = 1{,}659 \cdot 10^{-24}$ g and $v_{sn1} = 0{,}307$ cm/s (prior found), result $W_{snl} = 7{,}826 \cdot 10^{-26}$ erg.

Energy need for spin-flip will be:

$$W_{nl(spin\text{-}flip)} = 2W_{snl} \quad (136)$$

So : $W_{nl(spin\text{-}flip)} = 1{,}565 \cdot 10^{-25}$ erg $= 9{,}767 \cdot 10^{-19}$ MeV.

Because $W_{collis(\pi^+ - n_1)} > W_{n1(spin-filp}$, the condition for spin-flip of nuclear neutron through collision with π^+, is accomplished.

B.1.9. THE NUCLEAR FORCES OF REPULSION AT DISTANCES LESS THAN 10^{-13} CM

According to the presented theory of graviton, the distances between the constituent gravitons of nucleons decrease with radius decreasing.

Because at very short distances betwen nucleons, the component gravitons overlap each other, there is an additional agglomeration thereof, respective on various levels of gravitons with different vibration speeds. This leads to a preponderance of elastic collisions between gravitons, which lead to rise of some back down forces at some very short distances.

The calculation of these forces is not a subject of present work. We just limit to a calitative explanation of this phenomenon.

B.2. THE FIELD OF ELECTRIC AND ELECTROMAGNETIC FORCES

B.2.1. THE ELECTROSTATIC FIELD FORCES IN GRAVITON PHYSICS

Because the elementary electric charge: $e = 4{,}802.10^{-10}$ u.e.s.CGS. it is a fundamental size in elctro-statics and electro-dynamics, will show below its gravitonic characteristics.

As it is known, the existing equation for electric charge of electron is:

$$m_p c^2 = \frac{e^2}{R_p} \quad (137)$$

where: m_p and R_p are mass and electron radius.

Because electron mass m_p is made from „n_p" gravitons according to:

$$m_p = n_p \cdot m_\varphi \quad (138)$$

n_p is number of gravitons of electron, $n_p = 4{,}941 \cdot 10^{18}$gravitons and „$m_\varphi$" is graviton mass $m_\varphi = 1{,}843 \cdot 10^{-46}$ g, values prior determinated. So, equation (137) become:

$$\frac{e^2}{R_p} = n_p m_\varphi c^2 = n_p W_\varphi = n_p \frac{q_\varphi^2}{r_\varphi} = n_p \frac{G m_\varphi^2}{r_\varphi} \quad (139)$$

where: W_φ is internal energy of graviton, q_φ is gravitonic charge $q_\varphi = 4{,}763 \cdot 10^{-50}$ u.s.g. prior found, and $G=6{,}67 \cdot 10^{-8}$ $cm^3/g\ s^2$ is universal constant of gravitation.

From equation (138), result:

$$e = \sqrt{n_p R_p} \cdot \sqrt{m_\varphi c^2} = \sqrt{n_p R_p} \cdot \sqrt{\frac{q_\varphi^2}{r_\varphi}} = \sqrt{n_p R_p} \cdot \sqrt{\frac{G m_\varphi}{r_\varphi}} \quad (140)$$

Replace coresponding values in equation (140), result for „e" the value: $e = 4{,}80325 \cdot 10^{-10}$ ues CGS, **the exact value of electric charge size „e"[2].**

Equation (140) is proven to be correct and exact, and show in addition, the exact features of graviton previously determined.

This equation has more deep character because as fundamental size of electricity includes all of the graviton characteristics: m_φ, r_φ, q_φ , also G, the universal constant of gravitation, reveal the correctness of gravitonic component of electron and its electric field.

Because elementary electric charge value „e" is a constant, and in second part of equation (140) the radical: $\sqrt{m_\varphi c^2} = k_2$, is a constant which include constant values, result that the radical:

$\sqrt{n_p R_p} = k_1$ is a constant too.

So, the equation (140) can be write as:

$$e = k_1 \cdot k_2 \quad (141)$$

where: $k_1 = 1{,}18 \cdot 10^3$, that is: $k_1^2 = n_p R_p = 1.392 \cdot 10^6$.

Because the electron and the proton has the same value for electric charge, even has approximative same dimensions but different mass, result that for proton only an exterior spherical layer is resposible for its electrical charge, not its entire mass.

Same thing can say about the electron, because as it is known, the entire electromagnetic mass of electron conclude to essential contradictions in electron stability. Can write the equivalent equation:

$$n_p \cdot R_p = n_e \cdot R_{ech.} \quad (142)$$

where n_e is number of constituent gravitons of exterior layer of charge „e", and $R_{ech.}$ is equivalent radius of electric width radius.

To find the values of sizes n_e and R_{ech}, form equation (142), will consider as lower limit of electric charge of proton, the value:

$z_0 = 10^{-12}$ cm,

under is found experimental that electric charge is total perturbed. As upper limit of electric layer charge of graviton can consider: $z_1 = 5.291 \cdot 10^{-9}$ cm, which corresponds to atomic layer k (n=1) at proton, under doesn't exist any electronic orbit.

So, ocupied volume by elementary electric charge for proton is:

$$V_e = \frac{4\pi}{3}(z_1^3 - z_0^3) = 6{,}207 \cdot 10^{-25} cm^3 \quad (143)$$

Taking this volume V_e as a spherical volume of radius „$R_{ech.}$", that is:

$$V_e = \frac{4\pi}{3} R_{ech.}^3 \quad (144)$$

result: $R_{ech} = 5{,}291 \cdot 10^{-9}$ cm.

From equation (142): $n_e R_{ech.} = n_p R_p = 1{,}392 \cdot 10^6$, can find the number of gravitons „n_e" of elementar electric charge. Through elementar calculus can find: $n_e = 2{,}631 \cdot 10^{14}$ gravitons, which is the same for proton and for electron, whatever the sign of electric charge.

We will determine the structural charactristics of this volume V_e of electric charge. The mass of spheric layer of elementar electric charge is:

$$M_e = n_e \cdot m_\varphi \quad (145)$$

result: $M_e = 4{,}851 \cdot 10^{-32}$g.

Medium density of this layer is: $\rho_e = \frac{M_e}{V_e} = 7{,}82 \cdot 10^{-8}$ g/cm^3. So, the electric charge is found in a thin layer arround electric particle, same as an electric cloud.

Internal energy of this electric layer is:

$$W_e = M_e c^2 = 4{,}36 \cdot 10^{-11}\text{erg} = 27{,}213 \text{ eV} \quad (146)$$

Pulsating frequency of this sphericall layer is:

$$\nu_e = \frac{c}{2\pi R_{ech.}} = 9{,}017 \cdot 10^{17} s^{-1} \quad (147)$$

Medium radius of vibtating volume of a graviton in this layer is:

$$R_{\phi e} = \frac{R_{ech.}}{\sqrt[3]{n_e}} = 8{,}258 \cdot 10^{-14} \text{ cm} \quad (148)$$

And vibration energy if components gravitons is:

$$W_{T\varphi e} = 4\pi^2 n_e m_\varphi \nu_e^2 R_{\phi e}^2 = 1{,}062 \cdot 10^{-20} \text{ erg} = 6{,}6285 \cdot 10^{-9} \text{ eV} \quad (149)$$

So, total energy of gravitonic mass which compose this electric elementar layer will be:

$$W_{Te} = W_e + W_{T\varphi e} = 4{,}36 \cdot 10^{-11} \text{ erg} = 27{,}213 \text{ eV} \quad (150)$$

We will verify theoretical suppositions and values for this spherical layer of „e" charge.
In this way, accordint to (139) and (141), the equation of electric charge „e" will be:

$$e = \sqrt{n_e R_{ech.}} \cdot \sqrt{m_\varphi c^2} = \sqrt{W_{Te} R_{ech.}} = 4{,}80325 \cdot 10^{-10} \text{ ues CGS} \quad (151)$$

<u>This result is exact, so theoretical elements used aboveand and sizes values found are entirely correct.</u>

The sign of electric charge, in actual clasical physics, this thing was explain through those two algebric signs of Dirac equation from quantum mechanics:

$W_e = \pm\sqrt{p^2c^2 + m_0^2c^4}$, unde: $p = m\nu = \frac{h}{\lambda}$

But this equation can't explain the differences between physics aspects like how is chage the sign of energetic proton at a collision wiht a copper plate, the fact experimentally observed.

As a pure qualitative explanation, choosing a convenient a coordinate system, those two signs of electric charge can be explained becuse its opposite directions of own pulsating amplitudes of particles, i.e. the directions of vibration of component gravitons.

In this work we don't study these theoretical aspects.

How is known, any elementary electic charge is surrounded outside by an electric field and a structure that we will determine below using the new gravitonic physics.

For this purpose, we will consider the electric interaction between two elementary electric charges with opposite signs without a dielectric medium ($\varepsilon = 1$), for example between proton and neutron in hydrogen atom.

Classical, in this situation the coulumbian atraction force is equal with centifugal force of movement of electron rotation on orbit speed v_e, that is:

$$\frac{e^2}{z^2} = \frac{m_e v_e^2}{z} \quad (152)$$

where: m_e it is the electron mass, and z it is the radius of a considered circular orbit.

After calculus, the equation (152) become: $m_e v_e^2 = \frac{e^2}{z}$ (153)

If divide equation (153), result:

$$W_{ez} = \frac{m_e v_e^2}{2} = \frac{e^2}{2z} \quad (154)$$

where: $\frac{m_e v_e^2}{2}$ represent the kinetic energy of electron rotation arround proton. On the other hand according to clasical equation (137):

$$m_e c^2 = \frac{e^2}{R_e} \quad (155)$$

where: R_e is electron radius ($R_e = 2{,}818 \cdot 10^{-13}$ cm).
Divide equations (154) and (155) result:

$$v_e^2 \cdot z = c^2 \cdot R_e \quad (156)$$

The energy W_{ez} (152), it is the energy of electric field at distance z by proton, that is:

$$W_{ez} = m_{ez} c^2 = \frac{e^2}{2z} = \frac{m_e v_e^2}{2} \quad (157)$$

where: m_{ez} is field mass at distance z.
From equation (157), result:

$$\frac{m_e}{2m_{ez}} = \frac{c^2}{v_e^2} \quad (158)$$

Replacind in (158) the second member $\frac{c^2}{v_e^2}$ from equation (155), result:

$$\frac{m_e}{2m_{ez}} = \frac{z}{R_e} \quad (159)$$

Knowing the general equations:

$$m_e = n_e m_\varphi \quad (160)$$

and

$$m_{ez} = n_{ez} m_\varphi \quad (161)$$

where: n_e and m_{ez} are graviton numbers of electron and electric field mass m_{ez} , it result finally fom equation (159)

$$\frac{n_e}{2n_{ez}} = \frac{z}{R_e} \quad (162)$$

That is:

$$n_e R_e = 2 n_{ez} z \quad (163)$$

For a general situation can write:

$$\frac{n_e R_e}{2} = n_{ez_1} z_1 = n_{ez_2} z_2 = \cdots = n_{ez_n} z_n \quad (164)$$

Equations (163) and (164) clearly reveals that gravitonic constitution of electrric field in any piont of it. Using the correspondence principle form physics, the corresponding equations of main sizes of electrostatic field can be find replacing in equation (140) the sizes from equation (164). Can obtain for value of elementar electric charge „e" the equation:

$$e = \sqrt{2n_{ez} z} \cdot \sqrt{m_\varphi c^2} = \sqrt{2n_{ez} z} \cdot \sqrt{\frac{G m_\varphi^2}{r_\varphi}} = \sqrt{2n_{ez} z} \cdot \sqrt{\frac{q_\varphi^2}{r_\varphi}} \quad (165)$$

which correlate the size of electric charge with gravitonic structure of electric field at any z distance.
On the other hand, the electric field energy from equation (157), in any point of its field can be write:

$$W_{ez} = \frac{e^2}{2z} = m_{ez} c^2 = n_{ez} m_\varphi c^2 = n_{ez} W_\varphi = n_{ez} \frac{G m_\varphi^2}{r_\varphi} = n_{ez} \frac{q_\varphi^2}{r_\varphi} \quad (166)$$

This relation which show that the field energy at distance „z" is in fact the summ of all graviton energies of all component field at distance z.
The electric potential of elementary electric charge at any distance z" as it is known is:

$$V_z = \frac{e}{z} \quad (167)$$

In this equation , the size „e" with value from equation (164), result:

$$V_z = \frac{\sqrt{2n_{ez}z}\cdot\sqrt{m_\varphi c^2}}{z} = \sqrt{\frac{2n_{ez}}{z}}\cdot\sqrt{m_\varphi c^2} = \sqrt{\frac{2n_{ez}}{z}}\cdot\sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = \sqrt{\frac{2n_{ez}}{z}}\cdot\sqrt{\frac{q_\varphi^2}{r_\varphi}} \qquad (168)$$

We ca obseerve in electric potential equation, outside distance „z" occure only gravitonic terms, including universal constant of gravitation G.

Proceeding similar for potential difference between two potential points at distances z_1 and z_2 from electrical paticle can obtain equation:

$$\Delta V_{1-2} = \sqrt{2m_\varphi c^2}\left[\sqrt{\frac{n_{ez_1}}{z_1}} - \sqrt{\frac{n_{ez_2}}{z_2}}\right] = \sqrt{\frac{2Gm_\varphi}{r_\varphi}}\left[\sqrt{\frac{n_{ez_1}}{z_1}} - \sqrt{\frac{n_{ez_2}}{z_2}}\right] =$$

$$= \sqrt{\frac{2q_\varphi^2}{r_\varphi}}\cdot\left[\sqrt{\frac{n_{ez_1}}{z_1}} - \sqrt{\frac{n_{ez_2}}{z_2}}\right] \qquad (169)$$

Other size of electric field is field intensity in any point „z" with known value:

$$E_z = \frac{e}{z^2} \qquad (170)$$

Analogous, can replace the size „e" with theoretical value (165), result:

$$E_z = \sqrt{\frac{2n_{ez}}{z^3}}\cdot\sqrt{m_\varphi c^2} = \sqrt{\frac{2n_{ez}}{z^3}}\cdot\sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = \sqrt{\frac{2n_{ez}}{z^3}}\cdot\sqrt{\frac{q_\varphi^2}{r_\varphi}} \qquad (171)$$

In this case too, the electric field intensity at distance „z", show that in its equation appear only gravitonic terms.

Will do some comparative verifications using clasical equations and gravitonic too, for main sizes of electrostatic field. For this purpose, for z can take the value: $z = 10^{-8}$ cm, the same size like an athom.

In below table (2) are shown the comparative results obtained:

Table 2
Comparative calculus of field sizes

The way of calculus	Z cm	W_{ez} erg	$V_{ues\ de\ pot.}$	$E_{ues\ de\ int.}$
Clasic calculus	10^{-8}	$1{,}1529602\cdot10^{-11}$	$4{,}802\cdot10^{-2}$	$4{,}802\cdot10^{6}$
Gravitonic calculus	10^{-8}	$1{,}153561\cdot10^{-11}$	$4{,}803\cdot10^{-2}$	$4{,}803\cdot10^{6}$

Can observe a concordance of values, so the theoretical elements presents are exact. In situation of multiple tasks can use the equation:

$$Q = N_e e \qquad (172)$$

where N_e is number of elementar charges.

B.2.2. THE SPECTRAL LINES OF THE HYDROGEN ATOM IN GRAVITON PHYSICS

As is known, the electron of the hydrogen atom moves around the nucleus (of proton) on quantified, stationary (stable) orbits called also energy levels. When the electron receives a quantum of energy (photon) from outside, it jumps into outer orbit, then returns back to its stationary orbit releasing the received photon.

If the energy received from outside is large enough, the atom is ionized or the electron leaps into a far outer orbit, and upon it's return, it passes through various intermediate orbits of transition, releasing for each transient orbit a photon until it reaches its stationary orbit.

In this case, the number of emitted photons is equal with the number of transient orbits. These emitted photons are spectroscopically highlighted by spectral emission lines, each spectral line corresponding to a emitted photon, that is to say, for each spectral line it corresponds a $W_{h\nu}$ energy, a „ν" frequency and a wavelength characteristic of that photon.

The stable energy levels (stationary orbits) of atoms, as known, are denoted by: K, L, M, N, O, P and Q, in order to their distance of nucleus. For any type of atom, including hydrogen, there are spectra of lines determined experimentally (spectroscopically) and by well defined calculation. According to the usual quantum atomic physics, the photon energy emitted by the electron by its return from a level 2 to a level 1 is[13]:

$$\Delta W_{2\text{-}1} = -W_2-(-W_1) = W_1 - W_2 = m_{h\nu}c^2 = h\nu_{h\nu} \quad (173)$$

and $$\lambda_{h\nu} = \frac{c}{\nu_{h\nu}} \quad (174)$$

Knowing the value: $\Delta W_{2\text{-}1}$ wwhich can easily be calculated quantum, can be determined: $\lambda_{h\nu}$, $\nu_{h\nu}$ and $m_{h\nu}$ of the emitted photon, that is the characteristics of the corresponding spectral line.

In gravitonic physics, energies W_1 and W_2 from equation (173) represent the energies of the proton electric field at z1 and z2 distances from nucleus. Using equation (166), the equation (173) become:

$$\Delta W_{2-1} = m_{ez_1}c^2 - m_{ez_2}c^2 = m_{\varphi}c^2(n_{ez_1} - n_{ez_2}) = \frac{Gm_{\varphi}^2}{r_{\varphi}}(n_{ez_1} - n_{ez_2}) = \frac{q_{\varphi}^2}{r_{\varphi}}(n_{ez_1} - n_{ez_2}) = h\nu_{h\nu} \quad (175)$$

The values: n_{ez_1} and n_{ez_2} are easily obtained with equation (162): $\frac{n_e}{2n_{ez}} = \frac{z}{R_e}$, where n_e and R_e are the gravitons number of electron and his radius.

In below tables 3 and 4 are presented the comparative calculation results for several spectral lines of hydrogen atom, using the classical atomic-quantum method and gravitonic calculus equations (175) and (162).

Can observe that the results are consistent, the perfect accuracy of the comparative results being influenced by the inherent precision of the various sizes of used values, fact which is not essential for the theoretical calculation elements[7][8].

Table 3

Level	K	L	M	N	O	P	Q
Z cm	$z_1=5{,}2917\cdot10^{-9}$	$z_2=2{,}1167\cdot10^{-8}$	$z_3=4{,}7625\cdot10^{-8}$	$z_4=8{,}4667\cdot10^{-8}$	$z_5=1{,}3229\cdot10^{-7}$	$z_6=1{,}90512\cdot10^{-7}$	$z_7=1{,}5929\cdot10^{-7}$

Table 4
Comparative results of the characteristics of some hydrogen atom spectral lines

Classical determined values (computation and experimentation)					Values calculated gravitonically		
nr	$\Delta Z=Z_n-Z_{n-1}$(cm)	ΔW erg	λ cm (Å)	ν s^{-1}	ΔW erg	λ cm	ν s^{-1}
1	$\Delta Z_{2\text{-}1}=1{,}58751\cdot10^{-8}$	$1{,}633905\cdot10^{-11}$	$1{,}21568\cdot10^{3}$ (1215,68 Å)	$2{,}46605\cdot10^{15}$	$1{,}63617\cdot10^{-11}$	$1{,}21399\cdot10^{11}$ (1213,99 Å)	$2{,}46947\cdot10^{15}$

2	$\Delta Z_{3-2}=2{,}645849\cdot10^{-8}$	$3{,}026590\cdot10^{-12}$	$6{,}56284\cdot10^{-5}$ (6562,84 Å)	$4{,}56802\cdot10^{14}$	$3{,}02993\cdot10^{-12}$	$6{,}55562\cdot10^{-5}$ (6555,6 Å)	$4{,}57306\cdot10^{14}$
3	$\Delta Z_{4-3}=4{,}004189\cdot10^{-8}$	$1{,}059299\cdot10^{-12}$	$1{,}87511\cdot10^{-4}$ (18751,13 Å)	$1{,}59879\cdot10^{-14}$	$1{,}06047\cdot10^{-12}$	$1{,}87303\cdot10^{-4}$ (18730,3 Å)	$1{,}60057\cdot10^{14}$
4	$\Delta Z_{5-6}=6{,}87816\cdot10^{-8}$	-	-	-	$1{,}60738\cdot10^{-13}$	$1{,}23573\cdot10^{-3}$	$2{,}42602\cdot10^{13}$

B.2.3. THE ELECTRO-DYNAMICS OF ELECTRIC CURRENT IN GRAVITONIC PHYSICS

As it is known, electric current is the movement of electric charges (elementary or ions) under the action of an electric field, which can be propagated in ionized gases between two electrodes, in electrolytes (the movement of ions between electrodes) or in solid conductors.

a) <u>The electric current in ionized gases, neglecting the resistance of gases</u>

For simplicity we will consider a gas with a dielectric constant: $\varepsilon = 1$ and the displacement of a single electron between two electrodes situated at distance "z" with a potential difference between them: $\Delta V = V$. The classical energy equation of electron movement in field V will be:

$$\frac{m_e v_c^2}{2} = e \cdot V \qquad (176)$$

The potential of the electric field V between the electrodes at the distance "z" being produced by:

$Q = N_v \cdot e$ charges of electrodes (177)

Can write:

$$V = \frac{Q}{z} = \frac{N_v e}{z} \qquad (178)$$

Replace the value V (178) in equation (176) can have:

$$\frac{m_e v_e^2}{2} = N_v \frac{e^2}{z} \qquad (179)$$

Electric charge „e" according to known (155) equation: $\frac{e^2}{R_e} = m_e c^2$, that is $e^2 = m_e \cdot c^2 \cdot R_e$, and replacing in equation (178) in this form, can obtain:

$$\frac{m_e v_e^2}{2} = N_v \frac{m_e R_e c^2}{z} \qquad (180)$$

According to (164), can write: $N_v \cdot m_e \cdot Re = m_{ez} \cdot z$ (180') therefore equation (180) become:

$$\frac{m_e v^2}{2} = m_{ez} c^2 \qquad (180")$$

where m_{ez} is the mass of electric field at distance z.

From equation (180") can obtain the speed of electron „v_e" depending by mass of electric field „m_{ez}": $v_e = \sqrt{\frac{2m_{ez}c^2}{m_e}}$ (180"`).

Knowing general gravitonic equations: $m_{ez} = n_{ez} m_\varphi$ and $m_e = n_e m_\varphi$ where: n_{ez} and n_e are the number of component gravitons of masses m_{ez} and m_e, after replacind in equation (180"`) and calculus, result:

$$v_e = c\sqrt{\frac{2n_{ez}}{n_e}} \qquad (181)$$

This equation is valid in a uniform electric field.

Equation (180) of displacement kinetic energy of electron in electric field with mass m_{ez} can write in form:

$$W_e = \frac{m_e v_e^2}{2} = m_{ez}c^2 = n_{ez}m_\varphi c^2 = n_{ez}W_\varphi = n_{ez}\frac{Gm_\varphi^2}{r_\varphi} = n_{ez}\frac{q_\varphi^2}{r_\varphi} \quad (182)$$

This being the gravitonic form of electron motion energy.

In situation of moving the ionic currents into electrolytes, can take into account the masses of ions and the resistances encountered by the ions in their movement. These phenomena are not the subject of this work.

b) <u>The electric current in solid conductors</u>

The electric current in solid conductors is the displacement of free electrons from the conductors under the action of an electric field created by a potential difference ΔV between conductors made by an external electrical source.

That is, the electric current comprises two phenomena: the propagation of an electric field through a conductor with speed "c" due to the potential difference ΔV and the displacement of free electrons inside conductor with a relatively slow speed average v_e, due to conductor resistance R and the multiple collisions of electrons with conductor atoms.

The basic law of electric current in solid conductors is Ohm's law, which correlates those two phenomena above mentioned: $I = \frac{\Delta V}{R}$, or more simple:

$$I \cong \frac{V}{R} \quad (183)$$

(can consider ΔV=V) where: I is the intensity of electrons currrent, V is the potential difference of the electric field, and $R = \rho\frac{l}{s}$ is the conductor rresistance. The values of these terms are:

$$I = \frac{Q_e}{\tau_e} = \frac{N_e e}{\tau_e} \quad (184)$$

and

$$V = \frac{Q_v}{z} = \frac{N_v e}{z} \quad (185)$$

In this equations N_e is the number of electrons which are moving in the conductor, N_v is the number of elementar electric charges which compose the electric field, z is the lenght of conductor and τ_c is the time of electrons that are moving through conductor.

We can write:

$$\tau_c = \frac{z}{v_e} \quad (186)$$

where $\overline{v}_e$ is medium speed of electrons inside conductor.

Replace equations (184), (185) and (186) in Ohm equation (183), have: $\frac{Q_v}{z} = \frac{Q_e \overline{v}_e R}{z}$ i.e.:

$$Q_v = Q_e \overline{v}_e R \quad (187)$$

but: $Q_v = N_v \cdot e$ and $Q_e = N_e \cdot e$, equation (187) become:

$$N_v e = N_e e \overline{v}_e R \quad (188)$$

Multiplying equation (188) with „e", result:

$$N_v e^2 = N_e e^2 \overline{v}_e R \quad (189)$$

First member of equation (189) reffers to electric field in conductor and second member reffers to electrons movement inside conductor. Using this, according to equation (157) prior determinated:

$\frac{e^2}{2z} = m_{ez}c^2 = \frac{m_e v_c^2}{2}$, replace the value of e^2 from first part of equation (189) result:

$$2N_v z m_{ez} c^2 = N_e e^2 \overline{v}_e R \quad (190)$$

From equation (157):

$$e^2 = zm_e \bar{v}_e^2 \tag{191}$$

Replace the value e^2 according to (191), in equation (190), result:

$$N_v m_{ez} c^2 = N_e \frac{m_e \bar{v}_e^2}{2} \cdot \bar{v}_e R \tag{192}$$

This equation (192) show in fact, the change of electric field energy in kinetic energy of electrons motion inside the conductor. Because: $m_{ez} = n_{ez} m_\varphi$ and $m_e = n_e m_\varphi$ equation (192) become:

$$N_v n_{ez} c^2 = N_e \frac{n_e \bar{v}_e^2}{2} \cdot \bar{v}_e R \tag{193}$$

Or, under other form:

$$N_e \frac{m_e \bar{v}_e^2}{2} \cdot \bar{v}_e R = N_v n_{ez} m_\varphi c^2 = N_v n_{ez} \frac{G m_\varphi^2}{r_\varphi} = N_v n_{ez} \frac{q_\varphi^2}{r_\varphi} \tag{194}$$

The equations (193) and (194) are gravitonic equations of electric current in solid conductors.

B.2.4. THE FIELD OF ELECTROMAGNETIC FORCES IN GRAVITON PHYSICS

As is known, any electric charge in motion, that is electric current, or electric field which is propagating in space, generates rotating circular magnetic fields around them,

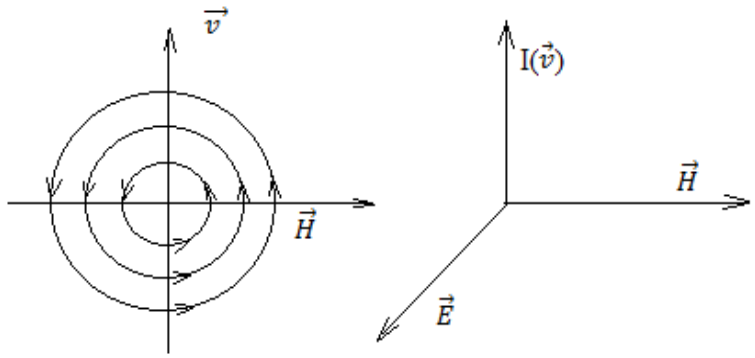


Figura 4

perpendicular to direction of moving charges, or to the respective electric fields. As shown in Figure 4, the direction of rotation of rotating magnetic field respects the "drill rule".

Those three vectors: $\vec{v}$, $\vec{E}$ *and* $\vec{H}$ are perpendicular between them (we note with $\vec{E}$ the intensity of electric field and with $\vec{H}$ the intensity of magnetic field). Are in evidence two situations:

a) electric field $\vec{E}$ and $\vec{v}$ are constants when $\vec{H}$ is constant;

b) electric field $\vec{E}$ is variable, lack of current I lead to $\vec{H}$ variable (case of photons and electro-magnetic waves).

a) <u>Electric field: $\vec{E}$ = constant, $\vec{v}$ = constant and $\vec{H}$ = constant</u>

In classical physics , the magnetic intensity field $\vec{H}$ at distance „r", produced by displacement of an elementary electric charge „e" with speed $\vec{v}_e$ is show vectorally by expression:

$$\vec{H} = \frac{e\vec{v}_e \cdot \vec{r}_0}{r^3} \tag{195}$$

where: $\vec{r}_0$ is the position vector $(|\vec{r}_0| = r)$, and scalar equation is:

$$H = \frac{ev_e}{r^2} \tag{196}$$

In the case of an electric current produced from a multiple charge: Q_e, in the all situations will be write the equation (196) in form:

$$H = \frac{Q_e v_e}{r^2} \tag{197}$$

where:

$$Q_e = N_e e \tag{198}$$

N_e bbeing the number of elementary electrical charges, the number of gravitons of magnetic field: n_{cm}, at distance „r" can be known using previous equation (162). In this situation : $\frac{n_e}{2n_{cm}} = \frac{r}{R_e}$, i.e.:

$$n_e R_e = 2n_{cm} \cdot r \tag{199}$$

where: n_e and R_e are the gravitonic number of electron and electron radius. According with equation (199), the gravitonic equation of electric charge „e" is:

$$e = \sqrt{2n_{cm} \cdot r} \cdot \sqrt{m_\varphi c^2} \tag{200}$$

Replace equation (200) in (196) and doing the algebraic calculus can obtain:

$$H = v_e \sqrt{\frac{n_{cm}}{r^3}} \cdot \sqrt{m_\varphi c^2} = v_e \sqrt{\frac{n_{cm}}{r^3}} \sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = v_e \sqrt{\frac{n_{cm}}{r^3}} \cdot \sqrt{\frac{q_\varphi^2}{r_\varphi}} \tag{201}$$

How is show in equation (201) the magnetic field intensity at distance „r" include except speed v_e of electrons only gravitonic sizes, including the universal constant of gravitation G.

In dielectric environments, often is used the size: $B = \mu H$ called magnetic induction, μ being the magnetic permeability of the environment.

Size B will be:

$$B = \mu v_e \sqrt{\frac{n_{cm}}{r^3}} \cdot \sqrt{m_\varphi c^2} = \mu v_e \sqrt{\frac{n_{cm}}{r^3}} \sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = \mu v_e \sqrt{\frac{n_{cm}}{r^3}} \cdot \sqrt{\frac{q_\varphi^2}{r_\varphi}} \tag{202}$$

The energy of magnetic field, for one volume:

$$V_{rm} = \frac{4\pi}{3} r^2 \tag{203}$$

In the gravitonic form, respecting the principle of the correspondence will be:

$$W_H = \frac{1}{8\pi} H^2 V_r = \frac{1}{8\pi} v_e^2 \cdot \frac{n_{cm}}{r^2} m_\varphi c^2 \frac{4\pi}{3} r^2 = \frac{1}{6} v_e^2 n_{cm} \frac{Gm_\varphi^2}{r_\varphi} = \frac{1}{6} v_e^2 n_{cm} \cdot \frac{q_\varphi^2}{r_\varphi} \tag{204}$$

Density of magnetic energy will be:

$$\rho_H = \frac{W_H}{V_r} = \frac{1}{8\pi} H^2 = \frac{1}{8\pi} \cdot \frac{v_e^2 n_{cm}}{r^3} m_\varphi c^2 \tag{205}$$

Multiplying with $\frac{4\pi}{3}$, doing calculus and knowing that: $\frac{4\pi}{3} r^3 = V_r$, is magnetic field volume of radius „r", and: $\frac{n_{cm}}{V_r} = \rho_{n_{cm}}$ is number of gravitons density in volume V_r, the equation of magnetic density ρ_H become:

$$\rho_H = \frac{1}{6} v_e^2 \rho_{n_{cm}} \cdot m_\varphi c^2 = \frac{1}{6} v_e^2 \rho_{n_{cm}} \cdot \frac{Gm_\varphi^2}{r_\varphi} = \frac{1}{6} v_e^2 \rho_{n_{cm}} \frac{q_\varphi^2}{r_\varphi} \tag{206}$$

Equations (204) and (206) show us that energy and density of energy of magnetic field include the sum of component gravitons energies.

Analogous can have the equation of electric field intensity produced by moving of charge „e".

As is known, the electric field intensity have vectorial equation:

$$\vec{E} = \vec{v}_e x \vec{H} \tag{207}$$

And scalar:

$$E = v_e H = v_e^2 \frac{e}{r^2} \tag{208}$$

Replace the size H from equation (201), can have:

$$E = v_e^2\sqrt{\frac{n_{ce}}{r^3}}\cdot\sqrt{m_\varphi c^2} = v_e^2\sqrt{\frac{n_{ce}}{r^3}}\sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = v_e^2\sqrt{\frac{n_{ce}}{r^3}}\cdot\sqrt{\frac{q_\varphi^2}{r_\varphi}} \quad (209)$$

Induction of the electric field D is:

$$D = \varepsilon E \quad (210)$$

where ε is dielectric constant of environment. So:

$$D = \varepsilon v_e^2\sqrt{\frac{n_{ce}}{r^3}}\cdot\sqrt{m_\varphi c^2} = \varepsilon v_e^2\sqrt{\frac{n_{ce}}{r^3}}\sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = \varepsilon v_e^2\sqrt{\frac{n_{ce}}{r^3}}\cdot\sqrt{\frac{q_\varphi^2}{r_\varphi}} \quad (211)$$

Analogous, the electric field energy of a volume:

$$V_r = \frac{4\pi}{3}r^3 \quad (212)$$

Will be:

$$W_E = \frac{1}{8\pi}E^2V_r = \frac{1}{8\pi}v_e^4\frac{n_{cm}}{r^3}\cdot m_\varphi c^2\cdot\frac{4\pi}{3}r^3 = \frac{1}{6}v_e^4 n_{cm}m_\varphi c^2 = \frac{1}{6}v_e^4 n_{cm}\cdot\frac{Gm_\varphi^2}{r_\varphi} = \frac{1}{6}v_e^4 n_{cm}\frac{q_\varphi^2}{r_\varphi} \quad (213)$$

The density of electric field energy will be:

$$\rho_E = \frac{W_E}{V_r} \quad (214)$$

Replace, can have:

$$\rho_E = \frac{1}{6}v_e^4\rho_{n_{cm}}m_\varphi c^2 = \frac{1}{6}v_e^4\rho_{n_{cm}}\cdot\frac{Gm_\varphi^2}{r_\varphi} = \frac{1}{6}v_e^4\rho_{n_{cm}}\cdot\frac{q_\varphi^2}{r_\varphi} \quad (215)$$

The equations obtained above, clearly indicate the gravitonic constitution of electric and magnetic fields. We mention that similar as for particles, the compound gravitons of fields have own vibrations, variable with distance "r".

b) <u>The variable electro-magnetic field. (E and H are variable)</u>

This type of electro-magnetic field, at its propagation do not intervene the displacement of electric charges, is meet in two situations: at photons and electro–magnetic waves. We will analyze them one by one.

b.1) <u>The photons (composition and characteristics)</u>

How is known, the photons have more different characteristics than the other particles: are kinetic particles with constant speed (c), that is don't exist in static stage and don't have variable speed. Have a double feature of particle and wave (as the all other particles), have vectors $\vec{H}$ and $\vec{E}$ pperpendicular and variables, and interact energetic with atomic particles through collisions or absorptions. Also, they interract with gravitational fields as found. Having spin, the photon rotates around it, perpendicular to direction of moving.

To found structural characteristics of photons will use the same methodology as in particle situation, presented at the beginning of this work. So, for any photon, can write equation (9) under form (were writed with ϕ the photon characteristics):

$$\rho_{\phi c} = \rho_{\phi v}e^{\frac{w_{\phi c}}{w_{\phi v}}} \quad (216)$$

Where similar:

$$\frac{W_{\phi c}}{W_{\phi v}} = \frac{c^2}{v_\phi^2 \sqrt[3]{n_\phi^2}} \tag{217}$$

result: $$v_\phi^2 \sqrt[3]{n_\phi^2} = c^2 \frac{\log e}{\log \frac{R_\phi^3}{R_{\phi c}^3}} \tag{218}$$

In (218), similar the photon colapsed radius is:

$$R_{\phi c} = \frac{G m_\phi}{c^2} \tag{219}$$

where m_ϕ is found from known equation $m_\phi = \frac{h\nu_\phi}{c^2}$

and: $m_\phi = n_\phi m_\varphi$ (220)

Equation (217) become:

$$\log \frac{R_\phi^3}{R_{\phi c}^3} = \frac{1}{v_\phi^2} \cdot \frac{c^2 \log e}{\sqrt[3]{n_\phi^2}} \tag{221}$$

In equation (221), the only unknown are: radius R_ϕ of photon and medium vibration velocity of component gravitons v_φ. The second equation is that similar to realation (19):

$$\frac{v_\phi^2}{n_\phi} = c^2 \frac{R_{\phi c}}{R_\phi} \tag{222}$$

From (221) result:

$$v_\phi^2 R_\phi = c^2 R_{\phi c} n_\phi \tag{223}$$

In this equation only v_ϕ and R_ϕ are unknown.

From the sistem with two equation (221) and (223) can found the values of: v_ϕ and R_ϕ.

Knowing the sizes v_ϕ and R_ϕ, can found easy the medium distance between two gravitons $\overline{R}_{\phi\phi}$ form photon composition, using similar equation:

$$\overline{R}_{\phi\phi} = \frac{R_\phi}{\sqrt[3]{n_\phi}} \tag{224}$$

Medium frequency vibration of component gravitons is:

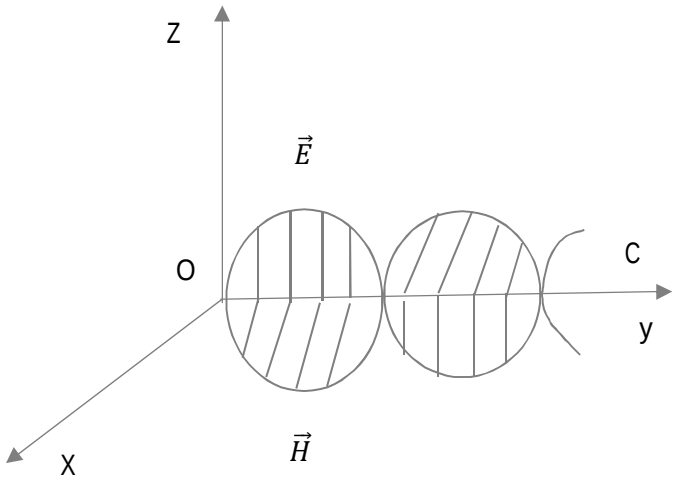
$$\nu_{\phi v} = \frac{V_\phi}{R_{\phi\phi}} \tag{225}$$

Mass density of a photon is: $\rho_{\phi v} = \frac{m_\phi}{V_\phi}$ (226)

Where photon volume V_ϕ is:

$$V_\phi = \frac{4\pi}{3} R_\phi^3 \tag{227}$$

As is known, the photon has a rectilinear displacement with the group velocity equal with „c" , at the same time has an undulating character through the perpendicular sinusoidal oscillations of magnetic and electric fields, according to fig.5. Those two amplitudes has the value:



$$A = \frac{\lambda_\phi}{2\pi} \tag{228}$$

where λ_ϕ is the photon wavelenght. Can observe that: $A >> R_\phi$, so can imagine the photon as a central core, more dense with radius R_ϕ , compose by gravitons like any other particle and an external gravitons cloud

arround it with dimension A which oscilate in that two perpendicular directions forming two fields.

Figure 5

Electromagnetic energy of photon is indicate by known equation:

$$W_\phi = \frac{E^2+H^2}{8\pi} V_R \tag{229}$$

where: E =c H (230)

so: $W_\phi = \frac{H^2(c^2+1)}{8\pi} V_R$ (231)

If consider:

$$V_R = \frac{4\pi R^3}{3} \tag{232}$$

where: $R = \frac{A}{2} = \frac{\lambda_\phi}{4\pi}$ (233)

$$V_R = \frac{4\pi}{3} \cdot \left(\frac{\lambda_\phi}{4\pi}\right)^3 = \frac{\lambda_\phi^3}{48\pi^2} \tag{234}$$

then: $W_\phi = \frac{H^2(c^2+1)}{8\pi} \cdot \frac{\lambda_\phi^3}{48\pi^2} = \frac{H^2\lambda_\phi^3(c^2+1)}{384\pi^2}$ (235)

Can write the photon energy:

$$W_\phi = h\nu_\phi = m_\phi c^2 = n_\phi m_\varphi c^2 = n_\phi \frac{Gm_\varphi^2}{r_\varphi} = n_\phi \frac{q_\varphi^2}{r_\varphi} \tag{236}$$

Variations of electric and magnetic fields can be found solving diferential equations:

$$\frac{\partial^2 E_z}{\partial y^2} = \frac{\partial^2 E_z}{\partial t^2} \tag{237}$$

and

$$\frac{\partial^2 H}{\partial y^2} = \frac{\partial^2 H_z}{\partial t^2} \tag{238}$$

The solutions are: $\vec{E} = \vec{E}_0 \cos\omega\left(t - \frac{y}{v}\right)$ (239)

and: $\vec{H} = \vec{H}_0 \cos\omega\left(t - \frac{y}{v}\right)$ (240)

where: $\vec{E}_0$ and $\vec{H}_0$ are maximu amplitudes of that two fields.

As we show above, using the phisycs of graviton can find dimensions and mass density of photons as its fundamental structural characteristics. In table (5) we present the physical characteristics of the main photon frequency ranges.

Table 5

THE STRUCTURAL CHARACTERISTICS OF PHOTONS

No	Domain		Photon λ_ϕ(Å) cm	Freqvency ν_ϕ s^{-1}	Energy $W_\phi=h\nu_\phi$ erg	Mass of inertia $m_\phi = \frac{h\nu_\phi}{c^2}$ g	No of gravitons $n_\phi = \frac{m_\phi}{m_\varphi}$	Photon radius R_ϕ cm
	Spectrum	Type						
0	1	2	3	4	5	6	7	8
1	γ	Nuclear photons	$(10^{-3}$Å$)10^{-11}$	$2{,}997925.10^{21}$	$1{,}9863052.10^{-5}$	$2{,}2100619.10^{-26}$	$1{,}1999884.10^{20}$	$1{,}44.10^{-18}$
2	X	X rays	$(1$Å$)10^{-8}$	$2{,}997925.10^{18}$	$1{,}9863052.10^{-8}$	$2{,}2100619.10^{-28}$	$1{,}1999884.10^{17}$	$8{,}83.10^{-27}$
3	U.V.	Ultraviolet λ_ϕ=100-4000Å	(1215,7 Å) $1{,}2157.10^{-5}$	$2{,}4660072.10^{15}$	$1{,}6338777.10^{-11}$	$1{,}8179336.10^{-32}$	$9{,}8707616.10^{13}$	$5{,}02.10^{-35}$
4	Vizibil λ_ϕ=	Violet	$(4000$ Å$)4.10^{-5}$	$7{,}4948125.10^{14}$	$4{,}965763.10^{-12}$	$5{,}5251594.10^{-33}$	$2{,}9999737.10^{13}$	$1{,}98.10^{-36}$
5		Indigo	$(4350$Å$)4{,}35.\ 10^{-5}$	$6{,}8917816.10^{14}$	$4{,}5662188.10^{-12}$	$5{,}0806022.10^{-33}$	$2{,}7585943.10^{13}$	$1{,}65.10^{-36}$

6		Blue	(4900Å)4,9.10^{-5}	6,1182142.10^{14}	4,053684.10^{-12}	4,5103304.10^{-33}	2,4489561.10^{13}	1,17.10^{-36}
7		Green	(5500Å)5,5.10^{-5}	5,4507727.10^{14}	3,611464.10^{-12}	4,0182944.10^{-33}	2,1817972.10^{13}	8,10.10^{-37}
8		Yelow	(5900Å)5,9.10^{-5}	5,0812288.10^{14}	3,366619.10^{-12}	3,7458677. 10^{-33}	2,0338788.10^{13}	6,62.10^{-37}
9		Orange	(6200Å)6,2.10^{-5}	4,8353629. 10^{14}	3,203718.10^{-12}	3,564616.10^{-33}	1,9354653.10^{13}	6,57.10^{-37}
10		Red	(7400Å)7,4.10^{-5}	4,05125.10^{14}	2,6841962.10^{-12}	2,9865702.10^{-33}	1,6216061.10^{13}	3,67.10^{-37}
11	λ_ϕ=7500-5.10^7 Å	Infrared	(10^5Å)10^{-3}	2,997925.10^{13}	1,9863052.10^{-13}	2,2100619.10^{-34}	1,1999884.10^{12}	4,35.10^{-40}
12	λ_ϕ>5.10^7 Å	Micro-wave	(5.10^7Å)5.10^{-1}	5,99585.10^{10}	3,9726104.10^{-16}	4,4201275.10^{-37}	2,399979.10^9	1,85.10^{-47}

- Table 5 Continuation -

No	Photon volume V_ϕ cm^3	Photon density ρ_ϕ g/cm^3	Distance radius between gravitons $R_{\phi\phi}$ cm	Medium vibration velocity of graviton v cm/s	Vibrating energy of photon's gravitons $W_{v\varphi}$ erg	The electromagnetic field amplitude of photon A cm
	9	10	11	12	13	14
1	1,2501319.10^{-53}	1,7678629.10^{17}	2,8922241.10^{-25}	3,839386.10^2	1,2848346.10^{-19}	1,5923566.10^{-12}
2	2,8823751.10^{-78}	7,6675027.10^{48}	1,860755.10^{-32}	4,4758269.10^3	1,7461046.10^{-20}	1,5923566.10^{-9}
3	5,2963848.10^{-103}	3,4324046.10^{70}	1,057869.10^{-39}	4,8828725.10^4	2,7094172.10^{-24}	1,935828.10^{-6}
4	3,2498547.10^{-107}	1,700125.10^{74}	6,3699308.10^{-41}	7,472423.10^4	1,2167096.10^{-21}	6,3694267.10^{-6}
5	1,880703.10^{-107}	2,7014378.10^{74}	5,4584262.10^{-41}	7,6776372.10^4	1,1811079.10^{-21}	6,9267515.10^{-6}
6	6,7054196.10^{-108}	6,7263954.10^{74}	4,0373076.10^{-41}	7,9353238.10^4	1,1801003.10^{-21}	7,8025477.10^{-6}
7	2,2249663.10^{-108}	1,8060023.10^{75}	2,8821615.10^{-41}	8,4966644.10^4	1,1440841.10^{-22}	8,7579617.10^{-6}
8	1,2146254.10^{-108}	3,0839695.10^{75}	2,423914.10^{-41}	8,7613829.10^4	1,1340104.10^{-21}	9,3949044.10^{-6}
9	1,187311.10^{-108}	3,0022597.10^{75}	2,44557098.10^{-41}	8,369102.10^4	9,8466784.10^{-22}	9,8726114.10^{-6}
10	2,0695054.10^{-109}	1,4431323.10^{76}	1,4490959.10^{-41}	9,3818595.10^4	1,03674.10^{-21}	1,1783439.10^{-6}
11	3,4461656.10^{-118}	6,4131041.10^{84}	4,5672963.10^{-44}	2,603292.10^5	5,907034.10^{-22}	1,5923566.10^{-4}
12	2,6508403.10^{-140}	1,6673197.10^{103}	1,3181088.10^{-50}	1,9556816.10^6	6,6673058.10^{-23}	7,9617834.10^{-2}

The structural-gravitonic physical characteristics of the electro-magnetic field of photons have been determined by us and will be probably presented in another work.

b.2) <u>The electromagnetic waves</u>

As it is known, electromagnetic waves can have very large wavelengths, which give them a special feature.

Today's classical physics considers them formally made from a large number of photons, but this representation is not conclusive because it does not explain how they are arranged in a wave, for example, so that the respective wave has, as a whole, well-defined physical characteristics as we observe in reality.

On the other hand, unlike ordinary photons, the conductors of the receiving antenna can capture electro-magnetic waves.

However, it is considered quantum that the electromagnetic waves are made up from virtual photons (quanta) moving as they do with the speed "c" and having the same two fields: electrically and magnetically, variable and perpendicular to the traveling speed, as in Fig.5.

From an undulating point of view, the electromagnetic waves are transverse waves and "obey" the wave equation presented above. It can be considered that an electromagnetic wave consists of a large number of elementary waves corresponding to the virtual photon components.

Below, we will determine the gravitonic constituent characteristics of such elementary wave.

We will note with the index "u" the physical features related to the electromagnetic waves. The energy of an elementary electromagnetic wave similar to a virtual photon is:

$$W_u = h\nu_u = m_u c^2 = \frac{\varepsilon E^2 + \mu H^2}{8\pi} \qquad (241)$$

where ε and μ are ddielectric constant and magnetic permeability of the environment. For vacuum: ε = 1and μ =1. Equation (241) can be written gravitonic as:

$$\frac{\varepsilon E^2+\mu H^2}{8\pi} = m_u c^2 = n_u m_\varphi c^2 = n_u \frac{Gm_\varphi^2}{r_\varphi} = n_u \frac{q_\varphi^2}{r_\varphi} \quad (242)$$

That is electromagnetic wave energy is the sum of component gravitons energy.

From equation (241) can be determined the mass of inertia of an elementary electromagnetic wave (the virtual photon of the wave):

$$m_u = \frac{h\nu}{c^2} \quad (243)$$

And the number of component gravitons:

$$n_u = \frac{m_u}{m_\varphi} \quad (244)$$

Note with: $A_u = \frac{\lambda_u}{2\pi}$ wave amplitude, the elelmentary volume of wave can be estimated:

$$V_u = \frac{4\pi}{3}\left(\frac{A_u}{2}\right)^3 \quad (245)$$

According to the classical equation from electrodynamics:

$$W_u = \frac{\varepsilon E^2+\mu H^2}{8\pi} \cdot V_u = \frac{\varepsilon E^2}{4\pi} V_u = \frac{\mu H^2}{4\pi} V_u \quad (246)$$

From equation (246) and (242) can have:

$$\frac{\varepsilon E^2}{4\pi} . V_u = m_u c^2 \quad (247)$$

and $$\frac{\mu H^2}{4\pi} . V_u = m_u c^2 \quad (248)$$

i.e. : $$E = \sqrt{\frac{4\pi m_u c^2}{\varepsilon V_u}} = \sqrt{\frac{4\pi n_u}{\varepsilon V_u}} \cdot \sqrt{m_\varphi c^2} = \sqrt{\frac{4\pi n_u}{\varepsilon V_u}} \cdot \sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = \sqrt{\frac{4\pi n_\varphi}{\varepsilon V_u}} \cdot \sqrt{\frac{q_\varphi^2}{r_\varphi}} \quad (249)$$

and $$H = \sqrt{\frac{4\pi m_u c^2}{\mu V_u}} = \sqrt{\frac{4\pi n_u}{\mu V_u}} \cdot \sqrt{m_u c^2} = \sqrt{\frac{4\pi n_u}{\mu V_u}} \cdot \sqrt{\frac{Gm_\varphi^2}{r_\varphi}} = \sqrt{\frac{4\pi n_\varphi}{\mu V_u}} \cdot \sqrt{\frac{q_\varphi^2}{r_\varphi}} \quad (250)$$

The equations (249) and (250) reveals the gravitonic constituencies and their respective characteristics for the electrical and magnetic components of the electromagnetic waves. The medium distance between two gravitons in the V_u volume of the elementary electromagnetic wave is:

$$R_{\phi u} = \frac{A_u}{2} \cdot \frac{1}{\sqrt[3]{n_u}} \quad (251)$$

And the kinematic average velocity of gravity oscillation is:

$$v_u = \nu_u R_{\phi u} \quad (252)$$

The mass density of the wave can be appreciated:

$$\rho_u = \frac{m_\varphi}{V_{R_{\varphi u}}} \quad (253)$$

where: $$V_{R_{\phi u}} = \frac{4\pi}{3} \cdot R_{\phi u}^3 \quad (254)$$

In table (6) are given some theoretical physical characteristics of electromagnetic waves.

The structural features of electromagnetic waves

Table 6

No.	Type of electromagnetic wave	Wavel engthλ$_u$ cm	Frequency ν_u s^{-1}	Energy $W_u=h\nu_u$ erg	Mass of inertia m_u g	No. of gravitons n_u
0	1	2	3	4	5	6

1	Radio Wave Long	10^6	$2{,}997925\cdot10^4$	$1{,}9863052\cdot10^{-22}$	$2{,}2100619\cdot10^{-43}$	$1{,}1999884\cdot10^3$
2	Medium	10^5	$2{,}997925\cdot10^5$	$1{,}9863025\cdot10^{-21}$	$2{,}2100619\cdot10^{-42}$	$1{,}1999884\cdot10^4$
3	Short	10^4	$2{,}997925\cdot10^6$	$1{,}9869025\cdot10^{-20}$	$2{,}2100619\cdot10^{-41}$	$1{,}1999884\cdot10^5$
4	Ultrashort	10^3	$2{,}997925\cdot10^7$	$1{,}9863025\cdot10^{-19}$	$2{,}2100619\cdot10^{-40}$	$1{,}1999884\cdot10^6$
5	Radio	10^1	$2{,}997925\cdot10^9$	$1{,}9863025\cdot10^{-17}$	$2{,}2100619\cdot10^{-38}$	$1{,}1999884\cdot10^8$
6	T.F.F.	3.10^5	$3{,}999083\cdot10^4$	$6{,}621017\cdot10^{-22}$	$7{,}366873\cdot10^{-43}$	$3{,}999962\cdot10^3$

- Table 6 continuation -

No.	Average distance between two gravitons $R_{\phi u}$ cm	Density ρ_u g/cm^3	Graviton oscillation velocity v_u cm/s	Amplitude $A = \frac{\lambda_u}{2\pi}$ cm	V_u cm^3	$V_{R\phi} = \frac{4\pi}{3}\cdot R_{\phi u}^3$ cm^3
0	7	8	9	10	11	12
1	$3{,}3071727\cdot10^3$	$1{,}1928692\cdot10^{-57}$	$9{,}9146557\cdot10^7$	$5\cdot10^5$	$2{,}1129998\cdot10^{15}$	$1{,}5439546\cdot10^{11}$
2	$1{,}0304356\cdot10^3$	$4{,}0206516\cdot10^{-56}$	$3{,}0891686\cdot10^8$	$5\cdot10^4$	$2{,}1129998\cdot10^{12}$	$4{,}5806901\cdot10^9$
3	$5{,}06857755\cdot10^1$	$3{,}3783193\cdot10^{-52}$	$1{,}5195215\cdot10^8$	$5\cdot10^3$	$2{,}1129998\cdot10^9$	$5{,}4516335\cdot10^5$
4	3,3071727	$1{,}2161534\cdot10^{-48}$	$9{,}9146557\cdot10^7$	$5\cdot10^2$	$2{,}1129998\cdot10^6$	$1{,}5143943\cdot10^2$
5	$5{,}0685755\cdot10^1$	$4{,}0206516\cdot10^{-52}$	$1{,}5195209\cdot10^{10}$	5	$2{,}1129998\cdot10^{-2}$	$4{,}5806901\cdot10^5$
6	$4{,}7247523\cdot10^3$	$4{,}1708238\cdot10^{-58}$	$4{,}7214846\cdot10^8$	$1{,}5\cdot10^5$	$5{,}7050994\cdot10^{13}$	$4{,}4157605\cdot10^{11}$

B.3. THE FIELD OF GRAVITATIONAL FORCES

B.3.1. THE STRUCTURE AND CHARACTERISTICS OF GRAVITATIONAL FIELD IN GRAVITON PHYSICS

All existing bodies, from elementary particles and photons, to celestial bodies, have gravitational fields proportional to their masses through which they interact.

Within the celestial bodies, the forces of the gravitational fields ensure the individuality and stability of the bodies, and for very massive celestial bodies they collapse. Outwardly, the fields are in the form of spheres of gravitational fields, for which the intensity decreases with distance. The gravitational interactions between bodies are achieved through their gravitational fields. These fields consist from gravitons that are the quanta of the gravitational fields. The gravitational fields of the bodies are united to the bodies and can not be broken by them for the benefit of other bodies.

We will consider a spherical mass body "m" and the radius R (fig.6) and a distance z from the center of the body, z > R.

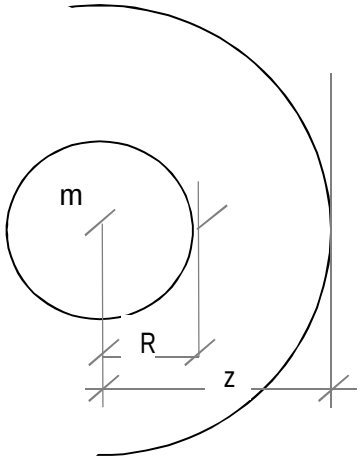


Figure 6

Gravitational energy of this body is:

$$W_R = \frac{Gm^2}{R} \qquad (255)$$

At distance z,the gravitational energy will be:

$$W_z = \frac{Gm^2}{z} \qquad (256)$$

So, the gravitational energy of field in area z – R is:

$$\Delta W_{z-R} = W_R - W_z = \frac{Gm^2}{R} - \frac{Gm^2}{z} = \frac{Gm^2(z-R)}{Rz} \qquad (257)$$

The volume of spheric area having the lenght z – R is:

$$V_{ech.} = \frac{4\pi}{3}z^3 - \frac{4\pi}{3}R^3 = \frac{4\pi}{3}(z^3 - R^3) \qquad (258)$$

Equivalent radius: $R_{ech.} = \sqrt[3]{z^3 - R^3}$ (259)

We can write the gravitational energy of field inside this sphere of volume $V_{ech.}$ as:

$$\frac{Gm^2(z-R)}{Rz} = \frac{Gm_{cg}^2}{R_{ech.}} \qquad (260)$$

where m_{cg} is the mass of gravitational field from volume $V_{ech.}$. From equation (260) can find the mass „m_{cg}" of gravitational field from volume $V_{ech.}$. Replace R_{ech} in equation (259), result:

$$m_{cg} = m\sqrt{\frac{z-R}{zR}\sqrt[3]{(z^3 - R^3)}}. \qquad (261)$$

The number of gravitons of gravitational field from area: z – R, will be:

$$n_{cg} = \frac{m_{cg}}{m_\varphi} \qquad (262)$$

The mass density for this gravitational field, will be:

$$\overline{\rho}_{cg} = \frac{m_{cg}}{V_{ech.}} \qquad (263)$$

The equations for main gravitonic structural features of gravitational fields are indicated in table no.8. This table include for example the sizes for three celestial bodies: the Sun, Earth and Moon.

The vibration frequency of gravitons at distance „z":

$$\nu_z = \frac{V_{\varphi z}}{R_{\phi z}} \qquad (264)$$

And the vibration energy of a graviton:

$$W_{\varphi z} = 2\pi^2 m_\varphi \nu_z^2 R_{\varphi z}^2 \qquad (265)$$

In this way can found all other physical and structural features of gravitational field in any other outside piont.

We show in table no.8 the results of our calculus. These were done using some well known data and are indicated in table no.7.

Table 7

The astrophysical features of some celestial bodies

No.	Celestial Body	Mass m (g)	Radius R (cm)	Density ρ (g/cm^3)	Surface graviton acceleration g (cm/s)	Radius of the orbit z (cm)	Time of revolution (days)

0	1	2	3	4	5	6	7
1	Sun	$1,989 \cdot 10^{33}$	$6,96 \cdot 10^{10}$	1,41	$2,74 \cdot 10^{4}$	-	-
2	Earth	$5,976 \cdot 10^{27}$	$6,37816 \cdot 10^{8}$	5,517	981	$1,496 \cdot 10^{13}$	365,25636
3	Moon	$7,35 \cdot 10^{25}$	$1,738 \cdot 10^{8}$	3,30	163	$3,844 \cdot 10^{10}$	27,32

Table 8

The gravitational structure of the gravity field for some celestial bodies

Note: For Earth, z is distance Earth – Moon. For Moon z is distance Moon – Earth

No.	Celestial Body		External energy of the gravitational field. $\Delta_{z\text{-}R}$ (erg)	Volume of the equivalent field sphere $V_{ech.}$ (cm^3)	Equiv. radius of the volume. V_{ech} $R_{ech.}$ (cm)	Mass of the gravitational field m_{cgz} (g)	Number of field gravitons n_{cgz}
0	1		2	3	4	5	6
1	Sun	Sun - Earth	$3,7736 \cdot 10^{48}$	$1,201405 \cdot 10^{40}$	$1,37951 \cdot 10^{13}$	$2,793702 \cdot 10^{34}$	$1,51688 \cdot 10^{80}$
		Sun -Pluto	$3,9711276 \cdot 10^{48}$	$8,59853 \cdot 10^{44}$	$5,9 \cdot 10^{14}$	$1,83118 \cdot 10^{35}$	$9,94267 \cdot 10^{80}$
2	Earth		$3,672697 \cdot 10^{39}$	$2,37803 \cdot 10^{31}$	$1,72019 \cdot 10^{10}$	$3,07764 \cdot 10^{28}$	$1,67105 \cdot 10^{74}$
3	Moon		$2,0638717 \cdot 10^{36}$	$2,37804 \cdot 10^{32}$	$3,83501 \cdot 10^{10}$	$1,08934 \cdot 10^{27}$	$5,91472 \cdot 10^{72}$

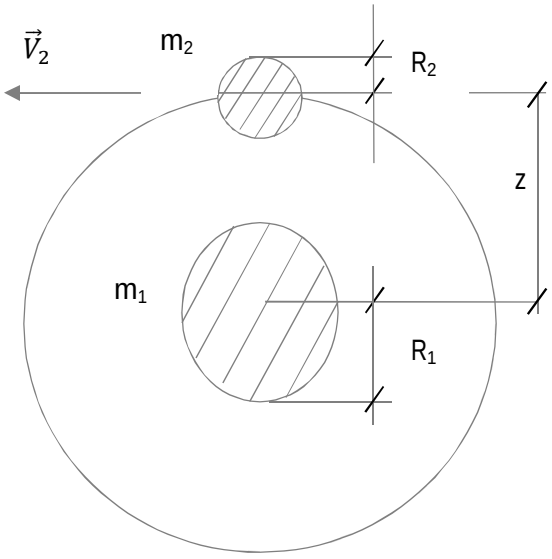
No.	Average density of the gravitational field. ρ_{cg} (g/cm^3)	No. of gravitons of body $n=m/m_{\varphi}$	$R_{\varphi} = \frac{R}{\sqrt[3]{n}}$ (cm)	Distance between bodies: z (cm)	$R_{\varphi z} = \frac{R_{\phi}}{R} z$ (cm)	$V_{R_{\phi z}} = \frac{4\pi}{3} R_{\phi z}^3$ (cm^3)	$\rho_z = \frac{m_{\varphi}}{V_{R_{\phi z}}}$ (g/cm^3)
0	7	8	9	10	11	12	13
	$2,32536 \cdot 10^{-6}$	$1,07996 \cdot 10^{79}$	$2,99141 \cdot 10^{-16}$	$1,496 \cdot 10^{13}$	$6,429805 \cdot 10^{-14}$	$1,11291 \cdot 10^{-39}$	$1,654876 \cdot 10^{-5}$
1	$2,12964 \cdot 10^{-10}$			$5,9 \cdot 10^{14}$	$2,53582 \cdot 10^{-12}$	$6,82689 \cdot 10^{-35}$	$2,69776 \cdot 10^{-12}$
2	$1,29419 \cdot 10^{-3}$	$3,24476 \cdot 10^{73}$	$1,98128 \cdot 10^{-16}$	$3,844 \cdot 10^{10}$	$1,19408 \cdot 10^{-14}$	$7,12803 \cdot 10^{-42}$	$2,58379 \cdot 10^{-5}$
3	$4,58082 \cdot 10^{-6}$	$3,99080 \cdot 10^{71}$	$2,36033 \cdot 10^{-16}$	$3,844 \cdot 10^{10}$	$5,22043 \cdot 10^{-14}$	$5,95645 \cdot 10^{-40}$	$3,11290 \cdot 10^{-5}$

We find that the masses of gravitational fields of the bodies are larger than the masses of the bodies. These being dispersed in the form of gravitons in very large volumes of space can not be noticed, the mass densities of the fields being extremely small: $\rho_{cgz} << 10^{-4}$ g/cm^3, therefore practically not measurable.

B.3.2. THE GRAVITATIONAL INTERACTION BETWEEN BODIES IN PHYSICS OF GRAVITON

The interaction of gravitational attraction between two masses m_1 and m_2 located at the distance z between them (Fig.7), is realized through their gravitational fields, previously analyzed, namely through the interpenetration of the gravitonic fields of the two masses and the reciprocal attraction between the constituent gravitons. In interaction, not all the gravitons of the two fields equally participate, this being proportional with the two masses m_1 and m_2, so that it does not influence the validity of the known gravitational equations. This explains the phenomena of flux and reflux in the attraction of celestial bodies, and the fact that a celestial body, although gravitationally coupled with another, still retains its gravitational capacity with other bodies too.

Figure 7



The strict calculation of the maximum coupling zones and differential graviton coupling addition is very difficult, but this can be avoided statistically. As is known, by the gravitational interaction between two bodies m_1 and m_2, the body with smaller mass will fall on the surface of the other body, or it will rotate around it with a tangential velocity $\overline{v}_r$ defined so that the force of attraction between that two masses to be equal with centrifugal force of rotation (orbiting). We will analyze the last situation. The energy of gravitational interaction between bodies m_1 and m_2 in this case will be:

$$W_{1-2} = \frac{Gm_1m_2}{z} = \frac{m_2v_r^2}{2} \qquad (266)$$

From this equation can easily find the rotation speed v_r for m_2 body:

$$v_r = \sqrt{\frac{2Gm_1}{z}} \qquad (267)$$

As we previous mention, the energy W_{1-2} is in fact the interaction energy of total gravitational field of those two bodies, field of gravitonic mass „m_{cg}", so can write:

$$W_{1-2} = \frac{Gm_{cg}^2}{Z-(R_1+R_2)} = m_{cg}\overline{w}_{cg}^2 \qquad (268)$$

where R_1 and R_2 are the radius of those two bodies, and $\overline{w}_{cg}^2$ is medium energetic velocity of interaction between those two bodies. From equations: (266) and (268) can determine the total mass of gravitational interaction field between bodies:

$$m_{cg} = \sqrt{[z-(R_1+R_2)]\frac{m_1m_2}{z}} = \sqrt{\frac{[z-(R_1+R_2)]}{G}\cdot\frac{m_2v_r^2}{2}} \qquad (269)$$

And the number of gravitons for this field will be:

$$n_{cg} = \frac{m_{cg}}{m_\varphi} \qquad (270)$$

The gravitonic contribution of two bodies fields can be obtained using proportionality rule of those two masses m_1 and m_2, that is:

$$m_{cg1} = m_{cg}\frac{m_1}{m_1+m_2} \qquad (271)$$

and

$$n_{cg1} = \frac{m_{cg1}}{m_\varphi} \qquad (272)$$

$$m_{cg2} = m_{cg}\frac{m_2}{m_1+m_2} \qquad (273)$$

and $$n_{cg2} = \frac{m_{cg2}}{m_\varphi} \qquad (274)$$

Total energy of coupling field will be:

$$W_{1-2} = m_{cg}c^2 + m_{cg}\cdot v_{cg}^2 = m_{cg}(c^2 + v_{cg}^2) \qquad (275)$$

i.e. the sum of internal energy and coupling of component gravitons.

We expose a model of calculus for gravitational system: Earth – Moon. Will use known data from table 7 for Earth and Moon.

With equation (267) can find the rotation velocity on orbit for Moon:

$v_L = 1{,}440 \cdot 10^5$ cm/s = $1{,}44 \cdot 10^3$ m/s ≈ 1,44 km/s.

The total gravific field mass of atraction Earth – Moon can be found with equation (271).

Result:

$m_{cg(E-M)} = 6{,}577 \cdot 10^{26}$ g, that is: $n_{cg(E-M)} = 3{,}560 \cdot 10^{72}$ gravitons.

The contribution of each celestial body to this gravitational field sizes will be:

Earth: $m_{cgE} = 6{,}48 \cdot 10^{26}$ g, so: $n_{cgE} = 3{,}519 \cdot 10^{72}$ gravitons.

Moon: $m_{cgM} = 7{,}64 \cdot 10^{24}$ g, so: $n_{cgM} = 4{,}151 \cdot 10^{70}$ gravitons.

Medium energetical velocity (theoretical) of coupling field Earth – Moon, will be: $v_{cg(E-M)} = 1{,}162 \cdot 10^9$ cm/s.

We mention that in this calculus was considered that the two bodies were spherical, the trajectory of the Moon is circular, the masses have an uniform distribution and ignored the influence of own rotations and other outside Cosmic disturbing factors. In reality there are some differences of the real characteristics of the two celestial bodies versus the adopted theoretical model.

B.4. THE CORRELATION OF FUNDAMENTAL FORCE FIELDS: NUCLEAR (STRONG), ELECTROMAGNETIC AND GRAVITATIONAL

Based on the theoretical results set forth and summarized in this work, by applying the graviton physics to nuclear, electrical, electromagnetic and gravitational phenomena, a synthesizing correlation of the three mentioned force fields can be presented, the only one capable of correlating the elements of common ground for the three fundamental situations. We also presents the theoretical and rational explanations of the specificity of the three fundamental interactions.

We mention that the problem of the correlation between weak and electromagnetic forces, for which physicists S. Weinberg and A. Sallam received the Nobel Prize in 1979, was not the subject of this work.

For all types of interactions, the interacting element is the field of these types of interactions constituted in all cases by a corresponding number of gravitons which decrease radially, a number that we have generically noted by n_{cz}.

Because of their specificity, all three fundamental forces: nuclear, electromagnetic and gravitational have different rays of action. We will note the number of gravitons n_{cz} with numerical indices $(1 \div 6)$, as well as the other physical sizes, corresponding to the type of force numbering, to distinguish them from each other.

For graviton as the single particle of all types of fields, we will use the same previous notations: q_φ for its gravitonic particular charge, r_φ its radius, etc.

We will write the previously determined gravitonic equations for the interaction energies of the fields of the three types of physical phenomena: nuclear, electro-magnetic (and electric) and gravitational (considered for vacuum: $\varepsilon = \mu = 1$).

B.4.1 THE ENERGY OF THE NUCLEAR FORCES OF COUPLING BETWEEN TWO NUCLEONS

$$W_1 = n_{cz1}\frac{q_\varphi^2}{r_\varphi}e^{-\gamma} + W_{int.s}(-\Delta W_s) + W_{osc.1} = m_{cz1}c^2e^{-\gamma}$$

Note: $m_{cz1} = m_{\pi}$ (virtual meson mass): n_{cz1} = no. of gravitons of meson π (of nuclear field);
$e^{-\gamma} = e^{-\pi}$ (directional neighboring factor of the nucleons);
Because $W_{int.s}$, ΔW_s and $W_{osc.1}$ are comparatively very small values, can write the reduced energy equation in form:

$$W_1 = n_{cz1}\frac{q_{\varphi}^2}{r_{\varphi}}e^{-\gamma} = m_{cz1}c^2e^{-\gamma} \text{ , that is: } n_{cz1}\frac{q_{\varphi}^2}{r_{\varphi}} = m_{cz1}c^2 = W_1$$

B.4.2. THE INTERACTION ENERGY OF ELECTROSTATIC FIELD

$$W_2 = n_{cz2}\frac{q_{\varphi}^2}{r_{\varphi}} + W_{osc.2} = \frac{m_e\bar{v}_e^2}{2}$$

Neglecting the energy of the own gravitons oscillations $W_{osc.2}$ which comparatively is small, the reduced equation will be:

$$W_2 = n_{cz2}\frac{q_{\varphi}^2}{r_{\varphi}} = \frac{m_e\bar{v}_e^2}{2}$$

where: n_{cz} is number of gravitons of electrostatic field, and second term represent kinetic energy of an electron moving under the action of electrostatic field.

B.4.3. THE ELECTRIC FIELD ENERGY OF ELECTRIC CURRENT IN SOLID CONDUCTORS

$$N_v n_{cz3}\frac{q_{\varphi}^2}{r_{\varphi}} = N_e\frac{m_e\bar{v}_e^2}{2}(v_eR).$$

Remember that N_v represents the number of elementary electrical charges that generate the electric field (voltage) inside the conductor. N_e is the number of electrons circulating through the conductor under the action of the electric field (current intensity), m_e is the mass of an electron, $\bar{v}_e$ the medium electron velocity and R the resistance of the conductor.

In the simplified situation, if: $N_v = N_e$, the above energy equation, according to Ohm's law becomes write gravitonic as: $W_3 = n_{cz3}\frac{q_{\varphi}^2}{r_{\varphi}} = \frac{m_e\bar{v}_e^2}{2}(\bar{v}_eR)$.

The term $(\bar{v}_eR)$ from second part is due to the specificity of the electrical interaction through the solid conductor. It can be write for the general situation of electric currents: $W_3 = n_{cz3}\frac{q_{\varphi}^2}{r_{\varphi}} = B\frac{m_e\bar{v}_e^2}{2}$ where B is a term that depends by the characteristics of the conductive environment. $B = f(\bar{v}_e, R)$,

B.4.4. THE ENERGY OF ELECTROMAGNETIC FIELD CREATED BY ELECTRIC CURRENTS (IN VACUUM)

$$W_4 = n_{cz4}\frac{q_{\varphi}^2}{r_{\varphi}}\left[\frac{\bar{v}_e^2(\bar{v}_e^2+1)}{6}\right] = \frac{E^2+H^2}{6\pi}$$

$\bar{v}_e$= the average speed of electrical charge of electric current. (For vacuum: $\varepsilon = \mu = 1$).

If note: $C = f(\bar{v}_e) = \frac{\bar{v}_e^2(\bar{v}_e^2+1)}{6}$, then: $W_4 = C \cdot n_{cz4} = \frac{q_{\varphi}^2}{r_{\varphi}} = \frac{E^2+H^2}{6\pi}$.

B.4.5. THE ENERGY OF PHOTONS AND ELECTROMAGNETIC WAVES (IN VACUUM)

$$W_5 = n_{\phi(u)}.\frac{q_{\varphi}^2}{r_{\varphi}} = hv_{\phi(u)} = \frac{E^2+H^2}{6\pi} .$$

B.4.6. THE FORCE ENERGY OF GRAVITATIONAL FIELD OF INTERACTION

$$W_6 = n_{cg}.\frac{q_\varphi^2}{r_\varphi}\cdot\left(\frac{w_{cg}^2}{c^2}\right) = \frac{m_2 v_2^2}{2}$$

where: w_{cg} is the energy velocity of the gravitational field (see above) m_2 and v_2 are mass and speed of a body 2 in interaction with gravitational field of other body with mass m_1.

Note with $D = \frac{w_{cg}^2}{c^2}$ (adimensional factor) $D = f(w_{cg})$

$$W_6 = D\cdot n_{cg}\frac{q_\varphi^2}{r_\varphi} = \frac{m_2 v_2^2}{2}$$

The group of the six general equations in the simplified form of the three fundamental force fields (nuclear, electro-magnetic and gravitational) can be written:

1. The field of nuclear forces: $W_1 = n_{cz1}.\frac{q_\varphi^2}{r_\varphi}e^{-\gamma} = m_{cz1}c^2e^{-\gamma}$; $\left(n_{cz1}.\frac{q_\varphi^2}{r_\varphi} = m_{cz1}c^2\right)$

Can note: $A = e^{-\gamma}$: $W_1 = An_{cz1}.\frac{q_\varphi^2}{r_\varphi} = m_{cz1}c^2A$

2. The field of electrostatic forces: $W_2 = n_{cz2}\frac{q_\varphi^2}{r_\varphi} = \frac{m_e v_e^2}{2}$

3. The field of electric current: $W_3 = n_{cz3}\frac{q_\varphi^2}{r_\varphi} = B\frac{m_e\overline{v}_e^2}{2}$; $[B = f(\overline{v}_e\cdot R)]$

4. Constant electromagnetic field of electric currents: $W_4 = Cn_{cz4}\frac{q_\varphi^2}{r_\varphi} = \frac{E^2+H^2}{6\pi}$

5. The variable electromagnetic field (photons and electromagnetic waves):

$$W_5 = n_{\phi(u)}\frac{q_\varphi^2}{r_\varphi} = \frac{E^2+H^2}{6\pi} = h\nu_{\phi(u)}$$

6. Field of gravitational forces: $W_6 = D.n_{cg}\frac{q_\varphi^2}{r_\varphi} = \frac{m_2 v_2^2}{2}$.

As we can see, the six general equations are very similar to each other with main terms identical between them.

The differences between them occur because of the different distances to which they interact, which reveal different values in number of gravitons n_e of the interacting fields, of some external environmental factors and specific interactions between gravitons in some cases, inherent and normal situations.

By making the ratios of the six equations, it is obtained:

1`. $\frac{W_1}{W_2} = \frac{n_{cz1}}{n_{cz2}}\cdot A = \frac{m_\pi c^2}{m_e v_e^2}\cdot 2A$ *i.e. :* $\frac{n_{cz1}}{n_{cz2}} = \frac{2m_\pi c^2}{m_e v_e^2}$

2`. $\frac{W_1}{W_4} = \frac{n_{cz1}}{n_{cz4}}\cdot\frac{A}{C} = \frac{m_\pi c^2}{E^2+H^2}\cdot 6\pi A$ *i.e. :* $\frac{n_{cz1}}{n_{cz4}} = m_\pi c^2\frac{6\pi C}{E^2+H^2}$

3`. $\frac{W_1}{W_5} = \frac{n_{cz1}}{n_{\phi(u)}}\cdot A = \frac{m_\pi c^2}{E^2+H^2}\cdot 6\pi A = \frac{m_\pi c^2}{h\nu_{\phi(u)}}.A$, *i.e. :* $\frac{n_{cz1}}{n_{\phi(u)}} = m_\pi c^2\frac{6\pi}{E^2+H^2} = \frac{m_\pi c^2}{h\nu_{\phi(u)}}$

4`. $\frac{W_1}{W_6} = \frac{n_{cz1}}{n_{cg}}\cdot\frac{A}{D} = 2A\frac{m_\pi c^2}{m_2 v_2^2}$ *i.e. :* $\frac{n_{cz1}}{n_{cz4}} = 2D\frac{m_\pi c^2}{m_2 v_2^2}$

5`. $\frac{W_2}{W_3} = \frac{n_{cz2}}{n_{cz3}} = \frac{v_{e2}^2}{v_{e3}^2}\cdot\frac{1}{B}$

$$6`.\ \frac{W_2}{W_6} = \frac{n_{cz2}}{n_{cg}} \cdot \frac{1}{D} = \frac{m_e v_e^{\,2}}{m_2 v_2^{\,2}} \qquad i.e.: \frac{n_{cz2}}{n_{cg}} = D \cdot \frac{m_e v_e^{\,2}}{m_2 v_2^{\,2}}$$

$$7`.\ \frac{W_4}{W_6} = \frac{n_{cz4}}{n_{cg}} \cdot \frac{C}{D} = \frac{E^2+H^2}{3\pi m_2 v_2^{\,2}} \qquad i.e.: \frac{n_{cz4}}{n_{cg}} = \frac{E^2+H^2}{m_2 v_2^{\,2}} \cdot \frac{D}{3\pi C}$$

$$8`.\ \frac{W_5}{W_6} = \frac{n_{\phi(u)}}{n_{cg}} \cdot \frac{1}{D} = \frac{2h\nu_{\phi(u)}}{m_2 v_2^2} = \frac{E^2+H^2}{3\pi m_2 v_2^{\,2}} \qquad i.e.: \frac{n_{\phi(u)}}{n_{cg}} = \frac{h\nu_{\phi(u)}}{m_2 v_2^{\,2}} \cdot 2D = \frac{E^2+H^2}{m_2 v_2^{\,2}} \cdot \frac{D}{3\pi}$$

The groups of equations: 1 ÷ 6 or 1` ÷ 8` represent the correlation equations of the fields of the three fundamental forces: nuclear, electro-magnetic and gravitational, determined through graviton physics.

For the rigorous calculations or influence of the external environment, can be used the appropriate elements presented in this paper.

C. THE IMPLICATIONS OF GRAVITON PHYSICS RELATED TO BIG BANG PHENOMENON AND BLACK HOLES

C.1. THE BIRTH OF THE UNIVERSE (BIG-BANG) AND ITS EVOLUTION EXPLAINED USING THE GRAVITON THEORY

As a fact, based on the theoretical and experimental data (astronomical and astrophysical data), the birth and the evolution of the Universe is based on the mutually accepted theory of Big-Bang[3][18][19]. According to this theory, the theoretical limit of current physics, also called "Planck's limit" has the following primordial characteristics:

Planck's time: $t \approx 10^{-44}$ s from the time t=0 of the big primordial explosion.

The following data corresponds with that "Planck's time": the energy: $W \approx 10^{19}$ GeV; the temperature: $T \approx 10^{32}$K; the radius of the Universe's spherule: $R \approx 10^{-33}$ cm[2][9].

In fact, the current theoretical cosmo-physical conclusions of the nucleosynthesis are limited to a much nearer time: $t = 10^{-8}$ s from t = 0, when: $T = 10^{11}$ K and the density of primordial sphere:

$\rho = 3{,}8 \cdot 10^9$ g/cm^3.

In the actual physics, no densities larger than the nuclear matter of atomic particles are known. For nucleons, ρ is of size order of 10^{14} g/cm^3.

However, in the present paperwork, we shed a light for the first time over the physical characteristics of the graviton, as a fundamental particle of all particles and fields, generally of the matter, its mass related density being theoretically determined as: $\rho_\varphi = 1{,}7149 \cdot 10^{175} g/cm^3$ this being the maximum density that the matter can have as it was previously proven.

According to the known relation in cosmology, the time corresponding to this density, at the moment of the "Big-Bang" explosion is:

$$t_0 = \frac{2}{n} \cdot \sqrt{\frac{3}{8\pi\rho G_u}} \qquad (276)$$

where $\rho_u = \rho_\varphi$ and for the matter: n = 3, since at that time, the compact material spherule of the Universe did not contain radiation.

Replacing the values of the sizes in equation (276) and perform calculations, it results that:

$$t_0 = 2{,}1529 \cdot 10^{-85}\ s.$$

This value for t_0 represents the moment of the large explosion called Big-Bang.

The initial spherule of the primordial Universe before the moment t_0 of the Big-Bang explosion of a radius of R_{u0} with the maximum mass-related density, same as the graviton: $\rho_{u0} = \rho_\varphi$ was made up exclusively from "primitive matter", that is theoretically all the unformed component gravitons were still gathered in an unstable unique mass. The volume of the primordial spherule was:

$$V_{u0} = \frac{4\pi}{3} R_{u0}^3 \qquad (277)$$

Designating with M_{u0} the mass of that spherule and with n_{u0} the theoretically equivalent number (but unreal) of the component gravitons, then:

$$M_{u0} = n_{u0}\, m_\varphi \qquad (278)$$

and $$V_{u0} = n_{u0}\, V_\varphi \qquad (279)$$

where $$V_\varphi = \frac{4\pi}{3} r_\varphi^3 \qquad (280)$$

represent the volume of a graviton.

From the equation (279), it results that: $\frac{4\pi R_{u0}^3}{3} = n_{u0} \frac{4\pi r_\varphi^3}{3}$

thus: $$R_{u0} = r_\varphi \sqrt[3]{n_{u0}} \qquad (281)$$

As we know, for a graviton there is the following equation (25):

$$\frac{G m_\varphi}{r_\varphi} = c^2 \qquad (282)$$

Multiplying with n_{u0} the numerator and the denominator of the first member of the equation (282), results that: $\frac{G m_\varphi n_{u0}}{r_\varphi n_{u0}} = c^2$, so according to (278):

$$\frac{G M_{u0}}{r_\varphi n_{u0}} = c^2 \qquad (283)$$

Since: $n_{u0} = \sqrt[3]{n_{u0}^3} = \sqrt[3]{n_{u0}} \cdot \sqrt[3]{n_{u0}^3}$ and according to equation (281), $R_{u0} = r_\varphi \sqrt[3]{n_{u0}}$, the equation (283) can be written as:

$$\frac{G M_{u0}}{R_{u0}} = c^2 \sqrt[3]{n_{u0}^2} = w_{u0}^2 \qquad (284)$$

The equation (284) is the representative equation of the primordial spherule of the Universe. As we see from this relation, the energetic speed:

$$w_{u0} = c \sqrt[3]{n_{u0}} \qquad (285)$$

is greater than „c" ($w_{u0} > c$), ***a fact which confirms that under the primordial density conditions, the physical theory of relativit cannot be applied as it is not valid anymore.***

The vibration frequency of the super-collapsed primordial spherule is:

$$\nu_{u0} = \frac{w_{u0}}{R_{u0}} = \frac{c \sqrt[3]{n_{u0}}}{r_\varphi \sqrt[3]{n_{u0}}} = \frac{c}{r_\varphi} = \nu_\varphi \qquad (286)$$

Thus, it is the same with the frequency of a graviton. The reverse of frequency is the vibration time. It results that:

$$t_{\nu u0} = t_{\varphi} = \frac{1}{\nu_{\varphi}} = 4{,}56704 \cdot 10^{-85} s \quad (287)$$

It is considered that: $t_{\nu u0} \cong t_0$ having the same size order, which means that between $t_0 = 0$ and $t_{\nu u0} \cong 10^{-85}$s when the Big-Bang explosion took place, a single vibration of the unstable super-collapsed spherule was generated, that is ***"a quanta of time"***.

In order to determine the internal energy of the initial spherule of the Universe and its theoretical temperature, we will use the known equation:

$$W_{u0} = \overline{M}_0 W_{u0}^2 \quad (288)$$

where: $\overline{M}_0$ is the mass of the Universe and $W_{u0} = kT_{u0}$ (289)

out of which: $T_{u0} = \frac{W_{u0}}{k}$ (290)

where k is the Boltzmann's constant. ($k = 1{,}3806 \cdot 10^{-16}$ erg/^{0}K). We have to determine beforehand the mass of the Universe.

According to the rectified calculations of Eddington (for the Hubble's constant: H ≅ 15 km/s/10^6 light years), the mass of the known Universe would be: $M_0^{`} = 1{,}779 \cdot 10^{56}$g , respectively: $N_H = 1{,}063 \cdot 10^{80}$ hydrogen atoms and a density of: $\rho_{ui} < \rho_{cr}$, where:

$\rho_{cr} = 4{,}5 \cdot 10^{-30}$ g/cm^3 is the calculated critical density of the Universe.

That is, the current dilatation of the Universe would be infinite in time. However, the researchers considered that the mass of the known Universe (Meta-galaxy) would be larger in reality since the masses of various radiations of neutrinos etc. were not taken into account.

We will recalculate (rectify) this mass of the Universe[9][10][11][14] with all the omitted factors. Designating with $M_{u0} = M_u$ this mass will be:

$$M_u = M_0^{`} + \overline{M}_{ucg} + \overline{M}_{u\phi} + \overline{M}_{u\nu} \quad (291)$$

where; $M_0^{`} = 1{,}779 \cdot 10^{56}$g (rectified Eddington's mass).

$\overline{M}_{ucg}$ = the mass of the universal gravitonic gravitational field (environment)

$\overline{M}_{u\phi}$ = the mass of the photons of the Meta-galactic Universe (environment)

$\overline{M}_{u\nu}$ = the mass of neutrinos of the Meta-galactic Universe (environment)

The mass of the Meta-galactic gravitational field can be determined as a mean value with help of the equation:

$$\overline{M}_{ucg} = M_0^{`} \frac{m_{cgs}}{m_s} \quad (292)$$

Considering the Sun as a reference standard start whose gravitational field is considered as having a radius of about 2 light years, using the previous gravitonic equations, the mean value for its gravitational field mass is: $m_{cgs} = 1{,}038 \cdot 10^{37}$ g.

Taking into account the Sun's mass as: $m_S = 1{,}989.10^{33}$ g , with the equation (292) we find that $\overline{M}_{ucg} = 9{,}288 \cdot 10^{59}$ g.

From the actual astrophysical data, it is considered that in the known Universe there is the mean relationship: 10^9 photons/1 proton. According to the rectified calculations of Eddington, the number of protons in the Universe would be:

$\overline{N}_H = 1{,}063 \cdot 10^{80}$ hydrogen atoms, and the number of photons in the Universe would be:

$\overline{N}_\phi = 10^9 N_H = 1{,}063.10^{89}$ photons.

Considering the average inertial mass of a photon: $\overline{m}_\phi = 5 \cdot 10^{-33}$ g, the total inertial mass of the photons of the universe will be:

$$\overline{M}_{u\phi} = \overline{m}_\phi \cdot N_H = 5 \cdot 10^{-33} x\, 1{,}063 \cdot 10^{89} = 5{,}315 \cdot 10^{56} g \quad (293)$$

In 1980 a group of researchers of the Physical Institute of Moscow, based on the nuclear reaction: $H_1^3 \rightarrow He_2^3 + e^- + \overline{\nu}$, managed to determine the mass of the anti-neutrino $\overline{\nu}$ as being about 20 eV, that is about $\frac{m_e}{3 \cdot 10^4}$, where m_e is the mass of the electron. Although three types of neutrinos were discovered, and can be considered as mean value of the neutrino's mass the following value:

$\overline{m}_\nu = 3{,}5 \cdot 10^{-32}$ *g.*

Since, from an astrophysical point of view, it is considered in the Universe that there are about 5 neutrinos/1 photon, the total estimated number of neutrinos in the Universe will be:

$$\overline{N}_\nu = 5\overline{N}_\phi = 5 \cdot 1{,}063.\, 10^{89} = 5{,}315 \cdot 10^{89} \text{ neutrinos} \quad (294)$$

Thus, the total mass of the neutrinos in the known Universe would be:

$$\overline{M}_{u\nu} = \overline{m}_\nu \cdot \overline{N}_\nu = 3{,}5 \cdot 10^{-32} x\, 5{,}315 \cdot 10^{89} = 1{,}86025 \cdot 10^{58} g \quad (295)$$

Thus, according to the equation (291), the recalculated total mass of the known Universe will be:

$$\overline{\boldsymbol{M}}_{\boldsymbol{U}} = 1{,}779 \cdot 10^{56} + 9{,}28829 \cdot 10^{59} + 5{,}315 \cdot 10^{56} + 1{,}86025 \cdot 10^{58} = \boldsymbol{9{,}48141 \cdot 10^{59} g} \quad (296)$$

According to the current data, we consider that the radius of the known Universe (Meta-galaxy) is:

$$R_u = 4{,}4 \cdot 10^{28} \text{ cm} \quad (297)$$

Thus, the volume of the known Universe (Meta-galaxy) will be:

$$V_u = \frac{4\pi}{3} R_u^3 = 3{,}57 \cdot 10^{86} cm^3 \quad (298)$$

Actually, the density of the known Universe would thus be:

$$\rho_u = \frac{\overline{M}_U}{V_u} = \frac{9{,}28829 \cdot 10^{59}}{3{,}57 \cdot 10^{85}} = 2{,}60 \cdot 10^{-27} \text{ g/cm}^3. \quad (299)$$

Since the critical density of the current Universe is accepted as: $\rho_{cr} = 4{,}5.10^{-30}$ g/cm^3, it results that:

$$\rho_U > \rho_{cr} \quad (300)$$

Therefore the Universe is of oscillating type, that is after a time, it will recompress and the cycle compression-dilatation-recompression will be infinitely repeated.

Knowing the mass $\overline{M}_U$ of the Universe, we may easily determine the number n_u corresponding to this mass: $n_u = \frac{\overline{M}_U}{m_\varphi} = 5{,}1426 \cdot 10^{105}$ *gravitons.* (301)

Coming back to the initial spherule of the Universe before the Big-Bang explosion, knowing the number of equivalent gravitons: n_u results with the help of the equation (281):

$R_{u0} = r_\varphi \sqrt[3]{n_u}$, the radius R_{U0} of that initial spherule of the Universe: $\boldsymbol{R_{u0} = 2{,}36328 \cdot 10^{-39}\ cm}$, that it had the average dimension of a current inertial photon in the infrared field.

From the equation (284): $\frac{GM_U}{R_{u0}} = w_{u0}^2$, we can easily determine: $w_{u0}^2 = 2{,}6777 \cdot 10^{91}$. Thus, the internal energy of the primordial spherule will be according to the equation (285):

$W_{u0} = \overline{M}_U w_{u0}^2 = 2{,}53884 \cdot 10^{151}$ erg.$= 1{,}584 \cdot 10^{154}$ GeV (302)

From the equation (289), we may determine the temperature of that primordial spherule:

$T_{u0} = \frac{W_{u0}}{k} = 1{,}83894 \cdot 10^{167}\ ^0K$ (303)

$\boldsymbol{T_{u0}}$ ***represents the upper theoretical limit of temperature.***

The internal pressure of the primordial spherule can be calculated with the equation:

$P_{uo} = \frac{G\overline{M}_U^2}{R_{uo}^4}$ (304)

It results that: $P_{U0} = 1{,}92348 \cdot 10^{267}$ dyne/cm^2 $= 1{,}92348 \cdot 10^{266}$ Pa

It is considered that, after the Big-Bang explosion, in the period: $4{,}56.10^{-85}$s $\div$ 10^{-43} s, the appearance of gravitons took place from the basic "primitive matter", between which there were many elastic collisions and interactions. Then the photons and various particles were progressively formed from them. We may estimate via calculation the stability degree of that initial spherule with help of the equation:

$\gamma_0 = \frac{W_{\sigma 0}}{W_{\nu 0}}$ (305)

In this equation, $W_{\sigma 0}$ is the energy of the superficial tension of the primordial spherule, that is the internal attraction energy of the component matter and $W_{\nu 0}$ is the vibration energy of the spherule with an opposite effect to $W_{\sigma 0}$.

If the coefficient: $\gamma_0 \geq 1$, the spherule would be stable in time. If: $\gamma_0 < 1$ the spherule would be unstable and it will disaggregate by explosion. The sizes of the two energies are:

$W_{\sigma 0} = S_0 \sigma_0 = 4\pi R_{uo}^2 \sigma_o$ (306)

And $W_{\nu\, 0} = 4\pi^2 \overline{M}_U \nu_\varphi^2 R_{uo}^2$ (307)

Replacing these sizes in (305) and making the corresponding deductions, it results that:

$\gamma_0 = \frac{\sigma_0}{\pi \overline{M}_U \nu_0^2}$ (308)

But: $\nu_0 = \nu_\varphi$ is the frequency of the graviton (ν_φ) as it was previously demonstrated and the superficial tension σ_0 is identical with the superficial tension of the graviton's matter σ_φ being the same component matter.

The value of σ_φ is easily determined knowing that: $\sigma_\varphi = \frac{F_\varphi}{R_\varphi}$ (309)

Resulting that: $\sigma_\varphi = \sigma_0 = 1{,}41 \cdot 10^{122}$dyn/cm . Replacing the sizes in (308), it results that $\gamma_0 = 9{,}8 \cdot 10^{-108}$.

Because: $\gamma_0 << 1$, that is the initial spherule was ***extremely unstable***, a fact which generated the Big-Bang explosion.

Regarding the physical appearance, in the period: t = 0 to t = 10^{-85}s, the entire external space as well as the primordial spherule were completely dark, of a pure black, since there were no photons yet. In that external space of a deep darkness, the notion of temperature itself lacked a physical sense as the external matter or radiations did not exist in order to highlight any temperature. Because the Big-Bang explosion was generated before the creation of photons, this explosion would be a perfectly dark explosion. In order to estimate those phenomena, it is known that any particle appears at "its threshold temperature" which is given by the equation for the photons:

$$T_{h\nu} = \frac{W_{h\nu}}{k} \qquad (310)$$

Where $W_{h\nu}$ is the energy of the photon ($W_{h\nu} = h\nu$) and k is the Boltzmann's constant.

Table 9
Threshold temperatures of some types of photons

Crt. No.	Photon type	Threshold temperature ^{0}K
1	γ	$1{,}448 \cdot 10^{11}$
2	X	$1{,}448 \cdot 10^{8}$
3	ultraviolet	$1{,}159 \cdot 10^{7}$
4	visible	$(2 \div 3) \cdot 10^{4}$
5	infrared	$1{,}448 \cdot 10^{3}$
6	microwaves	$(2 \div 4)$

In table 9, we have the "threshold temperatures" calculated for the main types of photons.
Of course some types of photons could also appear earlier on than the time corresponding to the threshold temperatures by various collisions between the particles that were forming or annihilations between the particles and anti-particles.

However, observing the same rule of threshold temperatures, the first photons that occurred were the γ at the time: t = 10^{-11} s after t=0, following the X photons and ultraviolet. The photons of the visible field occurred much later, at 10^4 – 10^5 years. Therefore, the dark background of the Big-Bang explosion (for us) lasted quite a considerable time.

As we have seen, only with the help of the new gravitonic physics, the main elements of the Big-Bang moment of the known Universe were discovered and have been presented in this paperwork.

C.2. THE BLACK HOLES EXPLAINED THROUGH THE PHYSICS OF GRAVITON

As we know, in the second part of last century, it was highlighted the existence of some celestial objects called "black holes" in all galaxies, even in the center of our galaxy.

These "Black Holes" have some common physical elements with the initial Big-Bang spherule in the way of large densities of the component matter by super-collapsing.

As there occur from the massive stars with the mass over the Openheimer-Volfkof limit of 2.5 solar masses, generally, these are old stars in which the internal thermonuclear reactions of balance of gravitational forces are wasted, therefore with a disturbed stellar stability. They transform to supernovas.

By the final explosion of supernovas, their external blankets are thrown out in space with speeds of about 2000 km/s creating nebulas and the remaining center of these supernovas enter in total collapse as they are transformed into Black Holes. A total gravitational collapse towards the center takes place. As in

the situation of the Big-Bang spherule, the actual physics could not settle this physical situation and all came down to a "mathematical singularity" without a physical appearance.

We, as a calculation example, using the new physics of graviton, will theoretically consider a Black Hole with mass of three solar masses, that is:

$$m_{GN} = 3M_O \quad (311)$$

Therefore, the mass of this Black Hole will be: $m_{GN} = 3 \times 1{,}989.10^{33}$ g. The number of gravitons corresponding to this mass will be: $n_{GN} = \frac{m_{GN}}{m_\varphi}$ (312)

i.e.: $n_{GN} = 3{,}2364 \cdot 10^{79}$ gravitons.

As we are talking about a total collapse, we will use the equation (281) for determining the final radius of the "black hole": $R_{GN} = r_\varphi \sqrt[3]{n_{GN}}$ (313)

From the calculation it results that: $R_{GN} = 4{,}3632 \cdot 10^{-48}$ cm, that is with similar dimensions as a photon from the microwave field[3].

The density of any black hole cannot exceed the maximum value:
$\rho_\varphi = \rho_{GN} = 1{,}7149 \cdot 10^{175}$ g/cm^3.

In these physical conditions, its theoretical internal energetic speed is given by the equation (284), that is: $\frac{Gm_{GN}}{R_{GN}} = w_{GN}^2$.
From the calculation, for the given examples, it results that: $w_{GN}^2 = 9{,}1275 \cdot 10^{36}$ cm^2/s^2.

The internal energy of this black hole is given by the equation (288):

$$W_{GN} = m_{GN} \cdot w_{GN}^2 \quad (314)$$

It results that: $W_{GN} = 5{,}4464 \cdot 10^{107}$ erg $= 3{,}399 \cdot 10^{113}$ GeV. The internal pressure of the black hole is obtained with the help of equation (304):

$P_{GN} = \frac{Gm_{GN}^2}{R_{GN}^4}$, resulting in the given example that: $P_{GN} = 6{,}5566 \cdot 10^{249}$ dyne/cm^2.

Of course, the example taken into account does not solve the complex problem of black holes, however, it solves the main physical hindrance of "mathematical singularity" which is unreal from a physical point of view.

We can also find out from the calculated example that the representation given by the theory of general relativity in the problem of black holes, which talks about a so-called "horizon line" related to them is totally unreal, even hilarious, since we cannot talk about a horizon line from which no luminous photons can come out when the dimensions of the black holes are smaller than the dimensions of the photons from the visible field. In fact, the theory of general relativity cannot be applied in these situations. In these conditions, the representations via this theory seem to be totally absurd.

Coming back to black holes, such a "Black Hole" can be imagined as something like a whirl of the gravitational field of the basic spherule in which any external accretion matter is practically destroyed as component atomic particles being combined in that extremely small nucleus.

We will roughly calculate for exemplification.

We consider for the sun a radius of gravitational action:

Ro=2 light years (1 light year = $9{,}472\cdot10^{12}$ km = $9{,}472\cdot10^{17}$ cm).

We consider a black hole of 10 solar masses, that is:

$m_{B\text{-}H}=10\ m_o$

The effective action radius on the same body with the mass m_l can be estimated in the same way:

$\frac{Gm_o m_l}{R_o^2} = \frac{Gm_{B-H}m_l}{R_{B-H}^2}$, from which it results that: $R_{B-H} = R_o\sqrt{\frac{m_{B-H}}{m_o}}$

Since in the given example $\frac{m_{B-H}}{m_o}=10$, and $R_o= 1.8944\cdot10^{18}$ cm , it results that $R_{B\text{-}H}= 5{,}991\cdot10^{18}$ cm.

Because all astronomical objects have their own rotation motion around their axes, the black holes also have very strong gravitational fields. We can estimate the existence of a vortex in the region of a black hole with a tangential speed "v" variable and ascending towards the center.

We will roughly calculate this speed "v" on the outside of a black hole for a certain body with a mass of m_l , located in this place. We will use the equality between the attraction force and the centrifugal force:

$\frac{Gm_{B-H}m_l}{R_{B-H}^2} = \frac{m_l v^2}{R_{B-H}}$, it results: $v^2 = \frac{Gm_{B-H}}{R_{B-H}}$,

That is: $v = \sqrt{\frac{Gm_{B-H}}{R_{B-H}}}$

With the values $G=6{,}67\cdot10^{-8}$ cm^3/gs^2 , $m_{B\text{-}H}= 1{,}989\cdot10^{34}$g and $R_{B\text{-}H}=5{,}991\cdot10^{18}$ cm, it results that the tangential speed of the vortex on the outside of this black hole is: $v=1{,}488\cdot10^4$cm/s = 148,8 m/s.

At this distance, there is also a gravitational action from this black hole.

We will determine the distance $R'_{B\text{-}H}$ from the center of the black hole, for the given situation, where the tangential speed "v" becomes equal with the light speed "c".

Using the above mentioned analogous equation, in which v = c, we find that:

$R'_{B-H} = \frac{Gm_{B-H}}{c^2}$

Replacing the terms, we find that: $R'_{B-H}= 1{,}477\cdot10^6$ cm = 14,77 km.

This value is analogous with the Schwarzschild type radius in which the actual relativist mechanics cannot be applied.

We mention that this vortex is not only formed from stellar matter. It is a gravitational vortex caused by the high intensity of the field, respectively by its gravitonic density.

In this way, the attraction of an outside mass toward the black hole is necessary to have a curved motion toward the center of the black hole. An observer located in this gravitational vortex does not see anything material inside the black hole, it rolls down in an accelerated way toward the center and in the end is completely crushed in the fundamental gravitonic form of matter.

Due to the magneto-gravitonic field highlighted in the first part of the paperwork, we consider that this gravitational vortex of the black hole, due to its high intensity, is the form of a magneto-gravitational field similar with the magnetic field of a spherical body in its own rotation. In this case, the curved lines of the field have the ends in the two extremities of the rotation axis. This compares a black hole to a similar one of hydro-dynamics.

For this reason, the attraction of the matter from outside towards the black hole will also have, besides a curved motion from outside due to the gravitational vortex, a curved, perpendicular, motion on the curves of the magneto-gravitonic field towards the center of the black hole.

From a long distance, the form of this attraction of the outside matter will appear curved. The form of the curve depends by the angle in which we will observe this accretion.

This fact can be astronomically observed.

DISCUSSIONS

By developing this method, we bring the light into a long-discussed field of quantum gravity and we offer a solution, verifiable by calculations, which is able to responds to one of the most important open problem in fundamental physics [15].
Establishing a logical reasoning with a set of plausible assumptions, we provided a calculation method that uses physical characteristics of well-known particles to identify a basic mass unit what could be a bundle of energy, a quanta of the gravitational field.
Applying the theoretical assumptions in the method developed for some well-known particles at atomic level (proton, neutron and electron) which have different masses, volumes and electric charges, the result obtained for the fundamental mass unit was similar. The difference between the particles considered was in the number of their "n_p" units. This fact confirms that the method offer consistent results.
Starting from this theoretical basic mass unit discovered, the verification calculations confirmed the exact determination of universal constant of gravitation value, and the conclusion is that can be only the graviton as a particle that generates the gravitational force. This clearly explains the general gravity of matter and photons. Given the dimensions discovered for this, it becomes obvious that it is absolutely impossible to determine it by actual observational or experimental physical methods.
Moreover, the equation (46) proves to be correct and further proves that the graviton characteristics previously determined are accurate. The equation has a much deeper character, because as the basic size of electricity contain all the characteristics of graviton: mass, radius, charge ($m_{\varphi,}$ $r_{\varphi,}$ q_{φ}) as well as the universal constant of gravitation G, also revealing the correctness of the gravitonic component of the electron and the electric field.
We demonstrated based on the theoretical results set forth and summarized in first part, that we can apply some elements from the physics of graviton to express the nuclear, electrical, electromagnetic and gravitational phenomena.
Starting from this fact, all forces were expressed according to the determined characteristics of the graviton.
We summarize in this article, a synthesizing correlation of the three mentioned fields of force, the only one able to correlate the elements of common ground for the three fundamental situations, including the theoretical and rational explanations of the specificity for the three fundamental interactions. It was not the subject of this work the correlation between weak and electromagnetic forces, for which physicists S. Weinberg and A. Sallam received the Nobel Prize in 1979.
Through that, we prove the existence of the graviton and offer a model which describes the gravity and unite it with all other fundamental forces[16].
The attempt to describe gravity in the framework of quantum field theory, like the other fundamental forces, such that the exchange of virtual gravitons create the attractive force of gravity offer a new approach of quantum mechanics, at distances lower than the Planck length [17].

Using the theoretical results presented in the first part of this study, applying the graviton characteristics in astrophysics, we can provide an explanation of the initial moment of Universe birth and the appearance and formation of the matter as we know it. This highlights new theoretical elements about the birth of the universe and establishing some of its features such as, for example, its mass of approx. 10^3 higher than actual estimated mass, or the oscillating character. We did a reevaluation by calculating the characteristics of the known Universe and we explained Black Holes through the vision of graviton physics.

We revealed for graviton, the density determined theoretically: $\rho_{\varphi}=1,7149\cdot 10^{175} g/cm^3$ being the maximum density that matter which may have, as it was previously proven.

The initial spherule of the primordial Universe before the moment t_0 of the Big-Bang explosion of a radius R_{u0} was made up exclusively from "primitive matter", that is theoretically all the unformed component gravitons were still gathered in an unstable unique mass. Regarding the physical appearance, in the period between $t = 0 \div t = 10^{-85}$s, the entire external space as well as the primordial spherule were completely dark, of a pure black, since there were no photons yet. In that external space of a deep darkness, the notion of temperature itself didn't have physical sense as external matter or radiations did not exist in order to highlight any temperature.
Because the Big-Bang explosion was generated before the creation of photons, this explosion would be a perfectly dark explosion. In order to estimate those phenomena, it is known that any particle appears at "its threshold temperature".

In the representative equation of the primordial spherule of the Universe the energetic speed was greater than speed of light ($w_{u0} > c$). This fact confirms that under the primordial density conditions, the physical theory of relativity cannot be applied.

Between $t_0 = 0$ and $t_{\nu u0} \cong 10^{-85}$s when start the Big-Bang explosion, was generated a single vibration of the unstable super-collapsed spherule, and that is ***"a quanta of time"***.
We can considered that, after the Big-Bang explosion, in the period: $4{,}56 \cdot 10^{-85}$s $\div 10^{-43}$ s, the appearance of gravitons took place from the basic "primitive matter", between which there were many elastic collisions and interactions. Then, after 10^{-43} s the photons and various particles were progressively formed from gravitons. However, observing the same rule of threshold temperatures, the first photons that occurred were γ at the time: $t = 10^{-11}$ s after t=0, followed by X photons and ultraviolet. The photons of the visible field occurred much later, at $10^4 - 10^5$ years. Therefore, the dark background of the Big-Bang explosion (for us) it lasted quite a considerable time.

CONCLUSIONS

The assumptions underlying this study and the developed method proved to be correct, the results obtained considering several well-determined particles, being similar.
Verification calculations for the mass unit highlighted indicates that it is the alleged particle which generates gravitational force, the graviton.
We demonstrate that the basic size of electricity contain all the characteristics of graviton and moreover all known force fields can be expressed according to graviton's characteristics. The calculations performed using the graviton characteristics revealed similar results as using "classical methods".
Applying the new knowledges about the graviton in cosmology, we can provide through calculation a new perspective about the Universe birth and we can explain very well each stage of its formation.

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