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# THEORY OF SIMILARITY OF MICRO AND MACRO COSMIC SYSTEMS

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# INTRODUCTION

This work was conceived as a study tool, in order to expand the horizon of knowledge of the universe, by establishing some relationships of similarity between the microcosm and the macrocosm, regarding the ways of organizing matter in the two micro and macrocosmic levels, taking into account the interaction relationships of particles, respectively of bodies, existing in a certain space.

If we refer to the form of organization of matter, we observe that at the microcosm level, matter is presented in granular, discrete form, such as; electrons, nucleons, mesons and other particles, while at the macrocosm level matter is presented in the form of satellites, planets, stars, nebulae, etc. Both in the microcosm and in the macrocosm matter is organized in systems of particles or celestial bodies, which are characterized by a periodic movement in a central field. In other words, cosmic systems of any size are rotational harmonic oscillators, in a permanent state of energetic balance with the environment. Any deviation from this balance leads to manifestations of energy absorption or emission from the respective systems, until their energetic rebalancing with the environment.

If in the microcosm these energy exchanges can be observed in the laboratory in real time, in the macrocosm the events occur in thousands or millions of years, becoming impossible to study in their entirety.

Although the nature of the fields that interact in the microcosm is different from that of the macrocosm fields, namely the electromagnetic and gravitational fields, they still have a common characteristic, that of being the binder of matter organized in harmonic systems, having an unlimited range of action, whose intensity decreases with the square of the distance, ensuring the conditions for the organization of particles or bodies in micro or macrocosm systems.

In the microcosm, the simplest and most widespread element is hydrogen, which recommends it as a natural system that can be considered as a standard of this cosmic level. In the macrocosm, the only system known very well is the Solar system, for which reason in the following study we will take into account its parameters (masses, speeds, orbits), as well as the satellite systems of the respective planets.

The simplest harmonic system assumes the existence of a large mass as a support (***M***) to which is connected by a spring, a much smaller mass (m) that oscillates around the equilibrium position.

In the case of natural systems, the support mass is called the nucleus, and the quasi-elastic connection between the two masses is ensured by the central field of interaction between them. The force of attraction or repulsion between bodies is nothing more than the tendency of the two bodies to occupy the relative position (distance) corresponding to the energy state in which they are. In atomic systems, the quasi-elastic bond is provided by the electrostatic field between the nucleus and the electron, while in the macrocosm, the quasi-elastic bond is given by the gravitational field of the celestial body (star or planet) around which a planet or satellite orbits, as the case may be.

The phenomenon itself is more subtle because there are no perfectly circular orbits, but only more or less elliptical orbits, which means a periodic variation of the distance between the nucleus and the orbital body or particle. So we are dealing with a periodic variation of kinetic energy and potential energy, which entitles us to state that every natural cosmic system is a rotational harmonic oscillator, there being a permanent correlation between the period of radial oscillation and the period of rotation around the center of mass. These oscillations are in harmony with the oscillations of the central field, that is, the entire ensemble formed by the nucleus of the system, the particle or body that orbits it, and the central field have their own oscillation frequency and when they are in energetic equilibrium with the environment, they do not absorb, nor do they emit energy. This principle characterizes both atomic systems and gravitational systems, and the energy absorbed or emitted is in the form of electromagnetic quanta for the microcosm and gravitational waves for the macrocosm.

In this paper we will seek to establish only the similarities that may exist between the forms of organization between micro and macrocosmic systems.

## CHAPTER 1

### DETERMINATION OF THE MICROCOSMIC INTERACTION CONSTANT

We know that any micro or macrocosmic system represents a form of organization of matter, which consists of systems of microcosmic harmonic oscillators called atoms, or macrocosmic harmonic oscillators called galaxies, solar or planetary systems, as the case may be. We know that the simplest natural system consists of two particles linked together by a field that provides a quasi-elastic force that decreases with the square of the distance. There are at least two complementary particles or bodies, one of which plays the role of the nucleus "$\boldsymbol{M}$" being about **1836** times larger than the other, which is the orbital particle "$\boldsymbol{m}$". Both particles are linked together by a force that can be expressed by the interaction constant denoted by "$\boldsymbol{k}$". As we know, the forces of attraction between particles are expressed by Coulomb's relation in the microcosm and by Newton's relation in the macrocosm. Mass and charge are two different properties of manifestation of the same particle, in two different environments but superimposed in the same space. As many types of interactions there are, as many interaction environments exist, environments that are all superimposed in the same physical space. Thus, a particle with a composite internal structure such as the proton will contain strong forces inside it, electromagnetic forces outside it, then weak forces, then mass forces, and each force imprints a certain character on the particle. We, living in gravitational space, perceive all these characteristics of each type of environment, as if the layers of the other environments were transparent. Looking at things this way, charge represents the property by which particles can form a stable structure such as the atom, the structure belonging to the electromagnetic environment, and the mass of bodies is another characteristic by which these entities manifest themselves in gravitational space, allowing the formation of stable structures such as cosmic systems.

The question is, if we can express electric charge as a function of mass, although they are two distinct properties of the same particle. We can make a connection between them, namely; the ratio between charge and mass gives us the specific charge of the particle, that is, an electron for example with charge "e" will behave the same in the "electromagnetic space", as a particle that has the mass of the electron "m" in the "mass space", if this space were characterized by an interaction constant "***ka***", different and with a value much higher than the gravitational constant "***K***". In other words, I create a virtual space in my imagination in which the electron and the proton would interact through their mass. This exercise of imagination helps me understand what similarities may exist between particle structures (atoms), and the macrocosmic systems known in the universe.

According to Coulomb's relations (1.1) for the atom, as well as Newton's relation (1.2) for the macrocosm, we can find the interaction forces of the particles and, respectively, of the bodies that are part of these natural harmonic systems as matter is organized.

Of course, there are many skeptics who do not see a similarity between the electric interaction and the gravitational interaction, because the electric field is a vector field and the gravitational field is a scalar field, and electric charges of the same kind repel each other, while opposite charges attract each other, which is why in gravitational interactions there are only attractive forces. Regarding these natural statements, I must make the following remark; both the electric field and the gravitational field are two different interpretations of the same interaction field, each reflecting a certain facet of the field, located at different scales of dimension. Those who claim that in the macrocosm only gravitational attractive forces manifest, must draw their attention to the fact that there are also repulsive forces between macrocosmic systems, without which all galaxies would be attracted to each other, which does not correspond to reality. Observations on the expansion of the universe prove that there are also repulsive forces between galaxies. In microcosm, we learn from primary school that two electric charges of the same sign repel each other, although no one has seen whether two free electrons repel each

other and with what force, because all electrostatic experiments are done with the help of bodies that are made up of atoms and molecules. Indeed, two bodies electrically charged with electrons repel each other, but those electrons once penetrated the body lead to the negative ionization of the atoms between which repulsive forces appear, but these ionic forces are not the same as the forces that manifest between free electrons because the entire atom participates. We know that between two parallel conductors crossed by a current in the same direction, forces of attraction and repulsion appear, respectively, if the currents have opposite directions, due to the magnetic fields produced by the electric current of the two conductors. So electrons in motion interact differently even though they have the same electric charge, they can generate attractive or repulsive forces depending on the orientation of their magnetic moments. The same thing can happen with free electrons if their magnetic moments have a certain spatial orientation. Moreover, if the electrons were repelled, the spots in the cathode ray tubes could no longer be focused and electron microscopes would no longer work. It should also be specified that free or coupled electrons are always in motion so that if they are subjected to a potential difference of only one volt they reach speeds of 10^5 m/s, so we will never have static electrons. Consequently, we should be more cautious when we say that two electrons repel each other, or that the nucleus of an atom attracts electrons in orbits, because the same electrons, when pumping the atom with a certain frequency, can cause electrons to jump to outer orbits and then return to the old orbit with a quantum emission, as happens in the case of lasers. So the electron is not only attracted by the nucleus but can also be repelled when the atom is removed from its fundamental energy state. The relative position of the electron to the nucleus is determined by the atom's own oscillation frequency and the frequency of the environment. So Coulomb's relation only gives us some incomplete information on the behavior of the electron that is part of an atom. In the case of a gravitational field, bodies are attracted to the center of the field only if their energy state is lower than the state corresponding to the position they occupy. Since all bodies on Earth down to the depth of the nucleus have an energy state consisting of the sum of kinetic energy plus potential energy less than those corresponding to their position, they are attracted by the gravitational field.
I believe that both in the micro and macrocosm, natural harmonic systems atoms or galaxies, solar and planetary systems, are material energy structures permanently in harmony with the energy state of the environment in which they are found, so that these systems absorb energy when an additional energy disturbance occurs, and give up energy when an energy deficit occurs in the environment, thus regulating the energy of the entire universe.
Returning now to the well-known relations of Coulomb's electrical interaction (1.1) and Newton's mass interaction (1.2), we will seek to see what the similarity between the two relations is, and how they can be converted from one to the other.

$$(1.1)\ \boldsymbol{F} = \frac{e_{me} \cdot e_{Mp}}{4\pi\varepsilon \cdot {R_a}^2}\ ; \quad (1.2)\ \boldsymbol{F} = \boldsymbol{K}\frac{m \cdot M}{R^2}\ ;$$

In these relations, the charges of the electron and the proton were denoted by e_me, and e_Mp, epsilon ε is the permittivity of the vacuum, m and M are the masses in interaction, and K is the gravitational interaction constant, R_a or R are the distances between the two material entities, charges or masses in interaction.
The two relations are similar because they refer to the determination of an interaction force between these material entities, forces that decrease with the square of the distance between them, and which also depend on a certain constant ε, or K, related to the parameters of the natural cause, that is, of the field, which produces this force.
It is observed that the two fields have a common property of imprinting a certain acceleration directed towards the center of the field on the particles or bodies that enter that field.
As we know, the mass and charge of a particle are inextricably linked, which allows us to consider that there is a physical connection between them.
Both mass and charge are attributes of particles, and both reside in the nature of the generating quanta. Since there is equality between the energy of the quantum and the energy of the particle, according to Einstein's relation,

$$\boldsymbol{E = m_0 \cdot c^2 = h \cdot \vartheta_0}\ ;$$

Knowing the value of the energy quantum, which is electromagnetic in nature, we see that there is a direct connection between mass and the nature of the field that produces it. If we talk about the energy of the generating quantum, we see that we use the product of Planck's constant $\boldsymbol{h}$ and the frequency of the quantum $\boldsymbol{\vartheta_0}$ and if we talk about the internal energy of the particle we will use the product of the rest mass $\boldsymbol{m_0}$ and the square of the speed of light $\boldsymbol{c}$ **.**
In fact, this equivalence allows us to believe that in both situations we are talking about the same thing (particle or quantum) and that they contain the same entities, located in different situations. This finding helps us to find a direct expression between mass and charge.

For this, we will consider from electrodynamics the Lorentz force " $\boldsymbol{F_L}$" exerted by an electromagnetic induction field "$\boldsymbol{B}$" on an electron that moves freely with speed "**v**", as well as the electromagnetic force "$\boldsymbol{F_e}$" exerted by a magnetic induction field "B" on a conductor of length "**L**" through which a current of intensity "**I**" circulates.
Lorentz force; ( (1.01) $\mathbf{F_L = e \cdot v \cdot B}$;
Electromagnetic force “Fe”; (1.02.) $\mathbf{F_e = I \cdot L \cdot B}$;
where;
**"e"** is the electric charge measured in Coulombs [C];
**"v"** is the electron velocity; [m/s]
**"B"** is the magnetic field induction; [T]
**"I"** is the current intensity; [A]

**"L"** is the length of the conductor.[m] perpendicular to the magnetic field."

We can choose the parameters of the two relationships, both the current intensity "**I**" and the induction "**B**" so that the value of the forces "**FL**" and "**Fe**" are equal.

Under these conditions **FL=Fe,** that is; (1.03.) **e·v·B=I·L·B;**

The induction "**B**" is simplified, and we can find the electric charge "**e**".

The electric charge is; (1.04.) **e=I·L/v;**

By definition in the International System of Units, the Ampere is equivalent to a force; **1A=2.10-7 N**, and this implies that we can establish an equivalence between electrical units of measurement and mechanical units of measurement in order to more easily explain certain physical phenomena.

Thus we can write the equivalence between Ampere and Newtons **; [A]≡[N]≡[Kg·m/s^2 ]** ;
But the electric charge is measured in Coulombs, and we can write the equivalence of the units of measurement using the relation (1.04) so corresponding to the terms in this relation we will write the units of measurement as follows;

$$\mathbf{e}[\boldsymbol{C}] = \mathbf{I}[\boldsymbol{A}] \cdot \frac{\mathbf{L}[\boldsymbol{m}]}{\mathbf{v}\left[\frac{\boldsymbol{m}}{\boldsymbol{s}}\right]} \;;$$

adica; (1.05.) $[\boldsymbol{C}] \equiv [\boldsymbol{N}] \cdot [\boldsymbol{m}] \cdot \left[\frac{\mathbf{1}}{\frac{\boldsymbol{m}}{\boldsymbol{s}}}\right] = \left[\boldsymbol{kg} \cdot \frac{\boldsymbol{m}}{\boldsymbol{s}^2}\right] \cdot [\boldsymbol{s}] = \left[\boldsymbol{kg} \cdot \frac{\boldsymbol{m}}{\boldsymbol{s}}\right];$

or by simplification, the Coulomb can be equated with an intrinsic momentum of the particle.

(1.06) **[C]≡[kg·m/s] ;**

So the electric charge is measured in Coulombs and is equivalent to an intrinsic momentum of the particle.
When I state that the electric charge is equivalent to an impulse, it must be understood that each material point of the particle is moving at the speed of light around the center of mass, but it does not mean that the charge is an impulse in the mechanical sense, but only at a mathematical level can I equate the electric charge with an impulse of the particle, because the charge is an attribute inextricably linked to the mass of the particles, just as in the gravitational macro field it is linked to the mass of the bodies, without tainting the intimate understanding of the phenomena. It is only about the mass of the charge carriers, the electron or the proton, which are complementary particles from the point of view of the electric field.

From Einstein's energy relation written for the proton we have; $E = M_p \cdot c^2 = h \cdot \vartheta_p$ ;

; where;

"$M_p$" - is the rest mass of the proton.

"**c**" - is the speed of light.

"**h**" - is Planck's constant.

"$\vartheta_p$" - is the frequency of the generating quantum corresponding to the Compton wavelength.

The intrinsic momentum of the proton is; (1.07) $I_p = M_p \cdot c = \frac{h \cdot \vartheta_p}{c}$ ;

substituting the respective values we observe that we obtain a momentum result approximately 3 times greater than the proton charge.

$$I_p = M_p \cdot c = \frac{h \cdot \vartheta_p}{c} = \frac{6{,}626 \cdot 10^{-34} \cdot 2{,}271 \cdot 10^{23}}{2{,}997 \cdot 10^{8}} = 5{,}0209 \cdot 10^{-19}\ [kg \cdot \frac{m}{s}];$$

If we relate the momentum of the proton to the value of its charge we have;

$$(1.07.1) \quad \frac{I_p}{e} = \frac{5{,}0209 \cdot 10^{-19}}{1{,}602 \cdot 10^{-19}} = 3.134 \approx \bar{\pi}$$

so the electric charge can be approximated as a value with the relationship below;

$$(1.08)\ e \cong \frac{M_p \cdot c}{\bar{\pi}};$$

**From now on, I will abandon the approximate equal sign to simplify the writing of mathematical relations, and I will use the notation with the "pi bar" sign. $3.134 \approx \bar{\pi}$ ;**

.

.

The ratio between the charge of the electron and its mass is called the specific charge, and is denoted by the Greek letter sigma "**σ**". Thus we have a specific charge for the electron "$\sigma_e$" and another for the proton "$\sigma_p$", because the masses of the two particles are different.

So we can write; for the electron;

(1.3) $e = \sigma_e \cdot m_e\ [C]$; ; where "$m_e$ " is the mass of the electron,

and for the proton; (1.4) $e = \sigma_p \cdot M_p\ [C]$; where "$Mp$" is the mass of the proton.

Substituting in Coulomb's relation (1), the electric charge by relations (1.3) and (1.4), we obtain;

$$F = \frac{(\sigma_e \cdot m_e) \cdot (\sigma_p \cdot M_p)}{4\pi \cdot \varepsilon \cdot R^2};$$

We group the terms conveniently and we will have a new relationship;

(1.5) $\boldsymbol{F} = \left[\frac{\sigma_e \cdot \sigma_p}{4\pi \cdot \varepsilon}\right] \cdot \frac{m \cdot M}{R^2}$ ; Notam paranteza cu constanta ***ka*** , si avem ;

(1.5.1) $[k_a] = \frac{\sigma_e \cdot \sigma_p}{4\pi \cdot \varepsilon}$ ; The units of measurement of the constant $k_a = \left[\frac{\frac{C^2}{Kg^2}}{\frac{F}{m}}\right]$;

From the relation (1.06) we get the equivalence between a Coulomb and the mass multiplied by the velocity, that is (1.06***) [C]≡[kg·m/s];*** also knowing that the force in (1.5) is measured in Newtons, we substitute and after simplifications we find that the Farad is equivalent to the Kilogram.

(1.5.2)$[F] \equiv [Kg]$ ; thus the units of measurement of the interaction constant at the atomic level are the same as at the gravitational level; $k_a \left[\frac{m^3}{s^2 \cdot kg}\right] = \left[\frac{N \cdot m^2}{Kg^2}\right]$;

since all the terms contained in "ka" are constants, it means that we have a new interaction constant at the atomic level, which takes into account the mass of the electron and the proton and the relation (1.1) becomes

$$(1.6)\ .\ F = k_a \frac{m_e \cdot M_p}{R^2}\ ;\ [N]\ ;$$

Expression (1.6) is similar to Newton's relation but does not change the nature of the electric field, and the constant ***ka*** is called the electron-proton interaction constant.

Equating the two interaction relations (1.1) and (1.6), after simplification we obtain;

$$(1.7)\quad \frac{e^2}{4\pi\varepsilon} = k_a \cdot M_p \cdot m_e;$$

We have denoted with alpha the ratio of the masses of the two particles proton $M_p$ / electron $m_e$ ; that is; (1.7.1)

$$\propto = \frac{M_p}{m_e} = \frac{1{,}6725.10^{-27}}{0.9109.10^{-30}} = 1{,}836.0961 \approx 6 \cdot \pi^5 = 1{,}836.118;$$

I will apply a mathematical trick that does not influence the result of the relation (1.7) in any way, but allows the terms to be explained as follows;

If we amplify the second term of the relation (1.7) and divide it by the same constants, $\left(\frac{\pi^2}{\pi^2} \cdot \frac{\alpha^2}{\alpha^2} \cdot \frac{c^2}{c^2}\right)$ its value remains unchanged.

$$\text{So ; } \frac{e^2}{4\pi\varepsilon} = k_a \cdot M_p \cdot m_e \cdot \left(\frac{\pi^2}{\pi^2} \cdot \frac{\alpha^2}{\alpha^2} \cdot \frac{c^2}{c^2}\right);$$

$M_p = \propto \cdot m_e$ ; where **c** - is the speed of light;

by conveniently grouping the terms in the parentheses in the second part of the equality we obtain ;

$$\frac{1}{4\pi\varepsilon} \cdot e^2 = \left(\frac{k_a \cdot \pi^2}{\propto \cdot c^2}\right) \cdot \left(\frac{\alpha \cdot m_e \cdot c}{\pi}\right)^2 ;$$

We identify the two terms that we denote by « e^2 » and « 4πε » and we write; (1.7.2)

$$e^2 = \left(\frac{\alpha \cdot m_e \cdot c}{\pi}\right)^2 ; \text{ (1.7.3) } \quad 4\pi\varepsilon = \frac{\alpha \cdot c^2}{k_a \cdot \pi^2}; \text{ (1.7.4) } \quad \varepsilon = \frac{\propto \cdot c^2}{4 \cdot \pi^3 \cdot k_a};$$

We remove the radical from the above expressions, and we obtain a new relation for the electric charge « e » as being equivalent to the intrinsic momentum of the particle as a function of the electron mass as also resulted from relation (1.04) and (1.06).

$$\text{(1.8) } e = \pm \frac{(\alpha \cdot m_e) \cdot c}{\pi}; \quad \text{care se masoara in ; } [C] \equiv \left[kg \cdot \frac{m}{s}\right] = \left[\frac{J \cdot s}{m}\right];$$

$$e = \frac{1836{,}089 \cdot 0{,}910 \cdot 10^{-30} \cdot 2{,}997 \cdot 10^8}{\pi} = 1,597.10^{-19} ; \left[kg \frac{m}{s}\right];$$

units of measurement which result to be equivalent to the unit of measurement of electric charge Coulomb expressed in mechanical units of measurement.

Taking into account the mass ratio between proton $M_p$ and electron $m_e$ ; $\propto = \frac{M_p}{m_e}$ ;

We will replace the electron mass in relation (1.8) with the proton mass; $\propto \cdot m_e = M_p$;

and we will obtain the relation (1.9) which coincides with the relation (1.8); that is;

$$\text{(1.9) } \boxed{e = \pm \frac{M_p \cdot c}{\pi};}$$

Substituting the mass in Einstein's expression for particle energy in relation

$$h \cdot \vartheta_p = M_p \cdot c^2 ; \qquad M_p = \frac{h \cdot \vartheta_p}{c^2};$$

Where; « $h$ » is Planck's constant. « $\vartheta p$ » is the frequency corresponding to the Compton wavelength for the proton. « $Mp$ » is the mass of the proton. « $c$ » is the speed of light.
We obtain the equivalent of the electric charge, depending on the intrinsic energy of the proton.

$$(1.10)\quad e = \pm \frac{h \cdot \vartheta_p}{\pi \cdot c} \quad \left[\frac{J \cdot s}{m}\right];$$

## Determining the maximum Z number of atomic charge.

Calculating the electron velocity v_o in the fundamental orbit of a hydrogen atom with Coulomb's relation (1.1.1) $\frac{m_e \cdot v_0^2}{R_1} = \frac{1}{4\pi \cdot \varepsilon} \cdot \frac{e^2}{R_1^2}$; de unde; $v_0^2 = \frac{1}{4\pi \cdot \varepsilon} \cdot \frac{e^2}{m_e \cdot R_1}$ ;

$$\text{or;}\quad v_0 = e \cdot \left(\frac{1}{4\pi \cdot \varepsilon \cdot m_e \cdot R_1}\right)^{\frac{1}{2}} ;$$

(Where the values for the electric charge e, the permittivity epsilon « $\varepsilon$ », the electron mass "$m_e$" and the radius of the Bohr orbit ***R1*** are given in any physics book) the result is the value of the electron velocity on the fundamental hydrogen orbit of; $V_0 = 2.187 \cdot 10^6 \ \frac{m}{s}$;

If we denote the charge number of the ideal atom by $Z_\uparrow$ (i.e. maximum Z) the ratio between the speed of light and the speed of the electron on the fundamental hydrogen orbit we obtain;

$$(1.11)\quad Z_\uparrow = \frac{c}{v_0} = \frac{2.997 \cdot 10^8}{2.187 \cdot 10^6} = 137.037 ;$$

.

## 2.1 THE "Zmax" NUMBER THAT CHARACTERIZES AN "IDEAL" COSMIC SYSTEM

We call an ideal cosmic system a rotationally oscillating harmonic system of particles or natural bodies, from the category of atoms or galaxies, which present certain limit properties, which are not found in nature, and are at the upper limit of their complexity.

In such a system, the maximum number of particles or bodies that form the nucleus, as well as the number of particles or bodies that orbit around the nucleus, is the maximum possible from a theoretical point of view, since any exceeding of this number implies speeds higher than the maximum oscillation speed of the system studied.

We have noted this number with the symbol "**Z↑**", and it can be calculated with the ratio between the maximum theoretical speed "**V↑**" of a particle in the system and the minimum (initial) speed, noted with "***Vo***" corresponding to a particle located on the orbit or the fundamental layer in the binary system of the "hydrogenoid" type. Taking into account the upper limit given by the speed of light, for the number "**Z↑**" of atomic systems and galaxies the ratio between the speed of light and the minimum speed "$V_o$" was established. In the case of other classes of systems such as stellar systems, solar systems or planetary systems the maximum orbital speed we will see that is always lower than the speed of light..

(2.1.1) $Z\uparrow = \frac{c_o}{V_0}$; sau, pentru atom vom avea: $Z\uparrow = \frac{2{,}997\cdot 10^8}{2{,}188\cdot 10^6} \approx 137;$

Value which is the exact inverse of the fine structure constant from atomic physics, as shown below;

What is the relationship between the fine structure constant and the maximum charge number $Z\uparrow$.

The calculation relationship of the fine structure constant taken from physics is;

$$(1.11.0)\quad \alpha_{fin} = \frac{e^2\cdot c\cdot \mu_0}{2\cdot h} = \frac{1}{137.037};$$

We know that the speed of light is calculated by the relationship ;

$$c = \sqrt{\frac{1}{\varepsilon_0\cdot\mu_0}}\text{ ; sau ; }\mu_0 = \frac{1}{c^2\cdot\varepsilon_0\cdot}\ ;$$

And Planck's constant is; $\mathbf{h = 2\pi \cdot m_e \cdot v_0 \cdot R_1}$;

We substitute these relations into "α_fin" and obtain; $\alpha_{fin} = \frac{e^2}{4\pi\cdot m_e\cdot v_0\cdot R_1\cdot c\cdot\varepsilon_0}$ ;

But from Coulomb's relation we have;; $\frac{e^2}{4\pi\varepsilon} = m_e \cdot v_0{}^2 \cdot R_1;$

Or; $\alpha_{fin} = \frac{4\pi\cdot\varepsilon\cdot m_e\cdot v_0{}^2\cdot R_1}{4\pi\cdot m_e\cdot v_0\cdot R_1\cdot c\cdot\varepsilon_0} = \frac{v_0}{c} = \frac{2.187\cdot 10^6}{2.997\cdot 10^8} = \frac{1}{137{,}037};$

So the fine structure constant is equal to the inverse of the maximum charge number.

$$(1.11.01)\quad \alpha_{fin} = \frac{1}{Z_\uparrow}\ ;$$

If we relate the dimensions of the fundamental orbit to the maximum charge number, we obtain the Compton wavelength for the electron "$\lambda_{c,e}$ " ;

$$(1.11.1)\quad \lambda_{c,e} = \frac{2\pi\cdot R1}{Z_\uparrow} = \frac{2\pi\cdot 0.529\cdot 10^{-10}}{137} = 2.426\cdot 10^{-12}\ m;$$

If we consider a hypothetical atom with charge number **Zmax=137,** the perimeter of the fundamental orbit is equal to the Compton wavelength for the electron, that is;

$$(1.12) \quad 2\pi \cdot R_0 = \lambda_{ce} \; ;$$

If we relate the Compton wavelength of the electron to the coefficient α=1836.098 ;
We obtain the Compton wavelength for the proton ; "$\lambda_p$" Thus we found out what is the connection between these wavelengths and the dimensions of the fundamental orbit for the theoretical speed limit c. (1.12.1.) $\lambda_p = \frac{\lambda_e}{\alpha} = \frac{2{,}426 \cdot 10^{-12}}{1836} = 1.321 \cdot 10^{-15}[m]$;
Using the above data we can find a new expression for Planck's constant as follows;
Determining Planck's constant as a function of charge
If we multiply and divide the classical expression for Planck's constant by the alpha number and then by the maximum charge number $Z$, grouping the terms we have;

$$h = 2\pi \cdot m_e \cdot v_0 \cdot R_1;$$

We amplify the mass of the electron with the constant alpha=1836 and divide the radius $R1$ of the hydrogen atom also by alpha, at the same time we write the speed $v_0$ as a ratio between the speed of light and the number $Z$maxim. By grouping the terms we obtain;

$$h = 2\pi \cdot m_e \cdot v_0 \cdot R_1 = 2\pi(\alpha \cdot m_e) \cdot \left(\frac{c}{Z_\uparrow}\right) \cdot \left(\frac{R_1}{\alpha}\right);$$

We thus obtain a new expression for the angular momentum constant;

$$h = \pi \cdot \left[\frac{1}{\pi}(\alpha \cdot m_e \cdot c)\right] \cdot \left[\frac{R_1}{Z_\uparrow \cdot \alpha}\right] = \pi \cdot e \cdot \lambda_p;$$

In which; (1.9) $e = \left[\frac{1}{\pi}(\alpha \cdot m_e \cdot c)\right]$; rel; (1.11.1) $\lambda_p = \left[\frac{R_1}{Z_\uparrow \cdot \alpha}\right]$;

This is how we established the relationship; (1.10.1) $h = \pi \cdot e \cdot \lambda_p$; which we check below;

$$h = \pi \cdot .602 \cdot 10^{-19} \cdot 1.321 \cdot 10^{-15} = 6.648 \cdot 10^{-34}[J \cdot s];$$

Where "$\lambda_p$" represents the Compton wavelength for the proton.
From (1.10.1) we get Planck's constant for electromagnetic waves, expressed as a function of the electron charge „$e$" and the Compton wavelength "$\lambda_p$" for the proton.

The plus or minus sign of the charge shows us that the respective particles are complementary, and can interaction.

The conclusion is that the mass of the particles can also have a plus or minus sign, when they are complementary, interacting in a cosmic system, as follows from the equation of Dirac.

$\boldsymbol{E^2 = (c \cdot p)^2 + \left(m \cdot c^2\right)^2}$ ; sau ; $\boldsymbol{E = \pm\sqrt{(c \cdot p)^2 + (m \cdot c^2)^2}}$ ;

In this relationship, only mass can give the plus or minus sign of energy.

Returning to the expression of the interaction force, (1.6) $\boldsymbol{F = k_a \frac{m_e \cdot M_p}{R_a^2}}$ ; it is seen that this is a new form of expression of Coulomb's relation, from which it follows that the electric charges are actually an attribute of the mass of particles permanently in an intrinsic movement with the speed of light. It should be noted that in this relation "ka" is a microcosmic interaction constant similar, but not identical to the constant of universal attraction "K", from Newton's relation specific to the macrocosm. being different fields. Of course the two constants belong to completely different fields, but we are only interested in what is similar between them. The important thing is that these fields ensure the quasi-elastic connection between the bodies or particles of the natural harmonic system, and that they behave similarly, each on its cosmic level considered. Substituting the specific load values; $\boldsymbol{\sigma_e, \sigma_p, \varepsilon,}$ known from atomic physics, in the relationship above (1.5.1), $\boldsymbol{k_a = \frac{\sigma_e \cdot \sigma_p}{4\pi \cdot \varepsilon}}$ ; the result for the microcosm is the value of the interaction constant depending on the masses of the electron and proton particles, denoted by "***ka***", whose value is;

(1.5.1.1.) $\boldsymbol{k_a = \frac{1.758 \cdot 10^{11} \cdot 9.578 \cdot 10^{7}}{4\pi \cdot 8.854 \cdot 10^{-12}} = 1.513 \cdot 10^{29}\ [N \cdot m^2 \cdot kg^{-2}]}$;

We will continue to use this constant to establish the relationships of similarity between the micro and macrocosm..

## SIMILARITIES BETWEEN MICRO AND MACRO COSMOS.

Compared to the microcosm in which particles are organized into atomic systems, bodies belonging to macrocosmic systems have more complex interactions. Each celestial body interacts both with the nucleus of the system it is part of and with the bodies that gravitate around it. For example, a planet interacts with both the Sun and the satellites that orbit around it, in turn the Sun interacts with both the galactic nucleus and the planets that orbit around it.

If we consider the structure of the atom, and especially the nucleus that is formed by an agglomeration of particles, we notice that at the macrocosmic level, only galaxies have a similar structure.

Thus, each galaxy can be associated with a gravitational charge number "**Zg**" corresponding to the number of stars forming the nucleus, and a mass "***Mg***" of each star in the nucleus, as well as a mass "$\boldsymbol{m_g}$" for the celestial bodies orbiting around the nucleus.

Under these conditions, we can write Newton's relation for a star in the galaxy as follows;

$$(1.11)\quad \boldsymbol{F = \frac{m_g \cdot Vg^2}{R_g} = Zg \cdot K_g \cdot \frac{Mg \cdot mg}{R_g^2}} \quad ;$$

where the index "g" refers to galactic sizes, « ***Fg*** » is the size of the interaction force, "***Kg***" is the interaction constant, "***Zg*** " the number of stars in the nucleus, "***Mg*** '' the mass of a star in the nucleus, "***mg***" the mass of the body gravitating around the nucleus, "***Vg***" the speed of the body and "***Rg***" represents the radius of the galactic orbit on which the body "***mg***" is located.

Through direct observations, astronomers have measured that the speeds of stars near the nucleus of the galaxy are very high, sometimes reaching fractions of the speed of light, and physicists have observed that some microparticles have speeds close to the speed of light, so in the present study we will create an imaginary model of an "ideal cosmic system" taken as a "standard", so that we can make a comparison between two completely different cosmic levels. If in the microcosm the hydrogen atom is the simplest atom and can be taken as a standard unit of measurement, in the macrocosm we do not have such a known system, so we will have to adopt it theoretically, during the work.

To begin with, the simplest natural harmonic system is formed by two particles or bodies, having a ratio between their masses of about. 1/2000, and which orbit around the common center of mass. In the microcosm we observe that the atoms with the highest atomic weights have the most complex structures, and as the complexity of the atom increases, the diameter of the first orbital decreases, and the speed of the electron increases towards the speed of light, respecting Planck's constant, in which; $\boldsymbol{h = 2\pi \cdot m \cdot v_1 \cdot R_1}$ ;

Thus the speed of the electron in the first orbital of a heavy atom can theoretically increase to values close to the speed of light. In this theoretical case, there is a maximum number ***Z*** of electrons and protons given by the ratio between the speed of light and the speed of the electron in the hydrogen atom. This number is given by;

**Zmax=C/V1 =2,997.10^8/ 2,188.10^6=137** ;

By this we have shown that there is an upper theoretical limit regarding the complexity of a natural harmonic system, the upper limit limited by the speed of light, and the lower limit determined by a minimum speed called the initial speed denoted by ***V0*** corresponding to the first orbit of a binary system of the hydrogen type in the microcosm, as well as of a macrocosmic binary system.

Under these conditions we will rewrite the interaction relations for the two « ideal theoretical systems » micro and macrocosmic, in which the particles or bodies on the first orbit approach the speed of light "$c$", and the number of particles charged with the charge from the nucleus of the system, (protons, respectively stars in the case of galaxies) is at its maximum possible limit "$Z\uparrow$". For the atomic system;

$$(1.12) \quad \frac{m_e \cdot c^2}{R_a} = Z_{\uparrow a} \cdot k_a \cdot \frac{Mp \cdot m_e}{R_a^2};$$

For the galactic system; (1.13) ; $\frac{m_g \cdot c^2}{R_g} = Z_{\uparrow g} \cdot K_g \cdot \frac{Mg \cdot mg}{R_g^2}$ ;

After simplifying the mass and the radius of the respective orbit we obtain the relations ;

For the atomic system; (1.12.1) $c^2 = Z_{\uparrow a} \cdot k_a \cdot \frac{Mp}{R_a};$

For the galactic system; (1.13.1) ; $c^2 = Z_{\uparrow g} \cdot K_g \cdot \frac{Mg}{R_g}$ ;

Having the speed of light in common, the two relations can be equalized obtaining;

$$(1.14) \quad Z_{\uparrow a} \cdot k_a \cdot \frac{Mp}{R_a} = Z_{\uparrow g} \cdot K_g \cdot \frac{Mg}{R_g};$$

In which "$Z\uparrow a$ " and "$Z\uparrow g$" denote the maximum number of charges (protons in the case of atomic systems, and celestial bodies (stars) in the case of galaxies) in the considered systems, and "$Ra$" and "$Rg$" denote the dimensions of the radii of the first energy level, or of the first orbits, for which the electrons, respectively the celestial bodies, orbit at speeds close to the speed of light. This equality can also be written as a product of ratios between the parameters of the two types of micro and macro systems;

$$(1.15) \quad \frac{k_a}{K_g} = \frac{Z_{\uparrow g}}{Z_{\uparrow a}} \cdot \frac{Mg}{Mp} \cdot \frac{R_a}{R_g} \;;$$

The above expression suggests to us the idea that there are certain relationships of similarity between the atomic and the galactic system. But to confirm this statement we need a few more points of support, invariable notions in the universe, regardless of the cosmic level (micro or macrocosm) considered.

### 1.2. UNIVERSAL CONSTANT OF MICRO AND MACROCOSMIC SYSTEMS.

Analyzing the structure of a natural harmonic system, we observe that the core of the system has a privileged role, because it enjoys certain properties, ensuring the stability of the entire system.

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From the relation (1.12), or (1.13) we will extract the speed of light "c" thus obtaining the relation . (1.2.0) $c^2 = \frac{Z_{\uparrow} \cdot K \cdot M}{R_c}$ ; ;

raising this relation to the third power and grouping the terms we obtain**;**

(1.2.1) $c^6 = (K^3 \cdot M^2) \cdot \frac{Z_{\uparrow}^3 \cdot M}{R_c^3}$;

we will analyze the first term in the parentheses in turn, then the second term.

Let's make the following observation: if we want to find the average mass "***Mg***" of a star in the galactic nucleus, knowing that the Sun is a medium-sized star, of ***mg≈10^30 kg****;* keeping the ratio between the mass of a star in the nucleus "Mg" and the mass orbiting the nucleus "***mg***" as in the atomic system, $\frac{M_g}{mg} \approx 10^3$ ;

result; $M_g \cong 10^3 \cdot 10^{30} = 10^{33} Kg$;

Now knowing the approximate mass of a star in the galactic nucleus « ***Mg*** », as well as the gravitational interaction constant "***Kg***", we will try to calculate the expression;

(1.2.2) $K_g^3 \cdot M_g^2 = (10^{-11})^3 \cdot (10^{33})^2 = 10^{33}$; *[N^3.m^6.Kg^-4];*

If we redo the same calculation, this time more rigorously, in the case of the atomic system, because we know the exact value of the proton mass and the mass interaction constant between the electron and proton determined in (1.5.1.1.) ***ka***, the above expression becomes; (1.2.3).$k_a{}^3 \cdot M_p{}^2 = (1,5157 \cdot 10^{29})^3 \cdot (1,672 \cdot 10^{-27})^2 = 9,701 \cdot 10^{33} [N^3 m^6 \cdot k_g{}^{-4}]$

It is observed that the two expressions have the same order of magnitude which is not accidental, as it is a new cosmic constant that is universally valid for any cosmic level. This invariable quantity will be called the "constant of cosmic systems", and we will denote it with the symbol "$\chi_M$"**;**

This is calculated with the relation (1.2.4) $\chi_M = K^3 \cdot M^2$ ;

From this constant we can accurately determine the rest mass of a star considered as a "standard" unit of measurement that is part of the core of a galaxy.

Thus; (1.2.5) $M_{og} = \sqrt{\frac{\chi_M}{K^3}}$; (1.2.5.1) $M_{og} = \sqrt{\frac{9,701 \cdot 10^{33}}{(6,67 \cdot 10^{-11})^3}} = 1,808 \cdot 10^{32} k_g$;

It should not be understood that a star cannot have a mass greater than this value, since this is a cosmic system taken as a standard, with this mass taken as a unit of measurement we will evaluate the size of real stars. From a cosmic point of view, in mathematical relations the mass of any celestial body is expressed by a number of standard units.

The first term of the relationship (1.2.4) $\chi_M = K^3 \cdot M^2$ ; is a universal constant for any cosmic level considered.

### 1.3. DIMENSIONAL CALCULATION RELATIONS OF PARTICLES AND BODIES OF NATURAL HARMONIC SYSTEMS.

For this we resume the relationship; (1.2.0); $c^2 = \frac{Z_{\uparrow} \cdot k_a \cdot M_p}{R_c}$ ; in which; « $c$ » is the speed of light. $Z_{\uparrow}$- is the theoretical maximum number of particles of the same kind in an oscillating harmonic system. ka-is the mass interaction constant of the atomic system. $Mp$ is the mass of the proton, $R_c$- is the radius of the theoretical orbit for which the electron would reach the speed of light. We arrange the terms and obtain. $\frac{R_c}{Z\uparrow} = \frac{k_a \cdot M_p}{c^2}$; we note with

(1.3.2) $r_e = \frac{R_c}{Z\uparrow}$; and we will obtain the calculation relationship of the sizes of particles or bodies, which orbit around the nucleus. (1.3.3)$r_e = \frac{k_a \cdot M_p}{c^2}$; We verify this statement by substituting the known data for the atomic system and obtain;

(1.3.3.1) $$r_e = \frac{1{,}5157 \cdot 10^{29} \bullet 1{,}672 \cdot 10^{-27}}{(2{,}997 \cdot 10^8)^2} = 2{,}8177 \cdot 10^{-15}; m;$$

which represents a theoretical dimension of the electron, within the atomic system, a value that is also found in the specialized literature determined with another relationship like the one below; https://ro.wikipedia.org/wiki/Raza_clasic%C4%83_a_electronului;

$$r_e = \frac{1}{4\pi \cdot \varepsilon} \frac{e^2}{m_e \cdot c^2} = 2{,}81774 \cdot 10^{-15}\, m;$$

As can be seen, the two relationships give the same result.

With the same relation $r_e = \frac{K_g \cdot M}{c^2}$; the radius of the body "$mg$" can also be determined for a galactic system considered as an "elementary system" which can be taken as a unit of comparison. Substituting the gravitational constant and the mass of a star considered as a standard in the nucleus of a galaxy we obtain;

(1.3.3.2) $$r_g = \frac{6{,}67 \cdot 10^{-11} \cdot 1{,}808 \cdot 10^{32}}{(2{,}997 \cdot 10^8)^2} = 1{,}342 \cdot 10^5 m \;;$$

This value represents the minimum size of **a mass standard unit** orbiting in the galaxy. It should be noted that the radius of these stars is very small compared to that observed by astronomical means, but we must consider that here we have determined a size of a mass standard, possibly of a black hole, and not of a real star.

Knowing the sizes of the particles or bodies, which orbit around the nucleus, we find their cross-sectional area using the relationship known from physics; $\boldsymbol{\sigma = \pi \cdot r^2}$;; If we amplify « $\boldsymbol{\sigma}$ » with the interaction constant "$\boldsymbol{Kg}$" we obtain the constant denoted by $\boldsymbol{\Sigma_\sigma}$**;**

(1.3.4) $$\Sigma_\sigma = Kg \cdot \pi \cdot r^2;$$

or replacing the radius of the body with expression (1.3.3) we obtain the relation

(1.3.4.1) $$\Sigma_\sigma = Kg \cdot \sigma = \frac{\pi}{c^4} \cdot \left(Kg^3 \cdot M^2\right);$$

or ; (1.3.5) $$\Sigma_\sigma = \frac{\pi}{c^4} \cdot \chi_M;$$

We will denote this new constant with "Σ_σ" and we will call it "the constant of the section of the particle, or of the body that generates the field" it is an invariant for any cosmic level and has the value;

(1.3.6) $$\Sigma_\sigma = 3{,}792 \;\; [N^3 m^2 s^4 kg^{-4}]$$

The relationship between the three constants **"c", "$\boldsymbol{\chi_M}$", si "$\boldsymbol{\Sigma_\sigma}$"** ;

(1.3.7) $$c = \sqrt[4]{\frac{\pi \cdot \chi_M}{\Sigma_\sigma}} \;;$$

So the speed of light can be expressed in terms of the cosmic system constant $\boldsymbol{\chi_M}$, and the particle cross section constant $\boldsymbol{\Sigma_\sigma}$**;**

## 1.4. PARTICLE DENSITY.

Now we can return to the relationship (1.3.1) $\boldsymbol{\rho_N = \frac{1}{4\pi} \cdot \frac{Z_\uparrow^3 \cdot M}{R_C^3}}$**;** and (1.7.1) $\boldsymbol{M = \alpha \cdot m;}$

which represents the correspondence between the mass « $\boldsymbol{M}$ » in the nucleus and the mass « m » orbiting around the nucleus forming a standard harmonic system. In which « alpha » shows that the nucleus has a mass **1836** times greater than the orbital particle.

After making the necessary substitutions in relation (1.3.1), with relation (1.3.2);

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$$\frac{Z_{\uparrow}^{3}}{R_{C}^{3}} = r_{o}^{3}; \quad \text{and} \quad M{=}\propto.\, m \ ; \quad \text{or} \ ; \ \alpha = \frac{M}{m} = \frac{\nu_{cp}}{\nu_{ce}} = \frac{\lambda_{ce}}{\lambda_{cp}} \cong 1836 \approx 6 \cdot \pi^{5} \ ;$$

rezult ; (1.4.1) $\rho_N = \frac{1}{4\pi} \cdot \frac{\propto \cdot m}{r_o^3};$

the fourth cosmic constant is obtained which has the dimension of a density denoted by "$\rho N$". Substituting the known values from the atomic system as well as from the galactic system we will obtain the value of this constant, as follows;

For the atomic system; $\rho_{atom} = \frac{1}{4\pi}\left[\frac{1836 \cdot 0.910 \cdot 10^{-30}}{(2{,}8177 \cdot 10^{-`15})^3}\right] = 5{,}942 \cdot 10^{15}\,\frac{Kg}{m^3};$

For the galactic system we have the density of the standard bodies;

$$\rho_{Gal} = \frac{1}{4\pi}\left[\frac{1836 \cdot 9.858 \cdot 10^{28}}{(1{,}344 \cdot 10^{5})^{3}}\right] = 5{,}932 \cdot 10^{15}\,\frac{Kg}{m^3};$$

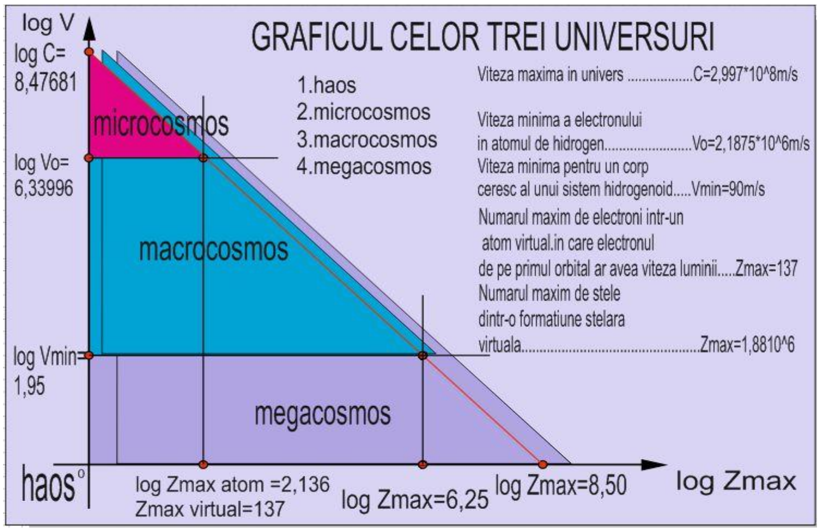
These values are equal for both the atomic system and the galactic system and represent the density of matter condensed in electrons, respectively in black holes in the universe.

**As we have seen before, the four cosmic constants: the speed of light "$c$", the cosmic system constant "$\chi M$", the particle section constant "$\Sigma\sigma$" and the matter hyperdensity constant "$\rho N$" form an invariable quartet for any cosmic level considered. To these is added the proportionality constant of the pair masses $M/m\propto$; which represents the proton-electron mass ratio or the frequency ratio, and inversely with the Compton wavelength ratio for these particles, a ratio that is preserved under certain circumstances, and for all celestial bodies that form natural cosmic systems.**

## 1.5. CLASSIFICATION OF COSMIC LEVELS

As we know, the universe is continuously evolving by reorganizing matter in two directions simultaneously, from the smallest forms of organization, which we have called hypo-cosmos, to the largest forms of organization that we have called hyper-cosmos, at the same time the universe is evolving from the simplest organizational schemes, to the most complex ones.

Currently we only know the microcosmic level represented by the atomic structure that consists of a natural harmonic oscillator, and the macrocosmic level represented by galaxies that have in their composition smaller structures such as star systems, planetary systems and satellite systems and possibly more complex structures such as groups of stars and clusters of galaxies. If we were to represent graphically the main levels of existence of the universe, these would be; The first form of manifestation of material entities that we have called « chaos » or the zero hypocosmic level of organization because there is nothing organized.
The second level of organized existence of matter known as the microcosm populated with subatomic particles, atoms, photons, etc.
Then the third level of manifestation of matter is the macrocosm organized in galaxies, star systems, solar systems and satellite systems.
But nothing prevents the existence of other cosmic levels of organization.




In this study we will focus only on the similarities that can be established between the microcosm and the macrocosm, after which we will extend the analysis to the submicrocosm levels.

Similar to the microcosm, the proportionality constant "α" also operates in the macrocosm, except that, while the microcosm is organized at the level of atomic systems, the macrocosm is organized in galaxy systems, and their subsystems such as; star systems, planetary systems and satellite systems.

If we denote by "$N_c$" the cosmic level considered, and by "$i$" the number of families of systems (i.e. star systems, solar systems, satellite systems, etc.) belonging to a cosmic level, we will be able to establish the following empirical relationship;

$$(1.5.1)\quad i = N_c^2 \;;$$

With this relationship, the indicative table below can be drawn up ;

TABLE CONTAINING THE CLASSIFICATION OF COSMIC LEVELS **table nr.1**

| THE COSMIC DOMAIN CONSIDERED | COSMIC LEVEL *Nc* | NUMBER OF SYSTEM FAMILIES $i = N_c^2$ | NAME OF COMPONENT COSMIC SYSTEMS |
|---|---|---|---|
| **HYPOCOSMOS (Chaos)** | 0 | 0 | **binary system** |
| **MICROCOSM** | 1 | 1 | **Atomic System** |
| **MACROCOSM** | 2 | 4 | **Galactic system**<br>**Stellar system (micro galaxies)**<br>**Planetary system**<br>**Satellite system** |

The number "i" operates as an exponent of the proportionality constant " **α** ", so that the ratio between the mass units "**M**" and "**m**" in a system, must be written as follows;

(1.5.2) **α^i=M/m;** So for the macrocosm we will have the index **i=4** between the mass unit of a star "**M**" in the galactic nucleus and the minimum mass unit "**m**" of a satellite, as the ratio; **α^4=Mg/m**sat ; so that from

$$(1.2.5)\ m_{sat} = \frac{1.808 \cdot 10^{32}}{1836^4} = 1.591 \cdot 10^{19} kg;$$

which represents the rest mass of a celestial body considered the standard unit for satellites, to which we give the gravitational charge number Zg=1. Thus the real mass of any satellite can be expressed in terms of this mass standard, multiplied by the gravitational charge number. *Mg,real= Zg·Mg,o ;*

When we talk about the mass of celestial bodies we will always refer to the standard mass unit for the class of the respective system.

Respecting the dimensional order of celestial bodies, a series of equal ratios can be written between their standard mass units, as follows;

$$(1.5.2.1.)\ \frac{M_g}{m_g} = \frac{M_{st}}{m_{st}} = \frac{M_{pl}}{m_{pl}} = \frac{M_{sat}}{m_{sat}} = \propto$$ ; in which;

Capital letters denote the masses of the bodies in the core of the system, and lowercase letters denote the masses of the bodies orbiting the core of the system under consideration..

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**Mg, mg ;** elementary mass units (standard) specific to galactic systems;

**Mst, mst ;** elementary mass units (standard) specific to stellar systems;

**Mpl, mpl ;** elementary mass units (standard) specific to planetary systems;

**Msat, msat ;** elementary mass units (standard) specific to satellite systems;

So any elementary mass can be obtained with the relation ;

(1.5.2.2); $Mi = m_{sat} \cdot \alpha^{j}$; where "**j**" has values between **0** and **3**.

After we make the necessary substitutions and artifices in the relationship;

$$\rho_N = \frac{1}{4\pi} \cdot \frac{Z_{\uparrow}^{3} \cdot M}{R_C^{3}};$$

in which; **Rc/Zmax= r0** ; **M=∝. m** ; rezult ; (1.4.1) $\rho_N = \frac{1}{4\pi} \cdot \frac{\alpha \cdot m}{r_o^{3}}$;

Knowing these values of the masses that are part of the standard binary systems, we will resume the relationship; (1.2.1) $c^6 = (K^3 \cdot M^2) \cdot \frac{Z_{\uparrow}^{3} \cdot M}{R_c^{3}}$;

and relationships; $\rho_N = \frac{1}{4\pi} \cdot \frac{Z_{\uparrow}^{3} \cdot M}{R_C^{3}}$; respectively $\rho_N = \frac{1}{4\pi} \cdot \frac{\alpha \cdot m}{r_o^{3}}$;

or ; $\rho_N = \frac{\alpha}{3} \cdot \frac{3 \cdot m}{4\pi \cdot r_0^{3}} = \frac{\alpha}{3} \cdot \rho_m$; where $\rho_N$ is the electron mass density

$$\text{and we get: } c^6 = (K^3 \cdot M^2) \cdot \frac{4\pi \cdot \alpha}{3} \cdot \rho_m;$$

$$\text{or ; } c^6 = \left(\alpha^{j}\right)^2 \cdot m_{sat} \cdot \left(\frac{4\pi \cdot \alpha}{3} \cdot K^3 \cdot \rho_m\right);$$

$$\text{we note; } {V_{\uparrow i}}^{6} = m_{sat}\left(\frac{4\pi \cdot \alpha}{3} K^3 \cdot \rho_m\right);$$

and we get; (1.2.1.1) $c^6 = (\alpha^j)^2 \cdot V_{\uparrow i}{}^6$ ;

From which we can obtain a relation that finds the maximum reference velocity "**Vi↑**" in any cosmic system. If "**c**" is the speed of light, alpha is the proportionality constant, and "**j**" is the index characterizing the family to which the system under consideration belongs, we deduce the relation of the maximum orbital velocity for all classes of macrocosmic systems.

$$(1.5.3)\quad Vi\uparrow = \frac{c}{\sqrt[3]{\alpha^j}} \;;$$

In the above relation if we give values of "**J**" between "**0**" and "**3**", we will obtain the series of maximum values of the oscillation or orbiting speeds, typical of the natural harmonic systems in the macrocosm. These speeds are related to the fundamental oscillation period of the system considered, as well as to the dimensions of the orbits much smaller than the orbits of the stars in the galaxy. All cosmic systems are harmonic systems characterized by a fundamental oscillation period and a series of harmonics, which depend on a range of speeds between a minimum speed denoted by "**Vo**" and a maximum speed "**V↑**", which in the case of galaxies approaches the speed of light.

**TABLE OF MAXIMUM VELOCITIES OF BODIES ORBITING A SYSTEM**

**The table nr.1.1.**

| Nr.crt | **Families of cosmic systems.** | **System family index «J»** | **Theoretical maximum orbital speed "Vi↑"** |
|---|---|---|---|
| 1. | galactic systems | 0 | $2.997 \cdot 10^8 m/s$ |
| 2. | star systems | 1 | $2.447 \cdot 10^7 m/s$ |
| 3. | solar systems | 2 | $1.998 \cdot 10^6 m/s$ |
| 4. | satellite systems | 3 | $1.632 \cdot 10^5 m/s$ |

From this table it can be seen that each class (family) of cosmic systems is characterized by an upper limit speed. Thus, we will not be able to find in the universe a planet or a satellite that can move in an orbit with speeds close to the speed of light, as are the stars in the first orbit of some gigantic galaxies.

## CHAPTER 2

## RELATIONSHIPS BETWEEN PARAMETERS OF THE ATOMIC SYSTEM

For the "study of the similarity of systems" we considered as universally valid both some relations specific to atomic physics, taken from specialized books such as "Atomic Physics by Max Born" and others, as well as the relations and data specific to celestial mechanics taken from specialized literature and from the internet with this specific, both fields referring to the way matter is organized in natural systems. Based on these statements, several observations were made that will be applicable to establishing subsequent similarity relations.

If in a complex atom, the charge number "**Z**" actually represents the number of pairs of particles (electron-proton) that oscillate coupled in a system.

In the macrocosmic case, the charge number "**Z**" if it refers to a celestial body of mass "$\boldsymbol{M_i}$ " represents the number of elementary bodies (standard) "$\boldsymbol{M_o}$"by which the gravitational charge of the given body is defined according to the relation; (2.0). $\boldsymbol{Z_i = \frac{M_i}{M_o};}$

### 2.2 RELATIONSHIP BETWEEN FUNDAMENTAL ORBIT RADIUS AND COMPTON WAVELENGTH

According to the energy relations established by Einstein and Planck we can write that (2.2.0) $\boldsymbol{m \cdot c^2 = h \cdot \frac{c}{\lambda_{ce}}}$; sau $\boldsymbol{h = m \cdot c \cdot \lambda_{ce};}$ where "m" is the mass of the electron, "$\boldsymbol{h}$" is Planck's constant, and "$\lambda ce$" is the Compton wavelength for the electron.

But from this relation (1.12) for the ideal atomic system we know that ;

(1.12) $\boldsymbol{m \cdot c^2 = Z_\uparrow \frac{k_a \cdot M \cdot m}{R_c}}$; in care ; $\boldsymbol{Z_\uparrow}$ -is the maximum number of electrons or protons of an ideal atom in which the electrons on the first orbit would have the speed of light.

$\boldsymbol{k_a}$ -is the mass interaction constant at the atom. $\boldsymbol{Rc}$ -represents the theoretical radius of the first orbit for which the electrons would attain the speed of light.

equating the two expressions (2.2.0) with (1.12) we find the relation of the angular momentum constant "$\boldsymbol{h}$"

$$(2.2.1) \qquad \boldsymbol{h = \frac{Z\uparrow \cdot k \cdot M \cdot m}{c} \cdot \frac{\lambda_{ce}}{R_c}};$$

It is observed that by substituting the values in the first part of the expression we obtain:$\boldsymbol{\frac{Z\uparrow \cdot k \cdot M \cdot m}{c} = \frac{137 \cdot 1{,}5157 \cdot 10^{29} \cdot 1{,}672 \cdot 10^{-27} \cdot 0{,}910 \cdot 10^{-30}}{2{,}997 \cdot 10^{8}} = 1{,}054 \cdot 10^{-34}[j \cdot s]}$

this is the very value of "$\frac{h}{2\pi}$" , deci $\frac{\lambda_{ce}}{R_c} = 2\pi$ ; from here we can establish the relationship

(2.2.2) $\lambda_{ce} = 2\pi \cdot R_c$ ; is the Compton wavelength for the electron. where "***Rc***" is the radius of the fundamental orbit for a theoretical atom in which we have **Z max=137**, and at which the electrons on the first orbit have the theoretical speed „ **co** „ close to the speed of light (other influences on the size of the orbits, as happens in real atoms, were not taken into account). If we replace from (1.15) pe $R_c = Z_{\uparrow} \cdot r_e$; the expression of the Compton wavelength as a function of the electron dimensions is obtained;

(2.2.3) $\lambda_{ce} = (2\pi \cdot r_e) \cdot Z_{\uparrow}$; substituting (2.2.2)

in (2.2.o) we obtain Planck's constant in another form, in which the speed of light intervenes, as follows; (2.2.4) $h = 2\pi \cdot m \cdot c \cdot R_c$ ; or ; (2.2.5) $h = m \cdot c \cdot \lambda_{ce}$ ;

### 2.3. DEPENDENCY RELATIONSHIPS BETWEEN PLANCK'S CONSTANT AND PARTICLE SIZES

As can be seen, Planck's constant governs the entire microcosm with all its particles, whether they are organized into atoms or free. In the case of free particles, it is natural that there is an expression of Planck's constant depending on its parameters such as mass, speed, or wavelength.

We start from the classical expression of Planck's constant , $h = 2\pi \cdot m_e \cdot V_0 \cdot R_0$; where "$R_0$" is the radius of the hydrogen atom, and "$V_0$" is the characteristic velocity of the electron on the fundamental orbit. We will do a simple trick, multiply and divide it by the maximum charge number "Z", which is the inverse of the fine structure constant, or more simply, we talk about the ratio between the speed of light and the velocity "$V_0$" of the electron. We observe that ; $V_0 . Z\uparrow = c$; and that the ratio ;

(2.3.0.) $$\frac{R_o}{Z_{\uparrow}^2} = r_e = \frac{0.529 \cdot 10^{-10}}{137^2} = 2.818 \cdot 10^{-15} m;$$

(2.3.1.) « $r_e$ » represents a dimension related to the electron, which we have called its radius, or more precisely the radius of a volume occupied by the electron.

(2.3.2.) So Planck's constant can be written in terms of the radius «$r_e$» and the mass « $m_e$ »of the electron as follows; $h = 2\pi \cdot m_e \cdot c \cdot (Z_{\uparrow} \cdot r_e)$;

(2.3.3) Or, replacing Zmaxim with; $Z\uparrow = \frac{c_o}{V_0}$ ;

we obtain; $\boldsymbol{h = (m_e \cdot c^2) \cdot 2\pi \cdot r_e \frac{1}{V_0}}$; and if we denote the rotation period by "$tr$";

$\boldsymbol{t_r = \frac{2\pi \cdot r_e}{V_0}}$ ; and "*tr*" is the inverse of the frequency $\boldsymbol{t_r = \frac{1}{\nu_e}}$; we have;

$$\boldsymbol{h \cdot \nu_e = m_e \cdot c^2};$$

Therefore, Einstein's relation also shows us that the energy contained in the rest mass of the electron is equivalent to an intrinsic periodic motion of it, having the period equal to the frequency corresponding to the Compton wavelength « $\boldsymbol{\lambda c}$ ». This relation should not be interpreted mechanistically, since the electron is more of a wave than a body, or rather it is a mixture of wave and body, but the equivalence of the apparent movements is obvious. Thus we can determine the rotation period; (2.3.1.0.) $\boldsymbol{t_r = \frac{2\pi \cdot r_e}{V_0} = \frac{\lambda_c}{c}}$;

This assumes that the electron has a proper motion (of the generating quantum) with a period equal to the orbital period around the nucleus with Zmax.

Another expression of Planck's constant can be obtained by replacing in the above relation, the mass of the electron in terms of the mass of the proton "***Mp***", thus resulting in a new expression of Planck's constant in terms of the mass of the proton;

(2.3.1.1) $\boldsymbol{h = 2\pi \cdot M_p \cdot c \cdot \left(\frac{Z_{\uparrow} \cdot r_e}{\alpha}\right)}$; but $\boldsymbol{\lambda_{c,p} = \frac{Z_{\uparrow} \cdot r_e}{\alpha}}$ ; which is the Compton wavelength corresponding to the proton.

Thus, we can write Planck's constant as a function of the proton mass and the Compton wavelength for the proton as "$\boldsymbol{\lambda_{c,p}}$ ".

For this one; (2.3.1.2) $\boldsymbol{h = M_p \cdot c \cdot \lambda_{cp}}$ ;

in which; (2.3.2)$\boldsymbol{\lambda_{cp} = 2\pi \cdot \left(\frac{Z_{\uparrow} \cdot r_e}{\alpha}\right)}$;

but the Compton wavelength for the proton must be related to the dimensions of the proton « ***rp*** » as is the case for the electron.

So it will be possible to write; (2.3.3) $\boldsymbol{\lambda_{cp} = 2\pi \cdot r_p}$;

from atomic physics, the Compton wavelength for the proton is equal to;

$$\boldsymbol{\lambda_{cp} = 1.32140 \cdot 10^{-15}\, m};$$

With relation (2.3.3), substituting the value of the wavelength, we can find the theoretical value of the radius of a volume occupied by a proton as follows;

$$r_p = \frac{\lambda_{cp}}{2\pi} = \frac{1.32140 \cdot 10^{-15}}{2\pi} = 2.103 \cdot 10^{-16}\ m\ ;$$

or from the relation (2.3. 2), we obtain the proton radius as a function of the electron radius;

(2.3.2.1.) $r_p = \frac{Z_{\uparrow} \cdot r_e}{\alpha}$ and substituting (1.16) into (2.3.2.) we obtain a generalized relation for the theoretical radius of the proton;

$$(2.3.4.1)\ r_p = \frac{Z_{\uparrow} \cdot k_a \cdot m_e}{c^2};$$

if we substitute those values into one of the relations, we obtain the theoretical radius of the proton as follows;

$r_p = \frac{137 \cdot 2.8177 \cdot 10^{-15}}{1836} = 2.102 \cdot 10^{-16}$m ; (value close to that obtained experimentally);

Based on these observations we can obtain a second relation of Planck's constant « $h$ », but this time depending on the dimensions of the radius "*rp*" and the proton mass "$M_p$" as follows

(2.3.5) $h = 2\pi \cdot M_p \cdot c \cdot r_p$; substituting the respective values we obtain;

$h = 2\pi \cdot 1,67252 \cdot 10^{-27} \cdot 2,99792 \cdot 10^{8} \cdot 2.102 \cdot 10^{-16} = 6.6222 \cdot 10^{-34}; [J.s]$

Relations (2.3.2) and (2.3.3) give us clearer information on the connection between the generating wave and the dimensions of the respective particles. In fact, particles should not be viewed as objects, but as vibrating volumes of electromagnetic space characterized by a certain wavelength specific to the volume they occupy.

Another relationship can be written between Planck's constant and the atomic interaction constant "*ka*", using the particular expression for the respective atoms in the relationship;

(1.33) $r_e = \frac{k_a \cdot M_p}{c^2}$; and knowing the "$R_c$" radius of the first orbit of the hypothetical atom with " $Z \uparrow$ ";From the relationship(1.2.0); $c^2 = \frac{Z_{\uparrow} \cdot k_a \cdot M_p}{R_c}$; we extract the size of the radius of the theoretical orbit for which the electron corresponds to the speed of light;

$R_c = \frac{k_a \cdot Z\uparrow \cdot M_p}{c^2}$; where ; $Z\uparrow$ is the theoretical maximum possible number of protons in a hypothetical atom and "$M_p$" is the mass of the proton.

We thus find the relationship between the electron radius and the radius of the minimum orbit of the hypothetical atom having the maximum number $\boldsymbol{Z}$ of protons;

$\frac{R_c}{Z\uparrow} = \frac{k_a \cdot M_p}{{c_o}^2} = \boldsymbol{r_e}$; from which we extract the proton mass $\boldsymbol{Mp}$, depending on the electron radius re multiplied by the square of the speed of light **c^2** and related to the mass interaction constant ka at the atomic level:

$M_p = \frac{r_e \cdot c^2}{k_a}$; and we introduce it into expression (2.3.5) the result is the constant of the kinetic momentum as a function of the radii of the electron and proton particles;

$$(2.3.6)\quad h = 2\pi \cdot \frac{c^3}{k_a} \cdot r_e \cdot r_p\ ;$$

**This relationship shows us that the dimensions of the particles themselves depend on the kinetic momentum constant, and on the interaction constant of the system.**

**Or replacing with the Compton wavelength of the electron $\lambda e$ and the proton $\lambda p$ we obtain Planck's constant;**

$$(2.3.6.0.)\quad h = \frac{c^3}{2\pi \cdot k_a \cdot Z_\uparrow} \cdot \lambda_e \cdot \lambda_p;$$

$$h = \frac{(2,997 \cdot 10^8)^3 \cdot 2,426 \cdot 10^{-12} \cdot 1,321 \cdot 10^{-15}}{2\pi \cdot 1,515 \cdot 10^{29} \cdot 137} = 6,615 \cdot 10^{-34} [J \cdot s];$$

Replacing the speed of light with the maximum orbital speed in the relation (2.3.6.0), specific to each family of micro or macrocosmic systems, the interaction constant and the radii of the "standard bodies", we obtain the calculation relation of the kinetic momentum constant for any standard macrocosmic system, thus denoted by ***Hi,*** as follows;

$$(2.3.6.1)\quad H_i = 2\pi \cdot \frac{V_{i\uparrow}^3}{K} \cdot r_{mi} \cdot r_{Mi}\ ;$$

This relation brings together some of the fundamental quantities of a cosmic system.

All these expressions of Planck's constant are related to the mass and dimensions of the particles, as well as the interaction constant corresponding to the respective system.

We have determined all these variants for expressing Planck's constant in order to better understand its importance, since in the macrocosm we will need to verify the sizes of cosmic bodies established by similarity relations, such as the maximum velocity of the system and the dimensions of the radius of the standard bodies.

From the relationship, (2.3.6.0.) $\boldsymbol{h} = \frac{c^3}{2\pi \cdot k_a \cdot Z_\uparrow} \cdot \boldsymbol{\lambda_e} \cdot \boldsymbol{\lambda_p};$ we can deduce the mass interaction constant "***ka***" for the atomic system and the gravitational constant "***K***" for macrocosmic systems as follows;

In the case of the atomic system we have; $\boldsymbol{k_a} = \frac{c^3}{2\pi \cdot Z_\uparrow \cdot h} \cdot \boldsymbol{\lambda_e} \cdot \boldsymbol{\lambda_p};$

we replace the kinetic momentum constant, ; $\boldsymbol{h} = \boldsymbol{m_e} \cdot \boldsymbol{c} \cdot \boldsymbol{\lambda_e};$

(2.3.7) $\boldsymbol{k_a} = \frac{c^3}{2\pi \cdot Z_\uparrow \cdot m_e \cdot c \cdot \lambda_e} \cdot \boldsymbol{\lambda_e} \cdot \boldsymbol{\lambda_p};$ or after simplification we obtain;

(2.3.7.1) $\boldsymbol{k_a} = \frac{c^2 \cdot \lambda_p}{2\pi \cdot Z_\uparrow \cdot m_e};$

$$k_a = \frac{(2,997 \cdot 10^8)^2 \cdot 1,321 \cdot 10^{-15}}{2\pi \cdot 137 \cdot 0,910 \cdot 10^{-30}} = 1,515 \cdot 10^{29} [N.m^2 \cdot kg^{-2}];$$

In the case of the galactic system, by expanding the relation (2.3.7.1) into (2.3.7.2.) we will have; $\boldsymbol{K_g} = \frac{c^2 \cdot \lambda_M}{2\pi \cdot Z_\uparrow \cdot m_0};$ in which we substitute the respective values and we will find the gravitational interaction constant as follows;

number **Zmax=3,325.10^6;** body mass $\boldsymbol{m_0}$**=9,851.10^28 kg**;

the wavelength is; $\boldsymbol{\lambda_M}$**=2π.r=1,55.10^9 m;**

$$K_G = \frac{(2,997 \cdot 10^8)^2 \cdot 1,55 \cdot 10^9}{2\pi \cdot 3,325 \cdot 10^6 \cdot 9,851 \cdot 10^{28}} = 6,7 \cdot 10^{-11}; [N.m^2 \cdot kg^{-2}];$$

Analyzing the units of measurement of the interaction constant, we notice that it can also be written; [N.m^2/kg^-2]=kg.m/s^2.m^2/kg^-2=[(m^3.s^-2)/kg];

but; m^3/kg=1/ $\rho_m$ ; the inverse of the density of matter denoted « $\rho_m$ »

and; s^-2= f^2 ; respectively the square of a frequency.

**So the interaction constant at the atomic level k_a represents the ratio between the square of the proton frequency and the density of the volume occupied by the mass of the vibrating**.

From the relationship (2.3.7.1) ;$\boldsymbol{k_a} = \frac{c^2 \cdot \lambda_p \cdot \propto}{2\pi \cdot Z_\uparrow \cdot M_p};$ we can replace the speed of light by;

$\boldsymbol{c} = \boldsymbol{\lambda_p . v_p};$ so **ka** becomes; $\boldsymbol{k_a} = \frac{(\lambda_p{}^2 \cdot v_p{}^2) \cdot \lambda_p \cdot \propto}{2\pi \cdot Z_\uparrow \cdot M_p} = \left(\frac{\propto}{2\pi \cdot Z_\uparrow}\right) \cdot \left(\frac{\lambda_p^3}{M_p}\right) \cdot \boldsymbol{v_p^2};$

Where the inverse of the density is; $\frac{1}{\rho_M} = \frac{\lambda_p^3}{M_p}$;

If we replace with the inverse of the density we have; (2.3.7.2) $k_a = \left(\frac{\propto}{2\pi \cdot Z_{\uparrow}}\right) \cdot \frac{\nu_p^2}{\rho_M}$;

For the atomic system, the Compton frequency of the proton is; ***$\upsilon_p$=2,268.10^23*** 1/s**;**

Pregnancy number ***Z max=137***; $\propto =$ **1836**;

The density is;$\rho_M = \frac{M_p}{\lambda_p^3} = \frac{1.672 \cdot 10^{-27}}{(1.321 \cdot 10^{-15})^3} = 7.253 \cdot 10^{17}; [kg/m^3]$;

Substituting these data into the "ka" relation, we obtain the interaction constant as a ratio between the square of the Compton frequency for the proton and the density of the space occupied by the proton vibrating at its Compton wavelength.

$$k_a = \frac{\propto}{2\pi \cdot Z_{\uparrow}} \cdot \frac{\nu_p^2}{\rho_M} = \left(\frac{1836}{2\pi \cdot 137}\right) \cdot \frac{(2.268 \cdot 10^{23})^2}{7.253 \cdot 10^{17}} = 1.513 \cdot 19^{29}; [kg^{-1} \cdot m^3 \cdot s^{-2}]$$

This value of the constant "k_a" was also obtained using relation (1.5.1.1) in the first chapter.

**We will extend this relationship to the galactic system;**

$$(2.3.7.3) \qquad K_g = \frac{\propto}{2\pi \cdot Z_{g\uparrow}} \cdot \frac{\nu_M^2}{\rho_M};$$

Where; "$\nu_M$" represents the frequency corresponding to the generating gravitational wave similar to the "Compton" wavelength in the case of the atom thus;$\nu_M = \frac{M_g \cdot V_{\uparrow}^2}{H_g}$;

si " $V_{\uparrow}^2$" the maximum squared velocity which in the case of the galaxy is the speed of light itself, and "Hg" is the angular momentum constant for the system considered.

***Zgmax=3,325.10^6***; the maximum number of elementary bodies that enter the nucleus.

The mass of the elementary body in the core of the galactic system; ***Mo,g=1.81.10^32*** **kg;**

The wavelength is given by "**r**" which is the theoretical radius of the standard body.

***$\lambda_M$=2π.r=1.55.10^9 m;***

The average density of the volume in which the unit mass oscillates is given by the ratio between the mass of the standard body and the cube of the wavelength of the nucleus.

$$\nu_M = \frac{c}{\lambda_M} = \frac{2,997 \cdot 10^8}{1,55 \cdot 10^9} = 0,192; [1/s];$$

The average density; $\rho_M = \frac{Mo,g}{\lambda_M^3} = \frac{1.81 \cdot 10^{32}}{(1,55 \cdot 10^9)^3} = 4.86 \cdot 10^4; [kg/m^3];$With this data we calculate the value of the gravitational constant at the galactic level as follows;

$$K_g = \left(\frac{1836}{2\pi \cdot 3,325 \cdot 10^6}\right) \cdot \frac{0,192^2}{4.86 \cdot 10^4} = 6,67 \cdot 10^{-11}; [kg^{-1} \cdot m^3 \cdot s^{-2}];$$

We observe that in both the atomic and galactic systems, the frequency and wavelength of the mass-generating quantum determine the value of the mass interaction constant for complementary particles (proton-electron) both at the atomic level and for complementary cosmic bodies at the galactic level.

**We will redo the evaluation in the case of the Solar system;**
in which; $Z_\uparrow = 2.24 \cdot 10^4$; s the maximum number of the elementary body that enter the system.
The mass of the reference body in the core of the system; $M_{o,s} = 5.369 \cdot 10^{25}$ kg;

The wavelength is; $\lambda_M = 2\pi.r$ ; $\lambda_M = 6.95 \cdot 10^4$ m ; where "$r_0$" is the radius of the reference body.
The maximum speed allowed in the system is **V=1,99.10^6** m/s; according to the table no;1.1.

The density is given by the ratio between the mass of the orbiting standard body and the cube of the wavelength of the body in the nucleus.

The frequency "$\lambda_M$" is given by the ratio between the maximum velocity "**V↑**" corresponding to the family of systems considered and the wavelength of the standard body of the respective nucleus;" $\lambda_M$"; $\nu_M = \frac{V_\uparrow}{\lambda_M} = \frac{1,99 \cdot 10^6}{6,95 \cdot 10^4} = 28,63; [1/s];$

The density "$\rho_M$" is given by the ratio between the mass of the particle orbiting the nucleus and the volume occupied by the wavelength of a standard mass in the nucleus

$$.\rho_M = \frac{M_S}{\lambda_M^3} = \frac{5.369 \cdot 10^{25}}{(6,95 \cdot 10^4)^3} = 1.599 \cdot 10^{11}; [kg/m^3];$$

With these known data we apply the relationship (2.3.7.3) $K_g = \frac{1}{2\pi \cdot Z_\uparrow} \cdot \frac{\nu_M^2}{\rho_M};$

we substitute those values and find the gravitational constant at the solar system level.

$$K_g = \left(\frac{1836}{2\pi \cdot 2,24 \cdot 10^4}\right) \cdot \frac{28,63^2}{1.599 \cdot 10^{11}} = 6,687 \cdot 10^{-11}; [kg^{-1} \cdot m^3 \cdot s^{-2}];$$

The same relationship can be calculated for each planet, provided we respect the appropriate data for the family of systems, for example for planets we have;

The number of charges **Zmax=1830**; maximum number of standard units entering the system.

- the elementary body orbiting the system; $M = 2.924 \cdot 10^{22}$ kg **;**

-The wavelength is; $2\pi \cdot r_M = \lambda_M = 4.63 \cdot 10^2\ m$; where "$r_M$" is the radius of the elementary body located in the core of the system.- The maximum orbital speed allowed in the system is; ***V =1,63.10^5*** *m/s*; according to the table (1.1.) pag.20.

The natural frequency of the body "***M***" is given by the ratio between the maximum speed allowed for planets compared to the wavelength corresponding to the respective orbit; $\nu_M = \frac{V_\uparrow}{\lambda_M} = \frac{1,63 \cdot 10^5}{4,63 \cdot 10^2} = 351; [1/s];$

$$\rho_m = \frac{M}{\lambda_M^3} = \frac{2.924 \cdot 10^{22}}{(4,63 \cdot 10^2)^3} = 2.946 \cdot 10^{14}; [kg/m^3];$$

$$K_g = \left(\frac{1836}{2\pi \cdot 1,836 \cdot 10^3}\right) \cdot \frac{351^2}{2.946 \cdot 10^{14}} = 6,66 \cdot 10^{-11}; [kg^{-1} \cdot m^3 \cdot s^{-2}];$$

As can be seen in all cases the above relationship is verified. So the smaller the family of systems is dimensionally, the higher the frequency of the core and the density increase.

# CHAPTER 3
# RELATIONS OF SIMILARITY BETWEEN MICRO AND MACRO COSMOS
## 3.1. ESTABLISHING THE SIMILARITY CONSTANT

Returning to the proportionality relationship (1.10), empirically, a similarity

relationship can be established between the masses of two cosmic systems of different levels as follows; (3.1) $M_g = \propto^s \cdot M_p;$ in which: $\propto = 1836,089$ is the constant of proportionality. The exponent "**S**" will be called the "similarity constant", and « ***Mp*** » represents the rest mass of the proton, and « ***Mg*** » represents the mass of a star in the galactic nucleus.

From this relationship we can find the value of the similarity constant "**S**" by taking the logarithm of relationship (3.1) as follows: **(3.2);** $S = \frac{\log \frac{M_g}{M_p}}{\log \propto}$ **;** substituting the known values we have; Mass of the proton $M_p$ ; $M_p = 1.672 \cdot 10^{-27}$ kg ;

From the relation (1.2.5.1) we extract the mass « ***Mg*** » of the elementary star from the galactic nucleus.

$$M_g = \sqrt{\frac{9,701 \cdot 10^{33}}{(6,67 \cdot 10^{-11})^3}} = 1,808 \cdot 10^{32} k_g;$$

**Thus the constant of similarity between micro and macrocosm is;**

$$(3.2.1) \quad s = \frac{log \frac{1,808 \cdot 10^{32}}{1.672 \cdot 10^{-27}}}{log\, 1836,089} = 18.087114;$$

Once the similarity constant S is established, it is still necessary to introduce a system constant "***β***", which will allow us to find the other masses for all families of systems such as: satellites, planets, stars, etc.

For this we return to the series of ratios (1.17), from where we can write a relationship between all the masses of the elementary bodies that are found in the core of macrocosmic systems; (galaxies, stellar systems or microgalaxies, solar systems and planetary systems with satellites). (3.2.2) $M_g = \propto \cdot M_{st} = \propto^2 \cdot M_{sol} = \propto^3 \cdot M_{pl};$

## The system coefficient "*β*"

which indicates to us which class of cosmic systems the respective body belongs to, can be found for each type of system separately with the relation**;**

$$(3.3) \quad \beta = \sqrt[S]{\propto j} \;;$$

where "***j*** " takes values from **"0"** to **"3"** depending on the family of systems considered. Substituting (3.3) into (3.1) we obtain the generalized similarity relations for all rest masses of macrocosmic systems.

$$(3.4) M_j = M_p \cdot \left(\frac{\propto}{\beta_j}\right)^S; \quad \text{si ;} \quad (3.5)\, m_j = m_e \cdot \left(\frac{\propto}{\beta_j}\right)^S;$$

Using relations (3.4) and (3.5), the standard masses with gravitational charge Z=1, common to all standard macrocosmic systems, were determined, according to the table below. These will be called Cosmic Nuclear Mass Units, for the standard masses forming the nucleus of the system, and Cosmic Orbital Mass Units, for the standard masses orbiting around the nucleus.

**TABLE OF ELEMENTARY MASS UNITS FOR ALL FAMILIES OF COSMIC SYSTEMS**

the table nr.2

| The system considered | Index "*J*" | System coefficient "$\beta$" | Elementary mass of the nucleus "*Mo*"[kg] (COSMIC NUCLEAR MASS UNIT) | Elementary orbital mass "$m_o$" [kg] (COSMIC ORBITAL MASS UNIT) |
|---|---|---|---|---|
| Galaxy | 0 | 1 | $1.810 \cdot 10^{32}$ | $9.851 \cdot 10^{28}$ |
| Star system | 1 | 1.5151447 | $9.851 \cdot 10^{28}$ | $5.369 \cdot 10^{25}$ |
| Planetary system (solar) | 2 | 2.2956633 | $5.369 \cdot 10^{25}$ | $2.924 \cdot 10^{22}$ |
| Satellite systems | 3 | 3.4782618 | $2.924 \cdot 10^{22}$ | $1.592 \cdot 10^{19}$ |
| | | | | |

### 3.2.INTERACTION CONSTANT FOR MICROCOSMOS

Knowing the value of the interaction constants "*K*" for both the microcosm and the macrocosm, and the universal cosmic constant , from ;

$$(1.3.4.1) \qquad \chi_\sigma = K \cdot \sigma = \frac{\pi}{c^4} \cdot \left(K^3 \cdot M^2\right);$$

using the mass similarity relation, the similarity relation for the interaction constant can be established: where « ***Kg*** » for the macrocosm and « ***ka*** » for the microcosm;

We can write the equality; $K_g^3 \cdot M_g^2 = k_a^3 \cdot M_a^2$ ; according to the similarity relation (3.1) we replace "$M_g$" with ; $M_g = \alpha^s \cdot M_p$ and we obtain:

$$(3.6) \qquad K_g = k_a \cdot \left(\sqrt[3]{\frac{1}{\alpha^2}}\right)^S;$$

The above expression represents the similarity relationship between micro and macrocosm for determining the mass interaction constant "$K$", and can be used to determine the atomic system constant as follows; (3.6.1) $k_a = K_g \cdot \left(\sqrt[3]{\alpha^2}\right)^S;$

that is, we can recalculate the interaction constant in the microcosm, since for the macrocosm its value is known exactly.

$$k_a = 6.67 \cdot 10^{-11} \cdot \left(\sqrt[3]{1836^2}\right)^{18.087114} = 1.514 \cdot 10^{29}(N.m^2.kg);$$

**3.3. SIMILARITY RELATIONS BETWEEN THE DIMENSIONS OF ATOMIC PARTICLES AND ELEMENTARY BODIES.**

If we return to the relation (1.10) $r_o = \frac{K \cdot M}{c^2}$; we notice that we now know the similarity relations for the interaction constant as well as for the masses of the standard bodies.

If we replace "$K$" and "$M$" with relations (3.1) and (3.6) in relation (1.10), we obtain the relation for determining the radius of elementary bodies for the macrocosm, denoted by "$r_g$" depending on the theoretical radius of the electron.

$$(3.7) \quad r_g = r_e \cdot \left(\sqrt[3]{\alpha}\right)^S;$$

This represents the similarity relation for the radius of the elementary body « $m_g$ » which is part of the galactic system, that is ;

$$r_{0g} = 2,8177 \cdot 10^{-15} \cdot \left(\sqrt[3]{1836}\right)^{18.087114} = 1.342 \cdot 10^5 \ m;$$

value that agrees with the one obtained with relation (1.10). For generalization we can rewrite relation (1.10) as follows; $r_{0i} = \frac{K \cdot M_i}{V_{max,i}^2};$

Taking into account the central mass "***Mi***" and the maximum orbital velocity "***Vmax,i***", for each type of system the minimum radius of the standard body for the respective system is obtained. The similarity relation for this case ;

$$(3.7.1)\quad r_{0m} = r_{el} \cdot \left( \sqrt[3]{\frac{\alpha}{\beta_j}} \right)^{s} ;$$

In the table below, the mass and radius of the standard bodies are calculated for all families of macrocosmic systems, as follows;

**TABLE DETERMINING THE MINIMUM RADIUS OF ELEMENTARY BODIES ORBITING AROUND THE NUCLEUS**

**table no.3**

| The binary system considered | Index "J" | System coefficient "$\beta$" | Elementary orbital mass "$m_0$"[kg] | Radius of the elementary body "$r_{0m}$" [m] |
|---|---|---|---|---|
| Galactic Systems | 0 | 1 | $9.851 \cdot 10^{28}$ | $1.344 \cdot 10^{5}$ |
| Star systems (microgalaxies) | 1 | 1.5151447 | $5.369 \cdot 10^{25}$ | $1.097 \cdot 10^{4}$ |
| Planetary systems (solar) | 2 | 2.2956633 | $2.924 \cdot 10^{22}$ | $0.896 \cdot 10^{3}$ |
| Satellite systems | 3 | 3.4782618 | $1.592 \cdot 10^{19}$ | $0.732 \cdot 10^{2}$ |

As can be seen, the mass of elementary bodies has a rate equal to 1/1836 times, while the radius of these bodies has a rate equal to the cube root of the alpha coefficient.

For now, we stop here with establishing the similarity relations, since it is necessary to determine some cosmic quantities without which we cannot go further.

# CHAPTER 4

## THE "REDUCED MOMENTUM" CONSTANT

To determine the following similarity relations, we need new data, such as the gravitational charge number "***Z maximum***" for the galaxy, as well as the initial velocity "***Vo***" for the macrocosm. For this we should be able to study several cosmic systems from the same family, and we only have our solar system with its satellite systems at our disposal.

One of the most important quantities that characterize a cosmic system is its angular momentum, namely the equivalent of Planck's constant "***h***", which must have the same value for all systems in the same class.

More precisely, all satellite systems in our solar system must have the same constant for angular momentum, which we will denote by "***Ho,sat***".

What prevents us from finding the value of this constant is, firstly, the fact that satellites have different masses and sizes, and secondly, the fact that we do not know what the first possible orbit of each planet is, or what the principal quantum number of each satellite is.Pentru a depasi acest impediment, vom introduce provizoriu o constanta a momentului cinetic pentru o masa egala cu unitatea. Aceasta constanta o vom nota cu "$H_u$" si o vom denumi **constanta momentului cinetic redus la unitatea de masa elementara.**

So; (4.1) $H_u = 2\pi \cdot [m] \cdot V_1 \cdot R_1$ ;

and for a satellite in orbit with quantum number "***n***" we will have the relationship;

(4.2); $n \cdot H_u = 2\pi \cdot [m] \cdot V_n \cdot R_n$ ;

Since we do not know the principal quantum number "n" for any satellite, we will consider the value of "***Hu***" as the minimum increase "$\Delta H$_(u,min)" between the unit angular momentums of two satellites occupying two closest successive orbits.

Adica:(4.3) $H_u = \Delta H_{u,min} = 2\pi \cdot [m] \cdot V_{n+1} \cdot R_{n+1} - 2\pi \cdot [m] \cdot V_n \cdot R_n$ ;

To apply this relationship, it was necessary to draw up a table with the data of the main satellite systems, Earth-Moon, Jupiter, Saturn, Uranus, and Neptune. Knowing the rotation periods of these satellites, their orbital velocities were calculated, after which the following table was drawn up:

## Table of the main satellite systems, with determination of unit angular momentum and orbital quantum number

table no.4

| Name of the system and satellites | Radius "R" of the orbit $\times 10^8 m$ | Satellite "V" speed. $\times 10^3 m/s$ | Unitary kinetic moment $\times 10^{12}$ (J.s) $\frac{n \cdot H_u}{2\pi} = [m] \cdot V_n$ | The increase in kinetic momentum between two satellites $\Delta H_u \times 10^{12} J \cdot s$ | Unit kinetic momentum constant $\frac{H_u}{2\pi} \times 10^{12} (J \cdot s)$ | Principal quantum number. rounded value | Radius of the first orbit $\times 10^5$ (m) | First orbit speed $\times 10^3$ (m/s) | Unit kinetic momentum constant. Recalculate $\frac{H_U}{2\pi} \times 10^{12}$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Earth Moon System** | 3. 844 | 1. 023 | 0. 393 | - | **0. 393** | 1 | 3844. 0 | 1. 023 | **0.393** |
| **The Jupiter system** | | | | | **0. 270** | | 5. 75 | 468. 7 | **0. 269** |
| Amaltheia | 1. 805 | 26. 360 | 4. 757 | - | | 18 | 5. 570 | 474. 40 | |
| Io | 4. 216 | 17. 330 | 7. 306 | 2. 549 | | 27 | 5. 783 | 467. 90 | |
| Europa | 6. 708 | 13. 730 | 9. 210 | 1. 904 | | 34 | 5.802 | 466. 80 | |
| Ganymede | 10. 700 | 10. 870 | 11. 640 | 2. 430 | | 43 | 5. 789 | 467. 50 | |
| Callisto | 18. 820 | 8. 204 | 15. 440 | 3. 800 | | 57 | 5. 795 | 467. 60 | |
| _ | 114. 700 | 3. 328 | 38. 170 | 22. 730 | | 141 | 5. 609 | 475. 90 | |
| _ | 118. 500 | 3. 268 | 38. 730 | 0. 560 | | 143 | 5. 714 | 470. 60 | |
| _ | 118. 000 | 3. 305 | 39. 000 | **0. 270** | | 144 | 5. 690 | 475. 90 | |
| _ | 212. 000 | 2. 443 | 51. 800 | 12. 800 | | 192 | 5. 750 | 469. 10 | |
| _ | 226. 000 | 2. 373 | 53. 630 | 1. 890 | | 198 | 5. 764 | 469. 90 | |
| _ | 235.000 | 2. 313 | 54. 350 | 2. 550 | | 199 | 5. 816 | 464. 80 | |
| **The Saturn system** | | | | | **0. 231** | | 14. 67 | 160. 40 | **0,235** |
| Ianus | 1. 580 | 15. 330 | 2. 422 | - | | 10 | 15. 800 | 153. 30 | |
| Mimas | 1. 854 | 14. 310 | 2. 653 | **0. 231** | | 11 | 15. 320 | 157. 40 | |
| Encelade | 2. 379 | 12. 620 | 3. 002 | 2. 728 | | 13 | 14. 070 | 164. 00 | |
| Thetys | 2. 945 | 11. 320 | 3. 333 | -2. 050 | | 14 | 15. 020 | 158. 40 | |
| Titan | 12. 210 | 5. 567 | 6. 797 | 2. 325 | | 29 | 14. 510 | 161. 40 | |
| Hyperion | 14. 790 | 5. 052 | 7. 472 | 0. 675 | | 32 | 14. 440 | 161. 60 | |
| Iapet | 35. 600 | 3. 263 | 11. 610 | 4. 145 | | 50 | 14. 240 | 163. 10 | |
| Phoebe | 129. 400 | 1. 710 | 22. 130 | 1. 051 | | 96 | 14. 040 | 164. 10 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sistemul Uranus** | | | | | **0. 190** | | 72. 350 | 28. 20 | **0. 202** |
| 1986 U 9 | 0. 591 | 9. 770 | 0. 577 | - | | 3 | 65. 66 | 29. 30 | |
| Miranda | 1. 230 | 6. 343 | 0. 780 | 0. 202 | | 4 | 76. 87 | 25. 30 | |
| Ariel | 1. 917 | 5. 529 | 1. 059 | 0. 279 | | 5 | 76. 68 | 27. 60 | |
| Umbriel | 2. 670 | 4. 685 | 1. 250 | **0. 190** | | 6 | 74.16 | 28. 10 | |
| Titania | 4. 380 | 3. 658 | 1. 602 | 0. 352 | | 8 | 68. 43 | 29. 20 | |
| Oberon | 5. 859 | 3. 164 | 1. 853 | 0. 251 | | 9 | 72. 33 | 28. 40 | |
| **he Neptune System** | | | | | **0.188** | | 54. 79 | 35. 49 | **0.194** |
| Naiad | 0. 482 | 11. 910 | 0. 574 | - | | 3 | 53. 55 | 35. 73 | |
| Thalassa | 0. 500 | 11. 690 | 0. 584 | 0. 010 | | 3 | 55. 50 | 35. 07 | |
| Despina | 0. 525 | 11. 410 | 0. 599 | 0. 015 | | 3 | 58. 30 | 34. 23 | |
| Galatea | 0. 619 | 10. 508 | 0. 650 | 0. 051 | | 3 | 68. 77 | 31. 52 | |
| Larissa | 0. 735 | 9. 643 | 0. 708 | 0. 058 | | 4 | 45. 93 | 38. 57 | |
| Proteus | 1. 176 | 7. 623 | 0. 896 | **0. 188** | | 5 | 47. 04 | 38. 115 | |
| Triton | 3. 547 | 4. 389 | 1. 556 | 0. 660 | | 8 | 55. 42 | 35. 112 | |
| Nereid | 55. 134 | 1. 113 | 6. 136 | 4. 580 | | 32 | 53. 84 | 35. 616 | |

Thus, according to table no. 3, column 6, the value of the unitary angular momentum for each system could be established, as well as the principal quantum numbers “n” for the occupied orbits. With the help of the principal quantum numbers (taken with integer values), the radii of the fundamental orbits “R1” and their proper velocities, respectively “V1”, were determined. With “V1” and “R1” the unitary angular momentum “Hu” was recalculated, after which the data were synthesized in the following table:

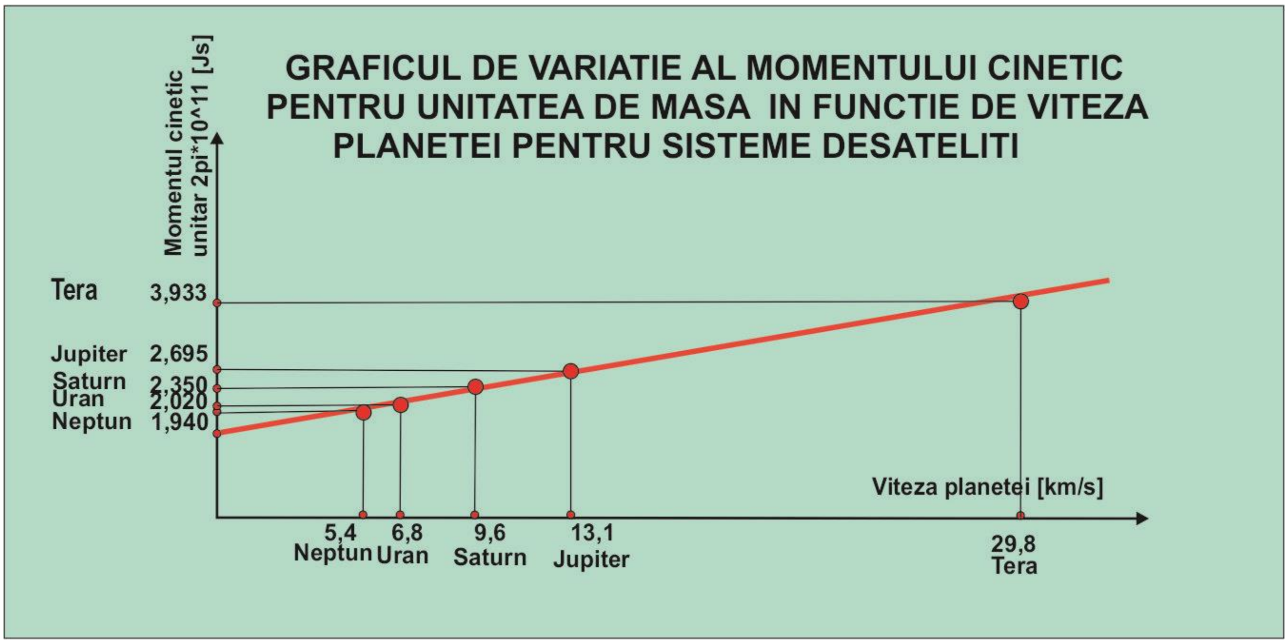
**TABLE OF UNIT KINETIC MOMENTUM CONSTANT**

table no.5

| The system of satellites of the planet: | The speed of the planet in orbit around the Sun (m/s) | The constant of the unit kinetic momentum “Hu” of the satellite system [J.s] |
|---|---|---|

| | | |
|---|---|---|
| Earth | 29800 | $2\pi \cdot 3.933 \cdot 10^{11}$ |
| Jupiter | 13100 | $2\pi \cdot 2.695 \cdot 10^{11}$ |
| Saturn | 9600 | $2\pi \cdot 2.350 \cdot 10^{11}$ |
| Uran | 6800 | $2\pi \cdot 2.020 \cdot 10^{11}$ |
| Neptun | 5400 | $2\pi \cdot 1.940 \cdot 10^{11}$ |

Below is the graph of the variation of the unit angular momentum depending on the speed of The respective planets;




**The graph above reveals a very important discovery. It is clearly seen that for the same family of systems, the unit kinetic momentum is dependent on the velocity of the nucleus in the respective system, the further the planet is from the Sun, the more the unit kinetic momentum decreases.**

**This assumes that all cosmic quantities of a system that are dependent on the constant of angular momentum are variable, depending on the speed of movement of the nucleus. The lower the speed of the nucleus, in this case of the planet, the lower the angular momentum approaches a minimum value denoted by “"ΔH(0,sat)”. The initial velocity for the macrocosm was denoted by “Vo”, and represents the velocity proper to the “initial state” of the bodies that form binary systems of the “hydrogenoid” type. This**

**velocity is different from zero, and the rest mass of the bodies "*Mo* " and "*mo*" is defined only for the velocity "*Vo*".**

## CHAPTER 5

### 5.1. DETERMINATION OF THE SPEED COEFFICIENT " $\varphi$ "

The dependence of the angular momentum on the velocity of the nucleus suggests the idea of introducing a coefficient called "velocity coefficient " $\varphi$" for the correction of the standard angular momentum, as well as other quantities such as: mass, orbit radius, body radius and quantities derived from these.

We will define "the velocity coefficient **φm, φM,** of the body of mass "**m**" or "**M**", as the square root of, the ratio of the orbital velocity "**V**", to the initial velocity "**Vo**", that is;

$$(5.1)\quad \varphi_m = \sqrt{\frac{V_m}{V_o}};\ \text{or;}\ \varphi_M = \sqrt{\frac{V_M}{V_o}}\ ;$$

As we have stated previously, the velocity coefficient influences all the quantities of a real system, compared to a standard system at rest. Thus the real mass of the body "*m*" in motion will be expressed by the relation;

$$\textbf{(5.2)}\qquad m = Z_m \cdot m_o \cdot \varphi_m;$$

**With the relation (5.2), we can find how many times the standard elementary mass "mo" is contained in the real mass "m" of a celestial body.**

We will denote by "*Zm*" the ratio between the real mass of the body "*m*", and the standard mass "*mo*" corrected with the velocity factor "$\varphi_m$", that is, the gravitational charge number of a moving celestial body is given by;

$$(5.3)\ Z_m = \frac{m}{\varphi_m \cdot m_o}; \qquad \text{respectively}(5.4)\quad Z_M = \frac{M}{\varphi_M \cdot M_0};$$

As can be seen, the number « Zm » gives us the information, how many times more intense is the gravitational field of the real celestial body, compared to a standard body for the respective system. The velocity coefficient is different in the case of the nucleus compared to the orbital body, which is why it was applied to the symbol « φ », followed by the index m or M, as the case may be.

## 5.2. ESTABLISHING THE INITIAL VELOCITY VALUE FOR THE MACROCOSM

The charge number "***Zm***" or "***ZM***" is the equivalent of the number "***Z***" in the atomic system, with the observation that in the macrocosm all celestial bodies can have their own number "***Z***", through which we can express the mass of the real body in terms of the mass of an elementary body considered a standard. In the atomic system, the "***Z***" number of an atom can be found by the ratio between the electron speed « ***V1*** » on the fundamental orbit and the minimum speed « ***V0*** » corresponding to the electron in the hydrogen atom considered as the standard;

(5.2.1) $Z_M = \frac{V_1}{V_0}$ **; likewise in the macrocosm the number "*Z*" for the nucleus of a system, can be found with the same relationship, but also with the relationship**

$$(5.4)\ Z_M = \frac{M}{\varphi_M \cdot M_0};$$

where: "***V*1**" - represents the velocity corresponding to the fundamental orbit of the system with "$Z_M$" and "***Vo***" represents the initial velocity for the macrocosm in the case of a hydrogenoid harmonic system with ***Z*=1.**

If we equate relations (5.2.1) with (5.4) we will obtain: $Z_M = \frac{V_1}{V_0} = \frac{M}{\varphi_M \cdot M_0}$;

in this equality we replace " $\varphi_M$ " using the relation (5.1) $\varphi_M = \sqrt{\frac{V_M}{V_o}}$; result;

(5.5) $\frac{V_1}{V_0} = \frac{M}{M_0 \cdot \sqrt{\frac{V_M}{V_0}}}$ ; we take out $V_0$; $\quad {V_0}^3 = \frac{M_0^2}{M^2} \cdot V_1^2 \cdot V_M$ ;

$$(5.6)\ V_0 = \sqrt[3]{\frac{M_0^2}{M^2} \cdot V_1^2 \cdot V_M};$$

with this relationship we can determine the initial velocity for bodies in the macrocosm, if we substitute the real values of a known system, such as the Earth-Moon system, in which:

***Mo-*** represents the mass of an elementary body of the planets ;

$M_0 = 2.924 \cdot 10^{22}\ kg$, according to table no. 2 page 30;

***M*** - represents the real mass of the Earth, that is: $M = 5.973 \cdot 10^{24}\ kg$;

$VM$- represents the speed of the Earth in orbit around the Sun, $V_M = 2.98 \cdot 10^4 m/s$ ;

$V1$- represents the speed of the Moon in orbit around the Earth, because the Moon is right on the Earth's fundamental orbit (we will see this later).In care viteza Lunii pe orbita este;

$$V_1 = 1.023 \cdot 10^3 m/s \ ;$$

Substituting the above values into relation (5.6) we obtain: (5.6.1)

$$V_0 = \sqrt[3]{\frac{(2.924 \cdot 10^{22})^2}{(5.973 \cdot 10^{24})^2} \cdot (1.023 \cdot 10^3)^2 \cdot 2.98 \cdot 10^4} = 90,745 \ m/s \ ;$$

If we redo the calculation in the case of the Sun, knowing that; $M_0 = 5.368 \cdot 10^{25} \ kg$ conform tabelului nr.2 pag.30.

$M$ - represents the real mass of the Sun, that is: $M = 1.99 \cdot 10^{30} \ kg$ ;

$V_M$-represents the speed of the Sun in orbit; $V_M = 2.2 \cdot 10^5 m/s$ ;

$V_1$- represents the theoretical speed corresponding to the first orbit around the Sun. $V_1 = 6.55 \cdot 10^4 \quad m/s$;

We obtain the minimum speed;

$$\textbf{(5.6.2)} \quad V_o = \sqrt[3]{\frac{(5.368 \cdot 10^{25})^2 \cdot (6.55 \cdot 10^4)^2}{(1.99 \cdot 10^{30})^2}} (2.2 \cdot 10^5) = 88.22 \ m/s;$$

Cunoscind acum “viteza initiala” pentru macrocosmos, de aproximativ ***90m/s***, cit si “viteza initiala” pentru sistemul atomic ca fiind $V_{0.at} = 2.188 \cdot 10^6 \ m/s$ ;

putem stabili o relatie de similitudine intre cele doua marimi utilizind constanta de proportionalitate “$\alpha$“ si constanta de similitudine “$S$”.

The relationship that responds to these conditions, established empirically, is; (5,6) $V_{o,g} = V_{o,a} \cdot \left(\frac{2}{\sqrt[6]{\alpha}}\right)^S$ ; With this relationship we will recalculate the value of the “initial velocity”. $V_{o,g} = 2.188 \cdot 10^6 \left(\frac{2}{\sqrt[6]{1836}}\right)^{18.087114} = 88.26 \ m/s;$

Here, as through similarity relations, the same result is reached, so the minimum orbital speed for a celestial body, for the macrocosm is between **88.26 m/s and 90.7 m/s,** values that are very close. In the following, I will consider in the calculations the initial speed in the macrocosm close to **90 m/s.** This minimum speed refers only to bodies that are part of a binary macrocosmic system in which both the nucleus and the body that orbits the nucleus have this minimum speed of ~ 90 m/s;.

# CHAPTER 6

## DETERMINATION OF THE "Zmax" NUMBER FOR THE MACROCOSM - SIMILARITY RELATIONS.- PART TWO-

Knowing from the atomic system that the number "***Zmax***" can be calculated with the ratio between the speed of light "C" and the minimum speed "***Vo***", similarly for the galaxy we will have: $Z_{\uparrow g} = \frac{C}{V_o}$; or substituting with the known values we have;

$$Z_{\uparrow g} = \frac{2.9979 \cdot 10^8}{90} = 3.33 \cdot 10^6;$$

This represents the number of star systems contained in a galaxy, considering that the speed of a body cannot exceed the speed of light.

The similarity relation that corresponds to this value is found using rel; (5.4) introduced in rel; (6.1). This results in the similarity relation ;

$$(6.3)\ Z_{\uparrow g} = Z_{\uparrow a} \left(\frac{1}{2}\sqrt[6]{\alpha}\right)^S ;$$

$$\text{or; } Z_{\uparrow g} = 137\left(\frac{1}{2}\sqrt[6]{1836}\right)^{18.087114} = 3,395 \cdot 10^6 ;$$

This relationship can be generalized for all bodies in the macrocosm, introducing the system coefficient "$\beta$", tabel 2 pag.29, astfel: $(6.4)\ Z_{\uparrow i} = Z_{\uparrow a} \cdot \left(\frac{1}{2}\sqrt[6]{\frac{\alpha}{\beta^2}}\right)^S$ ;

(6.5) With this relation we will establish the maximum possible charge numbers for all cosmic systems. If we introduce relation (6.4) into relation (6.1) we can find the maximum speed that any celestial body that is part of a cosmic system can have;

(6.6) $V_{\uparrow i} = C \cdot \left(\sqrt[3]{\frac{1}{\beta_j}}\right)^S$ ; Knowing the values of the coefficient "β" from table no. 2 page 29, using relations (6.4) and (6.5) we can draw up the following data table. It can be seen that the same data can be obtained using two simplified relations of the form;

$(6.7)\ Z_{\uparrow i} = \sqrt[3]{\alpha^q}$ ; si $(6.7)\ V_{\uparrow i} = V_0 \cdot \sqrt[3]{\alpha^q}$;

where "q" is a coefficient of the family of systems which has the value 3 for satellites, 4 for planets, 5 for stars in the Sun family and 6 for superior stars.

TABLE OF GRAVITATIONAL LOAD NUMBER AND MAXIMUM SPEED OF A CELESTIAL BODY

*table no.6*

| CATEGORY OF THE BODY CONSIDERED | COEFICIENT "$q$" AL FAMILIEI DE SISTEME | COEFICIENT DE SISTEM SIMILITUDINE "$\beta_j$" | MAXIMUM LOAD NUMBER $Z_{\uparrow i} = \sqrt[3]{\alpha^q}$ | MAXIMUM BODY SPEED [m/s] $V_{\uparrow i} = V_0 \cdot \sqrt[3]{\alpha^q}$ |
|---|---|---|---|---|
| STARS IN THE GALACTIC NUCLEUS | 6 | **1** | $\sqrt[3]{\alpha^6} = 3.370 \cdot 10^6$ | $V_0 \cdot \sqrt[3]{\alpha^6} = 2.997 \cdot 10^8$ |
| STARS IN THE NUCLEUS OF THE STAR SYSTEM | 6 | **1** | $\sqrt[3]{\alpha^6} = 3.370 \cdot 10^6$ | $V_0 \cdot \sqrt[3]{\alpha^6} = 2.997 \cdot 10^8$ |
| STARS IN THE SUN CATEGORY | 5 | **1.5151** | $\sqrt[3]{\alpha^5} = 2.753 \cdot 10^5$ | $V_0 \cdot \sqrt[3]{\alpha^5} = 2.42 \cdot 10^7$ |
| PLANETS | 4 | **2.2956** | $\sqrt[3]{\alpha^4} = 2.248 \cdot 10^4$ | $V_0 \cdot \sqrt[3]{\alpha^4} = 1.98 \cdot 10^6$ |
| SATELLITES | 3 | **3.4782** | $\sqrt[3]{\alpha^3} = 1.836 \cdot 10^3$ | $V_0 \cdot \sqrt[3]{\alpha^3} = 1.63 \cdot 10^5$ |

Studying this table, we notice that the maximum speeds calculated with the similarity relations correspond to the speeds calculated with the relation;

$$(1.5.3)\quad V_{\uparrow i} = \frac{c}{\sqrt[3]{\alpha^j}} \;;$$

## Calculation of the speed of bodies on orbit.

For the case when we know the number Z and the principal quantum number of the orbit denoted by n and the minimum speed $V_0$ , with the corresponding relation from atomic physics we can calculate the corresponding speed of the body on that orbit is;

$$(6.5.0)\quad V_n = \frac{Z \cdot V_0}{n} \;;$$

Knowing the maximum speed, we can calculate the limiting speed coefficients, using relation (5.1), and with relation (5.2) we can calculate the maximum moving masses that the nucleus of a system can have, or a body in that system. The data resulting from the calculation have been listed in the table below;

**TABLE CONTAINING VELOCITY COEFFICIENTS AND MAXIMUM MASS OF BODIES FOR THE MACROCOSM**

**table no. 7**

| FORMATION OR THE BODY CONSIDERED | MAXIMUM LOAD NUMBER "$Z_{\uparrow}$" | MAXIMUM SPEED ON FUNDAMENTAL ORBIT "$V_{\uparrow}$"[m/s] | MAXIMUM SPEED COEFFICIENT $\varphi_{\uparrow}$ | REST MASS OF AN ELEMENTARY BODY M0[kg] | MAXIMUM THEORETICAL WEIGHT $M_{\uparrow}$ [Kg] |
|---|---|---|---|---|---|
| THE GALACTIC NUCLEUS | $3.330 \cdot 10^{6}$ | $2.997 \cdot 10^{8}$ | 1836 | $1.808 \cdot 10^{32}$ | $1.118 \cdot 10^{42}$ |
| NUCLEUL SIST STELAR | $3.330 \cdot 10^{6}$ | $2.997 \cdot 10^{8}$ | 1836 | $9.851 \cdot 10^{28}$ | $6.092 \cdot 10^{38}$ |
| STARS IN THE SUN CATEGORY | $2.753 \cdot 10^{5}$ | $2.42 \cdot 10^{7}$ | 524.68 | $5.369 \cdot 10^{25}$ | $7.755 \cdot 10^{33}$ |
| PLANETS | $2.248 \cdot 10^{4}$ | $1.98 \cdot 10^{6}$ | 149.94 | $2.924 \cdot 10^{22}$ | $9.855 \cdot 10^{28}$ |

# CHAPTER 7

## RELATIONS OF SIMILARITY -PART THREE-

If we assume, a macrocosmic binary system for which we write Newton's relation, we have; $\frac{m \cdot V_0^2}{R_1} = K \frac{m \cdot M}{R_1^2}$ ; from here we can extract the radius of the fundamental orbit "R_1", with the relation (7.1) $R_1 = K \frac{M}{V_0^2}$ ; Since we know the similarity relations for all the respective terms (3.4), (3.6) and (5.4) the relation (7.1) becomes:

$$(7.2) \qquad R_{i,1} = R_a \left( \frac{1}{4 \cdot \beta_i} \cdot \sqrt[3]{\alpha^2} \right)^S \quad ;$$

where "Ra" is the radius of the hydrogen atom. This represents the similarity relation for the radii of fundamental orbits in binary macrocosmic systems for unitary "Z", with the help of which the data of the table below were calculated;

## TABLE OF FUNDAMENTAL ORBIT SIZES FOR MACROCOSMIC SYSTEMS WITH "Z=1"

Table no.8

| CATEGORY NAME OF THE COSMIC SYSTEM | SYSTEM CATEGORY CONSTANT "$\beta$" | FUNDAMENTAL ORBIT RADIUS SIZE *[m]* | RATE OF DECREASE OF RAYS $\alpha = 1836$ |
|---|---|---|---|
| GALACTIC SYSTEMS | **1.000** | $1.549 \cdot 10^{18}$ | 1/1 |
| STAR SYSTEMS | **1.5151** | $8.441 \cdot 10^{14}$ | 1 /α |
| SUN SYSTEMS | **2.2956** | $4.597 \cdot 10^{11}$ | $1 / \alpha^{2}$ |
| SATELLITE SYSTEMS | **3.4782** | $2.503 \cdot 10^{8}$ | $1 / \alpha^{3}$ |

Based on the similarity relationships established so far, we have all the data necessary to calculate the kinetic momentum constant similar to the "Planck" constant, for the macrocosm.

Starting from the Planck constant relation; $\boldsymbol{h = 2\pi \cdot m_0 \cdot V_0 \cdot R_0}$; specific to atomic physics, replacing "mo", "vo" and "Ro" with the similarity relations (3.5), (5.4) and (7.2), we obtain the similarity relation for the kinetic momentum constant for macrocosmic systems;

$$(7.3)\quad \boldsymbol{H_i = h \cdot \left(\frac{\sqrt{\alpha^3}}{2 \cdot \beta_i^2}\right)^S;}$$

If we apply this relationship to a galactic system we will determine the kinetic momentum constant that characterizes these cosmic systems; (7.3.1)

$$\boldsymbol{H_i = 6,62565 \cdot 10^{-34} \cdot \left(\frac{\sqrt{1836^3}}{2 \cdot 1^2}\right)^S = 8,4629 \cdot 10^{49}; [J.s]}$$

Substituting the known values, the following constants are obtained for each family of systems;

## TABLE CONTAINING THE CONSTANT OF ANGULAR MOMENTS FOR ALL FAMILIES OF MACROCOSMIC SYSTEMS

tabelul nr.9

| DENUMIREA CATEGORIEI DE SISTEME | SYSTEM CONSTANT "$\beta$" | ANGULAR MOMENTUM CONSTANT -- "*Hi*" [Js] | MOMENT DECREASE RATE. |
|---|---|---|---|
| GALACTIC SYSTEMS | 1.00 | Hg = $8.47 \cdot 10^{49}$ | 1 / 1 |
| STELLARY SYSTEMS | 1.5151 | Hst= $2.51 \cdot 10^{43}$ | 1 / $\alpha^2$ |
| PLANETARY SYSTEMS | 2.2956 | Hpl= $7.45 \cdot 10^{36}$ | 1 / $\alpha^4$ |
| SATELLITE SYSTEMS | 3.4782 | Hs = $2.21 \cdot 10^{30}$ | 1 / $\alpha^6$ |

Next, we can establish a similarity relation for determining the revolution periods of binary cosmic systems, depending on the revolution period of the electron "*To*" in the hydrogen atom, as follows: in the relation below (7.9) we replace the known terms with their similarity relations, (7.2), respectively (5.4) for the orbit radius "***Ro,i***" and for the corresponding minimum velocity "***Vo***".

(7.9) $T_{0,i} = \frac{2\pi \cdot R_{0,i}}{V_0}$ ; and we obtain; (7.10) ; $T_{o,i} = T_{o,at}\left(\frac{\sqrt[6]{\alpha^5}}{8 \cdot \beta_i}\right)^S$ ;

## TABLE OF REVOLUTION PERIODS FOR ALL CATEGORIES OF MACROCOSMIC SYSTEMS WITH « Z =1 » CALCULATED WITH THE RELATIONSHIP (7.10 )

Table no.10;

| SYSTEM CATEGORY NAME | SYSTEM CONSTANT "$\beta$" | PERIOD OF REVOLUTION [s] | RATE OF REDUCTION |
|---|---|---|---|
| GALACTIC SYSTEMS | 1.0000 | $1.103 \cdot 10^{17}$ (3.49 miliarde de ani) | $\propto^0$ |
| STELLARY SYSTEMS | | $6.000 \cdot 10^{13}$ | |

| | | | |
|---|---|---|---|
| | 1.5151 | (1.9 milioane de ani) | $\propto^1$ |
| **PLANETARY SYSTEMS** | 2.2956 | $3.271\cdot 10^{10}$ (1.036 mii ani) | $\propto^2$ |
| **SATELLITE SYSTEMS** | 3.4782 | $1.782\cdot 10^{7}$ (0.564 ani) | $\propto^3$ |

It is necessary to return to the dimensions of the elementary mass, for which, in chapter ***"3"***, only the similarity relation (3.7) for the radius of the body "***mg***" in the galaxy was established. Now since we know the relation of "***Zmax***" (6.3) and (6.4), if we extend the relation (2.3.2) for the calculation of the radius of the proton, in the case of the macrocosm, we will have a similarity relation for the calculation of the radii of the celestial bodies located in the core of the considered ideal systems, that is:

For the radius of elementary mass in the galactic nucleus.

$$(7.11)\ r_{Mg} = r_p \cdot \left(\frac{\sqrt{\propto}}{3}\right)^{S} ;$$

For the size of the elementary mass corresponding to the other systems, the system coefficient ***"βi"*** comes into play, as follows; (7.12), $r_{Mi} = r_p \left(\frac{1}{2}\cdot\sqrt[6]{\frac{\alpha^3}{\beta_i{}^4}}\right)^{S}$ ;

substituting the respective values we obtain;

$$r_{Mg} = 2,103\cdot 10^{-16}\left(\frac{1}{2}\cdot\sqrt[6]{\frac{1836^3}{\beta 1^4}}\right)^{S} = 2,483\cdot 10^{8};\ [m]$$

by replacing the values of (***βi*** ), we will obtain the radius of the "elementary mass" according to the table below;

**TABLE OF REST MASS AND RADIUS OF ELEMENTARY BODIES FOR ALL SYSTEM FAMILIES**

Table no..11

| NAME OF THE CELESTIAL BODY | SYSTEM COEFFICIENT "$\beta_j$" | REST MASS M [kg] | ELEMENTARY BODY RADIUS "$r_{Mi}$"[m] |
|---|---|---|---|
| STELE DIN NUCLEUL GALACTIC | 1 | $1.808 \cdot 10^{32}$ | $2.464 \cdot 10^{8}$ |
| STELE DIN NUCLEUL SIST. STELARE | 1.515144 | $9.851 \cdot 10^{28}$ | $1.643 \cdot 10^{6}$ |
| STELE DIN FAMILIA SOARELUI | 2.295663 | $5.369 \cdot 10^{25}$ | $1.107 \cdot 10^{4}$ |
| PLANETE | 3.478261 | $2.924 \cdot 10^{22}$ | $0.737 \cdot 10^{2}$ |

The same values for the radii of elementary bodies can also be obtained by generalizing the relations (2.3.2.) and (2.3.2.1) relations;

$$(7.13)\ r_{Mi} = \frac{Z_{\uparrow i} \cdot r_{mi}}{\propto};$$

where the values of "Zi" are taken from table no.5.

It is noted that on page 34, the dimensions of the standard bodies were determined starting from the dimensions of the electron for the bodies that orbit the nucleus of the system, and here the standard dimensions were calculated for the bodies that generate the nucleus of the system.

## CHAPTER 8

## RECALCULATION OF THE KINETIC MOMENTUM CONSTANT FOR THE MACROCOSM

Now that we know the dimensions of the "elementary bodies" of stars as well as the maximum speeds allowed in all families of systems, we will proceed to recalculate Planck's constant in order to verify the previously established data. For this we will apply the relation

$$(2.3.5.1)\quad H_i = 2\pi \cdot \frac{V_{i\uparrow}^3}{K} \cdot r_{mi} \cdot r_{Mi};$$

Substituting the values established in the previous relations, we will calculate the value of the kinetic momentum for galaxies as follows;

$$H_g = 2\pi \cdot \frac{(2.997 \cdot 10^8)^3}{6.67 \cdot 10^{-11}} \cdot 1.544 \cdot 10^5 \cdot 2.464 \cdot 10^8 = \mathbf{8.397 \cdot 10^{49}}; [J.s];$$

compared to **; $8.47 \cdot 10^{49}$** [Js] ; as shown in table no. 9, data that coincide very well.

For the remaining system categories, the calculation results have been listed in the table below:

**COMPARATIVE TABLE FOR MOMENTU ANGULAR CONSTANT**

table no. 12

| SYSTEM CATEGORY NAME | SYSTEM CONSTANT „ $\beta_i$ " | MOMENTUM CONSTANT "Hi" [Js] (similarity relation)Table no.9 | MOMENTUM CONSTANT "Hi" [Js] (calculated with rel. 2.3.5.1.) |
|---|---|---|---|
| GALACTIC SYSTEMS | 1.0000 | $8.47 \cdot 10^{49}$ | $8.397 \cdot 10^{49}$ |
| STARS SYSTEMS | 1.5151 | $2.51 \cdot 10^{43}$ | $2.519 \cdot 10^{43}$ |
| SOLAR SYSTEMS | 2.2956 | $7.45 \cdot 10^{36}$ | $7.33 \cdot 10^{36}$ |
| SATELLITE SYSTEMS | 3.4782 | $2.21 \cdot 10^{30}$ | $2.29 \cdot 10^{30}$ |

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## . CHAPTER 9

## AUXILIARY RELATIONSHIPS BETWEEN PARAMETERS OF COSMIC SYSTEMS

As shown in chapter 5, the velocity coefficient "**φ**" of a body of mass "m" is defined as the square root of the ratio of the transport velocity "**Vt**" of the body to the rest velocity "**Vo**".

$$(5.1) \quad ; \boldsymbol{\varphi} = \sqrt{\frac{Vt}{Vo}} \quad ;$$

If we consider that the mass "**m**" is on the first orbit of the system « $M$ » with the charge number "$Z_M$", the velocity corresponding to the first orbit "$V_1$" can be expressed with the relation;

(9.1) $V_1 = Z_M \cdot V_0$ ; Substituting (9.1) into (5.1) we obtain;

(9.2) $\varphi_{m,1} = \sqrt{\frac{V_1}{V_0}} = \sqrt{\frac{Z_M \cdot V_0}{Vo}} = \sqrt{Z_M}$

(9.3) Substituting (9.1) into (5.1) we obtain; $Z_M = \varphi_{m,1}^2$ ;

The charge number "Z" of the body "M" located in the nucleus of a system can be found to be equal to the square of the velocity coefficient corresponding to the fundamental orbit of the system.

For the case of orbit "n", the velocity coefficient can be written as follows;

$\varphi_n = \sqrt{\frac{V_n}{Vo}} = \sqrt{\frac{V_1}{n \cdot V_0}} = \frac{\varphi_1}{\sqrt{n}}$ ; where do we find out; (9.5) $n = \frac{\varphi_1^2}{\varphi_n^2}$ ;

this relation can be used to determine the principal quantum number, and if we substitute (9.2) into (9.5) we obtain; (9.6) ; $n = \frac{Z_M}{\varphi_n^2}$ ;

With this relation we can find the principal quantum number "$n$ " of an orbit in a given system, knowing the charge number "$Z_M$" of the nucleus "$M$" and the velocity coefficient of the respective orbit " $\varphi_n$"

As an example, we will apply these relations to the most well-known Earth-Moon system; We know the masses and respectively the orbital velocities of the two bodies, and we propose to find out on which orbit the Moon is located, knowing that;

- the mass of the Earth $M_P = 5.97 \cdot 10^{24}\ kg$ ;
- the mass of the Moon $M_P = 7.349 \cdot 10^{22}\ kg$ ;
- the speed of the Earth $V_P = 2.98 \cdot 10^4\ m/s$ ;
- the speed of the moon $V_L = 1.032 \cdot 10^3\ m/s$ ;

We calculate the Earth's gravitational charge using relation (5.3) knowing the value of the elementary rest mass of the planets from table no. 2, and the respective velocity coefficients as follows;

$\varphi_P = \sqrt{\frac{V_P}{V_0}} = \sqrt{\frac{2{,}98 \cdot 10^4}{90}} = 18{,}37$ ; $\varphi_L = \sqrt{\frac{V_L}{V_0}} = \sqrt{\frac{1{,}032 \cdot 10^3}{90}} = 3{,}386$ ;

and the number of the Earth's gravitational charge;

$$Z_P = \frac{M_P}{\varphi_P \cdot M_0} = \frac{5{,}97 \cdot 10^{24}}{18{,}19 \cdot 2{,}924 \cdot 10^{22}} = 11,22\ ;$$

Applying relation (9.6) we find the number of the orbit occupied by the Moon;

**We can conclude that the Moon is on the first orbit of the Earth-Moon system, and the Earth has a gravitational charge Zp = 11. In the same way, these parameters can be found for all the planets of the solar system as follows in table no. 13.**

**TABLE CONTAINING THE DETERMINATION OF VELOCITY COEFFICIENTS, GRAVITATIONAL LOADS AND PRINCIPAL QUANTUM NUMBERS FOR THE PLANETS OF THE SOLAR SYSTEM.**

table no. 13

| CELESTIAL BODY | BODY MASS (Mi) (Kg) | AVERAGE VELOCITY (Vi) ON ORBIT (m/s) | SPEED COEFFICIENT $\varphi = \sqrt{\frac{Vt}{Vo}}$ | TASK NUMBER $Z_M = \frac{M}{\varphi_M \cdot M_0}$; | QUANTUM NUMBER PRINCIPLE. $n = \frac{Z_M}{\varphi_n^2}$; |
|---|---|---|---|---|---|
| SUN | $1{,}99 \cdot 10^{30}$ | $2{,}20 \cdot 10^{5}$ | 49,44 | 740 | $\approx 1300$ |
| MERCUR | $3{,}3 \cdot 10^{23}$ | $4{,}79 \cdot 10^{4}$ | 23,06 | 0,489 | 1,4 |
| VENUS | $4{,}87 \cdot 10^{24}$ | $3{,}5 \cdot 10^{4}$ | 19,72 | 8,44 | 1.9 |
| EARTH | $5.97 \cdot 10^{24}$ | $2{,}98 \cdot 10^{4}$ | 18,19 | 11,22 | 2,2 |
| MARTE | $6{,}42 \cdot 10^{23}$ | $2{,}41 \cdot 10^{4}$ | 16,36 | 1,34 | 2,8 |
| JUPITER | $1{,}9 \cdot 10^{27}$ | $1{,}31 \cdot 10^{4}$ | 12,06 | 5388 | 5,0 |
| SATURN | $5{,}69 \cdot 10^{26}$ | $9{,}61 \cdot 10^{3}$ | 10,33 | 1876 | 7,0 |
| URANIA | $8{,}7 \cdot 10^{25}$ | $6{,}8 \cdot 10^{3}$ | 8,69 | 342 | 9,9 |
| NEPTUN | $1{,}03 \cdot 10^{26}$ | $5{,}4 \cdot 10^{3}$ | 7,74 | 455 | 12,5 |
| PLUTON | $1{,}3 \cdot 10^{22}$ | $4{,}7 \cdot 10^{3}$ | 7,22 | 0,06 | 14,3 |

.

We add below the graph showing the speed of the planets in orbit and their quantum number "**n**i";

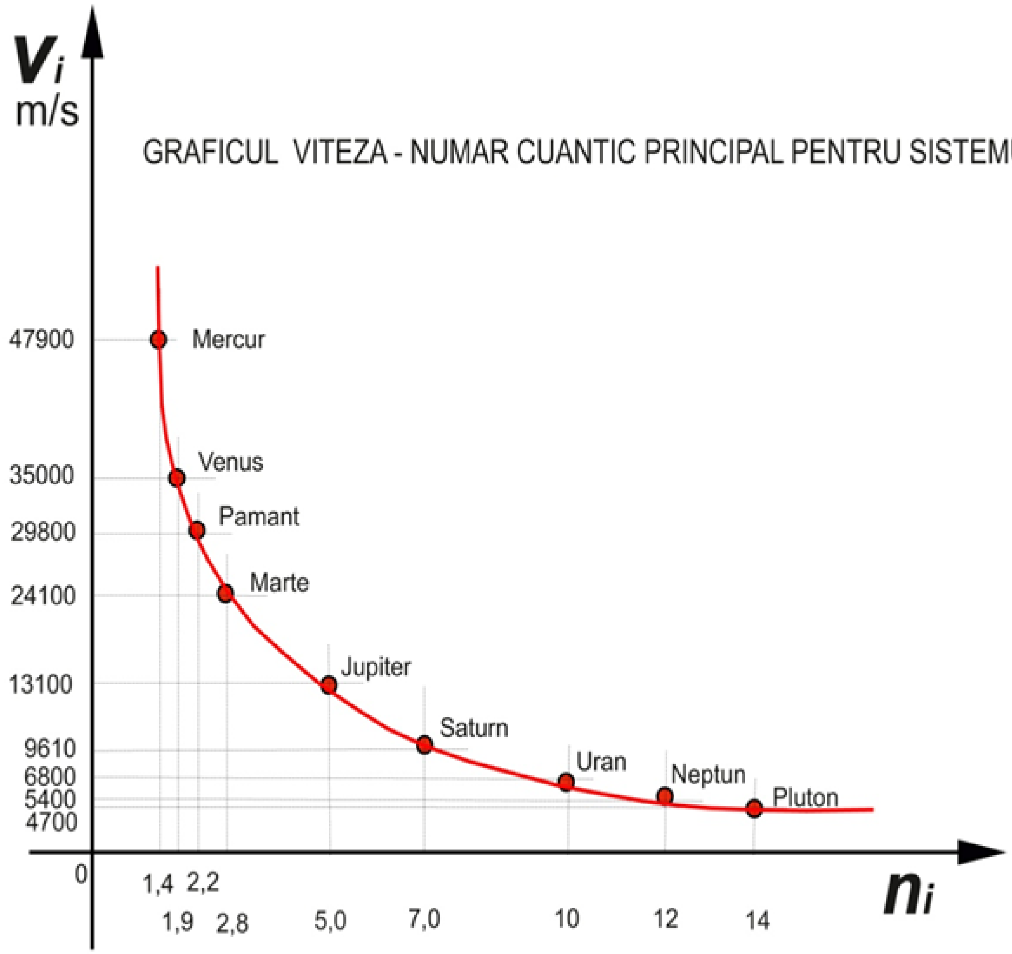


**TABLE CONTAINING THE DETERMINATION OF VELOCITY COEFFICIENTS, GRAVITATIONAL LOADS AND PRINCIPAL QUANTUM NUMBERS FOR A PART OF THE SATELLITES OF THE PLANETARY SYSTEMS**

tabelul nr.14

| **HEAVENLY BODY** | **BODY MASS (Kg)** | **ORBITAL SPEED (m/s)** $V_i = \frac{2\pi \cdot R_i}{T_i}$ | **SPEED COEFFICIENT** $\varphi = \sqrt{\frac{Vi}{Vo}}$ | **electric load number** $Z_M = \frac{M}{\varphi_M \cdot M_0}$ | **PRINCIPAL QUANTUM NUMBER** $n = \frac{Z_M}{\varphi_n^2}$ ; |
|---|---|---|---|---|---|
| **EARTH-** | $5.97 \cdot 10^{24}$ | $2,98 \cdot 10^4$ | **18,19** | **11,22** | **2,26** |
| *MOON* | $7,349 \cdot 10^{22}$ | $1,032 \cdot 10^3$ | **3,38** | **1363** | **1** |
| **JUPITER** | $1,9 \cdot 10^{27}$ | $1,31 \cdot 10^4$ | **12,06** | **5388** | **5** |
| ***IO*** | $8,933 \cdot 10^{22}$ | $1,732 \cdot 10^4$ | **13,87** | **404,5** | **28** |

| | | | | | |
|---|---|---|---|---|---|
| ***EUROPA*** | $4,797 \cdot 10^{22}$ | $1,373 \cdot 10^{4}$ | **12,35** | **243,98** | **35** |
| ***GANYMEDE*** | $1,482 \cdot 10^{23}$ | $1,087 \cdot 10^{4}$ | **10,98** | **847,8** | **45** |
| ***CALLISTO*** | $1,076 \cdot 10^{23}$ | $0,825 \cdot 10^{4}$ | **9,57** | **706,2** | **59** |
| **SATURN** | $5,69 \cdot 10^{26}$ | $9,61 \cdot 10^{3}$ | **10,33** | **1876** | **7** |
| ***MIMAS*** | $3,75 \cdot 10^{19}$ | $1,432 \cdot 10^{4}$ | **12,61** | **0,186 ?** | **12** |
| ***ENCELADUS*** | $7,3 \cdot 10^{19}$ | $1,263 \cdot 10^{4}$ | **11,84** | **0,387 ?** | **13** |
| ***TETHIS*** | $6,22 \cdot 10^{20}$ | $1,134 \cdot 10^{4}$ | **11,22** | **3,482** | **15** |
| ***DIONE*** | $1,052 \cdot 10^{21}$ | $1,002 \cdot 10^{4}$ | **10,55** | **6,263** | **17** |
| ***RHEA*** | $2,31 \cdot 10^{21}$ | $0,848 \cdot 10^{4}$ | **9,70** | **14,95** | **20** |
| ***TITAN*** | $1,34 \cdot 10^{23}$ | $0,556 \cdot 10^{4}$ | **7,85** | **1072** | **30** |
| ***IAPETUS*** | $1,59 \cdot 10^{21}$ | $0,326 \cdot 10^{4}$ | **6,01** | **16,61** | **52** |
| **URAN** | $8,7 \cdot 10^{25}$ | $6,8 \cdot 10^{3}$ | **8,69** | **342** | **10** |
| ***MIRANDA*** | $6,59 \cdot 10^{19}$ | $0,668 \cdot 10^{4}$ | **8,61** | **0,48** | **5** |
| ***ARIEL*** | $1,353 \cdot 10^{21}$ | $0,551 \cdot 10^{4}$ | **7,82** | **10,86** | **6** |
| ***UMBRIEL*** | $1,172 \cdot 10^{21}$ | $0,466 \cdot 10^{4}$ | **7,19** | **10,23** | **7** |
| ***TITANIA*** | $3,527 \cdot 10^{21}$ | $0,364 \cdot 10^{4}$ | **6,35** | **34,88** | **8** |
| ***OBERON*** | $3,014 \cdot 10^{21}$ | $0,314 \cdot 10^{4}$ | **5,90** | **32,08** | **10** |

# CHAPTER 10

## DETERMINATION OF THE CALCULATION RELATIONSHIP FOR THE RADIUS OF THE FUNDAMENTAL ORBIT OF THE NUCLEUS OF A SYSTEM

To find the calculation relationship necessary to determine the radius "**R1**" of the fundamental orbit of a celestial body of mass "**M**" moving with speed "**V**$_M$" and which is the nucleus of a system, we will start from Newton's relationship;

$$(10.1) \quad \frac{m \cdot V_m^2}{R_n} = K \frac{M \cdot m}{R^2{}_n} \quad ;$$

after simplifications it results;(10.2); $R_n = \frac{K \cdot M}{V_m^2}$; in which we will replace mass and velocity with the following relations. Mass can be written as a multiple of elementary masses M0 corrected by the velocity coefficient $\varphi_M$ and multiplied by the charge number Zm .

(10.3) $M = Z_M \cdot \varphi_M \cdot M_0$; in care ; $\varphi_M = \sqrt{\frac{V_M}{V_0}}$; si, (10.4) $V_m = \frac{V_0 \cdot Z_M}{n_i}$; where "n" is the principal quantum number of the body "m" gravitating around "M".

We will obtain for "Rn" the expression;

(10.5) $R_n = n^2 \frac{K \cdot \varphi_M \cdot M_0}{V_0^2 \cdot Z_M}$ if we replace

$Rn = n^2 \cdot R_1$ ; si pe $R_0 = n^2 \cdot k \cdot \frac{M_0}{V_0^2}$ ; the calculation relation of the fundamental orbit is obtained as follows;

(10.6) $R_1 = R_0 \cdot \frac{\varphi_M}{Z_M}$ ;

where "R0" represents the radius of the fundamental orbit for the reference standard system.

A similar simplified relationship is obtained if we introduce the following constant;

(10.7) $A_R = R_0 \cdot \frac{M_0}{V_0}$ ;then the relation (10.6) becomes,(10.8) $R_1 = A_R \cdot \frac{V_M}{M}$ ;

Where the constant "$A_R$ " is found in the table below. This relation has the advantage that we can find out what the first orbit of a system is, knowing only the mass and velocity of the nucleus.

For example, for the solar system we can calculate the constant "$A_R$" as follows;

$$A_R = R_0 \cdot \frac{M_0}{V_0} = 4.597 \cdot 10^{11} \cdot \frac{5.369 \cdot 10^{25}}{90} = 2.742 \cdot 10^{35}\ [kg.s]$$

.

## TABLE OF CONSTANTS “$A_R$”

## FOR DETERMINING THE RADIUS OF FUNDAMENTAL ORBITS

Table no.15

| THE CORE OF THE CONSIDERED SYSTEM | FUNDAMENTAL ORBIT RADIUS FOR THE REFERENCE SYSTE“Ro”(m) | MASA DE REPAUS A UNUI CORP DIN NUCLEUL SISTEMULUI “Mo”(kg) | INITIAL SPEED “Vo” (m/s) | CONSTANT “AR” $A_R = R_0 \cdot \frac{M_0}{V_0}$ |
|---|---|---|---|---|
| SATELLITE SYSTEMS | $2{,}503 \cdot 10^{8}$ | $2{,}924 \cdot 10^{22}$ | 90 | $8{,}131 \cdot 10^{28}$ |
| PLANETARY (SOLAR) SYSTEMS | $4{,}597 \cdot 10^{11}$ | $5{,}369 \cdot 10^{25}$ | 90 | $2{,}742 \cdot 10^{35}$ |
| STAR SYSTEMS | $8{,}441 \cdot 10^{14}$ | $9{,}851 \cdot 10^{28}$ | 90 | $9{,}239 \cdot 10^{41}$ |
| GALACTIC SYSTEMS | $1{,}549 \cdot 10^{18}$ | $1{,}808 \cdot 10^{32}$ | 90 | $3{,}111 \cdot 10^{48}$ |

Substituting in the relation (10.8) the velocity and mass of the known celestial bodies, using the constant corresponding to the type of system in column “5” of the table above, we obtain the value of the radii of the fundamental orbits for the respective systems. These values coincide with the determinations carried out empirically in table no. 1, which gives additional confidence to this relation. The resulting data have been entered in the following table;

## TABLE CONTAINING THE CALCULATION OF THE RADIUS OF THE FUNDAMENTAL ORBITS OF THE SOLAR SYSTEM AND OF THE SATELLITE SYSTEMS

table no.16

| THE CONSIDERED SYSTEM | CONSTANT “AR”(Kg.s) | VITEZA NUCLEULUI (m/s) | CORE SPEED (Kg) | RADIUS OF THE SYSTEM'S FUNDAMENTAL ORBIT (m) |
|---|---|---|---|---|
| THE SOLAR SYSTEM | $2{,}742 \cdot 10^{35}$ | $2{,}2 \cdot 10^{5}$ | $1{,}99 \cdot 10^{30}$ | $3{,}03 \cdot 10^{10}$ |

| | | | | |
|---|---|---|---|---|
| **EARTH-MOON SYSTEM** | $8{,}131 \cdot 10^{28}$ | $2{,}98 \cdot 10^{4}$ | $5{,}94 \cdot 10^{24}$ | $4{,}079 \cdot 10^{8}$ |
| **SIST. JUPITER** | " | $1{,}31 \cdot 10^{4}$ | $1{,}9 \cdot 10^{27}$ | $5{,}6 \cdot 10^{5}$ |
| **SIST. SATURN** | " | $9{,}61 \cdot 10^{3}$ | $5{,}69 \cdot 10^{26}$ | $1{,}37 \cdot 10^{6}$ |
| **SIST. URANIA** | " | $6{,}8 \cdot 10^{3}$ | $8{,}7 \cdot 10^{25}$ | $6{,}35 \cdot 10^{6}$ |
| **SIST. NEPTUN** | " | $5{,}4 \cdot 10^{3}$ | $1{,}03 \cdot 10^{26}$ | $4{,}26 \cdot 10^{6}$ |

From the table above it can be seen that, in the case of large planets, the fundamental orbit for the system is even smaller than the radius of the planet. Therefore, these orbits cannot be occupied in reality. At first glance it seems strange, but if we consider that each cosmic system is actually a harmonic oscillator, whose fundamental frequency has a wavelength smaller than the dimensions of the planet, then it is normal for satellites to occupy orbits outside the fundamental orbit, which are actually harmonics of it. To verify the fundamental orbit of the Solar system, we proceeded to determine the radius of the planetary orbits using the relation

$\boldsymbol{R_i = n_i^2 \cdot R_1}$ ;, where "$\boldsymbol{R_i}$" denotes the radius of the orbit of

planet "i", "n" denotes the principal quantum number for the orbit of the planet under consideration, and ""$\boldsymbol{R_1}$" denotes the value of the fundamental orbit for the class of systems to which the Sun belongs. These values were compared with real astronomical determinations, according to the table below; (and this time, quantum numbers with decimals were taken into account to comply with the mathematical calculation).

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## TABLE CONTAINING THE CALCULATION OF THE ORBITAL RADIUS OF THE PLANETS OF THE SOLAR SYSTEM

table no.17

| NAME OF THE PLANET | RADIUS OF THE SUN'S FUNDAMENTAL ORBIT $\boldsymbol{R_1}$(m) | PRINCIPAL QUANTUM NUMBER TAKEN INTO CALCULATION | ORBITAL RADIUS RESULTING FROM THE CALCULATION $\boldsymbol{R_i = n_i^2 \cdot R_1}$ (m) | ASTRONOMICALLY MEASURED ORBITAL RADIUS $\boldsymbol{R_i}$ (m) |
|---|---|---|---|---|
| **MERCUR** | $3{,}03 \cdot 10^{10}$ | 1,35 | $5{,}52 \cdot 10^{10}$ | $5{,}79 \cdot 10^{10}$ |
| **VENUS** | $3{,}03 \cdot 10^{10}$ | 1,9 | $1{,}09 \cdot 10^{11}$ | $1{,}08 \cdot 10^{11}$ |

| | | | | |
|---|---|---|---|---|
| **EARTH** | $3{,}03\cdot 10^{10}$ | 2,2 | $1{,}46\cdot 10^{11}$ | $1{,}49\cdot 10^{11}$ |
| **MARTE** | $3{,}03\cdot 10^{10}$ | 2,8 | $2{,}37\cdot 10^{11}$ | $2{,}28\cdot 10^{11}$ |
| **RING III OF LARGE ASTEROIDS (CERES, PALLAS)** | $3{,}03\cdot 10^{10}$ | ~3,6 | $3.92\cdot 10^{11}$ | $4.03\cdot 10^{11}$ |
| **JUPITER** | $3{,}03\cdot 10^{10}$ | 5,1 | $7{,}88\cdot 10^{11}$ | $7{,}78\cdot 10^{11}$ |
| **SATURN** | $3{,}03\cdot 10^{10}$ | 6,8 | $1{,}40\cdot 10^{12}$ | $1{,}42\cdot 10^{12}$ |
| **URANIA** | $3{,}03\cdot 10^{10}$ | 9,7 | $2{,}85\cdot 10^{12}$ | $2{,}86\cdot 10^{12}$ |
| **NEPTUN** | $3{,}03\cdot 10^{10}$ | 12,1 | $4{,}43\cdot 10^{12}$ | $4{,}48\cdot 10^{12}$ |
| **PLUTO** | $3{,}03\cdot 10^{10}$ | 13,0 | $5{,}93\cdot 10^{12}$ | $5{,}90\cdot 10^{12}$ |

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By comparing the results in column no. 4 with the astronomical measurements, a good dimensional agreement of the radii of the respective orbits results.

## COMPARISON OF THE QUANTUM NUMBER OF ORBITS WITH THE TITIUS-BODE SERIES

With the principal quantum numbers, the Titius-Bode series can be reached if the quantum numbers of the planets are squared, and the result is divided by the square of the Earth's quantum number, as shown in the following table;

## TABLE OF TITIUS-BODE SERIES AND ITS CORRESPONDENCE WITH THE PRINCIPAL QUANTUM NUMBERS

**tabelul nr.18**

| PLANET CONSIDERED | PRINCIPAL QUANTUM NUMBER | $\left(\frac{n_i}{n_{earth}}\right)^2$ | COMPARISON OF THE QUANTUM NUMBER OF ORBITS WITH THE TITIUS-BODE SERIES |
|---|---|---|---|
| 0 | 1 | 2 | 3 |
| **MERCUR** | 1,35 | 0.375 | 0.4 |
| **VENUS** | 1,9 | 0.74 | 0.7 |

| | | | |
|---|---|---|---|
| **EARTH** | 2,2 | 1.00 | 1.0 |
| **MARTE** | 2,8 | 1.61 | 1.6 |
| **RING III OF LARGE ASTEROIDS (CERES, PALLAS)** | ~3,6 | 2.67 | 2.8 |
| **JUPITER** | 5,0 | 5.16 | 5.2 |
| **SATURN** | 7.0 | 10.12 | 10.0 |
| **URANIA** | 10.0 | 20.66 | 19.6 |
| **NEPTUN** | 12.0 | 29.75 | - |
| **PLUTON** | 14.0 | 40.50 | - |

.

**From this table it is seen that the quantum number of planetary orbits "n" is correlated with the radius of the orbits expressed as a function of the radius of the Earth's orbit. The Titius Boode series was obtained empirically, the radius of the Earth's orbit being taken as equal to unity.**

I have carried out the quantification of the solar system by analogy with the method of quantifying atoms according to Bohr's theory. From this it follows that the entire Solar system oscillates on a series of harmonics of a fundamental frequency on which the Sun oscillates.

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The fundamental period of the Sun is equal to the period of the first orbit in the system which in our case is not occupied at all, the first planet being Mercury, whose orbit is somewhat further from the Sun, probably due to natural causes such as solar winds, or other causes. Any other orbit, occupied or not, corresponds to a period which depends on its quantum number and the fundamental period.

If we denote by **T1** the fundamental period of the first orbit, it is equal to; **T1=2pi.R1/v1 ;** where **R1** is the radius of the first orbit, and v1 is the speed of the planet that would be on the first orbit.

For orbit **n=2** the period **T2=2pi.R2/ v2;** where **R2=2^2.R1**; and **v2=v1/2 ;** or

substituting in T2 we find; **T2=2pi.R2/ v2=2pi.4.R1/(v1/2)=2^3.(2.pi. R1/v1) =2^3.T1 ;**

In the case of the third orbit **n=3**, the orbital period will be; **T3= 3^3.T1;** s. a.m.d,

For orbit **n**, we will have; **Tn=n^3.T1 ;**

If we want to find out more precisely the fundamental period of the solar system, we take the period of the planet Jupiter, which is the largest planet in the system, which is on the orbit with the quantum number n=5 and calculate; **T5=5^3.T1** ; from where **T1=T5/(5^3)= T5/125;** knowing that Jupiter's period is; **11.862** years or **4332.59** days, we will find the fundamental period of the solar system**; T1=4332.59z/125=34.6 days;**

Knowing that the orbital period of Mercury is 87.96 days, we can say that this planet is not on the first orbit of the solar system, that is, the quantum number for Mercury is; **n=(87.96/34.6)^1/3=1.36;** So; the quantum number calculated for Mercury **n=1.36;** not being an integer we can say that certain disturbances of the Solar system act on the planet Mercury. In fact, Venus, Earth and Mars also suffer disturbances, which confirms the idea that a cataclysm befell the Solar system that transformed a planet into the asteroid ring located between Mars and Jupiter, which influenced all the small planets in the system. This anomaly can last billions of years until each planet is repositioned on the correct orbit, in harmony with the fundamental period.

## CHAPTER 11

## DETERMINATION OF THE CALCULATION RELATIONSHIP OF THE PERIODS OF REVOLUTION FOR CELEBROUS BODIES

Knowing that the period of revolution is equal to the length of the circular orbit relative to the speed of the body in orbit, If we express the period of revolution (Ti) of a celestial body as the ratio between the space traveled on a complete circular orbit with radius (R i) and the average speed of revolution (V i) of the body, for an elementary binary system we have ;(11.0)

$$\boldsymbol{T_{0,i} = \frac{2\pi \cdot R_{0,i}}{V_0}};$$

and for a general case, (11.1) $\boldsymbol{T_i = \frac{2\pi \cdot R_i}{V_i}}$ ; in which we will replace the terms in the relations below. The dimensions of the radius of the first orbit in a system are calculated with the relation; $\boldsymbol{R_1 = R_0 \cdot \frac{\varphi_M}{Z_M}}$ ;To determine the radius of the other orbits, the principal quantum number "n" must be taken into account as follows;

$$\boldsymbol{R_i = n^2 \cdot R_0 \cdot \frac{\varphi_M}{Z_M}} \;;\quad \text{sau} \;;\; \boldsymbol{R_i = n^2 \cdot R_1} \;;$$

replacing with relationships; $\boldsymbol{V_i = \frac{Z_M \cdot V_0}{n_i}}$; and it is obtained;

$$(11.2) \quad T_i = n_i^3 \cdot T_0 \cdot \frac{\varphi_M}{Z_M^2} \;;$$

this represents the calculation relation of the period of revolution of a celestial body, if we know the orbital quantum number, and the parameters of the nucleus of which system it is part.

With the help of this relation we can calculate exactly the charge number ZM, the velocity coefficient φ and respectively the orbital velocity of the Sun. For this we proceed to replace the velocity coefficient with;

(11.3) $\boldsymbol{\varphi_M = \frac{M_S}{Z_M \cdot M_0}}$ ; in which ***Ms*** is the mass of the Sun the relationship

(11.2) becomes; $\boldsymbol{T_i = n_i^3 \cdot \frac{T_0}{M_0} \cdot \frac{M_S}{Z_M^3}}$; from this relationship we remove "***ZM***";

$$(11.4) \quad \boldsymbol{Z_M = n_i \cdot \sqrt[3]{\frac{T_0 \cdot M_S}{T_i \cdot M_0}}};$$

If we introduce the data of the planet Jupiter, as the most representative planet, for which the principal quantum number ni and ***Ti***, the period of revolution of the planet, are known, ***Ms*** is the mass of the Sun, ***T0*** is the orbital period of the elementary binary system, and ***M0*** is the mass of the nucleus as its elementary mass, we find;

$$(11.5) \quad \boldsymbol{Z_M = 5 \cdot \sqrt[3]{\frac{3{,}271 \cdot 10^{10} \cdot 1{,}99 \cdot 10^{30}}{3{,}741 \cdot 10^{8} \cdot 5{,}369 \cdot 10^{25}}} = 739{,}92};$$

We will have the same result if we enter data for the other planets, for example Uranus;

$$\boldsymbol{Z_M = 9{,}7 \cdot \sqrt[3]{\frac{3.271 \cdot 10^{10} \cdot 1.99 \cdot 10^{30}}{2{,}642 \cdot 10^{9} \cdot 5.369^{25}}} = 748.18};$$

Example, Neptune;

$$\boldsymbol{Z_M = 12 \cdot \sqrt[3]{\frac{3.271 \cdot 10^{10} \cdot 1.99 \cdot 10^{30}}{5{,}166 \cdot 10^{9} \cdot 5.369^{25}}} = 740.18}$$

**so "Z" for the Sun can be considered as an integer; Z= 740;**

**Returning to the relation (11.3) we find the velocity coefficient of the Sun; (11.6)**

$$\varphi_M = \frac{M_S}{Z_M \cdot M_0} = \frac{1,99 \cdot 10^{30}}{740 \cdot 5,369 \cdot 10^{25}} = 50,08\ ;$$

with this value we can find the speed of the Sun in the galaxy with the relationship below;

(11.7) $V_{Soare} = \phi_M{}^2 \cdot V_0 = 50.08^2 \cdot 90 = 2,25786 \cdot 10^5\ m/s;$

Knowing the exact parameters of the Sun, we can now recalculate the principal quantum numbers for the other planets using the relation

$$(11.4).\ n_i = \sqrt[3]{\frac{T_i \cdot Z_M^2}{T_0 \cdot \varphi_M}}\ ;$$

Intrucat parametrii sistemului Solar $Z_M$ ; $\varphi_M$; $T_0$; sunt date constante putem nota urmatoarea constanta $Cn$ ;

$$C_n = \sqrt[3]{\frac{Z_M^2}{T_0 \cdot \varphi_M}}\ ; \quad C_n = \sqrt[3]{\frac{740^2}{3{,}271 \cdot 10^{10} \cdot 50}} = 0,0069402\ ;$$

Deci **Cn=0,0069402** ; Introducand constanta in relatia de mai sus se obtin numerele cuantice principale in functie de perioada de orbitare a planetelor astfel ;

$$(11.6)\quad n_i = C_n \cdot \sqrt[3]{T_i};$$

Cu aceasta relatie s-au recalculat numerele cuantice orbitale si s-au trecut in urmatorul tabel:

**TABLE OF DATA ON RECALCULATION OF PRINCIPAL QUANTUM NUMBERS FOR THE PLANETS OF THE SOLAR SYSTEM**

table no. 19

| NAME OF THE PLANET | SOLAR SYSTEM CONSTANT (Cn) | PERIOD OF REVOLUTION [s] [s] | CALCULATED ORBITAL QUANTUM NUMBER | APPROXIMATE PRINCIPAL QUANTUM NUMBER |
|---|---|---|---|---|
| MERCUR | 0,0069402 | $7{,}594 \cdot 10^6$ | 1,36 | 1 |
| VENUS | “ | $1{,}941 \cdot 10^7$ | 1,86 | 2 |
| EARTH | “ | $3{,}155 \cdot 10^7$ | 2,19 | 2 |
| MARTE | “ | $5{,}935 \cdot 10^7$ | 2,70 | 3 |
| JUPITER | “ | $3{,}741 \cdot 10^8$ | 5,00 | 5 |
| SATURN | “ | $9{,}294 \cdot 10^8$ | 6,77 | 7 |

| | | | | |
|---|---|---|---|---|
| **URANIA** | " | $2{,}651 \cdot 10^9$ | 9,60 | 10 |
| **NEPTUN** | " | $5{,}199 \cdot 10^9$ | 12,00 | 12 |
| **PLUTO** | " | $7{,}814 \cdot 10^9$ | 13,77 | 14 |

…

## CHAPTER 12

## DETERMINATION OF THE CALCULATION RELATIONSHIP FOR THE FUNDAMENTAL PULSATION OF A MACROCOSMIC SYSTEM

If we consider the simplest system, consisting of a central body "***M***" and a body "***m***" that gravitates around "***M***", we can say that both bodies have a rotational motion around the common center of mass of the system, a center that is at a distance " ***r*** " from the axis of "***M***".

The pulsation of the nuclear field is equal to the rotation period of the fundamental orbit denoted by "***T1***". In this case the relation

(11.2) $\boldsymbol{T_i = n_i^3 \cdot T_0 \cdot \frac{\varphi_M}{Z_M^2}}$ ; for n=1 it becomes;

$$\boldsymbol{T_i = T_0 \cdot \frac{\varphi_M}{Z_M^2}}$$ ; we replace;

$$\boldsymbol{\varphi_M = \sqrt{\frac{V_M}{V_0}}}\text{; si }\boldsymbol{Z_M = \frac{M}{\varphi_M \cdot M_0}}$$ ; and we obtain;.

$$\boldsymbol{T_i = T_0 \cdot \frac{\sqrt{\frac{V_M}{V_0}}}{\left(\frac{M}{\cdot M_0 \cdot \sqrt{\frac{V_M}{V_0}}}\right)^2} = \left(\frac{T_0 \cdot {M_0}^2}{{V_0}^{1.5}}\right) \cdot \frac{{V_M}^{1.5}}{M^2}}\ ;$$

We denote by "***Ct***" the time constant in parentheses;

$$\boldsymbol{C_t = \left(\frac{T_0 \cdot {M_0}^2}{{V_0}^{1.5}}\right)};$$

and we write the period of the nucleus's own pulsation as follows;

$$(12.3)\quad t_M = C_t \cdot \frac{V_M{}^{1.5}}{M^2} \quad ;$$

The relation (12.3) represents the period of the fundamental pulsation of a macrocosmic system having the nucleus of mass "$M$" and velocity "$V_M$". It is observed that this pulsation practically depends only on the parameters of the central body "$M$".

For the nucleus of each family of systems, there corresponds a constant for the natural pulsation calculated with relation (12.2) according to the table below.

We could conclude that; **When a celestial body that is the nucleus of a cosmic system moves, it has a corresponding pulsation of its own gravitational field, the period of which depends on its mass and speed. This pulsation determines the rotation period of the first orbit of the respective system**.

**TABLE OF TIME CONSTANTS FOR THE PROPER PULSATION OF ELEMENTARY CELESTIAL BODIES**

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Table no.20

| THE CORE OF THE CONSIDERED SYSTEM | FUNDAMENTAL ORBIT PERIOD $T_0,[\text{sec}]$ | ELEMENTARY RESTING MASS $M_0,[kg]$ | INITIAL SPEED $V_0,[m/s]$ | TIME CONSTANT $C_t = \frac{T_0 \cdot M_0^2}{V_0^{1,5}}$ |
|---|---|---|---|---|
| STARS IN THE CORE OF GALACTIC SYSTEMS | $1{,}103 \cdot 10^{17}$ | $1{,}8102 \cdot 10^{32}$ | 90 | $4{,}233 \cdot 10^{78}$ |
| STARS IN THE CORE OF STAR SYSTEMS | $6{,}00 \cdot 10^{13}$ | $9{,}851 \cdot 10^{28}$ | 90 | $6{,}819 \cdot 10^{68}$ |
| SUN-TYPE STARS | $3{,}271 \cdot 10^{10}$ | $5{,}369 \cdot 10^{25}$ | 90 | $1{,}104 \cdot 10^{59}$ |
| PLANETS | $1{,}782 \cdot 10^{7}$ | $2{,}924 \cdot 10^{22}$ | 90 | $1{,}784 \cdot 10^{49}$ |

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As an example of applying these constants, we will determine, using relation (12.3), the proper pulsations expressed in seconds, of the main celestial bodies in the solar system, as shown in the following table;

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**TABLE CONTAINING THE CALCULATION OF THE PROPER PULSATION OF THE SUN AND THE MAIN PLANETS**

Table. no;21.

| THE CONSIDERED BODY | TIME CONSTANT | BODY SPEED [m/s] | BODY MASS [kg] | PERIOD OF THE OWN PULSE [s] |
|---|---|---|---|---|
| SUN | $1{,}104 \cdot 10^{59}$ | $2{,}25 \cdot 10^{5}$ | $1{,}99 \cdot 10^{30}$ | $2{,}876 \cdot 10^{6}$ (33,28 zile) |
| EARTH | $1{,}784 \cdot 10^{49}$ | $2{,}98 \cdot 10^{4}$ | $5{,}97 \cdot 10^{24}$ | $2{,}574 \cdot 10^{6}$ (29.80 zile) |
| JUPITER | " | $1{,}31 \cdot 10^{4}$ | $1{,}90 \cdot 10^{27}$ | 7,40 |
| SATURN | " | $9{,}61 \cdot 10^{3}$ | $5{,}69 \cdot 10^{26}$ | 51,90 |
| URANIA | " | $6{,}80 \cdot 10^{3}$ | $8{,}70 \cdot 10^{25}$ | 1321,63 (22.02 min) |
| NEPTUNE | " | $5{,}40 \cdot 10^{3}$ | $1{,}03 \cdot 10^{26}$ | 667,27 |

As can be seen from the table above, the proper pulsations of large planets such as Jupiter, Saturn, Neptune, have periods of the order of seconds or minutes, and for Earth, the proper pulsation corresponds to the rotation period of the Moon.

The image below shows a graphical representation of the dependence of the planetary field pulsation on the square of the charge number of the planets of the solar system. It can be seen that the logarithms of these quantities lie on a straight line inclined at 45 degrees.

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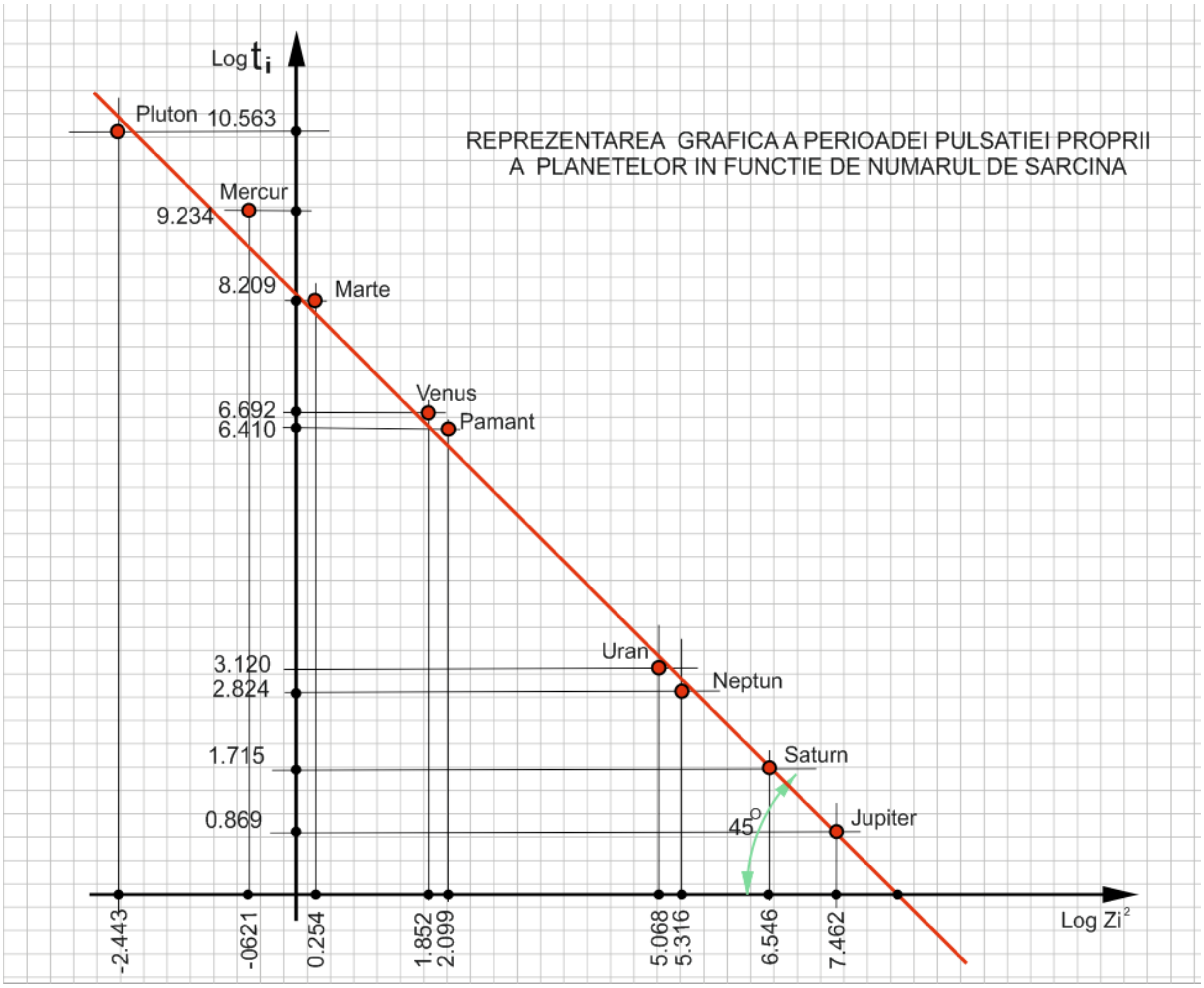


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## CHAPTER 13

## DETERMINATION OF THE CALCULATION RELATIONSHIP FOR THE REAL DIMENSIONS OF CELESTIAL BODY

Starting from the calculation relation (5.2) we can write;

$Z_{mi} = \frac{m_i}{\phi_{mi} \cdot m_0}$; or ; $m_i = Z_{mi} \cdot \varphi_{mi} \cdot m_0$; expressing the masses in terms of their densities and radii we can write;

$\frac{4}{3\pi} \cdot r_i^3 \cdot \rho_i = Z_{mi} \cdot \phi_{mi} \cdot \frac{4}{3\pi} \cdot r_{0r}^3 \cdot \rho_{0r}$; where wit "$r_{0r}$" and "$\rho_{0r}$",

the radii and densities of the elementary bodies, at rest, were noted, having Z=1.

from which the expression for the radius can be found;

$$(13.1)\quad r_i^3 = r_{0r}^3 \cdot Z_{mi} \cdot \phi_{mi} \cdot \frac{\rho_{0r}}{\rho_i};$$

$$\text{or; } (13.1.1)\quad r = r_{0r} \sqrt[3]{Z_{mi} \cdot \phi_{mi} \cdot \frac{\rho_{0r}}{\rho_i}};$$

where "$\rho_{0r}$" and "$\rho_i$" denote the densities of the elementary bodies at rest, and the densities of the real bodies in motion.

If we note; $x = \frac{Z_{mi} \cdot \phi_{mi} \cdot \rho_{0r}}{\rho_i}$; results; $r_i^3 = r_{0r}^3 \cdot x$; or by logarithm;

$$3 \log r_i = 3 \cdot \log r_{or} + \log x;$$

$$\text{or ; } (13.2)\quad \log r_{0r} = \frac{3 \cdot \log r_i - \log x}{3};$$

Knowing the parameters of all the planets and satellites in the solar system, we draw up the following tables, and with these data we can draw the family of curves characteristic of satellites, planets and, by extrapolation, for stars like the Sun. This family of curves is represented by parallel lines inclined at a certain angle, with the help of which we can find the minimum radii of celestial bodies at rest.

## TABLE WITH THE MAIN PARAMETERS OF SOME SATELLITES IN THE SOLAR SYSTEM, IN ORDER TO DETERMINE THE MINIMUM RADIUS

table no.22

| NAME OF THE CELESTIAL BODY | REAL RADIUS $r_i\ [m] \times 10^6$ | GRAVITY LOAD NUMBER « Zi » | SPEED COEFFICIENT $\varphi_i$ | REAL BODY DENSITY $\rho_i\ [kg/m^3]$ | $x_i = \frac{Z_i \cdot \varphi_i \cdot \rho_0}{\rho_i}$ | (y) $\log r_i$ | (x) $\log x_i$ |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| MOON | 1,737 | 1363 | 3,38 | 3340 | 2164 | 6,239 | 3,335 |
| IO | 1,821 | 404,5 | 13,87 | 3530 | 2493 | 6,260 | 3,396 |
| EUROPA | 1,565 | 243,98 | 12,35 | 2990 | 1581 | 6,194 | 3,198 |
| GANYMEDE | 2,634 | 847,8 | 10,98 | 1940 | 7529 | 6,420 | 3,876 |
| CALLISTO | 2,403 | 706,2 | 9,57 | 1851 | 5729 | 6,380 | 3,758 |
| MIMAS | 0,198 | 0,186 ? | 12,61 | 1140 | 3,22 | 5,298 | 0,508 |
| ENCELADUS | 0,249 | 0,387 ? | 11,84 | 1120 | 6,42 | 5,396 | 0,807 |
| TETHIS | 0,521 | 3,482 | 11,22 | 1050 | 58,37 | 5,716 | 1,766 |
| DIONE | 0,412 | 6,263 | 10,55 | 3591 | 28,86 | 5,615 | 1,46 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RHEA | 0,788 | 14,95 | 9,70 | 1127 | 201,88 | 4,896 | 2,305 |
| TITAN | 2,916 | 1072 | 7,85 | 1290 | 10235 | 6,464 | 4,010 |
| IAPETUS | 0,797 | 16,61 | 6,01 | 748 | 209,39 | 5,901 | 2,320 |
| MIRANDA | 0,234 | 0,48 | 8,61 | 1200 | 5,403 | 5,369 | 0,732 |
| ARIEL | 0,577 | 10,86 | 7,82 | 1670 | 79,78 | 5,761 | 1,901 |
| UMBRIEL | 0,584 | 10,23 | 7,19 | 1400 | 82,43 | 5,766 | 1,916 |
| TITANIA | 0,788 | 34,88 | 6,35 | 1710 | 203,22 | 5,897 | 2,307 |
| OBERON | 0,761 | 32,08 | 5,90 | 1630 | 182,18 | 5,881 | 2,26 |
| TRITON | 1,352 | 191,4 | 7,04 | 2054 | 1029 | 6,130 | 3,012 |
| CHARON | 0,586 | 67,63 | 1,57 | 1800 | 92,55 | 5,767 | 1,966 |

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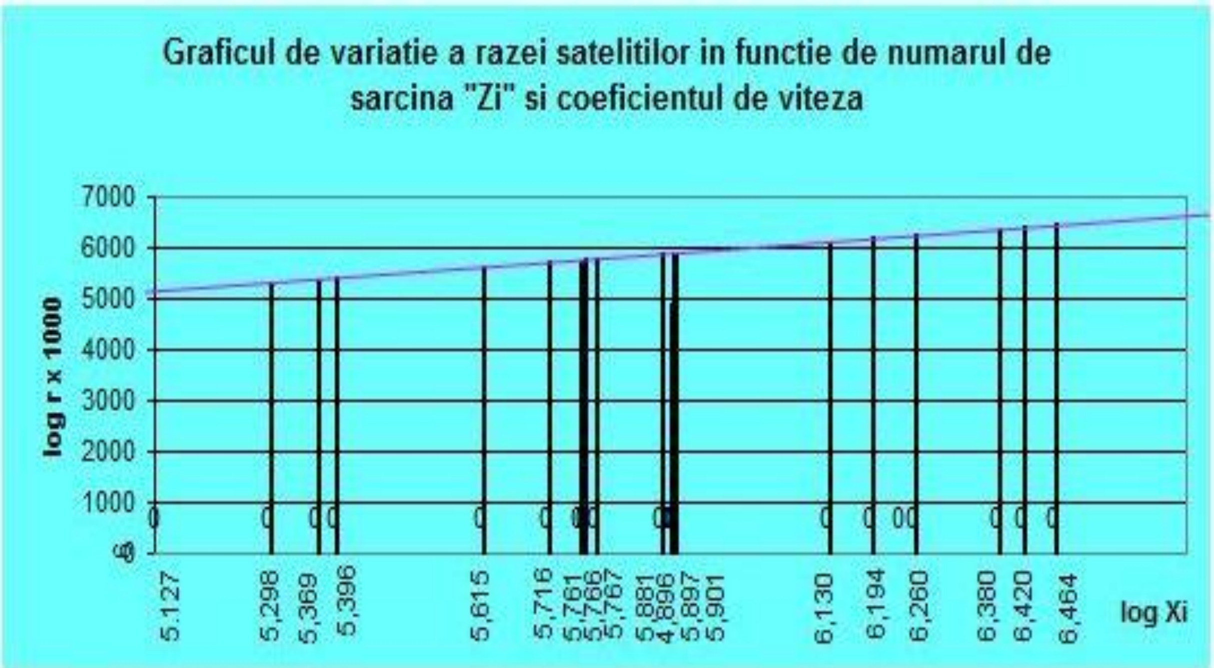
**NOTE**; in the table above, only the satellites for which we had the necessary data were listed.

With the data contained in columns 6 and 7, the following graph was drawn, which shows the linear variation of the satellite radius depending on the gravitational charge number **"Z".**




Next, we will make a similar table for the Solar System.

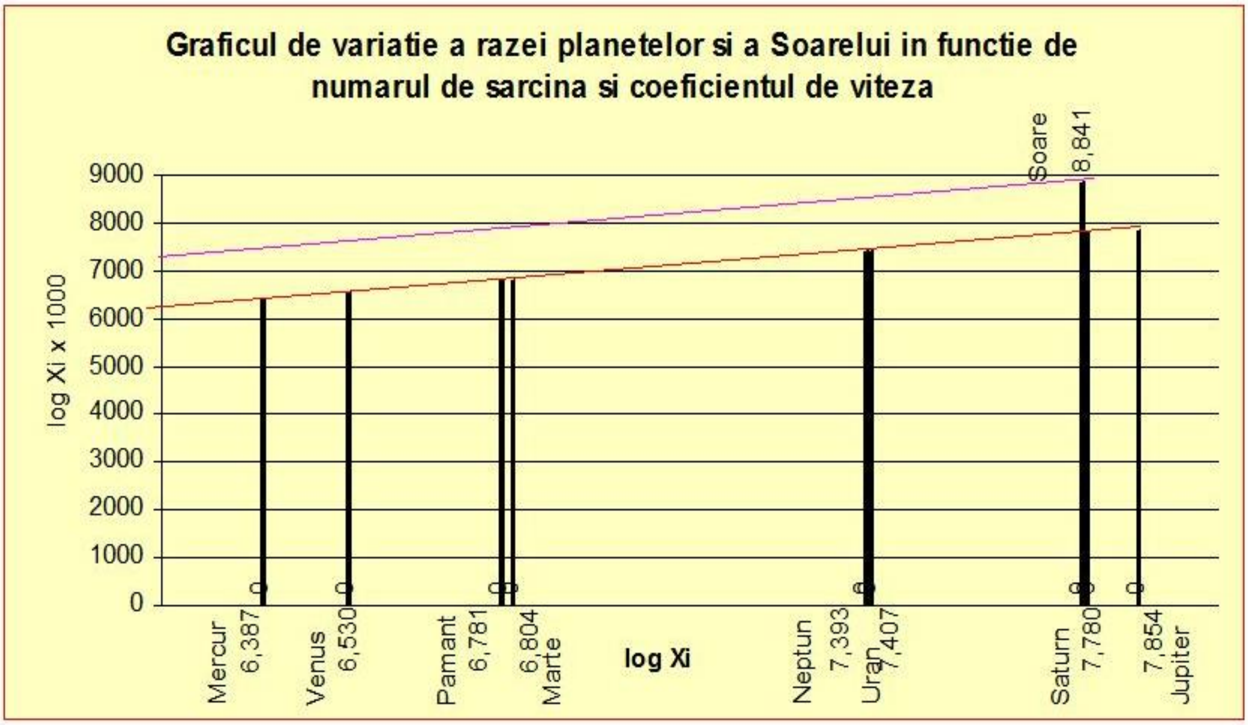
**TABLE WITH THE MAIN PARAMETERS OF THE PLANETS OF THE SOLAR SYSTEM, IN ORDER TO DETERMINE THE MINIMUM RADIUS**

Table no.23

| NAME OF THE | REAL RADIUS | GRAVITY LOAD NUMBER Zi | SPEED COEFFICIENT $\varphi_i$ | REAL BODY DENSITY $\rho_i$ $[kg/m^3]$ | $x_i = \frac{Z_i \cdot \varphi_i \cdot \rho_0}{\rho_i}$ | (y) $\log r_i$ | (x) $\log x_i$ |
|---|---|---|---|---|---|---|---|

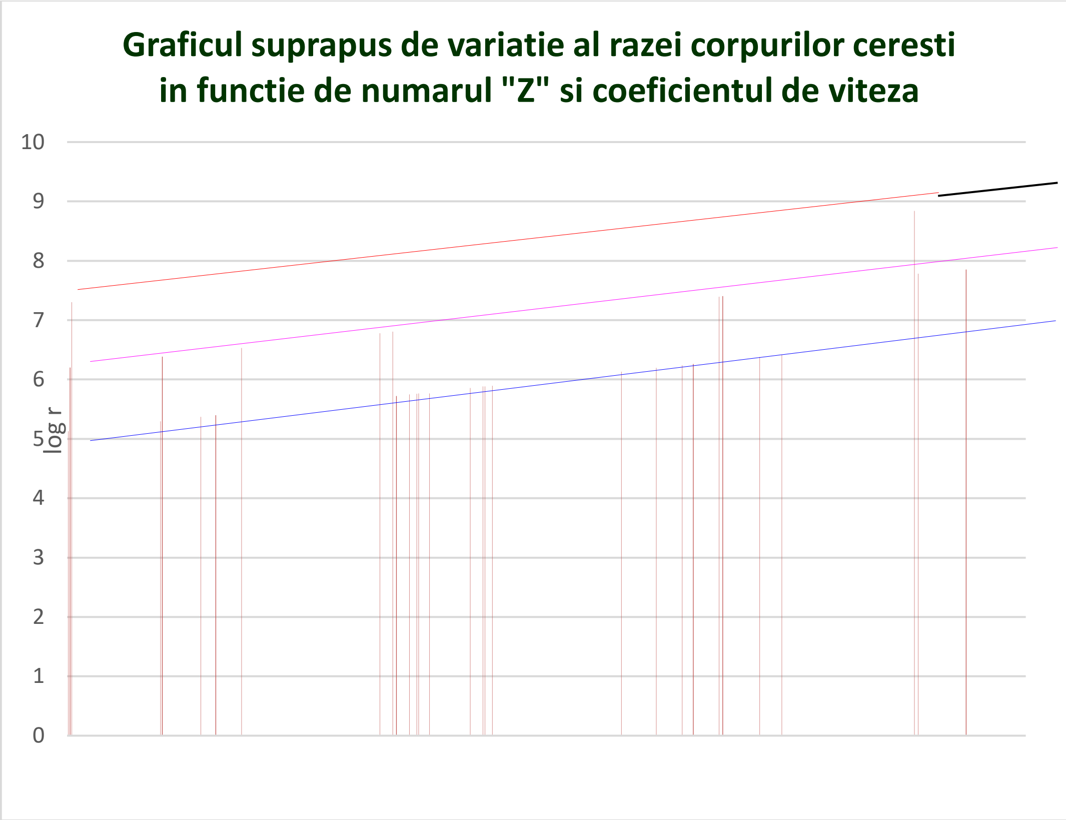
| CELESTIAL BODY | $r_i$ $[m]\times 10^6$ | | | | | | |
|---|---|---|---|---|---|---|---|
| SOARE | 695 | 740 | 50.08 | 1410 | 41269 | 8,841 | 4,615 |
| MERCUR | 2,439 | 0,489 | 23,06 | 5400 | 3,276 | 6,387 | 0,515 |
| VENUS | 6,050 | 8,44 | 19,72 | 5200 | 50,219 | 6,781 | 1,700 |
| PAMANT | 6,378 | 11,22 | 18,19 | 5500 | 58,221 | 6,804 | 1,765 |
| MARTE | 3,393 | 1,34 | 16,36 | 3900 | 8,819 | 6,530 | 0,945 |
| JUPITER | 71,492 | 5388 | 12,06 | 1300 | 78424,99 | 7,854 | 4,894 |
| SATURN | 60,268 | 1876 | 10,33 | 700 | 43436,82 | 7,780 | 4,637 |
| URAN | 25,554 | 342 | 8,69 | 1300 | 3586,95 | 7,407 | 3,554 |
| NEPTUN | 24,769 | 455 | 7,74 | 1600 | 3453,46 | 7,393 | 3,538 |
| PLUTON | 1,175 | 0,06 | 7,22 | 2000 | 0,339 | 6,070 | -0,468 |

With the above data, the following graph was drawn;




And from this graph results the dependence of the radius of the Sun and the planets on the gravitational charge number Z of the planets and the Sun, respectively.

Below we present a graph in which the lines of variation in the sizes of satellites, planets and, by extrapolation, the sizes of stars in the Sun category are plotted, depending on the gravitational charge number denoted by "Z".




By superimposing the two graphs into one, we will obtain a triad of curves that will give us information about the variation of the radius of all celestial bodies depending on the "Day" charge number and the correction coefficient that characterizes each individual body.

1. The red slanted line represents the radius variation curve of the stars in the Solar family.

2. The middle purple line represents the radius variation curve of the planets.

3. The lower blue line represents the radius variation curve of the satellites.

By extension, if we draw a parallel and equidistant line for each type of celestial body, we will obtain a graph with the sizes of all celestial bodies. It is observed that the radii of the celestial bodies under study form a cascade of sizes with an equal growth rate.

$\sqrt[3]{\boldsymbol{\alpha}} = \sqrt[3]{\mathbf{1836}} = \mathbf{12.244}$ or, on a logarithmic scale, $\mathbf{log}\ \sqrt[3]{\boldsymbol{\alpha}}\mathbf{=1.087;}$

If we read the intersection value of the "**y**" axis by the family of lines representing the variation mode of the radius of celestial bodies, we obtain the following values;

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## TABLE WITH GRAPHIC DETERMINATION OF THE MINIMUM RADIUS OF CELESTIAL BODIES AT REST

table no. 24

| NAME OF THE CATEGORY OF CELESTIAL BODIES | **log y** (Approximate value read from the graph) | MINIMUM RADIUS OF THE REAL BODY ATREST, WITH Z=1 (alog y) $r_{0r}$ [m] | ELEMENTARY BODY RADIUS $r_0$ [m] |
|---|---|---|---|
| SATELLITES | **5.1** | $1.25 \cdot 10^5$ | $0.732 \cdot 10^2$ |
| PLANETS | **6.2** | $1.58 \cdot 10^{56}$ | $0.896 \cdot 10^3$ |
| STARS IN THE SUN CATEGORY | **7.3** | $1.99 \cdot 10^7$ | $1.097 \cdot 10^4$ |
| STARS THAT ARE COMPONENTS OF THE NUCLEI OF STAR SYSTEMS | **8.4** (extrapolated value) | $2.5 \cdot 10^8$ | $1.344 \cdot 10^5$ |

It is observed that the values of the radii of real bodies, with the unitary charge number in the rest state, are 1836 times greater than the radii of the elementary bodies established in table 12. chap.3.

Taking this into account, the densities of real bodies will also be lower by 1836 times raised to the third power. That is; (13.3) $\boldsymbol{\rho_{0r} = \frac{\rho_0}{\alpha^3}}$**;** or replacing the values;

$$(13.4) \quad \rho_{0r} = \frac{9.711 \cdot 10^{12}}{1836^3} = \mathbf{1570 kg/m^3};$$

The average density of the standard celestial bodies “with Z=1” in a state of rest is obtained. Using the data in tables 22 and 23, we proceeded to determine the dimensions of the celestial bodies, by mathematical calculation applying the relation (13.2), after which the weighted average of the results was made, so that the satellites or planets with a high charge number would have the corresponding influence in determining the results

.

**TABLE WITH THE MATHEMATICAL DETERMINATION OF THE RADIUS OF THE SATELLITES**

Table. no. 25

| SATELLITE NAME | GRAVITATIONAL LOAD NUMBER Zi | (y) $\log r_i$ | (x) $\log x_i$ | $\log r_{0i} = \frac{1}{3}(3 \cdot \log r_i - \log x_i)$ | ELEMENTARY BODY RADIUS Z=1; Alog $r_{0i}$ [m] |
|---|---|---|---|---|---|
| 0 | 2 | 6 | 7 | 8 | 9 |
| MOON | 1363 | 6,239 | 3,335 | 5.127 | $1.340 \cdot 10^5$ |
| IO | 404,5 | 6,260 | 3,396 | 5.128 | $1.342 \cdot 10^5$ |
| EUROPA | 243,98 | 6,194 | 3,198 | 5.128 | $1.342 \cdot 10^5$ |
| GANYMEDE | 847,8 | 6,420 | 3,876 | 5.128 | $1.342 \cdot 10^5$ |
| CALLISTO | 706,2 | 6,380 | 3,758 | 5.127 | $1.340 \cdot 10^5$ |
| MIMAS | 0,186 ? | 5,298 | 0,508 | 5.128 | $1.344 \cdot 10^5$ |
| ENCELADUS | 0,387 ? | 5,396 | 0,807 | 5.127 | $1.339 \cdot 10^5$ |
| TETHIS | 3,482 | 5,716 | 1,766 | 5.127 | $1.340 \cdot 10^5$ |
| DIONE | 6,263 | 5,615 | 1,46 | 5.128 | $1.343 \cdot 10^5$ |
| RHEA | 14,95 | 4,896 | 2,305 | 4.127 | $0.134 \cdot 10^5$ |
| TITAN | 1072 | 6,464 | 4,010 | 5.127 | $1.340 \cdot 10^5$ |
| IAPETUS | 16,61 | 5,901 | 2,320 | 5.127 | $1.341 \cdot 10^5$ |
| MIRANDA | 0,48 | 5,369 | 0,732 | 5.125 | $1.333 \cdot 10^5$ |
| ARIEL | 10,86 | 5,761 | 1,901 | 5.127 | $1.340 \cdot 10^5$ |
| UMBRIEL | 10,23 | 5,766 | 1,916 | 1.916 | $1.340 \cdot 10^5$ |
| TITANIA | 34,88 | 5,897 | 2,307 | 5.128 | $1.342 \cdot 10^5$ |
| OBERON | 32,08 | 5,881 | 2,26 | 5.127 | $1.341 \cdot 10^5$ |
| TRITON | 191,4 | 6,130 | 3,012 | 5.126 | $1.336 \cdot 10^5$ |
| CHARON | 67,63 | 5,767 | 1,966 | 5.111 | $1.293 \cdot 10^5$ |
| WEIGHTED AVERAGE RADIUS $r_{o,med} = \frac{Z_i \cdot r_{0i}}{Z_{tot}}$ | | | | | (For satellites) $r_{0i} = 1.366 \cdot 10^5 m$ |

For satellites, the minimum radius value was adopted: **1.344·10^5 m,** a value that coincides with the radius of the smallest body in the galaxy according to the relationship ( 1.16).

And in the case of planets, the average radius was calculated using the table below, obtaining values close to those in the graph, as follows;

## TABLE DETERMINING THE RADII OF THE PLANETS

Table no.26

| NAME OF CELESTIAL BODIES | GRAVITATIONAL LOAD NUMBER (Zi) | $\log r_i$ | $\log x_i$ | $\log r_{0i} = \frac{1}{3}(3 \cdot \log r_i - \log x_i)$ | BODY RADIUS ELEMENTARY FOR Z=1 ; Alog $r_{0i}$ [m] |
|---|---|---|---|---|---|
| SUN | 740 | 8,841 | 4,615 | 7.302 | $2.007 \cdot 10^7$ |
| PLANETS | | | | | |
| MERCUR | 0,489 | 6,387 | 0,515 | 6.215 | $1.643 \cdot 10^6$ |
| VENUS | 8,44 | 6,781 | 1,700 | 6.214 | $1.638 \cdot 10^6$ |
| EARTH | 11,22 | 6,804 | 1,765 | 6.215 | $1.643 \cdot 10^6$ |
| MARTE | 1,34 | 6,530 | 0,945 | 6.215 | $1.640 \cdot 10^6$ |
| JUPITER | 5388 | 7,854 | 4,894 | 6.222 | $1.669 \cdot 10^6$ |
| SATURN | 1876 | 7,780 | 4,637 | 6.234 | $1.715 \cdot 10^6$ |
| URANIA | 342 | 7,407 | 3,554 | 6.222 | $1.668 \cdot 10^6$ |
| NEPTUN | 455 | 7,393 | 3,538 | 6.213 | $1.635 \cdot 10^6$ |
| PLUTON | 0,06 | 6,070 | -0,468 | 6.226 | $1.682 \cdot 10^6$ |
| WEIGHTED AVERAGE RADIUS | $r_{o,med} = \frac{Z_i \cdot r_{0i}}{Z_{tot}}$ | | | | (For planets) $r_{0i} = 1.677 \cdot 10^6$ m; |

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## TABLE DETERMINING THE MINIMUM RADIUS OF COSMIC BODIES AT REST

Table no .27

| NAME OF THE FAMILY OF COSMIC BODIES | log y (Approximate value read from the graph) | MINIMUM RADIUS OF THE BODY AT REST, WITH Z=1 [m] | | |
|---|---|---|---|---|
| | | GRAPHIC DETERMINATION | MATHEMATICAL DETERMINATION | THEORETICALLY ADOPTED VALUE |
| SATELITS | 5.1 | $1.25 \cdot 10^5$ | $1.366 \cdot 10^5$ | $1.344 \cdot 10^5$ |
| PLANETS | 6.2 | $1.58 \cdot 10^6$ | $1.677 \cdot 10^6$ | $1.645 \cdot 10^6$ |
| STARS IN THE SUN CATEGORY | 7.3 | $1.99 \cdot 10^7$ | $2.007 \cdot 10^7$ | $2.015 \cdot 10^7$ |
| STARS THAT ARE COMPONENTS OF THE NUCLEI OF STAR SYSTEMS | 8.4 (valoare extrapolat) | $2.5 \cdot 10^8$ | – | $2.467 \cdot 10^8$ |

## CHAPTER 14

## GENERALIZED RELATIONSHIP FOR CALCULATING ANGULAR MOMENTUM FOR MACROCOSMIC SYSTEMS

If we want to explain the value of the angular momentum of a body i depending on the parameters of the system it is part of, we can replace in (14.3) "$m$", "$V$" and "$R$", with the expressions;

$$m_i = m_o \cdot Z_i \cdot \phi_i \ ; \quad V_i = \frac{V_0 \cdot Z_M}{n_i}; \quad R_i = \frac{{n_i}^2 \cdot R_0 \cdot \phi_M}{Z_M} \ ;$$

$$(14.1) \quad H_i = 2\pi \cdot (m_o \cdot Z_i \cdot \phi_i) \cdot \left(\frac{V_0 \cdot Z_M}{n_i}\right) \cdot \left(\frac{{n_i}^2 \cdot R_0 \cdot \phi_M}{Z_M}\right);$$

from which after simplification and grouping the terms it results;

$$(14.2)\quad H_i = (2\pi \cdot m_0 \cdot V_0 \cdot R_0) \cdot n_i \cdot Z_i \cdot \varphi_i \cdot \varphi_M;$$

In which we note; $H_0 = 2\pi \cdot m_0 \cdot V_0 \cdot R_0;$

is - **the angular momentum constant** for the elementary system.

So replacing above results in; (14.3) $H_i = H_0 \cdot n_i \cdot Z_i \cdot \varphi_i \cdot \varphi_M$ ;

represents the generalized relationship of the angular momentum of the body "mi" in the system (M/m), and "Ho" is - **the angular momentum constant** for the family of systems to which the body considered in the macrocosm belongs.

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**Thus, in the case of the Sun-Earth system, we can find the angular momentum by replacing the respective parameters of the Earth and the Sun, in the above relation as follows**

- **the angular momentum constant** for the standard solar system. $H = 7.45 \cdot 10^{36}$ [J.s].

-the principal quantum number of the Earth is ***ni=2.2*** ;

-Earth's charge number; **Z=11.22;**

-Earth's velocity coefficient; $\varphi_{p=18.19}$;

-the speed coefficient of the Sun; $\varphi_{p=50}$;

-the mass of the Earth is; sq mp= $5.973 \cdot 10^{24}$ kg ;

-the speed of the earth in orbit is; $V_p = 2.99 \cdot 10^4$ m/s ;

**(14.4)** $H_{earth} = 7.45 \cdot 10^{36} \cdot 2.2 \cdot 11.22 . 18.19 . 50 = 1.672 \cdot 10^{41}$ **J.s ;**

**Substituting this constant into De Broglie's relation adapted for the macrocosm, we find that the accompanying wavelength of the Earth is equal to the length of the orbit around the Sun;**

$$(14{,}9)\quad \lambda = \frac{H_p}{m_p \cdot V_p};$$

$$\lambda = \frac{1.672 \cdot 10^{41}}{5.973 \cdot 10^{24} \cdot 2.99 \cdot 10^{4}} = 9.362.10^{11}\ \text{m};$$

The wavelength is equal to ; $\lambda = 9.361.10^{11}\ m;$

But the distance between Earth and Sun is; **1.49.10^11**, that is, multiplied by ($2\pi$)

represents; $\lambda = 9.361.10^{11}\ m$; exactly as it resulted from the calculation above.

For example, we proceeded to calculate the angular momentum for all the planets of the Solar system in the table below, applying the relationship; (14.9)

**in the case of the Sun;** $H_0 = \frac{m_i \cdot V_i^2 \cdot T_i}{n_i \cdot Z_i \cdot \phi_i \cdot \phi_M}$; in which; $\varphi_{M=50}$;;

**TABLE FOR CALCULATING THE ANGULAR MOMENTUM CONSTANT IN SOLAR SYSTEMS**

Table no.28

| NAME OF THE PLANET | MASS "mi " (Kg) | SPEED "Vi " (m/s) | PERIOD OF REVOLUTION "Ti " (sec) | PRINCIPAL QUANTUM NUMBER | GRAVITY NUMBER "Zi " | SPEED COEFFICIENT $\varphi_i$ | ANGULAR MOMENTUL CONSTANT PENTRU SISTEME SOLARE "Ho" |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| MERCUR | $3{,}3 \cdot 10^{23}$ | $4{,}79 \cdot 10^{4}$ | $7{,}594 \cdot 10^{6}$ | 1,4 | 0,489 | 23,06 | $7.28 \times 10^{36}$ |
| VENUS | $4{,}87 \cdot 10^{24}$ | $3{,}5 \cdot 10^{4}$ | $1{,}941 \cdot 10^{7}$ | 1,9 | 8,44 | 19,72 | $7.32 \times 10^{36}$ |
| EARTH | $5.97 \cdot 10^{24}$ | $2{,}98 \cdot 10^{4}$ | $3{,}155 \cdot 10^{7}$ | 2,2 | 11,22 | 18,19 | $7.45 \times 10^{36}$ |
| MARTE | $6{,}42 \cdot 10^{23}$ | $2{,}41 \cdot 10^{4}$ | $5{,}935 \cdot 10^{7}$ | 2,8 | 1,34 | 16,36 | $7.21 \times 10^{36}$ |
| JUPITER | $1{,}9 \cdot 10^{27}$ | $1{,}31 \cdot 10^{4}$ | $3{,}741 \cdot 10^{8}$ | 5,0 | 5388 | 12,06 | $7.50 \times 10^{36}$ |
| SATURN | $5{,}69 \cdot 10^{26}$ | $9{,}61 \cdot 10^{3}$ | $9{,}294 \cdot 10^{8}$ | 7,0 | 1876 | 10,33 | $7.2 \times 10^{36}$ |
| URANIA | $8{,}7 \cdot 10^{25}$ | $6{,}8 \cdot 10^{3}$ | $2{,}651 \cdot 10^{9}$ | 10 | 342 | 8,69 | $7.17 \times 10^{36}$ |
| NEPTUN | $1{,}03 \cdot 10^{26}$ | $5{,}4 \cdot 10^{3}$ | $5{,}199 \cdot 10^{9}$ | 12 | 455 | 7,74 | $7.38 \times 10^{36}$ |
| PLUTON | $1{,}3 \cdot 10^{22}$ | $4{,}7 \cdot 10^{3}$ | $7{,}814 \cdot 10^{9}$ | 14 | 0,06 | 7,22 | $7.39 \times 10^{36}$ |

As can be seen from column no. 8, an average value of ; $H_{0,S} = 7.32 \cdot 10^{36}$ **[J.s], for the angular momentum constant, specific to the solar system family, a value that is very close to that obtained using the similarity relations of ;** $H_{0,S} = 7.36 \cdot 10^{36}$ **[J.s].**

Similarly, the angular momentum constant of the family of satellite systems can be verified.

In the case of the Earth-Moon system, the angular momentum can be calculated with the relation (14.9 )

thus; $\boldsymbol{H_0} = \frac{m_i \cdot V_i^{2} \cdot T_i}{n_i \cdot Z_i \cdot \phi_i \cdot \phi_M}$; substituting the respective values we have;

$$H_o = \frac{7.349 \cdot 10^{22} \cdot (1.032 \cdot 10^3)^2 \cdot 2.36 \cdot 10^6}{1 \cdot 1355 \cdot 3.38 \cdot 18.19} = 2.21 \cdot 10^{30}; \text{ [J.s]};$$

Next, the following table was drawn up for the main satellites of the planet Saturn, for which we had all the necessary data. It was taken into account that; $\varphi_i$Saturn =11.33;

## TABLE FOR CALCULATING THE ANGULAR MOMENTUM CONSTANT FOR SATELLITE SYSTEMS

table no.29

| DENUMIREA SATELITU LUI | MASA "mi " (Kg) | VITEZA "Vi " (m/s) | PERIOADA DE REVOLUTIE "Ti " (sec) | NR. CUAN TIC PRINC IPAL | NUMAR DE SAR CINA "Zi " | COEFICIEN TUL DE VITEZA $\varphi_i$ | CONSTANTA LUI PLANK PENTRU SISTEME DE SATELITI "Ho" |
|---|---|---|---|---|---|---|---|
| **MIMAS** | $3,75 \cdot 10^{19}$ | $1,432 \cdot 10^4$ | $8.142 \times 10^4$ | 12 | 0,186 ? | 12,61 | $2.15 \times 10^{30}$ |
| **ENCELADUS** | $7,3 \cdot 10^{19}$ | $1,263 \cdot 10^4$ | $11.83 \times 10^4$ | 13 | 0,387 ? | 11,84 | $2.23 \times 10^{30}$ |
| **TETHIS** | $6,22 \cdot 10^{20}$ | $1,134 \cdot 10^4$ | $16.31 \times 10^4$ | 15 | 3,482 | 11,22 | $2.15 \times 10^{30}$ |
| **DIONE** | $1,052 \cdot 10^{21}$ | $1,002 \cdot 10^4$ | $23.64 \times 10^4$ | 17 | 6,263 | 10,55 | $2.15 \times 10^{30}$ |
| **RHEA** | $2,31 \cdot 10^{21}$ | $0,848 \cdot 10^4$ | $39.03 \times 10^4$ | 20 | 14,95 | 9,70 | $2.16 \times 10^{30}$ |
| **TITAN** | $1,34 \cdot 10^{23}$ | $0,556 \cdot 10^4$ | $137.7 \times 10^4$ | 30 | 1072 | 7,85 | $2.18 \times 10^{30}$ |
| **IAPETUS** | $1,59 \cdot 10^{21}$ | $0,326 \cdot 10^4$ | $685.4 \times 10^4$ | 52 | 16,61 | 6,01 | $2.15 \times 10^{30}$ |

As can be seen from column no. 8, the angular momentum constant for satellites resulting from the calculation is approximately equal to that determined by the similarity relations, which has the value of **Ho**,s=2.21 $\times 10^{30}$ [Js ] .

The same can be verified for the other satellites of other planets, the results being similar.

## CHAPTER 15

## DETERMINATION OF THE CALCULATION RELATIONSHIP OF THE PERIPHERAL VELOCITY OF CELESTIALS BODIES

From the point of view of the rotation period around their own axis, celestial bodies are divided into two categories: the first category includes celestial bodies that have a rotation period synchronous with the revolution period (satellites), and the second category includes other celestial bodies that have a rotation period different from the revolution period.

As far as is known in our solar system, satellites are usually part of the first category, with some exceptions, and planets, the Sun and stars are part of the second category.

In the following we will treat the two cases in turn, so we will start with the known satellites, such as the Moon, Io, Europa, Ganymede, Mimas, Enceladus, Thetys, Dione, Rhea, Titan, which have a rotation period synchronous with the revolution period.

A. The rotation period can be calculated with the relation; (15.1)

$t_i = \frac{2\pi \cdot r_i}{V_{pi}}$; where; "**ti**", "**ri**", and "**Vpi**" are the period, the radius of the satellite (not the central core), and the peripheral velocity, respectively, while the period of revolution is calculated with the expression:

(11.2) $\boldsymbol{T_i = n_i^3 \cdot T_0 \cdot \frac{\phi_M}{Z_M^2}}$; Since the periods "**Ti**" and "**ti**" are equal, in the case of synchronous satellites we have;

$$\boldsymbol{t_i = \frac{2\pi \cdot r_i}{V_{pi}} = n_i^3 \cdot T_0 \cdot \frac{\phi_M}{Z_M^2}};\ \text{in which, we can replace ;}$$

$$\boldsymbol{t_i = \frac{2\pi \cdot r_0}{V_0}};\ \text{and}\ \boldsymbol{R_0 = Z_\uparrow{}^2 \cdot r_0};\ \text{in which};\ \boldsymbol{Z_\uparrow = \alpha = 1836};,$$

in the case of satellites according to table no. 12, "$\boldsymbol{r_0}$" is the radius of an "elementary body (standard)" satellite with charge number **Z=1**. So we can write;

$$\boldsymbol{t_i = n_i^3 \cdot \frac{2\pi \cdot r_0 \cdot \alpha^2}{V_0} \cdot \frac{\phi_M}{Z_M^2}};$$

in which we note;

$$\boldsymbol{t_o = 2\pi \cdot r_0 \frac{\alpha^2}{V_0} = const.}$$

which represents the initial rotation time of an elementary satellite.

I mean, $t_i = t_0 \cdot \frac{n_i^3 \cdot \phi_M}{Z_M^2}$; in this relationship it can be replaced;

$Z_M = \frac{V_1}{V_0} = \frac{n_i \cdot V_i}{V_0} = n_i \cdot \phi_i^2$; and we get; (15.2) $t_i = t_0 \cdot \phi_M \cdot \frac{n_i}{\phi_i^4}$ ; which represents the calculation relationship of the rotation period of a synchronous satellite depending on the velocity coefficient "$\phi_M$ " of the planet around which the satellite revolves, the principal quantum number "ni" of the satellite and its velocity

coefficient " $\phi_i$".

Knowing the rotation period we can calculate the peripheral velocity as follows;

$$V_{Pi} = \frac{2\pi \cdot r_i}{t_i} = \frac{2\pi \cdot r_i \cdot \phi_i^4}{t_0 \cdot \phi_M \cdot n_i} = \frac{2\pi \cdot r_i}{2\pi \cdot r_0} \cdot \frac{V_0}{\alpha^2} \cdot \frac{\phi_i^4}{n_i \cdot \phi_M};$$

In this relation we will note; $V_{P0} = \frac{V_0}{\alpha^2} = \frac{90}{1836^2}$;

$$V_{P0} = 2.67 \cdot 10^{-6} m/s;$$

and we will call it the initial peripheral velocity of a standard satellite.

After simplifications we obtain;

$$(15.3) \quad V_{Pi} = V_{P0} \cdot \frac{r_i}{r_0} \cdot \frac{\phi_i^4}{n_i \cdot \phi_M};$$

This represents the calculation relationship for the peripheral velocity of a synchronous satellite.

Similarly, the calculation relationship for the angular velocity can be written as follows;

$$(15.4) \quad \varpi_i = \varpi_0 \cdot \frac{\phi_i^4}{n_i \cdot \phi_M};$$

where the initial angular velocity is;

$$\varpi_0 = \frac{V_{P0}}{r_0} = 3.65 \cdot 10^{-7} s^{-1};$$

From relation (15.3) we can extract the satellite radius;

$$(15.3.1.) \quad r_i = r_{0r} \frac{V_{Pi}}{V_{P0}} \cdot \frac{n_i \cdot \phi_M}{\alpha \cdot \phi_i^4} \;;$$

knowing the relationship between the real radius of the satellite with **Z=1** at rest, and the radius of the elementary body; $r_{0r} = \alpha \cdot r_0$;

from relation (13.1) the radius of a satellite is ;

$$(13.1.1)\quad r_i = r_{0r} \cdot \sqrt[3]{Z_i \cdot \phi_i \frac{\rho_{0r}}{\rho_i}}:$$

by equating the two relations we can find the density of a satellite, as follows;

$$\frac{V_{Pi}}{V_{P0}} \cdot \frac{n_i \cdot \phi_M}{\alpha \cdot \phi_i^4} = \sqrt[3]{Z_i \cdot \phi_i \cdot \frac{\rho_{0r}}{\rho_i}}; \text{ sau;}$$

$$(15.5)\rho_i = \rho_{0r} \cdot \frac{Z_i \cdot \alpha^3 \cdot \phi_i^{13}}{n_i^3 \cdot \phi_M^3} \cdot \left(\frac{V_{P0}}{V_{Pi}}\right)^3; \text{ in care } \rho_{0r} = 1570 kg/m^3;$$

For example, we can enter the known data for the Earth-Moon system and thus find the density of the Moon;

$$\rho_L = 1570 \cdot \frac{1369 \cdot 1836 \cdot 3.386^{13}}{1^3 \cdot 18.37^3} \cdot \left(\frac{2.67 \cdot 10^{-6}}{4.62}\right)^3 = 3230\ Kg/m^3;$$

value which is very close to the density measured by 3340 $Kg/m^3$;

**B** The case of large planets, and even the Sun, requires a distinct analysis based on observations. For this we propose to make a comparison between the product of the rotation period "$t_i$" and the radius of the respective body ,"$r_i$" with the product of the initial rotation period " $t_0$ " and the radius of the body with **Z=1** at rest "$r_{0r}$".

**In the case of the Sun;**

$$(t_0 \cdot r_{0r})_{Soare} = \frac{2\pi \cdot r_{0r}}{V_0} \cdot r_{0r} = \frac{2 \cdot \pi \cdot (2.012 \cdot 10^7)^2}{90} = 2.826 \cdot 10^{13};$$

**And in the case of planets;**

$$(t_0 \cdot r_{0r})_{Planet} = \frac{2\pi \cdot r_{0r}}{V_0} \cdot r_{0r} = \frac{2 \cdot \pi \cdot (1.643 \cdot 10^6)^2}{90} = 1.884 \cdot 10^{11};$$

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With the real data we will draw up the following table;

## TABLE FOR DETERMINING VELOCITY COEFFICIENTS AS A FUNCTION OF THE ROTATION PERIOD AND RADIUS OF THE RESPECTIVE BODY

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table no.30

| THE CELESTIAL BODY CONSIDERED | $t_i$ [sec] | $r_i$ [m] | $(t_i * r_i)$ | $(t_0 * r_{0r})$ | $\frac{t_i * r_i}{t_0 * r_{0r}}$ | SPEED COEFFICIENT $\varphi_i$ |
|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| SUN | $2.332 \cdot 10^6$ | $6.95 \cdot 10^8$ | $1.621 \cdot 10^{15}$ | $2.826 \cdot 10^{13}$ | 57.36 | 50.5 |
| JUPITER | $3.528 \cdot 10^4$ | $6.7 \cdot 10^7$ | $2.363 \cdot 10^{12}$ | $1.884 \cdot 10^{11}$ | 12.54 | 12.18 |
| SATURN | $3.672 \cdot 10^4$ | $5.7 \cdot 10^7$ | $2.093 \cdot 10^{12}$ | " | 11.10 | 10.43 |
| URANIA | $6.44 \cdot 10^4$ | $2.4 \cdot 10^7$ | $1.545 \cdot 10^{12}$ | " | 8.20 | 8.77 |
| NEPTUN | $6.876 \cdot 10^4$ | $2.27 \cdot 10^7$ | $1.560 \cdot 10^{12}$ | " | 8.28 | 7.82 |

If we compare the results in columns 5 and 6, we notice that they, with minor exceptions, are quite close, which allows us to establish the following relationship;

(15.6) $$t_i \cdot r_i = \phi_i \cdot (t_0 \cdot r_{0r}); \quad \text{sau;} \quad \frac{t_i \cdot r_i}{\phi_i} = (t_0 \cdot r_{0r}) = Const;$$

replacing time and velocity coefficient with their relations we obtain;

(15.6.1) $$\frac{2\pi \cdot r_i^2}{V_{Pi} \cdot \sqrt{\frac{V_i}{V_0}}} = \frac{2\pi \cdot r_{0r}^2}{V_0}$$ ; by squaring and simplifying we have;

(15.7) $$\frac{r_i^4}{V_{Pi}^2 \cdot V_i} = \frac{r_{0r}^4}{V_0^3} = C_V;$$

In which by "Cv" we have called the "state constant" specific to each type of celestial body, which has the following values;

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## TABLE OF STATE CONSTANTS "C V "

table no.31

| SYSTEM NAME | RADIUS OF THE BODY AT REST WITH Z=1 "$r_{or}$" [m] | STATE CONSTANT "CV" [m.s] |
|---|---|---|
| GALACTIC SYSTEM | $2.464 \cdot 10^{8}$ | $5.056 \cdot 10^{27}$ |
| STAR SYSTEM | $2.012 \cdot 10^{7}$ | $2.247 \cdot 10^{23}$ |
| SOLAR SYSTEM | $1.643 \cdot 10^{6}$ | $9.995 \cdot 10^{18}$ |
| SATELLITE SYSTEM | $1.342 \cdot 10^{5}$ | $4.449 \cdot 10^{14}$ |

Using relation (15.7) and the constants of state, we can find the radii of the bodies knowing their peripheral velocities and orbital velocities.

Returning to relation (15.6), and replacing the radius of the body with its expression in (13.1)

$$r_i = r_{0r} \cdot \sqrt[3]{Z_i \cdot \phi_i \frac{\rho_{0r}}{\rho_i}};$$

after making the respective substitutions, we obtain the expression;

$$(15.8) \quad t_i = t_0 \cdot \sqrt[3]{\frac{\phi_i^2 \cdot \rho_i}{Z_i \cdot \rho_{0r}}};$$

which represents the calculation relationship of the rotation period for the large planets and the Sun, depending on their parameters, namely: the velocity coefficient, the charge number, and the density of the body.

***For small planets this relationship is not valid.***

Next we can establish the calculation relationship for angular velocity;

$$(15.9)\ \varpi_i = \varpi_0 \cdot \sqrt[3]{\frac{Z_i \cdot \rho_{0r}}{\phi_i^2 \cdot \rho_i}};$$

By taking the product between the relations of angular velocity and the radius of the body, we obtain the relation of the peripheral velocity of the celestial bodies with large mass, from the Solar system, as follows;

$$(15.10) V_{Pi} = V_0 \cdot \sqrt[3]{\frac{Z_i^2}{\phi_i} \cdot \left(\frac{\rho_{0r}}{\rho_i}\right)^2};$$

in which;

$$\rho_{0r} = 1570 Kg/m^3; \quad \text{si} \quad V_0 = 90\ m/s;$$

Knowing all the parameters, we can proceed to the tabular calculation of the peripheral velocity for the large bodies in the system, using the relation (15.10) as follows:

## TABLE FOR CALCULATING THE PERIPHERAL VELOCITY OF CELESTIAL BODY

table nr.32

| THE CELESTIAL BODY CONSIDERED | GRAVITATIONAL LOAD NUMBER. $Z_i$ | SPEED COEFFICIENT $\varphi_i$ | REAL BODY DENSITY $\rho_{i[Kg/m^3]}$ | CALCULATED PERIPHERAL SPEED (rel.15.10) [m/s] | ACTUAL PERIPHERAL SPEED [m/s] |
|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 |
| SOARE | 740 | 50.0 | 1400 | 2157 | 2000 |
| JUPITER | 5333 | 12.18 | 1340 | 13540 | 12797 |
| SATURN | 1864 | 10.43 | 710 | 10364 | 10312 |
| URAN | 339 | 8.77 | 1300 | 2334 | 2491 |
| NEPTUN | 450 | 7.82 | 1600 | 2553 | 2262 |

As can be seen by comparing the data in columns 4 and 5, they are quite close.

Starting from relation (15.10) we can find the density of large bodies in the system as follows;

$$V_{Pi}^3 = V_0^3 \cdot \frac{Z_i^2}{\phi_i} \cdot \left(\frac{\rho_{0r}}{\rho_i}\right)^2; \text{ from where;}$$

It is seen that the density of these bodies depends on the number of charges, the peripheral velocity and the velocity coefficient.

$$(15.11)\quad \rho_i = \rho_{0r} \cdot Z_i \cdot \sqrt{\frac{V_0^3}{V_{Pi}^3 \cdot \phi_i}};$$

**For example, the density of Jupiter will be;**

$$\rho_J = 1570 \cdot 5333 \cdot \sqrt{\frac{90^3}{12797^3 \cdot 12.18}} = 1414 kg/m^3;$$

compared to 1340kg/mc, as given in the specialized literature.

and for Saturn;

$\rho_S = 1570 \cdot 1864 \cdot \sqrt{\frac{90^3}{10364^3 \cdot 10.43}} = 733 kg/m^3;$ compared to **710** kg/mc, as specified in the specialized literature.

It is observed that the results of the calculations are quite close to the astronomically determined values.

Another application of the relation (15.6.1) would be determining the orbital velocity of a star, when we know its peripheral velocity and radius.

Thus from (15.6.1) it follows;

$(15.6.2)\quad V_{Pi} = V_0 \cdot \left(\frac{r_i}{r_0}\right)^2 \cdot \frac{1}{\phi_i};$ in which we replace ;

$\phi_i = \sqrt{\frac{V_i}{V_0}};$ and we get; $(15.12)\quad V_i = \frac{V_0^3}{V_{pi}^2} \cdot \left(\frac{r_i}{r_0}\right)^4;$

**As an application, we will try to find the speed of the Sun, knowing the peripheral speed and radius, as follows:**

$$V_{Soare} = \frac{90^3}{(2.021 \cdot 10^3)^2} \cdot \left(\frac{6.95 \cdot 10^8}{2.012 \cdot 10^7}\right)^4 = 254.110. m/s;$$

compared to 220000 m/s, as determined by astronomical means of measurement.

For the planet Jupiter we will have;

$$Vjupiter = \frac{90^3}{(12.797 \cdot 10^3)^2} \cdot \left(\frac{6.7 \cdot 10^7}{1.643 \cdot 10^6}\right)^4 = 12310. m/s;$$

compared to 13100 m/s which is the average speed calculated from astronomical data.

***This relationship does not hold for small planets.***

## CHAPTER 16

## DECISION OF THE CALCULATION RELATIONSHIP FOR THE ORBITAL KINETIC ENERGY OF THE CELESTIAL BODY

The kinetic energy of celestial bodies can be divided into: the kinetic energy of orbital motion or movement, and the kinetic energy of rotation. The kinetic energy $E_{Ci}$ of bodies moving in the orbit of a system can be calculated with the relationship known from physics, thus for a body « $i$ » having mass « $mi$ » and speed of movement « $Vi$ »; the relationship is applied; (16.1) $E_{Ci} = \frac{1}{2} \cdot m_i \cdot V_i^2;$

in which we can replace the corresponding expressions previously established in terms of the elementary mass $m_0$, the charge number $Zi$, and the velocity coefficient $\varphi i$ for the real mass and respectively the real velocity of the body expressed in terms of the minimum velocity $Vo$, and the quantum number of the orbit ni as follows;

$$m_i = m_0 \cdot Z_i \cdot \phi_i \text{ ; and ; } V_i = V_0 \cdot \frac{Z_M}{n_i} \text{ ;}$$

Applying these relations, we obtain the expression for kinetic energy;

(16.1.1.) $E_{Ci} = \frac{1}{2} \cdot (m_0 \cdot Z_i \cdot \phi_i) \cdot V_0^2 \cdot \frac{Z_M^2}{n_i^2}$; in which we note;

$E_0 = \frac{1}{2} \cdot m_0 \cdot V_0^2;$ this represents the initial kinetic energy, which we substitute into the above relation, and we obtain the desired expression;

$$\text{(16.1.2) } E_{Ci} = E_0 \cdot \frac{Z_i \cdot \phi_i}{n_i^2} \cdot Z_M^2;$$

Also knowing the calculation relationship of the radius of the orbit of any body,

$$R_n = R_0 \frac{\varphi_M \cdot n_i^2}{Z_M} \text{ ;}$$

we can determine a generalized relation for calculating the angular momentum constant for a given system. Knowing that the angular momentum for an elementary body is given by the relation; (14.8) ; $\boldsymbol{H_0 = 2\pi \cdot m_0 \cdot V_0 \cdot R_0}$;

For any celestial body in a system, the angular momentum ***Hi*** can be written in terms of ***Ho***, and the principal quantum number of the orbit ***ni***, the charge number of the body ***Zi***, the velocity coefficient of the body $\boldsymbol{\varphi_i}$ and the velocity coefficient of the nucleus $\boldsymbol{\varphi_M}$; , obtaining the relation;

$$(16.1.4) \quad \boldsymbol{H_i = H_0 \cdot n_i \cdot Z_i \cdot \varphi_i \cdot \varphi_M};$$

The period of revolution of the body ***mi***, denoted by ***Ti,*** is calculated according to the period $\boldsymbol{T_0}$ corresponding to a body belonging to a standard system given by the relation (11.2); $\boldsymbol{T_0} = \frac{2\pi \cdot R_0}{V_0}$ ; corrected with the quantum number ni to the third power multiplied by the velocity coefficient of the nucleus $\boldsymbol{\varphi_M}$and related to the gravitational charge number of the nucleus squared $\boldsymbol{Z_M^2}$ resulting in the relation;

$$(16.3) \ \boldsymbol{T_i = T_0 \cdot \frac{n_i^3 \cdot \varphi_M}{Z_M^2}};$$

Using the orbital period and the angular momentum we will group the terms and after simplifications we obtain;

$$\boldsymbol{E_{Ci} = \frac{1}{2} \cdot \frac{H_0}{T_0} \cdot \frac{Z_i \cdot \phi_i \cdot Z_M^2}{n_i^2}} \text{;respectively; (16.5) } \boldsymbol{E_{Ci} = \frac{1}{2} \cdot \frac{H_i}{T_i}};$$

As can be seen, this relation for the kinetic energy of a body orbiting in a system is equal to half the ratio of the angular momentum constant to the period of revolution of the body in orbit. The energy is quantized and the relation is similar to the relation of the energy of the electron in the structure of the atom.

# CHAPTER 17

## DETERMINATION OF THE CALCULATION RELATIONSHIP OF THE ROTATIONAL KINETIC ENERGY OF CELEBRITIES

In this chapter, for ease of calculation, we will consider celestial bodies as being in a solid state, and we will ignore the fact that in reality they can have other states of aggregation.

The rotational kinetic energy of a solid spherical body is given by the well-known relation;

(17.1) $E_r = \frac{1}{2} J \cdot \omega^2$ ; where ***"J"*** is the moment of inertia of the body, and omega is its angular velocity. In the case of solid spherical bodies, the moment of inertia is

(17.2) $J = \frac{2}{5}\, m \cdot r^2$ ; where "***m***" is the mass and "***r***" is the radius of the body.

Substituting the moment of inertia into the energy relation we obtain;

$$(17.3)\quad E_r = \frac{1}{2} \cdot \left(\frac{2}{5} \cdot m \cdot r^2\right) \cdot \omega^2;$$

Where the angular velocity omega can also be written in terms of the rotation frequency as; $\omega = 2\pi \cdot \vartheta$ ; or depending on the rotation period ( $t$ ) ; $\omega = \frac{2\pi}{t}$ ; and the peripheral speed ***Vp*** is ; $V_p = \omega \cdot r$;

So the relation (17.3) becomes; $E_r = \frac{1}{5} \cdot (2\pi \cdot m \cdot V_p \cdot r) \cdot \vartheta = \frac{1}{5} \cdot h \cdot \vartheta$ ;

where; $m$ -is the mass of the body, $r$ -is the radius of the body, and $h$- is the angular momentum constant, $\vartheta$- is the rotation frequency of the body.

To facilitate the calculations below, we used the well-known expression of the kinetic energy of a rotating body as follows;

$$(17.1)\quad E_{ri} = \frac{1}{5} m_i \cdot V_{pi}{}^2;$$

where $m_i$ is the mass of the body and $V_{pi}$ is its peripheral velocity.

Next, we proceeded to calculate and interpret the concrete results for the rotational kinetic energy of the planets of the solar system, as follows;

**TABLE DETERMINING THE ROTATIONAL KINETIC ENERGY OF THE PLANETS**

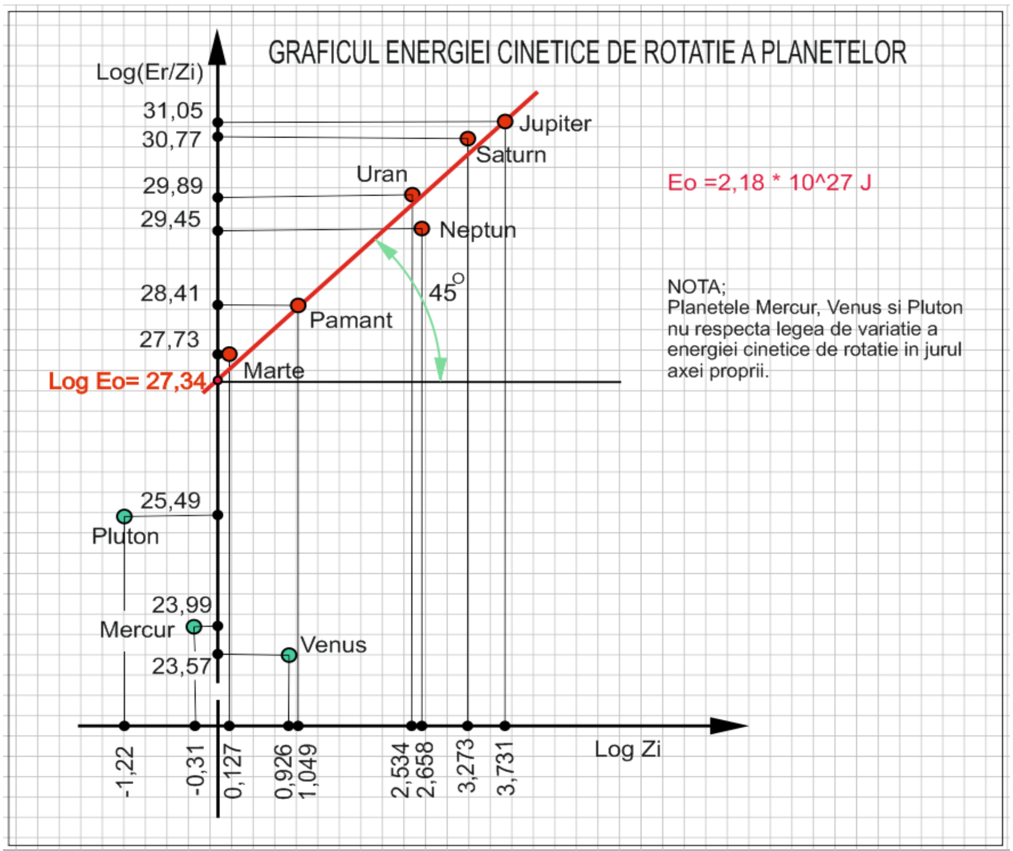
Table no.33

| NAME OF THE PLANET | MASS "mi " (Kg) | PERIPHERAL SPEED "Vp " (m/s) | ROTATIONAL KINETIC ENERGY $E_{ri}$ | NUMAR SARCI-NA "Zi " | ENERGIA RAPORTATA LA SARCINA Er/Zi | Log Zi | Log ( Er/Zi) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **MERCUR** | $3,3 \cdot 10^{23}$ | 3.024 | $6.035 \cdot 10^{23}$ | 0,489 | $1.234 \cdot 10^{24}$ | **-0.31** | **24.09** |
| **VENUS** | $4,87 \cdot 10^{24}$ | 1.81 | $3.19 \cdot 10^{24}$ | 8,44 | $3.77 \cdot 10^{23}$ | **0.926** | **23.57** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **EARTH** | $5.97 \cdot 10^{24}$ | 465.7 | $2.573 \cdot 10^{29}$ | 11,22 | $2.61 \cdot 10^{28}$ | **1.o49** | **28.41** |
| **MARTE** | $6{,}42 \cdot 10^{23}$ | 240.9 | $7.360 \cdot 10^{27}$ | 1,34 | $5.49 \cdot 10^{27}$ | **0.127** | **27.73** |
| **JUPITER** | $1{,}9 \cdot 10^{27}$ | 12603 | $6.126 \cdot 10^{34}$ | 5388 | $1.13 \cdot 10^{31}$ | **3.731** | **31.05** |
| **SATURN** | $5{,}69 \cdot 10^{26}$ | 9830 | $1.109 \cdot 10^{34}$ | 1876 | $5.91 \cdot 10^{30}$ | **3.273** | **30.77** |
| **URANIA** | $8{,}7 \cdot 10^{25}$ | 2596 | $2.691 \cdot 10^{32}$ | 342 | $7.86 \cdot 10^{29}$ | **2.534** | **29.89** |
| **NEPTUN** | $1.302 \cdot 10^{32}$ | 2684 | $2.86 \cdot 10^{29}$ | 455 | $2.86 \cdot 10^{29}$ | **2.658** | **29.45** |
| **PLUTON** | $1{,}3 \cdot 10^{22}$ | 13.6 | $1.867 \cdot 10^{24}$ | 0,489 | $3.11 \cdot 10^{25}$ | **-1.22** | **25.49** |

If we plot the results in the last two columns, we see that the rotational kinetic energy, relative to the number of charges, is inscribed on a straight line in "logarithmic coordinates" and is increasing as the gravitational charge of the planet increases.

GRAPH OF THE KINETIC ENERGY OF ROTATION OF THE PLANETS



It is observed that the line that connects the values of the specific kinetic energy of rotation is inclined at 45 degrees, and intersects the ordinate at the point « $\boldsymbol{Eo}$ », which is why we can write the relation;

(17.4) $\boldsymbol{log\frac{E_{ri}}{Z_i} = log\, E_0 + tg45^0 \cdot lg\, Z_i}$; dar, $\boldsymbol{tg45^0 = 1}$ ; so we can write the relation;

$\boldsymbol{\frac{E_{ri}}{Z_i} = E_o \cdot Z_i}$ ; or ; (17.5) $\boldsymbol{E_{ri} = E_o \cdot {Z_i}^2}$; where the $\boldsymbol{E_o}$ value read from the graph is;

(17.6) $\boldsymbol{E_0 = 2.18 \cdot 10^{27} J}$; ;

If we calculate the rotational kinetic energy of an elementary body (planetoid), we will notice that applying the relation (17.1) the following results;
From the graph it can be seen that the small planets Mercury, Venus, and Pluto deviate from the rule.

(17.7) $\boldsymbol{E_{ro} = \frac{1}{5} m_o \cdot {V_o}^2;}$ substituting the values of the elementary mass $\boldsymbol{m_o}$ a and

the value of the initial velocity $\boldsymbol{V_o}$obtinem;

(17.8) $$\boldsymbol{E_{ro} = \frac{1}{5} 2.924 \cdot 10^{22} \cdot 90^2 = 4.736 \cdot 10^{25} j;}$$

It is observed that the energy value in the graph is ; (17,9) $\boldsymbol{E_0 = 2.18 \cdot 10^{27} J;}$ It is 50

times greater than the value obtained by (17.8), this means that the kinetic energy of rotation of the planets is amplified by the Sun's correction factor, i.e. $\boldsymbol{\varphi M}$=50 ;

That is, the energy of the elementary body is; $\boldsymbol{E_o = \varphi_M \cdot \frac{1}{5} m_o \cdot {V_o}^2;}$

So the rotational energy $\boldsymbol{E_i}$ of body $\boldsymbol{i}$ is equal to the energy of an elementary body

$\boldsymbol{E_o}$ amplified by the charge number $\boldsymbol{Zi}$ squared and by the velocity coefficient $\boldsymbol{\varphi_M}$ of the nucleus of the system of which the body considered mi is a part.
so it can be expressed as follows;

$$(17.12)\quad \boldsymbol{E_{ri} = E_o \cdot {Z_i}^2 \cdot \varphi_M}\ ;$$

Of course, these relationships are valid for any cosmic system, so by studying the energy of the Sun's rotational motion we will be able to find out the coefficient of influence of the speed of the stellar system that rotates around the galaxy together with the Sun.

**INTERDEPENDENCE OF COSMIC MOVEMENT**

In this paper, we have determined, among other things, the main relations for calculating the orbital transport speed of celestial bodies, and the peripheral speed of rotation around their own axis. We further propose to see if there is a dependence between these two movements. From the relation (17.12) $\boldsymbol{E_{ri} = E_o \cdot Z_i{}^2 \cdot \varphi_M}$ ; we can calculate the rotational energy of celestial bodies, and therefore their peripheral rotational speed.

In which; $\boldsymbol{E_o = \varphi_M \cdot \frac{1}{5} m_o \cdot V_o{}^2}$; thus we can replace above and also specifying $\boldsymbol{E_{ri}}$, we will obtain;

$\boldsymbol{\frac{1}{5} m_i \cdot V_{rot,i}{}^2 = \frac{1}{5} m_0 \cdot V_0{}^2 \cdot Z_i^2 \cdot \varphi_M}$; If we amplify the right term by the ratio $\boldsymbol{\frac{\varphi_i}{\varphi_i}}$;the result does not change, $\boldsymbol{\varphi_i}$representing the velocity correction coefficient for the body or planet studied. Conveniently grouping the terms we obtain;

$\boldsymbol{\frac{1}{5} m_i \cdot V_{rot,i}{}^2 = \frac{1}{5} \cdot (m_0 \cdot Z_i \cdot \varphi_i) \cdot \left(V_0{}^2 \cdot Z_i \cdot \frac{\varphi_M}{\varphi_i}\right)}$; The term in the first parenthesis is equivalent to the mass of the planet $\boldsymbol{m_i = (m_0 \cdot Z_i \cdot \varphi_i)}$, while the term in the second parenthesis represents the square of the peripheral rotational velocity of the planet or body under study.

So; $\boldsymbol{V_{rot,i}{}^2 = \left(V_0{}^2 \cdot Z_i \cdot \frac{\varphi_M}{\varphi_i}\right)}$; or; (17.13) $\boldsymbol{V_{rot,i} = V_0 \cdot \sqrt{Z_i \cdot \frac{\varphi_M}{\varphi_i}}}$ ;

And with the relationship (10.4.) $\boldsymbol{V_{m,i} = \frac{V_0 \cdot Z_M}{n_i}}$; we can calculate the velocity $\boldsymbol{V_{m,i}}$ on the orbit of a body $\boldsymbol{m}$, which is part of a system whose nucleus is characterized by the gravitational charge number $\boldsymbol{Z_M}$, where ($\boldsymbol{n}$) is the principal quantum number of the orbit.

If we remove $\boldsymbol{V_0}$ from (10.4) and insert it into the relation (17.11) we obtain the rotational velocity; (17.14) $\boldsymbol{V_{rot,i} = V_{m,i} \cdot n_i \cdot \sqrt{\frac{Z_i}{\varphi_i}} \cdot \frac{\sqrt{\varphi_M}}{Z_M}}$;

**This is the relationship between the peripheral speed of rotation around its own axis and the speed of transport of the celestial body in orbit.**

Thus, knowing for example the orbital speed of the planet Jupiter, and the other parameters; the main orbital number ($\boldsymbol{ni}$), the charge number of the planet $\boldsymbol{Z_i}$ , the velocity coefficient of the planet $\boldsymbol{\varphi_i}$, as well as the parameters of the Sun $\boldsymbol{Z_M}$ and $\boldsymbol{\varphi_M}$, we can find the peripheral rotational speed of the planet Jupiter, as follows;

(17,15) $V_{rot,i} = 1,31 \cdot 10^4 \cdot 5 \cdot \sqrt{\frac{5388}{12,06} \cdot \frac{\sqrt{50}}{740}} = 13229 m/s;$

Compared to 12700 m/s, approximately how much is calculated knowing the rotation period and radius of the planet.

With the same relationship we can redo the calculation for all the large planets as well as for Earth as follows;

(17.16.) $V_{rot,i} = 2,98 \cdot 10^4 \cdot 2 \cdot \sqrt{\frac{11,12}{18,19} \cdot \frac{\sqrt{50}}{740}} = 489 m/s;$ fata de 460m/s.

## DETERMINATION OF GALACTIC MASS.

Knowing the following data about the Sun, we want to find the velocity coefficient of our galaxy.

- mass of the Sun ***Ms*** = 1,99.10^30 kg (day Wikipedia)
- the mass of the elementary body ***Mo,s*** = 5,368.10^25 kg
- equatorial peripheral speed of rotation of the Sun ***Vps*** = 1,994*10^3 m/s (din Wikipedia)
- minimum speed ***Vo***= 90 m/s
- The Sun's orbital speed ***Vs*** = 2,5.10^5 m/s ; (din Wikipedia)
- the Sun's gravitational charge number ***Zs*** =740 ;

The rotational kinetic energy of an elementary body in the category of the Sun is;

(17,17) $E_{ro} = \frac{1}{2} J_o \cdot \omega_o{}^2;$ replacing the moment of inertia with;

(17.18) $J_o = \frac{2}{5} \cdot m_o \cdot r_o{}^2$;is obtained ; (17.19) $E_{ro} = \frac{1}{5} m_o \cdot V_o{}^2;$

or substituting the values we get; (17.20) $E_{ro} = \frac{1}{5} \cdot 5,368 \cdot 10^{25} \cdot 90^2 = 8.696 \cdot 10^{28} j;$

The rotational kinetic energy of the Sun is;

(17.21) $E_{ri,soare} = \frac{1}{5} \cdot 1.99 \cdot 10^{30} \cdot 1.994 \cdot 10^3 = 1.581 \cdot 10^{36} j;$ we make the connection between these two values is the relationship

(17.12) ; $E_{ri} = E_o \cdot Z_i{}^2 \cdot \varphi_M;$ Where can we get it from?

(17.22) $\varphi_M = \frac{E_{ri}}{E_o \cdot Z_i^2}$ ; Applying the above relationship to the Sun we have

(17.23) $\varphi_M = \frac{E_{r,soare}}{E_o \cdot Z_{soare}^2}$ ; the velocity coefficient of the Sun $\varphi_M$;

$$\varphi_M = \frac{1.581 \cdot 10^{36}}{8.696 \cdot 10^{28} \cdot 740^2} = 33.21 \;;$$

The same constant can also be calculated with the relation ; $\varphi_M = \sqrt{\frac{V_M}{V_0}} = \sqrt{\frac{2{,}2 \cdot 10^5}{88{,}2}} = 50$ ;

Since the Sun has a variable rotation speed between the equator and the pole, because at the equator it makes a complete rotation in 25 days and at the pole it makes a rotation in 35 days, I consider that the value of the Sun's rotational energy is higher, the value of the speed coefficient calculated here being correct;

$\varphi_M = \sqrt{\frac{2{,}2 \cdot 10^5}{88{,}2}} = 50$ ; because the speed of the Sun in orbit is determined correctly by very precise astronomical methods. With this constant we can determine exactly the value of the Sun's rotational energy $E_{ri}$ with the relation(17.15.1.). $E_{ri} = \varphi_M \cdot E_o \cdot Z_i^2$ ;

(17,24) $E_{rs} = 50 \cdot 8.696 \cdot 10^{28} \cdot 740^2 = 2.38 \cdot 10^{36}\, J;$

With the value of the recalculated rotational energy, we can find the average rotational speed

of the Sun using the relationship; $E_{r,s} = \frac{1}{5} m_s \cdot {V_{r,s}}^2$; or; $V_{r,s} = \sqrt{5 \cdot \frac{E_{r,s}}{m_s}}$ ;

So the average peripheral rotational speed of the Sun $V_{r,s}$ is;

(17,25) $V_{r,s} = \sqrt{5 \cdot \frac{2.38 \cdot 10^{36}}{1.99 \cdot 10^{30}}} = 2{,}445 \cdot 10^3\, m/s;$

We find the velocity coefficient of the galaxy; $\varphi_{MG}$, The velocity coefficient of the galaxy is calculated with the square root of the ratio between the speed of the galaxy in space 630 km/s (value taken from Wikipedia) and the minimum velocity $Vo$. Thus we have;

(17.26) $\varphi_{MG} = \sqrt{\frac{6{,}3 \cdot 10^5}{90}} = 84{,}5$ ;

using the relationship of the rotation speed dependence on the transport speed on the Sun's orbit, (17.14) $V_{rot,i} = V_{m,i} \cdot n_i \cdot \sqrt{\frac{Z_i}{\varphi_i} \cdot \frac{\sqrt{\varphi_{MG}}}{Z_{MG}}}$; We remove (ZM) from this relation;

$$(17.14) \quad Z_{MG} = \frac{V_{m,i}}{V_{rot,i}} \cdot n_i \cdot \sqrt{\frac{Z_i \cdot \varphi_{MG}}{\varphi_i}};$$

We can approximate the quantum number of the orbit of the star formation of which the Sun is a part by relating the speed of light to the speed of the Sun, because the speeds of stars near the galactic nucleus (where black holes are also found) approach the speed of light;

(17.27) $n_{Soare} = \frac{3 \cdot 10^8}{2{,}25 \cdot 10^5} \approx 1330$; using this orbital quantum number of the Sun we can calculate the ZMG charge number of the galactic nucleus, applying the relation (17.14).

(17.28) $Z_{MG} = \frac{2{,}25 \cdot 10^5}{2{,}445 \cdot 10^3} \cdot 1330 \cdot \sqrt{\frac{740 \cdot 84{,}5}{50}} = 4{,}23 \cdot 10^6$;

Knowing that the elementary mass of a star in the core of the stellar system is evaluated by similarity relations at the value of; ***1.8·10^32*** kg, we will be able to approximately calculate the mass of the galactic core, using the relation below;

$$(17.29) \quad M_G = Z_G \cdot M_{0,G} \cdot \varphi_{MG};$$

Substituting the known values into this relationship, we obtain the approximate mass of the core of the galactic system to which the Sun belongs.

(17.30) $M_G = 4{,}23 \cdot 10^6 \cdot 1{,}8 \cdot 10^{32} \cdot 81{,}6 \approx 6{,}21 \cdot 10^{40}\ Kg$;

According to current data from; https://ro.wikipedia.org/wiki/Galaxie,
the mass of our galaxy would be approximately **6.10^11** solar masses, that is, approximately **10^42** kg, that is, approximately 100 times greater than the mass resulting above, so opinions remain different.

## CHAPTER 18

## EXTENSION OF COULOMB'S RELATIONSHIP TO THE MACROCOSM

Resuming Coulomb's relation written for a theoretical atom in which the maximum charge number would be; $\mathbf{Z_{\uparrow a}=137}$; for which the speed corresponding to the fundamental orbit is the speed of light, which means that the first orbit is not even occupied, we will have;

$$(18.1) \quad \frac{m_e \cdot c^2}{R_{ca}} = \frac{1}{4\pi \cdot \varepsilon_0} \cdot \frac{Z_{\uparrow a} \cdot e^2}{R_{ca}^2};$$

Where $m_e$ is the mass of the electron, e-is the electric charge, $R_{ca}$ is the radius of the fundamental orbit for the charge number having the maximum limit from a theoretical point of view, $Z_{\uparrow a}=137$ for which the electron speed would correspond to the speed of light "c".

We take out the speed of light; (18.1.1) $c^2 = \frac{1}{4\pi\cdot\varepsilon_0}\cdot\frac{Z_{\uparrow a}\cdot e^2}{m_e\cdot R_{ca}}$ ;

a similar relationship can be written for galactic systems where we will use the index "g"; for charge, permittivity, mass, fundamental orbit radius and maximum $Z$ number.

$$(18.1,2) \qquad c^2 = \frac{1}{4\pi\cdot\varepsilon_g}\cdot\frac{Z_{\uparrow g}\cdot {e_g}^2}{m_g\cdot R_{cg}} ;$$

Egaland ultimele doua relatii, avand ca termen comun viteza luminii putem scoate un sir de rapoarte dupa cum urmeaza;

$$(18.2)\ \frac{e_g^2}{\varepsilon_g} = \frac{e^2}{\varepsilon_0}\sqrt{\frac{m_g^2\cdot R_{cg}^2\cdot Z_{\uparrow a}^2}{m_e^2\cdot R_{ca}^2\cdot Z_{\uparrow g}^2}};\quad \text{or;}\quad \frac{e_g^2}{\varepsilon_g} = \frac{e^2}{\varepsilon_0}\cdot\frac{m_g}{m_e}\cdot\frac{R_{cg}}{R_{ca}}\cdot\frac{Z_{\uparrow a}}{Z_{\uparrow g}};$$

But replacing; $Z_{\uparrow} = \frac{c}{V_o}$; result; $\frac{e_g^2}{\varepsilon_g} = \frac{e^2}{\varepsilon_0}\cdot\frac{H_g}{h_a}\cdot\frac{V_{og}}{v_{0a}}$;

Since for the initial velocity, as well as for Plank's constant, we know the similarity relations, we can write a similarity relation of form here as well;

$$(18.3)\,\frac{e_g^2}{\varepsilon_g} = \frac{e^2}{\varepsilon_0}\cdot\left(\sqrt[6]{\alpha^8}\right)^S;$$

Looking at these relationships, we can state that the macrocosmic vacuum has different parameters than the microcosmic vacuum, in other words, we are dealing with different subspaces superimposed on the same physical space, one for each family of systems.

The existence of these distinct quantities for the gravitational permittivity of the cosmic ether assumes that each family of cosmic systems has its own environment, through which specific gravitational waves can propagate, with different propagation speeds, as shown in table no.5;

The problem that remains open is the discovery of "resonators" that would highlight the existence of these waves, at least for satellite systems where the oscillation periods are relatively small and can be measured in a timely manner. In the rest of the systems, the oscillation periods extend over durations of the order of years, thousands or even billions of years, which makes research impossible.

Returning to the first chapter, we will try to determine a generalized relationship of interaction of the gravitational charges that form macrocosmic systems.
We note the specific gravitational charge densities as follows;

$$\sigma_m = \frac{e_g}{m_g}; \text{ and } \sigma_M = \frac{e_g}{M}; \text{ and the relation}$$

$$\text{(1.1) becomes; } F = \left(\frac{\sigma_m \cdot \sigma_M}{4\pi\varepsilon_g}\right) \cdot \frac{m_g \cdot M_g}{{R_g}^2};$$

Whence (1.1.1) will be; $K = \frac{\sigma_m \cdot \sigma_M}{4\pi\varepsilon_g}$; or by replacing the charge densities we obtain;

$K = \frac{e_g^2}{4\pi\varepsilon_g} \cdot \frac{1}{m_g \cdot M_g}$; because "*K*" is constant for all families of macrocosmic systems denoted by the index "*i*", it means that the ratio (18.4) $\frac{e_{g,i}^2}{4\pi\varepsilon_{g,i}} = K \cdot M_i \cdot m_i$; has its own values for each family of systems, according to the table below;

**Tabel nr.35**

| SYSTEM CATEGORY | MASA ELEME ELEMENTARY MASS OF THE NUCLEO "M0" Z=1 [Kg] | ELEMENTARY MASS IN ORBIT "m0" [Kg] | INTERACTION CONSTANT [K] | $\frac{e_{g,i}^2}{4\pi\varepsilon_{g,i}} = K \cdot M_i \cdot m_i$ |
|---|---|---|---|---|
| GALACTIC SYSTEMS | $1.808 \cdot 10^{32}$ | $9.851 \cdot 10^{28}$ | $6.67 \cdot 10^{-11}$ | $1.182 \cdot 10^{51}$ |
| STAR SYSTEMS | $9.851 \cdot 10^{28}$ | $5.369 \cdot 10^{25}$ | $6.67 \cdot 10^{-11}$ | $3.527 \cdot 10^{44}$ |
| PLANETARY SYSTEMS | $5.369 \cdot 10^{25}$ | $2.924 \cdot 10^{22}$ | $6.67 \cdot 10^{-11}$ | $1.047 \cdot 10^{38}$ |
| SATELLITE SYSTEMS | $2.924 \cdot 10^{22}$ | $1.592 \cdot 10^{19}$ | $6.67 \cdot 10^{-11}$ | $3.104 \cdot 10^{31}$ |

Using the relationships established in the first part of the paper regarding the correspondence for charge and permittivity;

$$\text{(1.8)} \quad e = \pm\frac{\alpha \cdot m \cdot c}{\pi}; \quad \text{and; (1.7.4)} \ \varepsilon = \frac{\alpha \cdot c^2}{4\pi^3 \cdot K};$$

To apply these expressions in the macrocosm, it is necessary to replace the speed of light with the maximum speed of the system under consideration, and the two relations become;

(18.5) $e_i = \frac{\alpha \cdot m_i \cdot V_{\uparrow}}{\pi}$; $\varepsilon_{g,i} = \frac{\alpha \cdot V_{\uparrow i}^2}{4\pi^3 \cdot K}$; or; $\varepsilon_{g,i} \cdot K_i = \frac{\alpha \cdot V_{\uparrow i}^2}{4\pi^3}$;

inlocuim pe alfa cu valoarea lui; $\alpha = 1836 \cong 6\pi^5$ the last expression becomes;

$\varepsilon_{g,i} \cdot K_i = \frac{6\pi^5 \cdot V_{\uparrow i}^2}{4\pi^3} = \frac{3\pi^2}{2} \cdot V_{\uparrow i}^2$; or; (18.5.1) $\varepsilon_{g,i} \cdot K_i = \frac{3\pi^2}{2} \cdot c^2$;

The product of the vacuum permittivity and the interaction constant represents a constant specific to each family of cosmic systems.
Knowing the similarity relations for the mass and for the maximum velocity of the systems, we can find the similarity relations for the charge, respectively for the permittivity, as follows;

$$(18.6) \qquad e_{g,i} = e \cdot \left(\frac{\alpha}{\sqrt[3]{\beta_j^4}}\right)^S ; \qquad \varepsilon_{g,i} = \varepsilon_0 \cdot \left(\sqrt[3]{\frac{\alpha^2}{\beta_i^2}}\right)^S ;$$

Knowing the permittivity of the macrocosmic vacuum and its maximum speed, its magnetic permeability can also be calculated. Applying the known relationship for calculating the speed of light;

$c = \sqrt{\frac{1}{\varepsilon_0 \cdot \mu_0}}$; or; $\mu_0 = \frac{1}{c^2 \cdot \varepsilon_0}$; so ; (18.7) $\mu_i = \frac{4\pi^3}{\alpha} \cdot \frac{K}{V_{\uparrow i}^4}$;

from which we can also write the similarity relation for the permeability « $\mu_i$ » of the macrouniverse; (18.8) $\mu_i = \mu_0 \cdot \left(\frac{\beta_i^4}{\alpha^2}\right)^S$ ;

Applying the above relationships, the specific values for all families of macrocosmic systems were determined, and the table below was drawn up;

## TABLE OF GRAVITATIONAL FORCES AND MACROCOSMIC VACUUM PARAMETERS BY SYSTEM FAMILIES

Table No. 36

| SYSTEM CATEGORY NAME | SYSTEM CONSTANT " $\beta_i$ " | GRAVITATIONAL LOAD "$e_{g,i}$" | GRAVITATIONAL PERMITTIVITY OF VACUUM "$\varepsilon_{g,i}$" | PSEUDO MAGNETIC PERMEABILITY "$\mu_{g,i}$" |
|---|---|---|---|---|
| GALACTIC SYSTEMS | 1.0000 | $1.727 \cdot 10^{40}$ | $1.993 \cdot 10^{28}$ | $5.584 \cdot 10^{-46}$ |

| | | | | |
|---|---|---|---|---|
| STAR SYSTEMS | 1.5151 | $7.68 \cdot 10^{35}$ | $1.329 \cdot 10^{26}$ | $1.256 \cdot 10^{-41}$ |
| SOLAR SYSTEMS | 2.2956 | $3.414 \cdot 10^{31}$ | $8.867 \cdot 10^{23}$ | $2.827 \cdot 10^{-37}$ |
| SATELLITE SYSTEMS | 3.4782 | $1.518 \cdot 10^{27}$ | $5.913 \cdot 10^{21}$ | $6.345 \cdot 10^{-33}$ |

.

Returning to Coulomb's relation, adapted for the macrocosm, we observe that the gravitational charges $(Z_M \cdot Z_m)$, are influenced by the speed of movement, an influence that is adjusted with the corresponding speed factors $\varphi_M$ and $\varphi_m$;

Under these conditions, the generalized Coulomb's relation can be written as follows;

$$\frac{m \cdot V^2}{R} = \frac{Z_M \cdot Z_m \cdot \varphi_M \cdot \varphi_m \cdot {e_{g,i}}^2}{4 \cdot \pi \cdot \varepsilon \cdot R^2}; \quad (18.9)$$

In this way we could interpret gravitational interactions as if they were interactions similar to electromagnetic ones.

**The calculations performed on the planets have been centralized in this table.**

Table no, 37

| NAME OF THE PLANET | MASS "mi " (Kg) | SPEED "Vi " (m/s) | ORBIT RADIUS [m] | GRAVITATIONAL MASS NUMBER "Zi " | SPEED COEFFICIENT $\varphi_i$ | CENTRIFUGAL FORCE $\frac{m \cdot V^2}{R}$; | GRAVITO- STATIC FORCE $\frac{Z_M \cdot Z_m \cdot \phi_M \cdot \phi_m \cdot e^2}{4 \cdot \pi \cdot \varepsilon \cdot R^2}$ |
|---|---|---|---|---|---|---|---|
| SOARE | $1.99 \cdot 10^{30}$ | $2.20 \cdot 10^5$ | - | 740 | 50 | | |
| MERCUR | $3{,}3 \cdot 10^{23}$ | $4{,}79 \cdot 10^4$ | $5{,}79 \cdot 10^{10}$ | 0,489 | 23,06 | $1.30 \cdot 10^{22}$ | $1.30 \cdot 10^{22}$ |
| VENUS | $4{,}87 \cdot 10^{24}$ | $3{,}5 \cdot 10^4$ | $1{,}08 \cdot 10^{11}$ | 8,44 | 19,72 | $5.52 \cdot 10^{22}$ | $5.52 \cdot 10^{22}$ |
| PAMANT | $5.97 \cdot 10^{24}$ | $2{,}98 \cdot 10^4$ | $1{,}49 \cdot 10^{11}$ | 11,22 | 18,19 | $3.54 \cdot 10^{22}$ | $3.56 \cdot 10^{22}$ |
| MARTE | $6{,}42 \cdot 10^{23}$ | $2{,}41 \cdot 10^4$ | $2{,}28 \cdot 10^{11}$ | 1,34 | 16,36 | $1.63 \cdot 10^{21}$ | $1.63 \cdot 10^{21}$ |
| JUPITER | $1{,}9 \cdot 10^{27}$ | $1{,}31 \cdot 10^4$ | $7{,}78 \cdot 10^{11}$ | 5388 | 12,06 | $4.19 \cdot 10^{23}$ | $4.16 \cdot 10^{23}$ |
| SATURN | $5{,}69 \cdot 10^{26}$ | $9{,}61 \cdot 10^3$ | $1{,}42 \cdot 10^{12}$ | 1876 | 10,33 | $3.70 \cdot 10^{22}$ | $3.72 \cdot 10^{22}$ |
| URANIA | $8{,}7 \cdot 10^{25}$ | $6{,}8 \cdot 10^3$ | $2{,}86 \cdot 10^{12}$ | 342 | 8,69 | $1.40 \cdot 10^{21}$ | $1.40 \cdot 10^{21}$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NEPTUN | $1{,}03 \cdot 10^{26}$ | $5{,}4 \cdot 10^{3}$ | $4{,}48 \cdot 10^{12}$ | 455 | 7,74 | $6.70 \cdot 10^{20}$ | $6.80 \cdot 10^{20}$ |
| PLUTON | $1{,}3 \cdot 10^{22}$ | $4{,}7 \cdot 10^{3}$ | $5{,}90 \cdot 10^{12}$ | 0,06 | 7,22 | $4.86 \cdot 10^{16}$ | $4.82 \cdot 10^{16}$ |

.

**By comparing the last two columns of this table, a concordance between the two forces calculated with different relations results. This confirms that the relations reflecting the pseudo-electromagnetic character of the gravitational field are valid for determining the interaction forces in the macrocosm.**

## APPLICATIONS;

**1.** Calculate the interaction forces by applying the Coulomb relations adapted for the macrocosm, in the specific case of Sun-Jupiter, and Jupiter-Ganymede.
We will verify this Coulomb interaction relation in the particular case of the representative system;

**Sun- Jupiter; Jupiter - Ganymede;**

| | | |
|---|---|---|
| Mass of the satellite Ganymede | $1.482 \cdot 10^{23}$ | kg |
| The Jupiter mass | $1.9 \cdot 10^{27}$ | kg |
| The Sun mass | $1.99 \cdot 10^{30}$ | kg |
| Ganymede satellite speed | $10.87 \cdot 10^{3}$ | m/s |
| The speed of the planet Jupiter | $1.31 \cdot 10^{4}$ | m/s |
| Ganymede's orbital radius | $10.7 \cdot 10^{8}$ | m |
| Jupiter's orbital radius | $7.78 \cdot 10^{11}$ | m |
| numarul de sarcina Ganymede | 848 | |
| Jupiter gravitational charge number | 5388 | |
| Ganymede's velocity coefficient | 10.98 | |
| Jupiter's velocity coefficient | 12.06 | |
| The Sun's speed coefficient | 50 | |

**THE JUPITER-GANYMEDE SYSTEM**

We verify the equality of repulsive forces with attractive forces using the relations;

$$\boldsymbol{Fr} = \frac{m \cdot V^2}{R} = \frac{1.482 \cdot 10^{23} \cdot (10.87 \cdot 10^3)^2}{10.7 \cdot 10^8} = \mathbf{1.636 \cdot 10^{22}};\ \mathrm{N}$$

$$\boldsymbol{Fa} = \frac{e^2}{4\pi \cdot \varepsilon_i} \cdot \frac{Z_M \cdot Z_m \cdot \phi_M \cdot \phi_m}{R^2} = \mathbf{3.104 \cdot 10^{31}} \cdot \frac{5388 \cdot 848 \cdot 12.06 \cdot 10.98}{(10.7 \cdot 10^8)^2} = \mathbf{1.64 \cdot 10^{22}};\ \mathrm{N}$$

**THE JUPITER-SUN SYSTEM;**

$$Fr = \frac{m \cdot V^2}{R} = \frac{1.9 \cdot 10^{27} \cdot (1.31 \cdot 10^4)^2}{7.78 \cdot 10^{11}} = 4.19 \cdot 10^{23}; \text{ N}$$

$$Fa = \frac{e^2}{4\pi \cdot \varepsilon_i} \cdot \frac{Z_M \cdot Z_m \cdot \varphi_M \cdot \varphi_m}{R^2} = 1.047 \cdot 10^{38} \cdot \frac{740 \cdot 5388 \cdot 50 \cdot 12.06}{(7.78 \cdot 10^{11})^2} = 4.15 \cdot 10^{23}; \text{ N};$$

Comparing the results of the two relationships, we observe the equality of the forces calculated by applying the "gravito-static" load interaction relationship, which demonstrates their validity.

.

**2. Knowing the radius of the hydrogen atom, we want to find the radius of the Moon's orbit, applying the corresponding similarity relation.**

From the previously calculated data, we know that the Earth-Moon cosmic system has the following parameters;

- The gravitational charge number of the Earth is; **Zp=11.22**
- The Earth's velocity coefficient is**;** $\varphi = 18.37$
- the system category coefficient is ; $\beta_j = 3.4782618$
- the similarity constant is ; ***S***=**18.087114**
- the ratio of interactive masses is ; $\alpha = 1836$
- The radius of the hydrogen atom is; $R_a = 0.529 \cdot 10^{-10}$ m
- The radius of the Moon's orbit is given by the fundamental orbit similarity relation for satellites, amplified by the ratio of the velocity coefficient to the Earth's gravitational charge, as follows;

$$R_{Luna} = R_{atom} \cdot \left(\frac{\sqrt[3]{\alpha^2}}{4\beta_j}\right)^S \cdot \frac{\phi_P}{Z_P};$$ By replacing the respective values;

$$R_{Luna} = 0.529 \cdot 10^{-10} \cdot \left(\frac{\sqrt[3]{1836^2}}{4 \cdot 3.4782}\right)^{18.087114} \cdot \frac{18.37}{11.22} = 4.097 \cdot 10^8 m;$$

The size is very close to the radius of the Moon's orbit.$3.844 \cdot 10^8$ **m;**

.

**3. Knowing the radius of the hydrogen atom, we want to find the radius of the orbit of the planet Jupiter, applying the corresponding similarity relation.**

From the previous tables we have determined the following data;

- The gravitational charge number of the Sun is; **Zs=740**
- Jupiter's gravitational charge number is; **Zj=5388**
- The Sun's velocity coefficient is; $\varphi = 50$
- Jupiter's orbital quantum number is; **n=5 ;**
- the coefficient of the system category is; $\beta_j = 2.29566$ ;

- the similarity constant is; $S$ =18.087114 ;
- the ratio of interactive elementary masses is; $\alpha = 1836$ ;
- The radius of the hydrogen atom is; $R_a = 0.529 \cdot 10^{-10}$; m
- The orbital period of the electron in hydrogen is; $T_{atom} = 1.519 \cdot 10^{-16} sec$;

The radius of Jupiter's orbit is given by the fundamental orbit similarity relation for planets, amplified by the ratio between the life coefficient and the Sun's gravitational charge, as follows; $R_{Jupiter} = R_{atom} \cdot \left(\frac{\sqrt[3]{\alpha^2}}{4\beta_j}\right)^S \cdot \frac{n_j^2 \cdot \phi_S}{Z_S}$; Substituting the known values we obtain;

$$R_{Jupiter} = 0.529 \cdot 10^{-10} \cdot \left(\frac{\sqrt[3]{1836^2}}{4 \cdot 2.29566}\right)^{18.087114} \cdot \frac{5^2 \cdot 50}{740} = 7.759 \cdot 10^{11} m;$$

The size resulting from the calculation is close to the radius of the real orbit of $7.78 \cdot 10^{11} m$;.

.

**4. Knowing the period of rotation of the electron in the hydrogen atom, let us find the period of revolution of the planet Jupiter, applying the similarity relations.**

$$T_J = T_{at} \cdot \left(\frac{\sqrt[6]{\alpha^5}}{8 \cdot \beta_i}\right)^S \cdot \frac{n_J^3 \cdot \varphi}{Z_S^2};$$

substituting the known values in this relation we obtain;

$$T_J = 1.519 \cdot 10^{-16} \cdot \left(\frac{\sqrt[6]{1836^5}}{8 \cdot 2.29566}\right)^{18.0871} \cdot \frac{5^3 \cdot 50}{740^2} = 3.73 \cdot 10^8 sec ;$$

adica **11.8** ani, atat cat este perioada reala.

Knowing the radius of the fundamental orbit "***R***1" for a galaxy with unitary "***Z***", (7.1) and the number "maximum ***Z***" of a "giant" galaxy model, we can find the value of the radius of the fundamental orbit, for which the speed of the body on this orbit should be close to the speed of light:
Similarly, all similarity relations can be verified, which is why any macrocosmic system can be considered as a projection of the atomic system, passed through the similarity relations.

**5 Determining the maximum number of stars that can be contained in a galaxy;**

If we look at the theoretical number "***Z***" of stars in the galaxy it would seem that it is too small (3.37 million) compared to the three hundred or five hundred billion stars estimated in our galaxy. But if we calculate the number of stars we will also have to take into account the stars contained in the star systems which, I believe, can be identified in the arms of the galaxy, or in star systems which we cannot see due to our position in the equatorial plane of the galaxy, or due to the very long rotation periods of the order of millions or billions of years. Thus an approximate method of calculating the theoretical maximum number of stars that a galaxy can have, is given by the relationship;

$$N_{stele} = 3.33 \cdot 10^6 \cdot 2.75 \cdot 10^5 = 9,16 \cdot 10^{11};$$

That means over 900 billion stars, which is double the size of our galaxy, without adding the number of stars in the galaxy's core.

## CHAPTER 19

## DETERMINATION OF THE EQUIVALENCE OF THE RYDBERG CONSTANT AND THE EMISSED GRAVITATIONAL WAVELENGTH FOR THE MACROCOSM

The energy of a body that is part of a cosmic system represents the sum of kinetic energy and potential energy, taken with the minus sign;

$$E_{tot} = E_c + E_p = \frac{m.V^2}{2} - K.\frac{M.m}{R} \;;$$

where; "**M**"- is the mass of the nucleus, "**m**"- is the mass of the body considered, "**V**"- is its velocity on the orbit, "**R**"- is the radius of the orbit, and "**K**"- is the interaction constant.

Kinetic energy can be found from Newton's relation; $\frac{m.V^2}{R} = K.\frac{M.m}{R^2}$;

from where; $\frac{m.V^2}{2} = K.\frac{M.m}{R}$; Substituting into the above relation, we find the expression for the total energy; (19.1) $E_{tot} = -\frac{1}{2} \cdot \frac{K \cdot M \cdot m}{R}$;

According to Bohr's postulates valid for the atomic system, when the body passes from one orbit to another, a quantum of energy is emitted or absorbed, according to the relationship below, in which $h$ is Planck's constant, and $\vartheta$ is the frequency of the quantum, which is equal to the speed of light c relative to the wavelength $\lambda$;

$h \cdot \vartheta = E_j - E_i$; in which; $\vartheta = \frac{c}{\lambda}$; In the case of galactic systems we will adapt the relationship thus;

(19.2) $H_g \cdot \vartheta_g = E_{g,j} - E_{g,i}$; knowing that; $\vartheta_g = \frac{c}{\lambda_g}$; where the index g indicates that these are galactic sizes. And c refers to the propagation speed of gravitational waves and the radii of the orbits;

And; $\boldsymbol{K\cdot M\cdot m = n_i^2\cdot R_1}$ ; $\boldsymbol{R_j = n_j^2\cdot R_1}$ ;

We can rewrite Balmer's relation adapted to galactic systems as follows;

$$\boldsymbol{H_g\cdot\vartheta_g = H_g\cdot\frac{c}{\lambda_g} = \frac{1}{2}\cdot\frac{K\cdot M_g\cdot m_g}{R_{1,g}}\cdot\left(\frac{1}{n_i^2}-\frac{1}{n_j^2}\right)}$$ ; from which we extract ;

(19.3) $$\boldsymbol{\frac{1}{\lambda_g} = \frac{1}{2}\cdot\frac{K\cdot M_g\cdot m_g}{R_{1,g}\cdot c\cdot H_g}\cdot\left(\frac{1}{n_i^2}-\frac{1}{n_j^2}\right)}\ ;$$ In which we will note the Rydberg constant for macrocosmic systems as;

(19.4) $$\boldsymbol{\mathfrak{R} = \frac{1}{2}\cdot\frac{K\cdot M_g\cdot m_g}{R_{1,g}\cdot c\cdot H_g}}\ ;$$

For galactic systems, the Rydberg constant can be calculated by substituting the specific values, from table no. 11, into the relationship above;

(19.5) $$\boldsymbol{\mathfrak{R} = \frac{1}{2}\cdot\frac{6.673\cdot10^{-11}\cdot1.81\cdot10^{32}\cdot9.85\cdot10^{28}}{1.549\cdot10^{18}\cdot2.997\cdot10^{8}\cdot8.47\cdot10^{49}} = 1.51\cdot10^{-26}\left[\frac{1}{m}\right]}\ ;$$

For the other families of systems, we can determine the value of the Rydberg constant by replacing in relation (19.4) the speed of light "c" with the maximum speed of the system,

obtaining; (19.6) $$\boldsymbol{\mathfrak{R}_i = \frac{1}{2}\cdot\frac{K\cdot M_i\cdot m_i}{R_{1,i}\cdot V_{\uparrow,i}\cdot H_i}}\ ;$$

Using the data established in table no. 11, we will establish the other constants in a tabular form by applying relation (19.5).

**TABLE OF RYDBERG CONSTANT VALUES FOR MACROCOSMIC SYSTEMS**

tabelul nr.38

| GALACTIC SYSTEMS | ELEMENTARY MASS OF THE NUCLEAR "$M_{0,i}$ "[Kg] | ELEMENTARY MASS ON ORBIT "$m_{0,i}$" [Kg] | FUNDAMENTAL ORBIT RADIUS "$R_{1,i}$"[m] | SPEED MAXIMUM "$V_{\uparrow,i}$" [m/s] | CONSTANT OF KINETIC MOMENTUM "$H_g$" [J.s] | RYDBERG CONSTANT "$\mathfrak{R}_i$"[1/m] |
|---|---|---|---|---|---|---|
| GALACTIC SYSTEMS | $1.808\cdot10^{32}$ | $9.851\cdot10^{28}$ | $1{,}549\cdot10^{18}$ | $2.997\cdot10^{8}$ | $8.47\cdot10^{49}$ | $1.511\cdot10^{-26}$ |
| STAR SYSTEMS | $9.851\cdot10^{28}$ | $5.369\cdot10^{25}$ | $8{,}441\cdot10^{14}$ | $2.997\cdot10^{8}$ | $2.51\cdot10^{43}$ | $2.810\cdot10^{-23}$ |
| PLANETARY SYSTEMS | $5.369\cdot10^{25}$ | $2.924\cdot10^{22}$ | $4{,}597\cdot10^{11}$ | $2.42\cdot10^{7}$ | $7.45\cdot10^{36}$ | $6.307\cdot10^{-19}$ |
| SATELLITE SYSTEMS | $2.924\cdot10^{22}$ | $1.592\cdot10^{19}$ | $2{,}503\cdot10^{8}$ | $1.98\cdot10^{6}$ | $2.21\cdot10^{30}$ | $1.406\cdot10^{-14}$ |

From this table it can be seen that the Rydberg constant has an increase rate of; $\sqrt[3]{\propto^4}$. A simplified relation for the Rydberg constant can be established if we make the followingsubstitutions: We write Newton's relation for an ideal system with maximum "Z";$\frac{m_g \cdot c^2}{R_g} = Zg \cdot K_g \cdot \frac{Mg \cdot mg}{R_g^2}$ where do we get it from; $K_g \cdot Mg \cdot mg = \frac{m_g \cdot c^2 \cdot R_g}{Zg}$ ;

from previous chapters we know that the expression for the angular momentum constant is;

$H_g = 2\pi \cdot m_g \cdot c \cdot R_g$ ; in care; $R_g = \frac{R_1}{Zg}$; iar $\lambda_g = 2\pi \cdot R_g$ represents the Compton wavelength for the body “m” in the given system.

Substituting the above group of relations in rel.(18.4) we obtain a new expression for the Rydberg constant; (19.7) $\mathfrak{R} = \frac{1}{2 \cdot Z_{\uparrow g}^2 \cdot \lambda_g}$ ;

Substituting the atomic parameters into this relation, we will find the Rydberg constant for hydrogen ;

(19.8) $\mathfrak{R}_a = \frac{1}{2 \cdot Z_{\uparrow g}^2 \cdot \lambda_g} = \frac{1}{2 \cdot 137^2 \cdot 2.426 \cdot 10^{-12}} = 1.097 \cdot 10^{-7}$ [1/m] ;

and if we replace the parameters of the galactic system we obtain the constant of this system;

(19.9) $\mathfrak{R}_g = \frac{1}{2 \cdot Z_{\uparrow g}^2 \cdot \lambda_g} = \frac{1}{2 \cdot (3.371 \cdot 10^6)^2 \cdot 2.839 \cdot 10^{12}} = 1.51 \cdot 10^{-26}$ [1/m] ;

So, we could define the Rydberg constant as the inverse of the product of the maximum number of elementary nuclear masses squared, and twice the mass-generating wavelength. This gives us information about the maximum wavelength that can be emitted by a natural system. What is different from the atomic system is that the radiations in question for systems in the Sun family, as well as for planetary systems, have propagation speeds lower than the speed of light.

**In the macrocosm there are four categories of gravitational waves with different propagation speeds, corresponding to the number of categories of existing systems.**

We can look for a similarity relationship between the constants of the two cosmic levels, atomic and galactic respectively. Substituting the known similarity relationships, in the formula that gives us the Rydberg constant, we can find its similarity relationship as follows;

$$(19.10)\quad \mathfrak{R}_g = \mathfrak{R}_a \cdot \frac{1}{\left(\frac{1}{8}\cdot\sqrt[6]{\alpha^5}\right)^s};$$

We can extend the reasoning to find the connection between the charges of the two cosmic levels by taking the expression of the Rydberg constant from atomic physics as follows; For the hydrogen atom we have the expression; $\mathfrak{R}_a = \frac{1}{8}\cdot\frac{m_e \cdot e^4}{\varepsilon_0^2 \cdot h^3 \cdot c}$;

For the galaxy; (19.11) $\mathfrak{R}_g = \frac{1}{8}\cdot\frac{m_g \cdot e_g^4}{\varepsilon_g^2 \cdot H_g^3 \cdot c}$;

Using the values obtained through the similarity relationships between micro and macrocosm we will obtain the same values as through the previous methods.

$$\mathfrak{R}_g = \mathfrak{R}_a \cdot \frac{1}{\left(\frac{1}{8}\cdot\sqrt[6]{\alpha^5}\right)^s} = 1.0973 \cdot 10^7 \frac{1}{\left(\frac{1}{8}\cdot\sqrt[6]{1836^5}\right)^{18.087114}} = 1.52 \cdot 10^{-26} \left[\frac{1}{m}\right];$$

$$\mathfrak{R}_g = \frac{1}{8}\cdot\frac{m_g \cdot e_g^4}{\varepsilon_g^2 \cdot H_g^3 \cdot c} = \frac{1}{8}\cdot\frac{9.85 \cdot 10^{28} \cdot (1.727 \cdot 10^{40})^4}{(1.993 \cdot 10^{28})^2 \cdot (8.397 \cdot 10^{49})^3 \cdot 2.997 \cdot 10^8} = 1.55 \cdot 10^{-26} \left[\frac{1}{m}\right];$$

Both results are equal, so their relationships are correct, which provides us with additional information about galaxies.

.

# CHAPTER 20

# EXTENSION OF THE CLASSIFICATION OF COSMIC LEVELS

## 20.1 The series of similarity constants

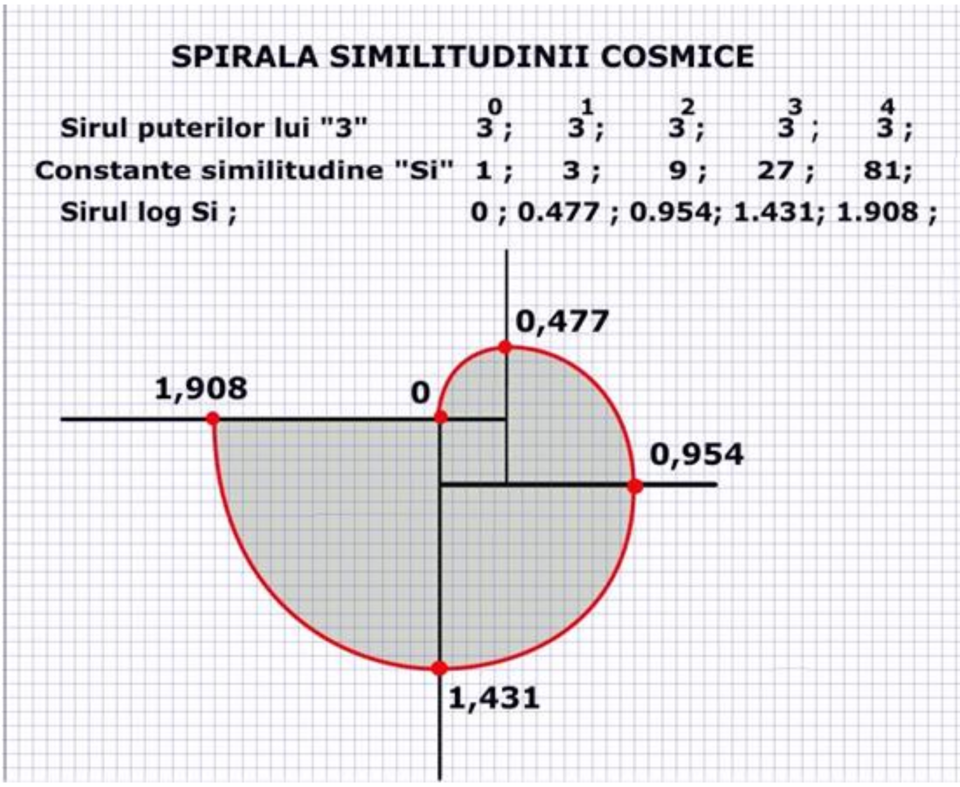
Analyzing the first part of this paper, we see a major difference between the macrocosmic level and the micro level, through both their dimensional differences and the complexity of the systems, which is reflected in their maximum charge number. If for the galactic system we have a **Zmax=3.37.10^6** , for the atomic system we have **Zmax=137,** which means that going down a descending scale we will reach a **Zmax=1**, because nothing stops us from assuming this.

If we order the similarity constants by their size, we notice that they are part of an increasing series like this; **1, 3, 9, 27, 81,...** obtained from the series of "**3**" raised to a linearly increasing power like this; $3^0, 3^1, 3^2, 3^3, 3^4$ .... where the exponent of three corresponds to the number of cosmic levels of organization of matter in "orbital harmonic systems".

For the cosmic level zero, the constant equal to unity corresponds. Then follows the constant corresponding to atomic systems **Sa=8.7955,** the next being the similarity constant belonging to the macrocosmic level corresponding to galactic systems **Sg=26,892582.**

For unknown reasons, there are some fairly small deviations from these values, such as instead of "**9**" we have "**8.795558**", and instead of "**27**" we have "**26.892582**";
It is observed that the second term in this series represented by the similarity constant "**3**" belongs to an intermediate cosmic level between the zero level (hypocosm) and the atomic level (microcosm), which we have called the "submicrocosm level", for which the respective parameters are calculated according to the same similarity relations modifying only the similarity constant. As this series is unlimited, the fifth term represents a similarity constant **SM = 81**; which could define a so-called megacosm about which we know nothing, but represents a possibility for which with the same similarity relations we can determine all its characteristics. With this series, a logarithmic spiral corresponding to the dimensional structure of the systems corresponding to all possible cosmic levels in the universe can be constructed;

**THE SPIRAL OF COSMIC SIMILARITY**




The number "$i$" operates as an exponent of the proportionality constant " $\propto = \mathbf{1836}$" so the ratio between the masses "$M_i$" and "**mi**" in a system, and must be written as follows;

$$(1.1) \quad \propto^{i} = \frac{M_i}{m_i};$$

Based on these observations, this classification was generalized for the entire Universe. Knowing the similarity relations between the micro and macrocosm, we can determine the similarity constants for the other cosmic levels, with the help of which we can find the masses, the dimensions of the microparticles, and their other characteristics according to the table with the similarity relations below;
https://drive.google.com/file/d/1NMrsgDkcQxr_HI56On0WUG5G28hcdSKn/view?usp=sharing

Using the relationship below we can find the value of the similarity constant for any cosmic level, if we know the minimum velocity ***V0,i*** of a hydrogenoid binary system and the proportionality constant alpha; substituting the values specific to the hydrogen atom we

obtain; (20.01) $\boldsymbol{S = \frac{log\left(\frac{V_{o,a}}{c}\right)}{log\left(\frac{2}{\sqrt[6]{\alpha}}\right)}}$ ; substituting; $\boldsymbol{S = \frac{log\left(\frac{2.187 \cdot 10^6}{2{,}997 \cdot 10^8}\right)}{log\left(\frac{2}{\sqrt[6]{1836}}\right)} = 8.795568;}$

.

## 20.2 THE HYPO-COSMIC LEVEL OR LEVEL ZERO.

With this constant, using the similarity relations we can determine the mass and dimensions of the particles belonging to the zero level also called hypo-cosmos, denoted by the index « h ». For the mass of the particles that characterize the zero cosmic level, we will use the relations below adapted to this level; (20.02) $\boldsymbol{m_h = \frac{m_e}{\alpha^s};}$

By replacing the value of the electron mass "$\boldsymbol{m_e}$", the alpha proportionality constant « ∝ » and the similarity constant « ***s*** » we obtain the mass of **the electron-**like subparticle belonging to the zero level, denoted by « $\boldsymbol{m_h}$ »;

(20.03) $\boldsymbol{m_h = \frac{0.910 \cdot 10^{-30}}{1836^{\,8.795568}} = 1.785 \cdot 10^{-59} kg;}$

Knowing that the ratio between the masses of the microparticles is ∝ = 1836;, we can find the mass of the subparticle corresponding to the proton for the zero level, denoted by “Mh”.

(20.04) $\boldsymbol{M_h = \propto \cdot\, m_h = 1836 \cdot 1.785 \cdot 10^{-59} = 3{,}277 \cdot 10^{-56}\, kg\,;}$

**Mass interaction constant for level zero;**

Using the similarity relations, and knowing the mass of motion of the zero-level microparticles, we can also determine the mass interaction constant at this cosmic level; The similarity relation is; (20.05) $\boldsymbol{k_h = k_a \cdot \left(\sqrt[3]{\alpha^2}\right)^S}$ ; where Ka is the atomic interaction constant, alpha is the proportionality constant and “s” is the similarity constant; (20.06)

$$k_h = 1,514 \cdot 10^{29} \cdot \left(\sqrt[3]{1836^2}\right)^{8,795568} = 2,0731 \cdot 10^{48} \quad [Nm^2kg^{-2}];$$

Now one can easily find the radius of a possible "binary system", applying the relationship;

(20.07) $$R_h = \frac{K_h \cdot M_h}{c^2} = \frac{2.0731 \cdot 10^{48} \cdot 3,277 \cdot 10^{-56}}{(2.997 \cdot 10^8)^2} = 7.563 \cdot 10^{-25} m;$$

In which all symbols with index “h” refer to the quantities that characterize the zero level, that is, the smallest cosmic level that is formed by binary harmonic oscillators similar to hydrogen but 10^15 times smaller than it, and at which there is only one speed of movement equal to the speed of light.

Next we find the constant of the angular momentum; $h_h = 2\pi \cdot m_h \cdot c \cdot R_h$;

(20.08)

$$h_h = 2\pi \cdot 1.785 \cdot 10^{-59} \cdot 2.997 \cdot 10^8 \cdot 7.563 \cdot 10^{-25} = 2.542 \cdot 10^{-74} \, [J.s];$$

We will find the frequencies “ $\nu_{hm}, \nu_{hM}$ “ and the wavelengths “ $\lambda_{h,m}, \lambda_{h,M}$" for the generating quantum of the hypo-particle “$mh$” and “$M_h$” similar to the electron and the proton in the hydrogen atom, respectively, but on an infinitely smaller dimensional scale, using Einstein's relation as follows;

$$h_h \cdot \nu_{hm} = m_h \cdot c^2; \text{ sau; } \nu_{hm} = \frac{1}{h_h} \cdot m_h \cdot c^2;$$

(20.09) $$\nu_{hm} = \frac{1.785 \cdot 10^{-59}}{2.542 \cdot 10^{-74}} \cdot (2.997 \cdot 10^8)^2 = 6.307 \cdot 10^{31} s^{-1};$$

(20.09.1) $$\nu_{hM} = \frac{3,277 \cdot 10^{-56}}{2.542 \cdot 10^{-74}} \cdot (2.997 \cdot 10^8)^2 = 1.157 \cdot 10^{35} \; s^{-1};$$

(20.10) $$\lambda_{h,m} = \frac{c}{\nu_{h,m}} = \frac{2.997 \cdot 10^8}{6.307 \cdot 10^{31}} = 4.751 \cdot 10^{-24} m;$$

(20.10.1 ) $$\lambda_{h,M} = \frac{c}{\nu_{h,M}} = \frac{2.997 \cdot 10^8}{1.157 \cdot 10^{35}} = 2.588 \cdot 10^{-27} m;$$

(20.11 ) Particle radius$M_h$ ; $$r_{h,M} = \frac{\lambda_{h,M}}{2\pi} = \frac{2.588 \cdot 10^{-27}}{2\pi} = 4.119 \cdot 10^{-28} m;$$

(20.11.1) Particle radius $m_h$ ; $$r_{h,m} = \frac{\lambda_{h,m}}{2\pi} = \frac{7.563 \cdot 10^{-25}}{2\pi} = 7.563 \cdot 10^{-25} m;$$

Now knowing the dimensions of the hypo-particles of the zero level, using the relation for determining Planck's constant in terms of these dimensions, we will check to see if we obtain the same value of it. Substituting the dimensions of the radii of the two hypo-particles into the relation below, we should obtain the same constant for the angular momentum;

(2.3.6) $\boldsymbol{h = 2\pi \cdot \frac{c^3}{k_a} \cdot r_e \cdot r_p}$ ; Using this relationship adapted with the notations for hypo-cosmos, we check whether the dimensions and interaction constant have been determined correctly. (20.12 ) $\boldsymbol{h_h = 2\pi \cdot \frac{c^3}{k_h \cdot Z_h} \cdot (r_{h,m} \cdot r_{h,M})}$;

$$h_h = 2\pi \cdot \frac{(2.997 \cdot 10^8)^3}{2.0822 \cdot 10^{48}} \cdot 7.563 \cdot 10^{-25} \cdot 4.119 \cdot 10^{-28} = 2.530 \cdot 10^{-74} J.s;$$

And the result is the same value as at (20.8)

Value close to; $\boldsymbol{h_h = 2.542 \cdot 10^{-74}}$ ***J.s*** ; as we calculated previously. It should be noted that the particle radius r_(h,m) is equal to the orbit radius Rh because at this cosmic level the charge number **Z=1** and the particle density is maximum with no free space between them, at least apparently. Knowing the dimensions and radii of the zero-level particles, we can calculate their densities as follows:; (20.12.1) $\boldsymbol{\rho_{h,M} = \frac{M_h}{V_h}}$ ; substituting the previously determined values we obtain the static density of the particle.

$$\rho_{M_h} = \frac{3,277 \cdot 10^{-56}}{\frac{4}{3}\pi \cdot (4.119 \cdot 10^{-28})^3} = 1,119.10^{26}\ kg/m^3;$$

But in reality this particle is in continuous oscillation on a wavelength equal to; (20.10.1 ) $\boldsymbol{\lambda_{h,M} = 2.588 \cdot 10^{-27} m;}$ thus the calculated density relative to the occupied volume is lower.$\boldsymbol{\rho_{M_h} = \frac{3,277 \cdot 10^{-56}}{\frac{4}{3}\pi \cdot (2.588 \cdot 10^{-27})^3} = 4,513 \cdot 10^{23} \frac{kg}{m^3}}$;

Since this cosmic level fills all space, it is expected that the absolute density of space will be close to this value.

The absolute density of space "$\boldsymbol{\rho_0}$" calculated in my paper "Universal cosmic constants" is;

$$(20.16)\quad \rho_0 = 9,51745 \cdot 10^{22} \left[\frac{kg}{m^3}\right];$$

(a se vedea aici; )

https://drive.google.com/file/d/1ZbvWGfg3aMOn4uW41ymaaZnnoAlQ5BK4/view?usp=sharing

**Determination of permittivity and permeability for the zero level.**

For this we will use the relation; (18.5.1) adapted to;(20.13 ) $\varepsilon \cdot k = \frac{3\pi^2}{2} \cdot c^2;$ from which we extract the appropriate relations for the hypo-cosmic level as follows; (20.14 ) $\varepsilon_h = \frac{3\pi^2}{2} \cdot \frac{c^2}{k_h}$ ; in relation we have; $\varepsilon_h$- It is the permittivity of vacuum.

**c**- Speed of light; $k_h$- Mass interaction constant. We substitute the respective values and obtain;

$$\varepsilon_h = \frac{3\pi^2}{2} \cdot \frac{c^2}{k_h} = \frac{1836 \cdot (2.997 \cdot 10^8)^2}{4\pi^3 \cdot 2,0822 \cdot 10^{48}} = 6.385 \cdot 10^{-31} \left[\frac{F}{m}\right] \equiv \left[\frac{kg}{m}\right];$$

or; (20.14.1 ) $k_h = \frac{3\pi^2}{2} \cdot \frac{c^2}{\varepsilon_h}$ ; We know that the speed of light is; $c^2 = \frac{1}{\varepsilon \cdot \mu}$ ;

from which we extract; $\mu = \frac{1}{\varepsilon \cdot c^2}$ ; substituting the respective values we find the value of the magnetic permeability for the cosmic "zero" level;

$$\mu_h = \frac{1}{\varepsilon \cdot c^2} = \frac{1}{6.385 \cdot 10^{-31} \cdot (2.997 \cdot 10^8)^2} = 1.743 \cdot 10^{13} \quad \left[\frac{N}{A}\right] ;$$

## Interpretation of the permittivity of vacuum denoted by epsilon .

Extract from Wikipedia; Farad [F]. -Unit of measurement of electrical capacitance.

“The farad (symbol “F”) is the SI unit of measurement for electrical capacitance; 1 farad is equal to the capacitance of a capacitor which, charged with a charge of one coulomb, gives a potential difference of one volt[1]. The following equalities hold:”

$$\mathrm{F} = \frac{\mathrm{A \cdot s}}{\mathrm{V}} = \frac{\mathrm{J}}{\mathrm{V^2}} = \frac{\mathrm{C}}{\mathrm{V}} = \frac{\mathrm{C^2}}{\mathrm{J}} = \frac{\mathrm{C^2}}{\mathrm{N \cdot m}} = \frac{\mathrm{s^2 \cdot C^2}}{\mathrm{m^2 \cdot kg}} = \frac{\mathrm{s^4 \cdot A^2}}{\mathrm{m^2 \cdot kg}}$$

We will take into account the equality; **[F]≡[J/V^2]**; in which we have the unit of measurement of energy "Joul" in the numerator, that is, energy is expressed with the relation; $E = \frac{1}{2} \cdot m \cdot v^2$; so the unit of measurement of energy is; $1[J] = 1[Kg] \cdot 1 \left[\frac{m}{s}\right]^2$;

substituting in the farad relation we obtain; (20.15.1) $[F] \equiv \left[\frac{Kg \cdot \left[\frac{m}{s}\right]^2}{V^2}\right]$;

According to the equivalence relations between electrical units of measurement and mechanical units of measurement, for the unit of measurement of potential, the volt, we have as an equivalence a speed [V]≡[m/s]; (see here)

https://drive.google.com/file/d/13JWVyJRD6t3UjdLycGF0Omnth3f45IZ/view?usp=sharing

Taking into account the equivalence of the volt with speed, we arrive at the expression **of the equivalence of the Farad with the unit of measurement of mass;**

$$[F] \equiv \left[\frac{Kg\cdot\left[\frac{m}{s}\right]^2}{V^2}\right] \equiv [Kg]\,;$$

The farad in its narrow form can be likened to an active mass with which the plates of a capacitor were charged or discharged, with negative charges being charged on one side of the plates and the same charges being discharged on the other. Intuitively, the example would be a container divided into two by an elastic membrane, in which, with the help of a pump, we extract air from one compartment and compress it in the other. This compressed air mass represents the active mass that generates a potential difference between the two compartments measured in mass units. Thus, we can make the analogy between the quantity of electrons at a certain energy measured in Farads in the case of the electric capacitor, with the mass of air in the example shown above.

The permittivity of the vacuum represents a constant of it that has the value;

$\boldsymbol{\varepsilon = 8,8543\cdot 10^{-12}}\ \left[\frac{F}{m}\right]$ ; in which the ratio of farad per meter can be equated to the following units of measurement. (20.15.2) $\boldsymbol{\varepsilon = \frac{F}{m} \equiv \left[\frac{Kg}{m}\right]}$; and shows us that the active mass can be electrically unbalanced without the vacuum (dielectric) being broken when the **reinforcements** are one meter apart.

If we consider the kinetic energy of the electrons, then we can determine this with the relationship; (19) $\boldsymbol{E = \frac{1}{2}\cdot \mathrm{m}\cdot \mathrm{v}^2}$; where $\mathbf{m}$ is the mass of the electron, and $\mathbf{v}$ represents its velocity.

If we want to express the energy stored in an electric capacitor, we see that it is expressed in terms of the capacitance of the capacitor denoted by $\mathbf{Q}$ and the voltage to which it is subjected denoted by $\mathbf{V}$ as follows;

(20) $E = \frac{1}{2} Q \cdot V^2$; Comparing the two relations (19.and 20) the only possible identification of terms is; m≡Q and v≡V; so the equivalents of the measurement units made above are correct; $\varepsilon \left[\frac{F}{m}\right] \equiv \left[\frac{kg}{m}\right]$;

We will resume the calculation relationship; (20.13 ) $\varepsilon \cdot k_a = \frac{3\pi^2}{2} \cdot c^2$; in which it is shown that the product of permittivity and mass interaction constant is a constant proportional to the square of the speed of light, from which we extract epsilon and determine its units of measurement as follows;$\varepsilon \left[\frac{F}{m}\right] = \frac{3\pi^2}{2} \cdot \frac{c^2}{K}$ ; expressing the respective units of measurement we have;

$$\left[\frac{\frac{m^2}{s^2}}{\frac{m^2}{s^2} \cdot \frac{m}{kg}}\right] = \left[\frac{kg}{m}\right];$$

After the respective simplifications, we remain as units of measurement of epsilon [kg/m] which must be equivalent to [F/m], which also results from the equivalence of electrical units of measurement with mechanical units of measurement.

Let's assume that we have isolated a cubic meter of this space belonging to the zero level, and we try to find out how many pairs of subparticles are in this volume, knowing the density of the medium. As we wrote before, a zero level formation is similar to the hydrogen atom, but of "infinitely" smaller dimensions, and any volume of space is occupied by this ultradense medium whose density is; The absolute density of space " $\rho_{v.i}$ "calculated with the rel

$$(20.16\ )\quad \rho_{v.i} = \frac{\varepsilon_i \cdot Z\uparrow^2}{\lambda_{Mi}{}^2};$$

According to the hypocosmic level data we have;

$$\rho_{v.h} = \frac{\varepsilon_i \cdot Z\uparrow^2}{\lambda_{Mi}{}^2} = \frac{6.385 \cdot 10^{-31} \cdot 1^2}{(2.588 \cdot 10^{-27})^2} = 9.533 \cdot 10^{22}\ kg/m^3;$$

According to the atomic system data we have;

$$\rho_{v,a} = \frac{\varepsilon_i \cdot Z\uparrow^2}{\lambda_{Mi}{}^2} = \frac{8,854 \cdot 10^{-12} \cdot 137^2}{(1,321 \cdot 10^{-15})^2} = 9.523 \cdot 10^{22}\ kg/m^3;$$

Taking into account the accuracy of the atomic system data, I consider that the exact value of the vacuum density is; $\boldsymbol{\rho_v = 9.523 \cdot 10^{22} \frac{kg}{m^3}}$ ;

If we isolate an infinitesimal volume element dx,dy,dz, from the environment corresponding to the hypo-cosmic level, also called the zero level of space, we will observe that this volume is filled with countless oscillating spherical volumes that embody these hypo-cosmic particles.

As we have calculated the mass of a zero level particle (equivalent to the mass of the proton in the hydrogen atom) is; $\boldsymbol{M_h = 3,277 \cdot 10^{-56}\ kg}$;

But the ratio between the mass "$\boldsymbol{M_h}$" and the wavelength is equal to epsilon, knowing that the number **Zmax =1** in the case of the hypo-cosmic level, it results from here; (20.17 )

$$\boldsymbol{\varepsilon_h = \frac{M_h}{2\pi^2 \cdot Z_{\uparrow} \cdot \lambda_{h,M}} = \frac{3{,}227 \cdot 10^{-56}}{2\pi^2 \cdot 1 \cdot 2.599 \cdot 10^{-27}} = 6.30 \cdot 10^{-31};\ \left[\frac{kg}{m}\right];}$$

Epsilon can also be calculated with the relation;$\boldsymbol{\varepsilon_h = \rho_v \cdot \lambda_v{}^2}$ ; in which;

$\boldsymbol{\rho_v = 9.523 \cdot 10^{22} \left[\frac{kg}{m^3}\right]}$ is the absolute density of the vacuum,

and ; $\boldsymbol{\lambda_0 = 2.599 \cdot 10^{-27} [m]}$ is the wavelength of the natural oscillation of the vacuum for the zero level, considering that it is an oscillating medium.

$$\boldsymbol{\varepsilon_h = 9.523 \cdot 10^{22} \cdot \left(2.599 \cdot 10^{-27}\right)^2 = 6.432 \cdot 10^{-31}\ \left[\frac{kg}{m}\right]\ ;}$$

### 20.3 SUB-ATOMIC LEVEL

The similarity relation for determining the minimum velocity for the macrocosmic system, compared to the atomic system, established at the beginning of this work is;

$$(1.2)\ \boldsymbol{V_{0,S} = c\left(\frac{2}{\sqrt[6]{\propto}}\right)^{S}};$$

replacing the values of the speed of light, the proportionality constant alpha=1836 and the similarity constant corresponding to the sub-microcosmic level taken from the above string « **S=3.1** », we obtain the maximum oscillation speed for the sub-micro level;

$$(20.18)\quad \boldsymbol{V_{0,S} = 2,997 \cdot 10^{8}\left(\frac{2}{\sqrt[6]{1836}}\right)^{3,1} = 5,291 \cdot 10^{7}\ \left[\frac{m}{s}\right]};$$

The number of sub-microcosmic charges $\boldsymbol{Z_{s\uparrow}}$ is ;

$$(20.19)\quad \boldsymbol{Z_{s\uparrow} = \frac{c}{V_{0,s}} = \frac{2{,}997 \cdot 10^{8}}{5{,}291 \cdot 10^{7}} \cong 6\ ;}$$

With this constant, using the similarity relations from the theory of similarity of systems, we can determine the mass and dimensions of the primordial particles belonging to the sub-microcosmic level, denoted by the index « **s** ».
For the masses we will use the relations below adapted to the respective level.

(20.18 ) $m_s = m_h \cdot \alpha^s$; substituting the known data we find;

$$m_s = 1.785 \cdot 10^{-59} \cdot 1836^{3,1} = 2,342 \cdot 10^{-49}\ [kg];$$

Knowing that the ratio between the masses of the microparticles is $\propto = $ **1836**, we can find the mass of the microparticle equivalent to the proton for the zero level, denoted by "**Ms**".

$$(20.19)\quad M_s = \propto \cdot\, m_s;$$

$$M_s = 1836 \cdot 2,342 \cdot 10^{-49} = 4,300 \cdot 10^{-46}\ [kg];$$

**Mass interaction constant at the subatomic level**

Using the similarity relations, and knowing the mass of the zero-level microparticles, we can also determine the mass interaction constant at this cosmic level;

The similarity relation is; (20.20 ) $k_s = k_h / \left(\sqrt[3]{\alpha^2}\right)^S;$

in this relationship we have;

"$k_s$" is the interaction constant at the subatomic level,

$k_h$ is the interaction constant at the hypocosmic level, that is, at the first level of organization of matter.

$\propto = \mathbf{1836}$ alpha is the proportionality constant

"**s=3,1**" is the similarity constant;

$$k_s = 2.0822 \cdot \frac{10^{48}}{\left(\sqrt[3]{1836^2}\right)^{3,1}} = 3,742 \cdot 10^{41}\ [N \cdot m^2 \cdot kg^{-2}];$$

Let's check the data using the universal constant of systems, which is the same for any cosmic level.

$$.\ (20.21)\ k_i^3 \cdot M_i^2 = 9.7 \cdot 10^{33}\ \left[N^3 \cdot m^6 \cdot k_g{}^{-4}\right];$$

To demonstrate that this constant is valid for any cosmic level, we will express the mass interaction constant $K_i$ and the mass of its standard body particle in the nucleus of the systems $M_i$, through their relations below;

$$K_i = \frac{3\pi^2}{2} \cdot \frac{c^2}{\varepsilon_i}$$ ; and we replace the mass of the particle or body;

$$M_i = \frac{2\pi^2}{Z\uparrow} \cdot \varepsilon_i \cdot \lambda_{Mi} \ ;$$

$K_i^3 \cdot M_i^2 = \left(\frac{3\pi^2}{2} \cdot \frac{c^2}{\varepsilon_i}\right)^3 \cdot \left(\frac{2\pi^2}{Z\uparrow} \cdot \varepsilon_i \cdot \lambda_{Mi}\right)^2$ ; after raising to powers and simplifying we obtain;

(20.22) $K_i^3 \cdot M_i^2 = \frac{27\pi^{10}}{2} \cdot \frac{c^6}{\rho_v}$ ; where $\mathbf{c}$ is the speed of light, and $\rho_v$ is the density of the vacuum considered as the medium of the cosmic zero level.

(20.22.1) $\rho_v = \frac{\varepsilon_i \cdot Z\uparrow^2}{\lambda_{Mi}{}^2} = \frac{8{,}854 \cdot 10^{-12} \cdot 137^2}{(1{,}321 \cdot 10^{-15})^2} = 9.523 \cdot 10^{22}\ ]kg/m^3;$ this is the absolute density of the cosmic vacuum.

$$\rho_v = 9{,}51745 \cdot 10^{22} \left[\frac{kg}{m^3}\right];$$

Now one can easily find the radius of a possible "binary system", located on the sub-microcosmic level by applying the relationship;

(20.23) $$R_{s,1} = \frac{K_s \cdot M_s}{v^2} = \frac{3{,}742 \cdot 10^{41} \cdot 4{,}300 \cdot 10^{-46}}{(5{,}291 \cdot 10^7)^2} = 5.747 \cdot 10^{-20}\ m;$$

Next we find the frequency and wavelength for the generating quantum with Einstein's relation as follows; $h_s \cdot \nu_{s,m} = m_s \cdot c^2;$

Planck's constant for the sub-atomic level; Can be determined using the data above; (20.24)

$h_s = 2\pi \cdot m_s \cdot v_{0,s} \cdot R_{s,1}$ ; substituting the respective values we obtain;

$h_s = 2\pi \cdot 2{,}342 \cdot 10^{-49} \cdot 5{,}291 \cdot 10^7 \cdot 5.747 \cdot 10^{-20} = 4{,}475 \cdot 10^{-60};$ [J.s]

First we find the eigenfrequencies of the subparticles $m_s$ si $M_s$ with the relationship;

$$\nu_{s,m} = \frac{1}{h_s} \cdot m_s \cdot c^2 \ ;$$

(20.25) $\nu_{s,m} = \frac{1}{4{,}475 \cdot 10^{-60}} \cdot 4{,}300 \cdot 10^{-46} \cdot (2.997 \cdot 10^8)^2 = 4{,}700 \cdot 10^{27}\ [s^{-1}];$

The natural frequency for the subparticle $M_s$ is 1836 times greater, because it has the same mass as many times greater than $m_s$: $\nu_{s,M} = \frac{1}{h_s} \cdot M_s \cdot c^2;$

(20.26) $\nu_{s,M} = \frac{1}{4{,}475\cdot 10^{-60}} \cdot 2,342 \cdot 10^{-49} \cdot (2.997 \cdot 10^8)^2 = 8,629 \cdot 10^{30}\ [s^{-1}];$

The wavelength for the subparticle $m_s$ is;

$$(20.28)\ \lambda_{s,m} = \frac{c}{\nu_{s,m}} = \frac{2.997\cdot 10^8}{4{,}700\cdot 10^{27}} = 6,375 \cdot 10^{-20} m;$$

The wavelength for the $M_s$ subparticle is 1836 times smaller;

$$(20.29)\qquad \lambda_{s,M} = \frac{c}{\propto\cdot \nu_{s,m}} = \frac{2.997\cdot 10^8}{1836\cdot 4{,}700\cdot 10^{27}} = 3,472 \cdot 10^{-23}\ [m];$$

The radius of the subparticle $M_s$ is equal to the wavelength reported at 2 pi;

$$(20.30)\qquad r_{s,M} = \frac{3{,}472\cdot 10^{-23}}{2\pi} = 5,525 \cdot 10^{-24}\ [m];$$

The minimum orbital radius of the particles $m_s$ is; (20.31)

$$R_{s,m,c} = \frac{K_s \cdot Z \cdot M_s}{c^2} = \frac{3,742 \cdot 10^{41} \cdot 5,66 \cdot 4,300 \cdot\ 10^{-46}}{(2,997 \cdot 10^8)^2} = 1,013 \cdot 10^{-20}\ [m];$$

The radius of the subparticle $m_s$, is;

$$(20.32)\ \ r_{s,m} = \frac{\lambda_{s,m}}{2\pi\cdot Z} = \frac{6{,}375\cdot 10^{-20}}{2\pi\cdot 5{,}66} = 1,789 \cdot 10^{-21}[m];$$

Now knowing the dimensions of the particles at the subatomic level, using the relation for determining Planck's constant in terms of these dimensions, we will check to see if we obtain the same value of it;

substituting in the relation below we obtain the same constant for the angular momentum;

$$(20.33)\qquad h_s = 2\pi \cdot \frac{c^3}{K_s} \cdot (r_{s,m} \cdot r_{s,M});$$

$$h_s = 2\pi \cdot \frac{(2.997 \cdot 10^8)^3}{3,742 \cdot 10^{41}} \cdot 1,789 \cdot 10^{-21} \cdot 5,525 \cdot 10^{-24} = 4,467 \cdot 10^{-60}\ [J.s];$$

.

**Determination of permittivity and permeability for the subatomic level;**

Let's get back to the relationship; $\boldsymbol{\varepsilon} = \frac{3 \cdot \pi^2}{2} \cdot \frac{c^2}{k}$; in which; $\boldsymbol{c}$- speed of light;

$\boldsymbol{k_s}$- interaction constant of subatomic masses;

$$(20.34)\ \boldsymbol{\varepsilon_s} = \frac{\propto \cdot c^2}{4\pi^3 \cdot k_h} = \frac{1836 \cdot (2.997 \cdot 10^8)^2}{4\pi^3 \cdot 3{,}742 \cdot 10^{41}} = \mathbf{3.553 \cdot 10^{-24}}\ [\frac{F}{m}];$$

We know that the speed of light can be replaced by the relationship;

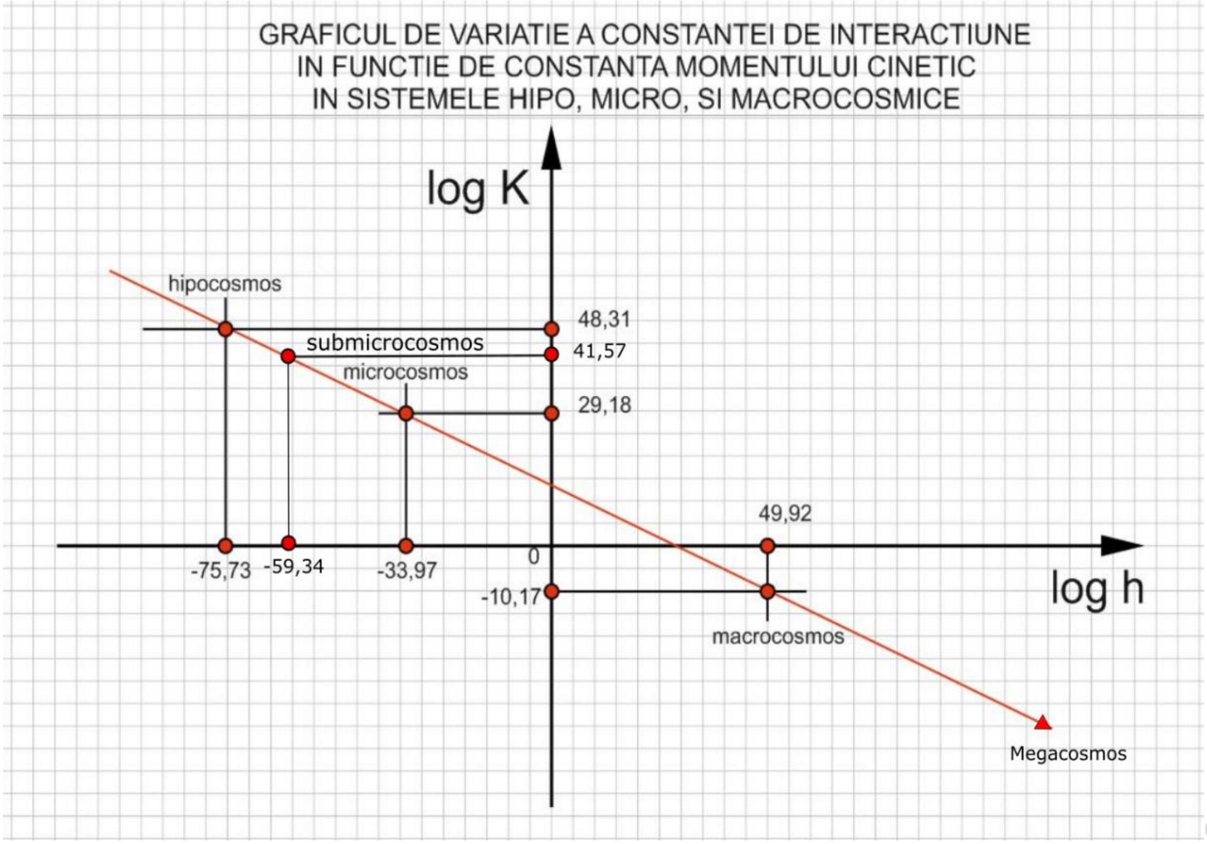
$c^2 = \frac{1}{\varepsilon \cdot \mu}$ ; from which we remove; $\boldsymbol{\mu} = \frac{1}{\varepsilon \cdot c^2}$ ; substituting the respective values we find; (20.35) $\boldsymbol{\mu_S} = \frac{1}{\varepsilon \cdot c^2} = \frac{1}{3.553 \cdot 10^{-24} \cdot (2.997 \cdot 10^8)^2} = \mathbf{3.133 \cdot 10^6}\ \left[\frac{N}{A}\right]$ ;

**With the data found for the interaction constant and the angular momentum constant, we will draw the following graph valid for all cosmic levels as follows;**

Table no.39

| COSMIC LEVEL CONSIDERED. | INTERACTION CONSTANT (K,k) | LOGARITHM OF THE CONSTANT ( log K,k) | ANGULAR MOMENTUL CONSTANT (H,h) | LOGARITMUL MOMENTULUI CINETIC (logH,h) |
|---|---|---|---|---|
| **Hypo-cosmos** | $2{,}0731 \cdot 10^{48}$ | 48,31 | $2.542 \cdot 10^{-74}$ | -73.59 |
| **Subatomic** | $3{,}742 \cdot 10^{41}$ | 41,57 | $4{,}467 \cdot 10^{-60}$ | -59.34 |
| **Microcosm** | $1{,}514 \cdot 10^{29}$ | 29,18 | $1.054 \cdot 10^{-34}$ | -33.97 |
| **Macrocosm** | $6{,}67 \cdot 10^{-11}$ | -10,17 | $8.397 \cdot 10^{49}$ | 49.92 |
| **Megacosm** | $1{,}178 \cdot 10^{-128}$ | -128 | - | - |

**INTERACTION CONSTANT VARIATION GRAPH**
**AS A FUNCTION OF KINETIC MOMENTUM**




Cunoscand

Knowing the mass values of the elementary particles that evolve around the nucleus for each cosmic level according to the table below, we will draw a logarithmic diagram for these as well. **Hypocosmic level zero.**

**$m_h$=1.785.10^-59kg**; the electron -like particle but on an infinitely smaller scale.
**$M_h$=3.277-10^-56 kg**; the proton-like particle on a scale about 10^30 times smaller.

**Subatomic level**

**$m_s$=$2.342 \cdot 10^{-49}$kg**; the electron -like particle

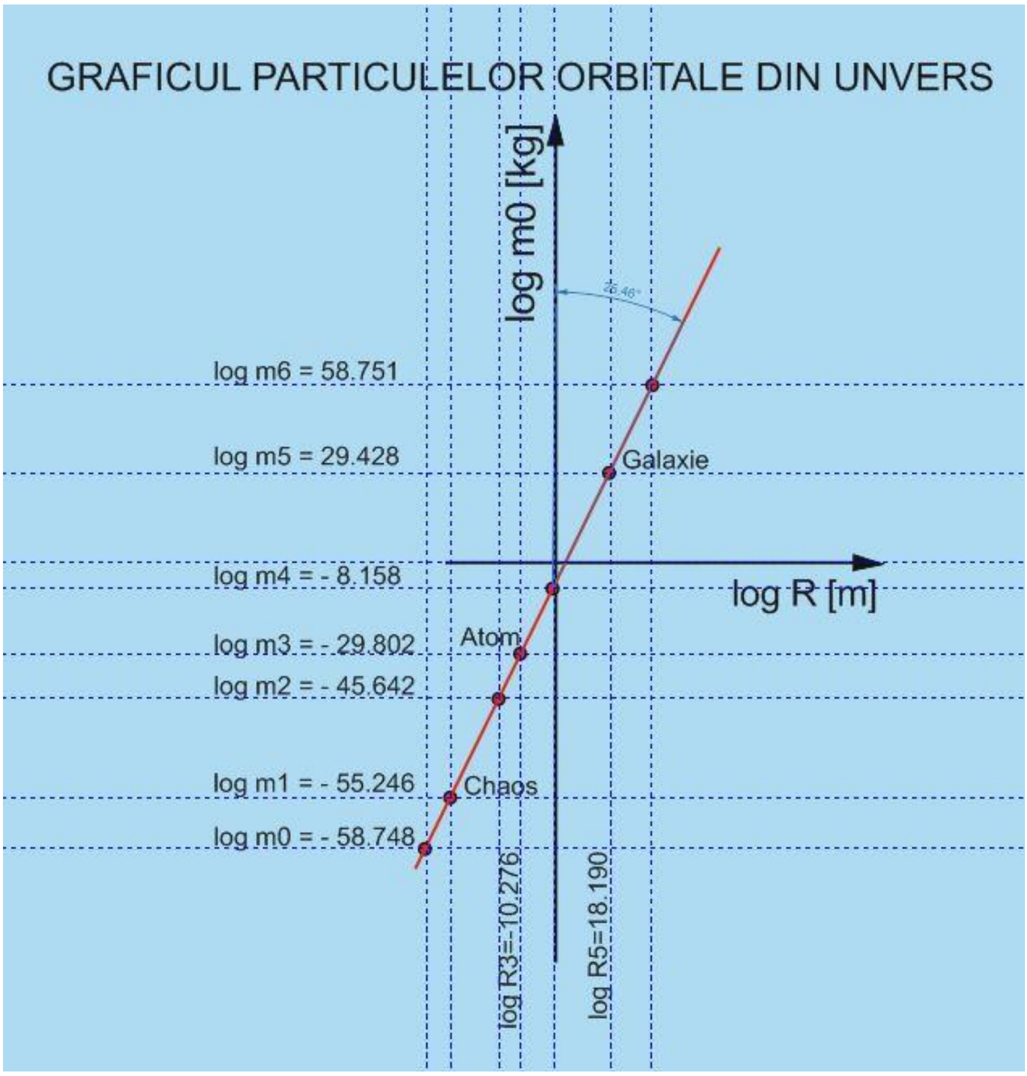
**$M_s$=$4.300 \cdot 10^{-46}$ kg**; the mass of the particle in the nucleus of the system.

**Nivelul microcosmic.**

**$m_e$=9,109.10^-31 kg**; electron mass
**$M_p$=3.275-10^-56 kg**; proton mass

**The Macrocosmic Level.**

**$m_g$= 9.851.10^28 kg;** the elementary mass for a star orbiting the galaxy.
**$M_g$= 1.81.10^32 kg;** the elementary mass for a star in the galactic core.




**Returning to the constant (20.22), we observe that the same value is obtained by substituting the specific data for any cosmic level.**

So; $\boldsymbol{K_i^3 \cdot M_i^2 = \frac{27\pi^{10}}{2} \cdot \frac{c^6}{\rho_v} = \frac{27\pi^{10}}{2} \cdot \frac{2.997 \cdot 10^6}{9{,}51745 \cdot 10^{22}} = 9.626 \cdot 10^{33}} \left[\frac{m}{s}\right]^6 \cdot \left[\frac{m^3}{kg}\right]$ ;

In which the units of measurement are corresponding

For hypo-cosmos level zero;

$\boldsymbol{k_h{}^3 \cdot M_h{}^2 = (2.0822 \cdot 10^{48})^3 \cdot (3.277 \cdot 10^{-56})^2 = 9{,}695 \cdot 10^{33}\,[N^3 \cdot m^6 \cdot k_g{}^{-4}]}$;

For the sub-atomic level.

$\boldsymbol{k_s{}^3 \cdot M_s{}^2 = (3{,}742 \cdot 10^{41})^3 \cdot (4{,}300 \cdot 10^{-46})^2 = 9{,}688 \cdot 10^{33}\,[N^3 \cdot m^6 \cdot k_g{}^{-4}]}$;

Which is verified to be the same constant of the other cosmic levels;

For the atomic level;

$\boldsymbol{k_a{}^3 \cdot M_a{}^2 = (1{,}5157 \cdot 10^{29})^3 \cdot (1{,}672 \cdot 10^{-27})^2 = 9{,}701 \cdot 10^{33}\,[N^3 \cdot m^6 \cdot k_g{}^{-4}]}$;

For the macrocosmic, at the galactic level.

$\boldsymbol{K_G{}^3 \cdot M_G{}^2 = (6.67 \cdot 10^{-11})^3 \cdot (1{,}808 \cdot 10^{32})^2 = 9{,}701 \cdot 10^{33}\,[N^3 \cdot m^6 \cdot k_g{}^{-4}]}$;

For subgalactic systems this constant decreases by $\propto^2 = [\mathbf{1836^2}]$ with each level of system organization due to the decrease in the elementary mass $\boldsymbol{M_{o,S}}$ by the coefficient of proportionality alpha.
Thus for the Solar system this constant becomes;

$$\boldsymbol{K_S}^3 \cdot \boldsymbol{M_{o,S}}^2 = \frac{\mathbf{9,701 \cdot 10^{33}}}{[\mathbf{1836^2}]^2} = \mathbf{8.537 \cdot 10^{20}}; \left[\boldsymbol{N^3 \cdot m^6 \cdot k_g}^{-4}\right]$$

For a satellite system we will have a constant of size;

$$\boldsymbol{K_P}^3 \cdot \boldsymbol{M_{o,p}}^2 = \frac{\mathbf{9,701 \cdot 10^{33}}}{[\mathbf{1836^2}]^3} = \mathbf{2.532 \cdot 10^{14}}; \left[\boldsymbol{N^3 \cdot m^6 \cdot k_g}^{-4}\right]$$

# CHAPTER.21.

## ON THE MASS OF PARTICLES AND CELELESTIAL BODIES. AND THE ELECTROMAGNETIC NATURE OF THEM.

### 21.1 EQUIVALENCE BETWEEN ELECTRICAL UNITS OF MEASUREMENT AND MECHANICAL UNITS OF MEASUREMENT

The mass of bodies is not identical with the charge, but the effect of the charge produced in the microcosm is similar to the effect of the mass produced in the macrocosm. In other words, what we call the electric field at the atomic level is similar to what we call the gravitational field at the macrocosm level. Both fields do the same thing, representing the quasi-elastic connection between particles or bodies, which allows the organization of matter in systems of micro and macrocosmic harmonic oscillators, in atomic structures, or at the cosmic level in galaxies and their subsystems. The electric field, and the mass interaction field, are two aspects of the same natural phenomenon but at different dimensions, which ensure the interaction of material entities, whether subatomic particles or celestial bodies.
Both Coulomb's interaction relation and Newton's relation can be expressed by a single relation that reflects both states, provided that we can make an equivalence between the electromagnetic units of measurement with the mechanical units of measurement (kilogram, meter and second).
We often encounter in the microcosmic space values of electrical quantities such as electrical permittivity, magnetic permeability, inductance, magnetic induction and others, against which we do not have the possibility of making a value comparison with the mechanical phenomena produced in the macrocosmic space, due to the lack of equivalents between the units of measurement of these properties.
Electrical units of measurement were established according to the physical effects that occur as a result of experiments. For example, the unit of measurement of electric current is the "ampere", which was initially defined as;

Extract from Wikipedia; Definitions of the ampere.
"In a photoelectric device such as the light sensor in a camera, light falling on the metal detector causes electrons to move. The more the intensity of light rays of the same frequency increases, the more electrons move, but they will not move faster. By contrast, an increased frequency of light rays will cause electrons to move faster. Therefore, the intensity of light controls the electric current, and
the frequency of light controls the electric voltage."
So the intensity of the light controls the number of electrons set in motion, that is, the intensity of the current, and the frequency controls the electric voltage, respectively the speed of the electrons.
"The electrolytic ampere
The international ampere was defined according to the electrolytic effects of the electric current, which passing through a silver nitrate solution for one second, deposits 0.001118 grams of silver at the cathode. The international ampere was replaced in 1948 by the absolute ampere (the electrodynamic ampere)".
The current in this case represents the cause that sets the silver ions in motion, respectively the force with which they are acted upon.
"The electromagnetic ampere
The ampere is the intensity of a constant electric current which, maintained in two parallel and rectilinear conductors of infinite length, of negligible circular cross-section and placed in a vacuum at a distance of one meter from each other, produces between these conductors a force equal to 2×10–7 newtons per meter of length".
From this definition, the equivalence between the ampere and the force clearly results.
"The international ampere is 0.99985 of the absolute ampere. In relation to the movement of electrons, one ampere represents a flow of approximately 6.241506×10^18 electrons per second".
If we take into account the electromagnetic ampere, we observe that it is defined following the measurement of an attractive force which is measured in Newtons. So we can write that there is an equivalence between the unit of measurement of electric current, with a certain force, that is, whenever we encounter the notion of "ampere", we can imagine a force that manifests itself between two conductors."

1. So the ampere is equivalent to a force; 1A=2.10-7 N, this implies that we can establish other equivalences between electrical units of measurement and mechanical units of measurement, so that we can more easily explain certain physical phenomena. Physicists have always measured the effects of electric current using observations in the world of macroscopic physics, such as forces, displacements, metal deposits, etc., so a direct equivalence between electrical and mechanical units of measurement is necessary as follows;

Thus the ampere is equivalent to the newton $[A] \equiv [N] \equiv \left[Kg \cdot \frac{m}{s^2}\right]$; in other words the ampere translated through our senses, represents the manifestation of a force.

But; an ampere represents a flow of approximately 6.241506×10^18 electrons per second". Each electron has an intrinsic momentum $\mathcal{J} = (\mathbf{m} \cdot \mathbf{v})$; we observe that the ratio between this momentum and the unit of time results as; $\mathcal{J} \cdot \left(\frac{1}{t}\right) = (\mathbf{m} \cdot \mathbf{v}) \cdot \boldsymbol{\vartheta}$ ;that is, the ampere can be understood as a product between momentum and frequency, respectively the momentum of the electron "I" and "1/t=ϑ" the frequency of these impulses according to the relationship;

$$(21.1)\ [A] \equiv \left[kg \cdot \frac{m}{s}\right] \cdot \left[\frac{1}{s}\right] = [kg] \cdot [\frac{m}{s^2}] \equiv F\ [N];$$

In fact, any force applied to a body can be reduced to a number of impulses which acts with a certain frequency. For example, the pressure of a gas or a liquid exerted on a certain surface is due to molecular impulses that are exerted with a certain frequency on that surface. Even in the case of solid bodies, forces are transmitted at the molecular or atomic level through micro-impulses, the proof being the plastic deformation and local heating during the application of these forces, heating which involves the increase in the thermal agitation of the molecules or atoms in the crystal lattices.
On the other hand, we also know that the ampere represents a flow of approximately 6.241506×10^18 electrons per second, which move through an electrical conductor, so it resembles a flow of particles, which exert a series of impulses on the medium through which it propagates.
Knowing that the charge of the electron is expressed in coulombs, and the coulomb is equal to a current of one ampere in one second, we have;
$[1A] = \frac{[1C]}{[1s]}$ so the coulomb can be equivalent to;

$$(21.1.1)\quad [C] = [A] \cdot [s] \equiv \left[Kg \cdot \frac{m}{s^2} \cdot s\right] = \left[Kg \cdot \frac{m}{s}\right];$$

That is; (21.1.2) $[C] \equiv \left[Kg \cdot \frac{m}{s}\right]$; The coulomb is equivalent to the sum of the momentums of a number of 6.241506×10^18 electrons, which coincides with the appreciation that the electric charge can be equivalent to a momentum, as was shown by the equivalence between Coulomb's law and Newton's law; (I emphasize that equivalence does not mean
Salvate identitate). The coulomb is actually a unit of measurement of electric charge, a property of particles that makes interaction between them possible.
If we start from Einstein's famous energy relation; $E = h \cdot \vartheta_c = M \cdot c^2$;
we obtain the equivalent of the electric charge as follows; we multiply and divide the right side by "π" and order the terms as follows;
$h \cdot \vartheta_c = M \cdot c^2 = \pi \left[\frac{1}{\pi}(M \cdot c)\right] \cdot c$ ; Replacing the speed of light with the product of the Compton wavelength and the corresponding frequency; $c = (\lambda_c \cdot \vartheta_c)$ ; we will

obtain $\boldsymbol{h \cdot \vartheta_c = \pi \left[\frac{1}{\pi}(M \cdot c)\right] \cdot (\lambda_c \cdot \vartheta_c)}$; simplifying both terms of the relationship with the Compton frequency $\boldsymbol{\vartheta_c}$;

$\boldsymbol{h = \pi \left[\frac{1}{\pi}(M \cdot c)\right] \cdot \lambda_c}$; if we note; $\left[\frac{1}{\pi}(M \cdot c)\right] = \boldsymbol{e}$;

we obtain a new relation for Planck's constant; (21.1.3) $\boldsymbol{h = \pi \cdot e \cdot \lambda_c}$; so energy can be expressed with the relation ; $\boldsymbol{h \cdot \vartheta_c = \pi \cdot e \cdot (\lambda_c \cdot \vartheta_c) = \pi \cdot e \cdot c}$;

from where the electric charge can be expressed with the relation; (21.1.4) $\boldsymbol{e = \pm \frac{h \cdot \vartheta}{\pi \cdot c}}$;

From these relations, we obtain Planck's constant for electromagnetic waves, expressed as a function of the charge (e) and the Compton wavelength ( $\boldsymbol{\lambda_c}$) for proton. We will verify this in the case of the atomic system; $\boldsymbol{h = \pi \cdot e \cdot \lambda_c}$; that is, by replacing value we have;

$$h = 3{,}1415 * 1{,}6o2.\ 10^{-19} * 1{,}319.10^{-15} = 6{,}638.10^{-34}\ [J.s];$$

According to the above relationship, Planck's constant **"h"** is measured in **[C.m]** equivalent to **[J.s]** and has the meaning of the moment of electric charge.

*From Wikipedia documentation;*

*"The joule was originally defined as a unit of measurement for mechanical work and mechanical energy, but is now used to measure all forms of energy transfer and all forms of energy. It is expressed as:"*

$$J = \frac{kg \cdot m^2}{s^2} = N \cdot m = Pa \cdot m^3 = W \cdot s,,$$
,,

**Wattul** – is the unit of measurement of power, while mechanical work is measured in Joules;

So; (21.1.5) $[W] = \left[\frac{J}{s}\right] \equiv \left[Kg \cdot \frac{m^2}{s^2}\right] \cdot \left[\frac{1}{s}\right]$;

so the Watt is the product of mass, the square of a velocity, and time. It is verified that power is the product of kinetic energy per unit of time.

But mechanical power $\boldsymbol{P_M}$ can also be written as the product of force and velocity; (21.1.5.1) $\boldsymbol{P_M = F \cdot v \equiv \left[Kg \cdot \frac{m}{s^2}\right] \cdot \left[\frac{m}{s}\right]}$;

However, we know that the electrical power $\boldsymbol{P_E}$ is given by the product of the intensity $\boldsymbol{I}$ and the voltage $\boldsymbol{U}$. (21.1.5.2) $\boldsymbol{P_E = I \cdot U}$ ;

As from the definition of the ampere in "**S.I**." it is measured in Newtons. *1A=2.10^-7 N*, comparing relations (1.5.1) with (1.5.2), it means that the voltage $\boldsymbol{U}$ can be equated with a speed, that is ; (21.1.5.3) $\boldsymbol{U[V] \equiv v\left[\frac{m}{s}\right]}$;

or; $\mathbf{1[W] = 1[V] \cdot 1[A]}$; in which **the ampere** is; (21.1.6) $\boldsymbol{A \equiv \left[kg \cdot \frac{m}{s^2}\right]}$;

**The volt-** can also be equated from relations (21.1.5) and (21.1.6) as follows;

$\boldsymbol{1[V] = \frac{1[W]}{1[A]} \equiv \left[Kg \cdot \frac{m}{s^2} \cdot \frac{m}{s}\right] \cdot \left[\frac{s^2}{Kg \cdot m}\right] = \left[\frac{m}{s}\right]}$; or; (21.1.7) $\boldsymbol{[V] \equiv \left[\frac{m}{s}\right]}$; In the narrow form, the volt can be mathematically equivalent to the speed that electrons in an electric potential acquire, and it will be measured in meters per second. Since the energy of electrons consists not only in the speed of movement but also in the frequency of the accompanying wave, it is correct to associate the electron with a periodic movement, characterized by a natural frequency. Since the electron cannot exceed the speed of light, and its voltage can reach millions of volts, we must accept the idea that with the increase in transport energy, their oscillation frequency also increases, so the entire energy of the electron is expressed by;

(21.1.7.1) $\boldsymbol{E = \frac{m.v^2}{2} + h.\vartheta}$;

The volt is the unit of measurement of the potential difference of the electric field, which manages to give an electron a transport speed, and a speed of (virtual rotation) equal to the one above. But this implies that the electron is accelerated with a specific speed, acceleration that occurs in time, that is, the speed of the electron is just the product of the acceleration and the time traveled by the electron through the potential difference.

The electric voltage can also be interpreted as an acceleration multiplied by time, so a certain speed, which represents the voltage, and the amperage being given by the flow represented by the number of particles, multiplied by the mass of a particle and its speed, and everything related to the unit of time.

or; $\boldsymbol{[1A] \equiv [kg] \cdot \left[\frac{m}{s}\right] \cdot \left[\frac{1}{s}\right] = \left[kg \cdot \frac{m}{s2}\right]}$; and thus a force results.

**The volt is equivalent to;** (21.1.8) $\boldsymbol{[V] \equiv \left[\frac{m}{s}\right] = \left[m \cdot \frac{1}{s}\right] \equiv \lambda \cdot \nu}$;

And actually represents the speed of the De Broglie wave that accompanies the electron. We know that the energy of electrons is measured in electronvolts, and represents the energy that an electron acquires when subjected to a potential difference of one volt, and is denoted by [eV].

One electronvolt is equivalent to; **1eV=1.602·10^(-19) J ;**

This energy refers to the kinetic energy of the electron, which consists of both its transport speed and its oscillation frequency. De Broglie's relations establish the parameters of the accompanying wave that show us the energy of the electron.

**De Broglie's relations ;** (21.1.9) $\boldsymbol{\lambda = \frac{h}{p} = \frac{h}{m_\gamma \cdot v} = \frac{h}{m_0 \cdot v} \cdot \sqrt{1 - \frac{v^2}{c^2}}}$ ;

(21.1.10) $\boldsymbol{\vartheta} = \frac{E}{h} = \frac{m_\gamma \cdot c^2}{h} = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \cdot \frac{m_0 \cdot c^2}{h}$ ;

If we only consider the transport speed, then we can approximately determine this speed with the relation;(21.1.11) $\boldsymbol{E = \frac{1}{2} \cdot m \cdot v^2}$;

From this relationship we can find the speed acquired by the electron when it has an energy of one electronvolt; (21.1.12) $\mathbf{v} = \sqrt{\frac{2E}{m}}$ ;

so for one volt; $\mathbf{v_1} = \sqrt{\frac{2 \cdot 1.602 \cdot 10^{-19}}{0.91 \cdot 10^{-30}}} = \mathbf{5.933 \cdot 10^5} \left[\frac{m}{s}\right]$;

*This calculation is not rigorous when it comes to relativistic speeds, because even the mass of the electron increases as it approaches the speed of light.*
*So one volt is equivalent to a potential difference, for which the speed of the electron would reach 5,933,10^5 [m/s]; . But an electron subjected to a potential difference of one million volts would have to exceed the speed of light, which is impossible. Therefore, this equivalence method is only indicative for low energies, because it neglects the relativistic influences of the electron. In the case of high energies, the transport speed approaches the speed of light, but the oscillation energy increases indefinitely, thus reaching voltages of millions of volts.*
*For this situation, the energy is calculated with the relation;* $\boldsymbol{E = h \cdot \vartheta}$ ; where **h** is Planck's constant, and $\boldsymbol{\vartheta}$ is the frequency of the De Broglie wave. Joule's Law (from Wikipedia)
*When electric current passes through a conductor, the heat released* $\boldsymbol{Q}$ *is equal to the product of the square of the electric current intensity* $\boldsymbol{(I)}$, *the electrical resistance* $\boldsymbol{(R)}$ *of the conductor and the duration* $\boldsymbol{(t)}$ *of the electric current passing through the conductor;*
(21.1.13) *Amount of heat;* $\boldsymbol{Q = I^2 \cdot R \cdot t;\quad W = U \cdot I \cdot t}$ ;

*but the tension;* $\boldsymbol{U = I \cdot R}$ ; *or;* $\boldsymbol{R}$ **=>(1.14)** $\boldsymbol{W = I^2 \cdot R \cdot t;}$

So; (21.1.14) $\boldsymbol{Q = W}$ (The heat released when electric current passes through a conductor is equal to the electrical energy consumed)
Electrical resistance is the ratio between the energy consumed and the square of the current intensity flowing per unit of time. (21.1.15) $\boldsymbol{R = \frac{W}{I^2 \cdot t}}$ ;

.

but the mechanical equivalent of energy is; (21.1.16) $\boldsymbol{w = \frac{1}{2} \cdot m \cdot v^2}$; which expressed in units of measurement becomes; Joule is the unit of measurement for energy in the

International System. $[J] = [Kg] \cdot \left[\frac{m^2}{s^2}\right]$ ; and the ampere expressed in equivalent units is;

(21.1.6) $[A] \equiv \left[kg \cdot \frac{m}{s^2}\right]$;

Substituting into relation (21.1.15) we find what resistance means;

$$(21.1.15.1)\quad R = \frac{W}{I^2 \cdot t} = \frac{[Kg]\cdot\left[\frac{m^2}{s^2}\right]}{\left[kg\cdot\frac{m}{s^2}\right]^2\cdot[s]} \equiv \frac{[s]}{[kg]};$$

From Wikipedia;

"Magnetic inductance, or simply inductance, is a physical quantity that characterizes the ability of an electrical circuit to store energy in a magnetic field. More precisely, inductance describes the ability of a coil to generate a magnetic field when an electric current flows through it. The unit of measurement for inductance is the Henry ***(H)***."

knowing that Henry is; $1[H] = [V] \cdot \left[\frac{s}{A}\right]$; in which; Volt; $[V] \equiv \left[\frac{m}{s}\right]$;

and Amper; $[A] \equiv \left[kg \cdot \frac{m}{s^2}\right]$; it turns out that Henry (H)

$$1[H] = [V] \cdot \left[\frac{s}{A}\right] \equiv \left[\frac{m}{s}\right] \cdot \frac{s}{\left[kg\cdot\frac{m}{s^2}\right]} = \left[\frac{s^2}{Kg}\right];$$

so Henry is equivalent to; (21.1.17) $1[H] \equiv \left[\frac{s^2}{Kg}\right]$ ;

*From Wikipedia;*

*"The unit of measurement for magnetic field strength, in the International System (S.I), is the ampere per meter* ***(A/m).*** *Magnetic field strength is a vector quantity, usually denoted by* ***H****, that characterizes a magnetic field at any point in space, "*

*magnetic field strength with "$H_m$" to distinguish it from magnetic inductance denoted by "H". As can be seen, magnetic field strength is the inverse of inductance.*

So; (21.1.18) $H_m = \frac{1}{H}$; That is; $\left[\frac{Kg}{s^2}\right] = \frac{1}{\left[\frac{s^2}{Kg}\right]}$;

**The intensity of the magnetic field is**; (21.1,18.1) $H_m = \frac{A}{m} \equiv [kg] \cdot \left[\frac{1}{s^2}\right]$;

.

**Magnetic permeability is measured in Henry per meter and is denoted by miu** (1.19)

$$\mu = \left[\frac{H}{m}\right] \equiv \left[\frac{1}{Kg} \cdot \frac{s^2}{m}\right];$$

So magnetic permeability is equivalent to the inverse of one force, or the inverse of one ampere. Now we can verify the correctness of the established relations with the expression for the speed of light; $C = \sqrt{\frac{1}{\varepsilon \cdot \mu}} = \sqrt{\frac{m}{Kg}} \cdot \sqrt{\frac{Kg \cdot m}{s^2}} = [m/s];$

**Magnetic induction B;** $B = \mu \cdot H \equiv \left[\frac{s^2}{Kg \cdot m}\right] \cdot \left[\frac{Kg}{s^2}\right] = \left[\frac{1}{m}\right]$; or; (1.20) $B \equiv \left[\frac{1}{m}\right];$

**Electrical load;** Next we will consider the Lorentz Force; (21.1.21) $F_L = e \cdot v \cdot B;$

And the electromagnetic force **"Fe";** (21.1.22) $F_e = I \cdot l \cdot B;$

Where; "$e$" is the electric charge; "$v$" is the electron velocity; "$B$" is the induction of the magnetic field; "$I$" is the current intensity; "$L$" is the length of the conductor in the magnetic field. The parameters of the two forces can be conveniently chosen so that both the induction $B$ and the value of the forces are equal. Under these conditions; $FL = Fe$;

That is; $e \cdot v \cdot B = I \cdot l \cdot B;$ The induction $B$ simplifies, and we can find the electric charge; $e = I \cdot \frac{l}{v}$; expressing the current intensity through the units of measurement, namely the ampere, with the mechanical equivalent which represents a force, we obtain;

$e = I \cdot \frac{l}{v}$; $\equiv \left[kg \frac{m}{s^2}\right] \cdot [m] \cdot \left[\frac{s}{m}\right]$; Or the unit of measurement Coulomb will be equivalent to; (21.1.23) $e[C] \equiv \left[kg \cdot \frac{m}{s}\right];$

"From Wikipedia, the free encyclopedia;

In physics, electric displacement (denoted $D$) or electric induction is a vector field that appears in Maxwell's equations. It models the effects of an electric field on charges(d) in materials. "D" stands for "displacement", as in the related concept of displacement current(d) in dielectrics(d). In a vacuum, electric induction is equivalent to electric flux density, a concept present in Gauss's theorem. In the International System of Units (SI), electric induction is measured in coulombs per square meter $\left[\frac{C}{m^2}\right]$;

As we saw above, the coulomb is equivalent to an intrinsic impulse, which means that electric induction, which is measured in coulombs per square meter, is equivalent to a "impulse density per square meter. $D\left[\frac{C}{m^2}\right] \equiv \left[kg \cdot \frac{m}{s}\right] \cdot \left[\frac{1}{m^2}\right] = \left[\frac{Kg}{m}\right] \cdot \left[\frac{1}{s}\right]$;

So the electric induction "$D$" is equivalent to the product of the permittivity "$\varepsilon$" and the frequency "$\vartheta$" of the field. (21.1.24) $D = \varepsilon \cdot \vartheta$; (21.1.24.1) $\left[\frac{C}{m^2}\right] \equiv \left[\frac{Kg}{m}\right] \cdot \left[\frac{1}{s}\right];$

**Equivalence table between electrical units of measurement and mechanical units of measurement, [Kg, m, s];**

Table.no;40

| | | | |
|---|---|---|---|
| **Ampere** | $[A] \equiv [N] \equiv \left[Kg \cdot \frac{m}{s^2}\right];$ | **Induction flux Magnetic [Weberul]** | $[Wb] = [V \cdot s] \equiv [m];$ |
| **Volt** | $[V] \equiv \left[\frac{m}{s}\right];$ | **Farad** | $[F] = \left[\frac{A \cdot s}{V}\right] \equiv [Kg]\ ;$ |
| **Ohm** | $[\Omega] = \left[\frac{V}{A}\right] \equiv \left[\frac{s}{Kg}\right];$ | **Inductance [Henry]** | $[H] \equiv \left[\frac{s^2}{Kg}\right];$ |
| **Coulomb** | $[C] \equiv \left[Kg \cdot \frac{m}{s}\right];$ | **Magnetic induction** $[Tesla]$ | $[T] = \frac{[Wb]}{[m^2]} \equiv \left[\frac{1}{m}\right];$ |
| **energy [Watt]** | $[W] \equiv \left[Kg \cdot \frac{m^2}{s^2}\right];$ | **Magnetic field intensity "Hm"** | $H_m = \left[\frac{A}{m}\right] \equiv \left[\frac{Kg \cdot m}{s^2}\right] \cdot \left[\frac{1}{m}\right];$ $H_m = \frac{1}{\mu} \cdot B\ ;$ |
| **Electric field intensity** | $E = \left[\frac{V}{m}\right] \equiv \left[\frac{1}{s}\right];$ | **Inductia magnetica** | $B = \mu \cdot H_m \equiv \left[\frac{1}{m}\right];$ |
| **Electrical permittivity** | $\varepsilon \left[\frac{F}{m}\right] \equiv \left[\frac{kg}{m}\right];$ | **Magnetic permeability** | $\mu \left[\frac{H}{m}\right] \equiv \left[\frac{1}{Kg} \cdot \frac{s^2}{m}\right];$ |
| **Electric field induction D.** | $\left[\frac{C}{m^2}\right] \equiv \left[\frac{Kg}{m}\right] \cdot \left[\frac{1}{s}\right]$ | **Electric charge "e"** | $[C] \equiv \left[kg \cdot \frac{m}{s}\right]$ |

•

## 21.2. WHAT IS THE MASS OF PARTICLES

Determining the mass of a static body "$M$" can also be done as the product of the volume "$V$" and the density "$\rho$" with the relation; $M = V \cdot \rho$ ; but in the case of particles and celestial bodies we are dealing with masses in continuous intrinsic motion at which its content oscillates on the Compton frequency and wavelength whose volume increases significantly. According to Einstein's relation; $M \cdot c^2 = h \cdot \vartheta$ ; any mass of a particle is in an intrinsic motion at the speed of light, that is, each material point of this mass oscillates like a pendulum around the center of mass occupying a volume given by the wavelength of this oscillation, because these are born from energy quanta of a certain frequency corresponding to the Compton wavelength denoted by "$\lambda_{c,M}$". Under these conditions, when we talk about the volume of a particle, we must take into account the Compton wavelength which is (21.1) "$\lambda_{c,M}$" and thus the spherical volume occupied by the particle in space will be;

$$(21.2.1)\ V_M = \frac{4}{3}\pi \cdot \lambda_{c,M}{}^3\ ;$$

Regarding particle density, I must remember that each cosmic level "$Ni$" is characterized by a specific medium, whose frequency and wavelength determine the density of space denoted by "$\rho_{v,i}$ " according to the relationship; (21.2.2) $\rho_{v,i} = \frac{3\pi}{2} \cdot \frac{\rho_{v,0}}{Z_{\uparrow}^3}$ ; where the absolute density of the vacuum "$\rho_{v,0}$" is; (21.2.3) $\rho_{v,0} = 9.517 \cdot 10^{22} \frac{kg}{m^3}$;

Among the characteristics of the "vacuum space" at the zero level, we note; Absolute vacuum density "$\rho_{v,0}$ " electric permittivity "$\varepsilon_0$ ", and magnetic permeability "$\mu_0$", quantities that differ from one cosmic level to another. Thus the microcosmic level will have different values from the "zero" level, and the macrocosmic level will have completely different values from the microcosmic level.

The number " $Z_{\uparrow}$ " represents the Zmaxim charge number that characterized a virtual atom at which the electrons on the fundamental orbit would have the speed of light "$c$".

So " $Z_{\uparrow}$ " is a ratio between the speed of light "$c$" and the speed of electrons on the fundamental orbit of hydrogen denoted by "$Vo$" that is;

(21.2.4) $Z_{\uparrow} = \frac{c}{v_0} = \frac{2.997 \cdot 10^8}{2.187 \cdot 10^6} = 137.0224;$ value corresponding to the inverse of the fine structure constant, that is; $a = \frac{2\pi \cdot \mu \cdot e^2 \cdot c}{2 \cdot h}$ ;

$$(21.2.5)\quad Z_{\uparrow} = \frac{1}{a} = 137{,}0359;$$

Thus, the mass of a particle such as the proton in the nucleus of a system can be determined as the product of the particle's "dynamic" volume " $V_{Mi}$ " and its density " $\rho_{v,i}$ " .

The difference between the dynamic volume and the static volume of a particle is that the dynamic volume is calculated based on the Compton wavelength "$\lambda_{c,i}$" on which all the material points of the particle oscillate, while the static volume considers that all the material points have fixed positions in the particle, which is why the radius of the particle's volume sphere is replaced with the Compton wavelength. Thus, the volume written in blue and the density are written in red in the relation;

$$(21.2.6)\ \boldsymbol{M_i = V_{M,i} \cdot \rho_{v,i}} = \left(\frac{4}{3}\pi \cdot \lambda_{c,i}{}^{3}\right) \cdot \left(\frac{3\pi}{2} \cdot \frac{\rho_{v,0}}{Z_{\uparrow}^{3}}\right);$$

If we make the respective simplifications, we will have the particle mass relationship as follows;

$$(21.2.7)\quad \boldsymbol{M_i = 2\pi^2 \cdot \lambda_{c,i}{}^{3} \cdot \frac{\rho_{v,0}}{Z_{\uparrow}^{3}}};$$

If we note with; (21.2.8) $\boldsymbol{\lambda_{v,i}{}^{3} = \frac{\lambda_{c,,i}{}^{3}}{Z_{\uparrow,i}^{3}}}$; where with " $\lambda_{v,i}$ " we have noted the wavelength at which the "empty space" of the cosmic level index "*i*" oscillates as a ratio between the Compton wavelength and the theoretical maximum charge number. Thus it follows that the mass of the particle can be calculated with the relation;

$$(21.2.9)\quad \boldsymbol{M_i = 2\pi^2 \cdot \lambda_{v,i}{}^{3} \cdot \rho_{v,0}};$$

We can say that the mass of any particle in the nucleus of a system is expressed as a function of the cube of the wavelength of the cosmic level from which the particle is made multiplied by the absolute density of the vacuum.

We will verify this relationship in the case of the atom with the maximum theoretical charge number is ; $\boldsymbol{Z_{\uparrow}} \approx \mathit{137}$; and the Compton wavelength for the proton taken from the documentation is; $\boldsymbol{\lambda_{c,Mp} = 1.321 \cdot 10^{-15}\ m}$;

$$(21.2.10)\ \boldsymbol{M_p = 2\pi^2 \cdot \frac{(1.321 \cdot 10^{-15})^3}{(137)^3} \cdot 9.517 \cdot 10^{22} = 1.672 \cdot 10^{-27}\ Kg};$$

**It is worth noting that this determination of the mass does not take into account the internal structure of the proton, which in turn has its origin in the empty space from which all material particles were born.**

Here the resulting mass is quite close to; $\boldsymbol{1.672 \cdot 10^{-27}\ Kg}$; which is the measured value.
Returning to the vacuum permittivity relation from the previous chapter with the observation that we specified in the table the equivalence between the electrical units of measurement with the mechanical units of measurement in which the **Farad** is equivalent to the **Kilogram,** we can write; (21.2.11) $\boldsymbol{\varepsilon_o} = \left[\frac{F}{m}\right] \equiv \left[\frac{Kg}{m}\right]$ let's check if this is confirmed when calculating the mass of the particles.

We resume the relationship; (21.2.8) $\boldsymbol{M_i = 2\pi^2 \cdot \frac{\lambda_{c,Mi}{}^{3}}{Z_{\uparrow,i}^{3}} \cdot \rho_{v,0}}$; and we rewrite it in the following form;

$$(21.2.9)\quad \boldsymbol{M_i = 2\pi^2 \cdot \left(\frac{\lambda_{c,Mi}{}^{2}}{Z_{\uparrow,i}^{2}} \cdot \rho_{v,0}\right) \cdot \frac{\lambda_{c,Mi}}{Z_{\uparrow}}};$$

In this relation we denote the parenthesis with epsilon (2.10) $\varepsilon_o = \frac{\lambda_{c,Mi}{}^2}{Z^2_{\uparrow,i}} \cdot \rho_{v,0}$ ; si and we obtain a new expression for the particle mass as a function of the vacuum permittivity;

$$(21.2.11)\ M_i = 2\pi^2 \cdot \varepsilon_o \cdot \frac{\lambda_{c,Mi}}{Z_\uparrow};$$

For the electromagnetic vacuum, the value of the electrical permittivity denoted by epsilon taken from the documentation is equal to; $\varepsilon_o = 8.854 \cdot 10^{-12} \left[\frac{F}{m}\right]$;

we verify the connection of epsilon with the determination of the proton mass;

(21.2.12) $M_i = 2\pi^2 \cdot 8.854 \cdot 10^{-12} \cdot \frac{1.321 \cdot 10^{-15}}{137} = 1.685 \cdot 10^{-27}\ [Kg]$;

compared to the mass of the proton which is; $M_p = 1.672 \cdot 10^{-27}\ [Kg]$;

***These relationships are valid for any cosmic level.***

## 3. MAGNETIC FIELD ENERGY OF PARTICLES.

**3.1. BOHR'S MAGNETON**, it is calculated with Bohr's relation taken from Physics;

$$(21.3.1)\quad \mu_{B,e} = \frac{1}{4\pi} \cdot \frac{e \cdot h}{m_e};$$

**"e"** is the electric charge of the electron, measured in Coulombs.
**"me"** is the mass of the electron, measured in [kg].
**"v1"** is the velocity of the electron at the hydrogen atom, measured in [m/s].
**"R1"** is the radius of the hydrogen atom in the ground state, measured in [m].
**"h"** is Planck's constant (the constant of angular momentum), and is determined by the known relationship; (21.3.1.2) $\mathbf{h = 2\pi \cdot m_e \cdot v_1 \cdot R_1}$;

If we multiply and divide the Planck constant relation by the ratio c/v_1 in which this ratio is, we obtain a new relation for Planck's constant, as follows;

Deci; (21.3.1.2.1) $\mathbf{h = 2\pi \cdot m_e \cdot v_1 \cdot \frac{c}{v_1} \cdot \frac{v_1}{c} \cdot R_1}$; we group the terms conveniently;

$\mathbf{h = (m_e \cdot v_1 \cdot \frac{c}{v_1}) \cdot (2\pi \cdot \frac{v_1}{c} \cdot R_1)}$; we simplify on v1 in the first parenthesis, and denote the second parenthesis by " $\lambda_{C,e}$ "; (3.1.2.2) $\lambda_{C,e} = 2\pi \cdot \frac{v_1}{c} \cdot R_1$;

Substituting those values, we notice that we have obtained the Compton wavelength for the electron. (3.1.2.2.1) $\lambda_{C,e} = 2\pi \cdot \frac{2.187 \cdot 10^6}{2.997 \cdot 10^8} \cdot 0.529 \cdot 10^{-10} = 2.426 \cdot 10^{-12}\ [m]$

Therefore Planck's constant can be written more conveniently in the form;

$$(3.1.2.3)\ h = m_e \cdot c \cdot \lambda_{C,e};$$

A similar relationship is obtained using the Compton wavelength for the proton as follows;

$$(3.1.2.4)\quad h = M_P \cdot c \cdot \lambda_{C,P};$$

where; "c" is the speed of light, and "$\lambda_{C,e}$ " is the Compton wavelength for the electron, respectively for the proton "$\lambda_{C,P}$ " .
Substituting the last relation for the angular momentum in the Bohr magneton and simplifying the terms results for the electron;

$$(21.3.1.2.5.) \qquad \mu_{B,e} = \frac{1}{4\pi} \cdot \frac{e \cdot m_e \cdot c \cdot \lambda_{C,e}}{m_e} \; ;$$

and after simplifying the mass we have a new Bohr magneton relation for the electron;

$$(21.3.1.2.6) \qquad \mu_{B,e} = \frac{1}{4\pi} \cdot e \cdot c \cdot \lambda_{C,e} \; ;$$

And similarly for the proton we will have; (21.3.1.2.7) $\mu_{B,p} = \frac{1}{4\pi} \cdot e \cdot c \cdot \lambda_{C,P}$ ;

We verify the relationship and obtain the value of the Bohr magneton **for the electron;**

$$\mu_{B,e} = \frac{1}{4\pi} \cdot 1.602 \cdot 10^{-19} \cdot 2.997 \cdot 10^{8} \cdot 2.426 \cdot 10^{-12} = 9.268 \cdot 10^{-24} \left[\frac{J}{T}\right];$$

And the Bohr magneton **for the proton;**

$$\mu_{B,p} = \frac{1}{4\pi} \cdot 1.602 \cdot 10^{-19} \cdot 2.997 \cdot 10^{8} \cdot 1.321 \cdot 10^{-15} = 5.047 \cdot 10^{-27} \left[\frac{J}{T}\right];$$

As can be seen, the Bohr magneton for the proton is 1836 times smaller than the electron magneton, because the Compton wavelength for the proton is also that many times smaller.

**3.3**. If we replace the electric charge “**e**” with its equivalent in the magneton relations above, we obtain;

(21.3.1) **pentru electron;** $\mu_{B,e} = \frac{1}{4\pi} \cdot \frac{\alpha \cdot (m \cdot c)}{\pi} \cdot c \cdot \lambda_{C,e} = \frac{\propto}{4\pi^2} \cdot (m \cdot c^2) \cdot \lambda_{C,e}$ ;

(21.3.3.2) **pentru proton;** $\mu_{B,p} = \frac{1}{4\pi} \cdot \frac{M_p \cdot c}{\pi} \cdot c \cdot \lambda_{C,P} = \frac{1}{4\pi^2} \cdot (M_p \cdot c^2) \cdot \lambda_{C,P}$;

We will denote the energy according to Einstein's relation;$W_{Mp} = M_p \cdot c^2 = h \cdot \vartheta_{C,p}$ ; and replacing the energy we have a new relation for Bohr's magneton.

(21.3.3.3) $\mu_{B,e} = \frac{1}{4\pi^2} \cdot (\propto \cdot W_{me}) \cdot \lambda_{C,e}$ ;

(21.3.3.4) $\mu_{B,p} = \frac{1}{4\pi^2} \cdot W_{Mp} \cdot \lambda_{C,P}$;

but; $(\propto \cdot W_{me}) = W_{Mp}$ ; in which; $\propto = 1836$;

**It is observed that the Bohr magneton is a moment of energy quantity for both the electron and the proton, and differs only in the Compton wavelength of the particles, which makes the electron magneton larger than the proton's, having a Compton wavelength 1836 times larger.**

Next we will express the magnetic energy of particles in terms of the Bohr magneton and the Compton wavelength for the electron or proton.

(21..3.5) $W_{me} = 4\pi^2 \cdot \frac{\mu_{B,e}}{\propto \cdot \lambda_{C,e}}$;

Substituting the known values we have the magnetic energy of the electron;

(21.3.3.6) $W_{me} = \frac{4\pi^2}{1836} \cdot \frac{9.268 \cdot 10^{-24}}{2.426 \cdot 10^{-12}} = 8.214 \cdot 10^{-14}\ [J]$;

We notice that it has the same value as the energy calculated with Einstein's relation;

(21.3.3.7) $W_{me} = m_e.c^2 = 9.109 \cdot 10^{-31} \cdot (2.997 \cdot 10^8)^2 = 8.181 \cdot 10^{-14}\ [J]$;

**We can do the same calculations for the proton;**

(21.3.3.8) $W_{Mp} = 4\pi^2 \cdot \frac{\mu_{B,P}}{\lambda_{C,P}}$ ;

(21.3.3.9) $W_{Mp} = 4\pi^2 \cdot \frac{5.047 \cdot 10^{-27}}{1.321 \cdot 10^{-15}} = 1.508 \cdot 10^{-10}\ [J]$; **sau;**

$W_{Mp} = Mp \cdot c^2 = 1.672 \cdot 10^{-27} \cdot (2.997 \cdot 10^8)^2 = 1.501 \cdot 10^{-10}\ [J]$;

As can be seen in the case of the proton, the magnetic energy is equal to the energy calculated with Einstein's relation, and is 1836 times greater than the electron energy. These are the new relations for calculating the electron and proton energy depending on the Bohr magneton and their Compton wavelength.

And if we express the ratio of the magnetic energies depending on the ratio of the magnetons of the two particles, we will have;

(21..3.10) $\frac{W_{Mp}}{W_{me}} = 4\pi^2 \frac{\mu_{B,P}}{\lambda_{C,P}} \cdot \frac{\propto \cdot \lambda_{C,e}}{4\pi^2 \cdot \mu_{B,e}} = \propto^2 \frac{\mu_{B,P}}{\mu_{B,e}}$;

(21.3.11) $\frac{W_{Mp}}{W_{me}} = 1836^2 \cdot \frac{5.047 \cdot 10^{-27}}{9.268 \cdot 10^{-24}} = 1836$ ;

### 3.4. Magnetic field energy

The magnetic field energy is calculated with the relationship taken from physics;

(21.3.4.1) $W_{mag} = \frac{1}{2} \cdot B \cdot H \cdot V\ ;[J]$ in which;

***B*** **-** represents the magnetic field induction.

***H*** **-** represents the intensity of the magnetic field.

***V*** – represents the volume occupied by the magnetic field

We want to find out what are the values of induction ***B***, intensity ***H*** and volume ***V*** that will give us new information about the particles.

We will use the energy relation given by Einstein for the electron and for the proton;

(21.3.4.2) $W_{me} = m_e.c^2$; (21.3.4.3) $W_{Mp} = Mp \cdot c^2$;

in which the speed of light is replaced by the product of the quantum frequency and the wavelength; $c^2 = \vartheta^2 \cdot \lambda^2$;

**The magnetic field of the electron as a particle is;**

(21.3.4.4) $W_{me} = m_e . c^2 = m_e . (\vartheta^2{}_{c,e} \cdot \lambda^2{}_{c,e})$;

we multiply this relation by the fraction $\left(\frac{\lambda_{c,e}}{\lambda_{c,e}}\right)$; and the energy value does not change, then we group the terms conveniently marked with different colors;

(21.3.4.5 ) $W_{me} = m_e . c^2 = m_e . (\vartheta^2{}_{c,e} \cdot \lambda^2{}_{c,e}) \cdot \left(\frac{\lambda_{c,e}}{\lambda_{c,e}}\right)$; sau (3.4.6)

$$W_{me} = \left(\frac{1}{\lambda_{c,e}}\right) \cdot (m_e \cdot \vartheta^2{}_{c,e}) \cdot (\lambda_{c,e}{}^3);$$

After identifying the terms, we must introduce a coefficient $\beta$ with which to adjust the values calculated above so that the relationship is respected. (21.3.4.1) $W_{me} = \frac{1}{2} \cdot B \cdot H \cdot V$; this is how expressions become;

(21.3.4.7) $W_{me} = \frac{1}{2} \cdot \left(\frac{1}{\beta_e \cdot \lambda_{c,e}}\right) \cdot \left(\frac{1}{\beta_e{}^2} . m_e \cdot \vartheta^2{}_{c,e}\right) \cdot \left(\beta_e{}^3 \cdot \lambda_{c,e}{}^3\right)$ ;

So; **The induction** "$B_e$" is determined by the relation;

(21.3.4.7.1) $B_e = \frac{1}{\beta_e \cdot \lambda_{c,e}} = \frac{1}{\beta_e} \cdot \frac{1}{2.426 \cdot 10^{-12}} = \frac{1}{\beta_e} \cdot 4.122 \cdot 10^{11} \left[\frac{1}{m}\right]$;

**The magnetic field strength of the electron is**"$H_e$" ;

(21.3.4.7.2) $H_e = \frac{1}{\beta_e{}^2} \cdot (m_e \cdot \vartheta^2{}_{c,e})$ ;

$H_e = \frac{1}{\beta_e{}^2} \cdot 9.109 \cdot 10^{-31} \cdot (1.235 \cdot 10^{20})^2 = \frac{1}{\beta_e{}^2} \cdot 1.389 \cdot 10^{10} \quad [\frac{kg}{s^2}]$;

**The volume of the electron's magnetic field;**

(21.3.4.7.3) $V_e = \beta_e{}^3 \cdot \lambda_{c,e}{}^3 = \beta_e{}^3 \cdot (2.426 \cdot 10^{-12})^3 = \beta_e{}^3 \cdot 1.427 \cdot 10^{-35} m^3$;

There is a relationship between the induction $B$ and the magnetic field intensity $H$;

$\mu = \frac{B}{H}$ ; in which; $\mu = 4\pi \cdot 10^{-7} [\frac{N}{A^2}]$; is the magnetic permeability of vacuum.

We will introduce the beta coefficient into the relation;

But; $\mu = \frac{B_e}{H_e} = \frac{\beta_e{}^2}{\beta_e} \cdot \frac{4.122 \cdot 10^{11}}{1.389 \cdot 10^{10}} = \beta_e \cdot 29{,}676 = 4\pi \cdot 10^{-7}; [\frac{N}{A^2}]$;

Thus we find the value of the Beta coefficient in the case of the electron;

(21.3.4.8) $\beta_e = \frac{4\pi \cdot 10^{-7}}{29{,}676} = 4{,}234 \cdot 10^{-8}$ ;

The proportionality coefficient "$\boldsymbol{\beta}$ " depends on the charge number $\boldsymbol{Z}\uparrow$ and also depends on the ratio of the masses or Compton wavelengths for the electron and proton according to the relationship; (21.3.4.9) $\boldsymbol{\beta} = \frac{2\pi^2}{Z_\uparrow} \cdot \left(\frac{M_i}{M_p}\right)^2$ ;

In this relation "$\boldsymbol{M_i}$ " can take the value of the electron mass " $\boldsymbol{m_e}$ " in the case of calculating the beta coefficient for the electron "$\boldsymbol{\beta e}$ ", and the value "$\boldsymbol{M_p}$ "for the proton when calculating the coefficient "$\boldsymbol{\beta_p}$".

For the electron we have the coefficient "$\boldsymbol{\beta_e}$" (21.3.4.9) $\beta_e = \frac{2\pi^2}{Z_\uparrow} \cdot \left(\frac{m_e}{M_p}\right)^2$ ; in which the electron-proton mass ratio is; $\frac{m_e}{M_p} = \frac{1}{1836}$ ;

so; (21.3.4.10) $\beta_e = \frac{2\pi^2}{Z_\uparrow} \cdot \left(\frac{m_e}{M_p}\right)^2 = \frac{2\pi^2}{138} \cdot \left(\frac{1}{1836}\right)^2 = 4.242 \cdot 10^{-8}$; compared to the value of ; $\beta_e = 4.234 \cdot 10^{-8}$ resulting from the relationship; (21.3.4.8)

Determination **of the induction** "$\boldsymbol{B_e}$" of the electron's magnetic field;

(21.3.4.11) $B_e = \frac{1}{\beta_e} \cdot 4.122 \cdot 10^{11} = \frac{4.122 \cdot 10^{11}}{4{,}234 \cdot 10^{-8}} = 9.735 \cdot 10^{18} \left[\frac{1}{m}\right] \equiv [T]$;

Determining **the intensity** $\boldsymbol{H_e}$ of the electron magnetic field;

(21.3.4,12) $H_e = \frac{1}{\beta_e{}^2} \cdot 1.389 \cdot 10^{10} = \frac{1.389 \cdot 10^{10}}{(4{,}234 \cdot 10^{-8})^2} = 7.748 \cdot 10^{24} \left[\frac{kg}{s^2}\right]$ ;

Determining the volume "$\boldsymbol{V_e}$" of the electron magnetic field;

(21.3.4.13) $V_e = \beta_e{}^3 . 1.427 \cdot 10^{-35}$;

(21.3.4.14)$V_e = (4{,}234 \cdot 10^{-8})^3 \cdot 1.427 \cdot 10^{-35} = 1.0831 \cdot 10^{-57} m^3$ ;

Considering the spherical volume we can find the radius of this volume as follows;

(21.3.4.15) $R_{m,e} = \sqrt[3]{\frac{3 \cdot V_e}{4\pi}} = \sqrt[3]{\frac{3 \cdot 1.0831 \cdot 10^{-57}}{4\pi}} = 6.3711 \cdot 10^{-20}\, m$;

This is the radius of the volume in which the electron's magnetic field is concentrated, which is five orders of magnitude smaller than the theoretical radius of the electron.

$$R_e = 2.817 \cdot 10^{-15}\, m \,;$$

**The magnetic field of the proton.**

The same reasoning is repeated as in the case of the electron, expressing the magnetic energy $\boldsymbol{W_{Mp}}$ as a function of the mass $\boldsymbol{M_p}$ , the frequency $\boldsymbol{\vartheta^2{}_{c,p}}$ and the Compton wavelength $\boldsymbol{\lambda^2{}_{c,p}}$ for the proton;

(21.3.4.16 ) $W_{Mp} = M_p . c^2 = M_p . (\vartheta^2{}_{c,p} \cdot \lambda^2{}_{c,p})$;

If we multiply the above relationship by the ratio "$\left(\frac{\lambda_{c,p}}{\lambda_{c,p}}\right)$" the result remains the same.

(21.3.4.17) $\boldsymbol{W_{Mp} = M_p . c^2 = M_p . (\vartheta^2{}_{c,p} \cdot \lambda^2{}_{c,p}) \cdot \left(\frac{\lambda_{c,p}}{\lambda_{c,p}}\right)}$;

Now we group the terms conveniently to get the volume.

(21.3.4.18) $\boldsymbol{W_{Mp} = \left(\frac{1}{\lambda_{c,p}}\right) \cdot (M_p \cdot \vartheta^2{}_{c,P}) \cdot ({\lambda_{cP}}^3)}$;

**We move on to identifying the terms with a new constant $\beta_P$ for the proton;**

(21.3.4.19) $\boldsymbol{W_{M,P} = \frac{1}{2} B \cdot H \cdot V = \frac{1}{2} \cdot \left(\frac{1}{\beta_P \cdot \lambda_{cP}}\right) \cdot \left(\frac{1}{{\beta_P}^2} . M_p \cdot \vartheta^2{}_{cP}\right) \cdot \left({\beta_P}^3 \cdot {\lambda_{c,P}}^3\right)}$;

**Magnetic field induction of the proton "*Bp*";**

Deci; (21.3.4.20) $\boldsymbol{B_P = \frac{1}{\beta_P \cdot \lambda_{c,P}} = \frac{1}{\beta_P} \cdot \frac{1}{1.321 \cdot 10^{-15}} = \frac{1}{\beta_P} \cdot 7.570 \cdot 10^{14} \left[\frac{1}{m}\right]}$;

**The magnetic field strength of the proton"$H_P$";**

(21.3.4.21) $\boldsymbol{H_P = \frac{1}{{\beta_P}^2} \cdot (M_p \cdot \vartheta^2{}_{c,P})}$;

(3.4.22)$\boldsymbol{H_P = \frac{1}{{\beta_P}^2} \cdot 1.672 \cdot 10^{-27} \cdot (2.271 \cdot 10^{23})^2 = \frac{1}{{\beta_P}^2} \cdot 8.623 \cdot 10^{19} \left[\frac{kg}{s^2}\right]}$;

**The volume occupied by the magnetic field "*Vp*";** (3.4.23)

$$\boldsymbol{V_P = {\beta_P}^3 \cdot {\lambda_{c,P}}^3 = {\beta_P}^3 \cdot \left(1.321 \cdot 10^{-15}\right)^3 = {\beta_P}^3 \cdot 2.305 \cdot 10^{-45} m^3};$$

We write the ratio between the induction "$\boldsymbol{\beta_P}$" and the magnetic field intensity "$\boldsymbol{H_P}$"

which represents the coefficient "$\boldsymbol{\mu}$" itself, i.e. the magnetic permeability;

$$\boldsymbol{\mu = \frac{B_P}{H_P} = \frac{{\beta_P}^2}{\beta_P} \cdot \frac{7.570 \cdot 10^{14}}{8.623 \cdot 10^{19}} = \beta_P \cdot 8.778 \cdot 10^{-6} = 4\pi \cdot 10^{-7}; \left[\frac{N}{A^2}\right]};$$

Where do we find the proportionality coefficient "$\boldsymbol{\beta_P}$".

(21.3.4.25) $\boldsymbol{\beta_P = \frac{4\pi \cdot 10^{-7}}{8.778 \cdot 10^{-6}} = 0.143157 \cong \frac{2 \cdot \pi^2}{137}}$; In which $\boldsymbol{Z_\uparrow = 137}$ ;

**Determination of the "$B_P$" induction of the proton magnetic field;**

(21.3.4.26) $\boldsymbol{B_P = \frac{1}{\beta_P} \cdot 7.570 \cdot 10^{14} = \frac{7.570 \cdot 10^{14}}{0.1431} = 5.290 \cdot 10^{15} \left[\frac{1}{m}\right] \equiv [T]}$;

(21.3.4.27) $\boldsymbol{H_P = \frac{1}{{\beta_P}^2} \cdot 8.623 \cdot 10^{19} = \frac{8.623 \cdot 10^{19}}{(0.1431)^2} = 4.210 \cdot 10^{21} \left[\frac{kg}{s^2}\right] \equiv \left[\frac{A}{m}\right]}$ ;

(21.3.4.28)

$$\boldsymbol{V_P = {\beta_P}^3 \cdot 2.305 \cdot 10^{-45} = (0.1431)^3 \cdot 2.305 \cdot 10^{-45} = 6.754 \cdot 10^{-48} m^3};$$

Considering the spherical volume we can find the radius of this volume as follows;

(3.4.29) $$R_{M,P}=\sqrt[3]{\frac{3\cdot V_P}{4\pi}}=\sqrt[3]{\frac{3\cdot 6.754\cdot 10^{-48}}{4\pi}}=\mathbf{1.173\cdot 10^{-16}}\ m;$$

the radius of that volume is equal to the order of magnitude of the proton radius calculated by me at the value of; $R_{M,P}=2.102\cdot 10^{-16}\ m$;

This work helps us interpret the relationships between the parameters of the particle generator quantum and the parameters of their magnetic field;

Looking at relations (21.3.1.4) and (21.4.1.4) shows us that the magnetic field induction denoted by "$\boldsymbol{B}$" (marked in green), is inversely proportional to the Compton wavelength of the respective particles, that is, the ratio between the density of the field lines, which can be expressed by the distance between them, and the surface area of the section through which this flux passes, is given by the ratio between a length and a surface area, resulting in a quantity inversely proportional to the Compton wavelength.

## 4. WHAT IS THE RELATIONSHIP BETWEEN MASS, ELECTRICAL PERMITTANCE AND MAGNETIC INDUCTION OF PARTICLES.

Knowing the magnetic field induction determined in the previous chapter with the relationship; (21.4.1.7) $B_P=\frac{1}{\beta_P}\cdot 7.570\cdot 10^{14}=\frac{7.570\cdot 10^{14}}{0.1431}=\mathbf{5.290\cdot 10^{15}}\left[\frac{1}{m}\right]\equiv[T]$;

Next we will show that we can determine the mass of the proton as a ratio between the permittivity of the vacuum and the magnetic induction, which tells us the nature of the mass of the particles.

In the first chapter we established the equivalents between the electrical units of measurement and the "mechanical units of measurement" (m , Kg, s). Thus we saw that the electrical permittivity of the vacuum measured in farads per meter [F/m] is equivalent to the measurement in [kg/m], that is; $\left[\frac{F}{m}\right]\equiv\left[\frac{kg}{m}\right]$;

Applying this equivalence we can find the mass of the particle. We return to the relation

(21.9) $M_i=\left(2\pi^2\cdot\frac{\lambda_{c,Mi}}{Z_\uparrow}\right)\cdot(\varepsilon_o)$; in which;

(21.4.1.8) $$2\pi^2\frac{\lambda_{c,Mi}}{Z_\uparrow}=2\pi^2\frac{1.321\cdot 10^{-15}}{137.8849}=1.891678\cdot 10^{-16}[m];$$

**We observe that this value represents the very inverse of the magnetic induction. From the relation (21.4.1.4) we observe that the magnetic induction of the proton is given by the relation;** $B_i=\frac{1}{\beta_P\cdot\lambda_{cP}}$; where the coefficient "$\boldsymbol{\beta_P}$" is;

(21.4.1.9.) $\boldsymbol{\beta_P} = \frac{4\pi \cdot 10^{-7}}{8.778 \cdot 10^{-6}} = \mathbf{0.1431} = \frac{2\pi^2}{Z_\uparrow} = \frac{2\pi^2}{137.8849}$; or ;

(21.4.1.10) $\boldsymbol{B_P} = \frac{1}{\beta_P} \cdot 7.570 \cdot 10^{14} = \frac{7.570 \cdot 10^{14}}{0.1431} = 5.28631 \cdot 10^{15} \left[\frac{1}{m}\right] \equiv [T]$;

Or the inverse of the magnetic induction of the particle is;

$$\text{(21.4.1.11)} \quad \frac{1}{B_P} = \frac{1}{5.290 \cdot 10^{15}} = \mathbf{1.890 \cdot 10^{-16}}\ [m];$$

So there is equality in this relationship; (21.4.1.12) $2\pi^2 \frac{\lambda_{c,Mi}}{Z_\uparrow} = \frac{1}{B_P}$;

**It means that the mass of the particles is given by the ratio between the permittivity of the vacuum " $\varepsilon_O$" and the magnetic field induction" $B_P$" corresponding to the particle.** (21.4.1.13) $M_p = \frac{\varepsilon_O}{B_P}$; by replacing value we obtain;

$$M_p = \frac{8.854 \cdot 10^{-12}}{5.290 \cdot 10^{15}} = 1.673 \cdot 10^{-27} [kg];$$

Here, in the case of the proton, the mass represents a ratio between the electrical permittivity of the vacuum and its magnetic field induction.

**We will do the same calculations for the electron.** The electron induction is;

(21.4.1.14) $B_e = \frac{1}{\beta_e} \cdot 4.122 \cdot 10^{11} = \frac{4.122 \cdot 10^{11}}{4{,}234 \cdot 10^{-8}} = 9.735 \cdot 10^{18} \left[\frac{1}{m}\right] \equiv [T]$;

**The mass of the electron** is also given by the ratio between the permeability denoted by epsilon and the magnetic induction according to the relationship ; $m_e = \frac{\varepsilon_O}{B_e}$**;** in which**;**

(21.4.1.15) $m_e = \frac{8.854 \cdot 10^{-12}}{9.735 \cdot 10^{18}} = 9.095.10^{-31} [kg]$;

As in the case of the electron, the mass represents a ratio between the permittivity of the vacuum and the magnetic field induction of the electron.

The same calculations can be made for the particles of the systems belonging to the other lower cosmic levels such as the subatomic level and the hypo-cosmic level or the zero level, as well as in the case of the macrocosmic level for the celestial bodies.

In these cases it is clearly observed that the mass of the particles is of electromagnetic nature as well as the field from which they are formed under the action of energy quanta also of electromagnetic nature.

4.2. Determinations at the macrocosmic level Since the celestial bodies have different sizes and dimensions, we can express their mass by a multiple of elementary bodies (taken as a standard) denoted by “Mo” with which the real bodies can be measured. Since the real mass of the celestial bodies is given by a number “Z” of elementary bodies, and the mass of these elementary bodies is influenced by the speed of movement through the correction coefficient denoted by $\boldsymbol{\varphi} = \sqrt{\frac{V_M}{V_o}}$; the calculation relations of the real mass will be determined taking into account these values.

**For example, we will discuss the mass of the Sun.**

**From Wikipedia;https://ro.wikipedia.org/wiki/Sistemul_solar**

The Sun's Mass$\boldsymbol{M_s = 1.99 \cdot 10^{30}\ Kg}$;

Its diameter is approximately; $\emptyset_s = \boldsymbol{1.39 \cdot 10^{9}\ m}$;

The volume of the Sun is; $\boldsymbol{V_s = 1.41 \cdot 10^{27}\ m^3}$;

Solar mass density; $\boldsymbol{\rho_s = 1.40 \cdot 10^{3}\ \frac{Kg}{m^3}}$;

The speed of the Sun in the Galaxy; $\boldsymbol{v_s = 220\ km/s}$;

From my Study on the similarity of micro and macrocosmic systems, from tables 2; 7; 11; 13; we extract the following data for the Sun;

The mass of an elementary body;$\boldsymbol{M_{os} = 5.369 \cdot 10^{25}\ Kg}$;

Radius of the elementary body; $\boldsymbol{r_{os} = 1.097 \cdot 10^{4}\ m}$;

The theoretical maximum number of tasks; $\boldsymbol{Z_{\uparrow.s} = 2.245 \cdot 10^{4}}$;

The Sun's gravitational charge number; $\boldsymbol{Z_s = 740}$;

Speed correction coefficient; $\boldsymbol{\varphi_s = 50}$;

Absolute density of vacuum; $\boldsymbol{\rho_{v,0} = 9.517 \cdot 10^{22}\ \left[\frac{kg}{m^3}\right]}$;

We resume relation (21.5) and calculate; $\boldsymbol{M_i = 2\pi^2 \cdot \frac{{\lambda_{G,i}}^3}{Z^3_{\uparrow,i}} \cdot \rho_{v,0}}$;

The specific wavelength of elementary bodies for stars of the Sun class is equal to;

(21.4.2.1) $\boldsymbol{\lambda_{G,s} = 2\pi . r_{Mos} = 2\pi \cdot 1.097 \cdot 10^4 = 6.892 \cdot 10^4\ m}$;

The mass of the elementary body will be;

(21.4.2.2) $\boldsymbol{M_{o,s} = 2\pi^2 \cdot \left(\frac{6.892 \cdot 10^4}{2.245 \cdot 10^4}\right)^3 \cdot 9.517 \cdot 10^{22} = 5.511 \cdot 10^{25}\ kg}$;

The speed coefficient was calculated with the relationship;$\boldsymbol{\varphi_{s,i} = \sqrt{\frac{V_i}{V_0}}}$ ; where "$\boldsymbol{Vi}$"is the speed of movement of the body "$\boldsymbol{i}$" on the orbit of the system, and "$\boldsymbol{V_0}$" is the minimum speed of the body on the fundamental orbit in a binary system similar to hydrogen.

$\boldsymbol{\varphi_{s,i} = \sqrt{\frac{2.20 \cdot 10^5}{90}} = 49.44}$; Knowing the mass of the body "$\boldsymbol{M_i}$" and the mass of the elementary body "$\boldsymbol{M_{os}}$", we find the number; $\boldsymbol{Z_s = \frac{M_s}{\varphi_{s,i} \cdot M_{o,s}} = \frac{1.99 \cdot 10^{30}}{49.44 \cdot 5.511 \cdot 10^{25}} = 730}$;

and the mass-velocity correction coefficient we can calculate the mass of the Sun;

(21..2.3) $\boldsymbol{M_s = Z_s \cdot \varphi_s \cdot M_{os} = 730 \cdot 49.44 \cdot 5.651 \cdot 10^{25} = 2 \cdot 10^{30}\ Kg}$;

As can be seen, we obtained a value very close to the value determined by other astronomical means.

If we want to express the mass of the Sun in terms of its real volume and real density, we will apply the following empirical relationship;

(21.4.2.4) $\boldsymbol{M_s = V_s \cdot \rho_s} = \left[\pi \cdot Z_s{}^4 \left(\frac{4}{3}\pi \cdot \lambda_{G,s}{}^3\right)\right] \cdot \left[\frac{\varphi_s}{Z_s{}^3}\left(\frac{3}{2} \cdot \frac{\rho_{v,0}}{Z_{\uparrow.s}{}^3}\right)\right]$ ; $[\boldsymbol{kg}]$ ;

After simplifications we have the theoretical volume of the Sun;

(4.2.5) $\boldsymbol{V_s = Z_s{}^4 \cdot \left(\frac{4}{3}\pi^2 \cdot \lambda_{G,s}{}^3\right)}$ $[\boldsymbol{m^3}]$;

Let's verify these relationships by substituting the known values;

(21.4.2.6) $\boldsymbol{V_s = 740^4 \cdot \left[\frac{4}{3}\pi^2 \cdot (6.95 \cdot 10^4)^3\right]} = 1.324 \cdot 10^{27}$ $\boldsymbol{m^3}$;

compared to the volume measured by; $\boldsymbol{V_{s,m} = 1.41 \cdot 10^{27} m^3}$ ;

And the density of the Sun is; (21.4.2.7) $\boldsymbol{\rho_s = \frac{\varphi_s}{Z_s{}^3}\left(\frac{3}{2} \cdot \frac{\rho_{v,0}}{Z_{\uparrow.s}{}^3}\right)}$ ;

Substituting the known values we obtain the density;

(21.4.2.8) $\boldsymbol{\rho_s = \frac{49.44}{740^3}\left[\frac{3}{2} \cdot \frac{9.517 \cdot 10^{22}}{(2.245 \cdot 10^4)^3}\right] = 1.539 \cdot 10^3}$ $\left[\frac{Kg}{m^3}\right]$;

compared to; $\boldsymbol{1.408 \cdot 10^3}$ $\left[\frac{Kg}{m^3}\right]$; quite close values.

We want to show that in the case of the Sun we can express the mass as a ratio between the permittivity of the macrocosmic vacuum and the magnetic induction of the Sun calculated with

the same physical relations as for microparticles.

With these relations we will determine the mass of an elementary body of the Sun M_o;

The permittivity of the macrocosmic vacuum for solar systems is determined with the help of similarity relations whose values we find in table no. 38 page 86.

**The calculated value for epsilon is;** $\boldsymbol{\varepsilon_S = 8.867 \cdot 10^{23}} \left[\frac{kg}{m}\right] \equiv \left[\frac{F}{m}\right]$;

Using the relationship below we will find the value of Inductance "$\boldsymbol{B_{Mi}}$" ;

(21.4.2.9) $\boldsymbol{2\pi^2 \frac{\lambda_{c,Mi}}{Z_\uparrow} = \frac{1}{B_P}}$ ; (4.2.10) $\boldsymbol{B_{Mi} = \frac{1}{2 \cdot \pi^2} \cdot \frac{Z\uparrow}{\lambda_{c,Mi}}}$ ;

substituting the values mentioned above we find the induction "$\boldsymbol{B_{Mi}}$" for an elementary body " $\boldsymbol{Mi}$ " for stars of the Sun class.

(21.4.2.11) $\boldsymbol{B_{M,S} = \frac{1}{2 \cdot \pi^2} \cdot \frac{2.248 \cdot 10^4}{6.95 \cdot 10^4} = 1.638 \cdot 10^{-2}}$; $\left[\boldsymbol{T \equiv \frac{1}{m}}\right]$

So the value of an elementary mass for the Sun "$\boldsymbol{M_{0,S}}$" can be found with the same relationship applied to the proton;

(21.4.2.12) $\boldsymbol{M_0 = \frac{\varepsilon_{o,s}}{B_{M,S}} = \frac{8.867 \cdot 10^{23}}{1.638 \cdot 10^{-2}} = 5.413 \cdot 10^{25}}$ $[\boldsymbol{kg}]$;

Compared to; $\boldsymbol{M_{os} = 5.369 \cdot 10^{25}}$ $[\boldsymbol{kg}]$; value obtained through similarity relationships;

Recalculating the mass of the Sun taking into account the gravitational charge number "$Z_s$ ", as well as the velocity coefficient "$\varphi_s$" we obtain;

(21.4.2.13) $M_s = Z_s \cdot \varphi_s \cdot M_{os} = 740 \cdot 49.44 \cdot 5.413 \cdot 10^{25} = 1.980 \cdot 10^{30}\ Kg$ ;

As can be seen, the mass of the Sun calculated with the above relations gave the same result..

**And the density of the Sun is;** (4.2.14) $\rho_s = \frac{\varphi_s}{Z_s{}^3}\left(\frac{3}{2} \cdot \frac{\rho_{v,0}}{Z_{\uparrow.s}{}^3}\right)$ ;

Substituting the known values we obtain the density;

$$(21.2.15)\ \rho_s = \frac{18.19}{(11.12)^3}\left[\frac{3}{2} \cdot \frac{9.523 \cdot 10^{22}}{(2.245 \cdot 10^4)^3}\right] = 1.540 \cdot 10^3 \left[\frac{Kg}{m^3}\right];$$

Compared to; $1.408 \cdot 10^3 \left[\frac{Kg}{m^3}\right]$; deci o valoare apropiata .

**We will redo the same calculations in the case of our planet Earth.**

[https://ro.wikipedia.org/wiki/Sistemul_solar](https://ro.wikipedia.org/wiki/Sistemul_solar)

Planet's Mass; $M_p = 5.972 \cdot 10^{24}\ Kg$;

The volume of the planet is; $V_p = 1.083 \cdot 10^{21}\ m^3$;

Planetary mass density; $\rho_p = 5.514 \cdot 10^3\ \frac{Kg}{m^3}$ ;

The planet's orbital speed; $v_p = 30\ km/s$ ;

From my Study on the similarity of micro and macrocosmic systems, from tables 2; 7; 11; 13; we extract the following data for planet Earth;

The mass of an elementary body for planets; $M_{op} = 2.924 \cdot 10^{22}\ Kg$;

Radius of the elementary planetary body; $r_{op} = 0.738 \cdot 10^2\ m$;

The theoretical maximum gravitational charge number for planets; $Z_{\uparrow.s} = 1836$

Numarul de sarcina gravitationala al planetei Pamant;. $Z_p = 11.12$;

Velocity coefficient for correction of the elementary mass of the planet; $\varphi_p = 18.19$ ;

Absolute density of vacuum; $\rho_{v,0} = 9.65 \cdot 10^{22} \left[\frac{kg}{m^3}\right]$;

The specific wavelength of elementary bodies for planets is equal to;

(21.4.2.1.7) $\lambda_{c,Mp} = 2\pi . r_{Mop} = 2\pi \cdot 73.8 = 4.63 \cdot 10^2\ m$;

Calculating the elementary mass of planets can be done with the relationship;

(21.4.2.1.6) $M_i = 2\pi^2 \cdot \frac{\lambda_{c,Mi}{}^3}{Z^3_{\uparrow,i}} \cdot \rho_{v,0}$ ; resulting in the same value obtained with the similarity relations. Next we calculate the mass of the Earth with the following relation;

(21.4.2.1.8) $M_p = Z_p \cdot \varphi_p \cdot M_{op} = (11.12) \cdot (18.19) \cdot 2.924 \cdot 10^{22} = 5.914 \cdot 10^{24}\ Kg$;

As can be seen, we obtained a value very close to the value determined by other astronomical means.

If we want to express the mass of the Earth in terms of its real volume and real density, we will apply the following relationship;

(21.4.2.1.9 ) $$M_p = V_p \cdot \rho_p = \left[\frac{4}{3}\pi^2 \cdot {Z_p}^4 {\varphi_p}^6 {\lambda_{G,p}}^3\right] \cdot \left[\frac{3}{4} \cdot \frac{1}{{Z_p}^3 \cdot {\varphi_p}^5}\left(\frac{\rho_{v,0}}{{Z_{\uparrow.s}}^3}\right)\right] ;$$

So the theoretical volume is; (21.4.2.1.10) $V_p = \frac{4}{3}\pi^2 \cdot {Z_p}^4 \cdot {\varphi_p}^6 \cdot {\lambda_{G,p}}^3 \ [m^3]$;

Let's verify these relationships by substituting the known values;

(21.4.2.1.11) $$V_p = \frac{8}{3}\pi^2 \cdot 11.12^4 \cdot 18.19^6 \cdot (463)^3 = 1.446 \cdot 10^{21} \ [m^3];$$

compared to the volume measured by; $V_{p,m} = 1.83 \cdot 10^{21} \, m^3$ ;

The density calculated with the above relationship is;

(21.4.2.1.12) $$\rho_p = \left[\frac{3}{4} \cdot \frac{1}{(11.12)^3 \cdot (18.19)^5}\left(\frac{9.65 \cdot 10^{22}}{(1836)^3}\right)\right] = 4.27 \cdot 10^3 \ \left[\frac{kg}{m^3}\right];$$

compared to the real density; $\rho_p = 5.514 \cdot 10^3 \ \left[\frac{kg}{m^3}\right]$;

Next we will express the mass as a ratio between the permittivity of the macrocosmic vacuum and the magnetic induction of the Earth calculated with the same physical relations as for microparticles.

With these relations we will determine the mass of an elementary body of the planets $M_{op}$;

The permittivity of the macrocosmic vacuum for planetary systems with satellites is determined using the similarity relations and whose values we find in table no.38

The calculated value for epsilon in the case of planetary satellite systems was determined by similarity relations. (21.4.2.1.13) $\varepsilon_{o,S} = 5.913 \cdot 10^{21} \left[\frac{kg}{m}\right] \equiv \left[\frac{F}{m}\right]$;

Using the relationship below we will find the value of Inductance "$B_{Mi}$";

(21.4.2.1.14) $2\pi^2 \frac{\lambda_{c,Mi}}{Z_\uparrow} = \frac{1}{B_P}$; or; (4.2.1.15) $B_{Mi} = \frac{1}{2 \cdot \pi^2} \cdot \frac{Z\uparrow}{\lambda_{c,Mi}}$ ;

Substituting the previously mentioned values regarding the wavelength of the generating quantum for the elementary bodies of the planets and the maximum $Z$ number of their gravitational charge, we find the induction "$B_{Mi}$ " for an elementary body "$Mi$" for the celestial bodies of the planet class. (21.4.2.1.15) $B_{M,p} = \frac{1}{2 \cdot \pi^2} \cdot \frac{1836}{463} = 0.200; \left[T \equiv \frac{1}{m}\right]$;

So the value of an elementary mass for planets $M_{0,p}$ can be found with the same relationship applied to the proton;

(21.4.2.1.16) $$M_{0,p} = \frac{\varepsilon_{o,s}}{B_{M,P}} = \frac{5.913 \cdot 10^{21}}{0.200} = 2.956 \cdot 10^{22} \ [kg];$$

Compared to; $M_{op} = 2.924 \cdot 10^{22} \ [kg]$; mass obtained by similarity relations.

Recalculating the mass of the Earth taking into account the gravitational charge number "$Zp$", as well as the velocity coefficient "$\varphi_p$" we obtain;

$$M_T = Z_p \cdot \varphi_p \cdot M_{op} = (11.12) \cdot (18.19) \cdot 2.956 \cdot 10^{22} = 5.975 \cdot 10^{24}\,[Kg];$$

So the mass of any celestial body can be determined if we know these parameters, or if we know the mass and velocity of the body we will be able to determine the other unknown parameters.

## 5. The essential link between micro and macrocosm

We will determine the relationship that exists between the electrical permittivity and the mass interaction constant. We start with Coulomb's relationship for the atomic system;

The interaction force in the case of the hydrogen atom is; $F = \frac{m_e \cdot v^2}{R} = \frac{1}{4\pi\varepsilon} \cdot \frac{e \cdot e}{R^2}$ ; in which;"$m_e$" is the mass of the electron, "e" is the electric charge, "$\varepsilon$" is the electric permittivity of vacuum and "R " is the radius of the electron orbit, "**v**" is the velocity of the electron in the orbit.We showed in the first chapter that the electric charge is equivalent to an intrinsic momentum of the particle, since each mass point belonging to the particle moves at the speed of light in a continuous vibration. So the charge of the proton can be written as;

(21.5.1) $e \equiv \frac{M_p \cdot c}{\pi}$; in which;; "$M_p$" is the mass of the proton and "$c$" is the speed of light;

In the case of the electron we know that the mass is **1836** times smaller than the mass of the proton and if we denote this ratio with the letter alpha we can write;

$$\propto = 1836 = 6\pi^5\text{ ; deci; (21.5.2) } e \equiv \frac{\alpha \cdot m \cdot c}{\pi};$$

(21.5.3) $\frac{1}{4\pi\varepsilon} \cdot \frac{e \cdot e}{R^2} = \frac{1}{4\pi\varepsilon} \frac{M_p \cdot c}{\pi} \frac{\alpha \cdot m \cdot c}{\pi} \frac{1}{R^2}$; We are noting; (21.5.4) $k = \frac{1}{4\pi\varepsilon} \cdot \frac{\alpha \cdot c^2}{\pi^2}$;

And the expression of force expressed as a function of the interaction of masses has the same value;

$$(21.5.5)\quad \frac{1}{4\pi\varepsilon} \cdot \frac{e \cdot e}{R^2} = k\,\frac{M_p \cdot m}{R^2};$$

In the expression of the interaction constant "$k$" we replace alpha with the expression;

$$\propto = 6 \cdot \pi^5 = 1836;\quad \text{so ; } k = \frac{1}{4\pi\varepsilon} \cdot \frac{6\pi^5 \cdot c^2}{\pi^2} = \frac{6 \cdot \pi^5}{4 \cdot \pi^3} \cdot \frac{c^2}{\varepsilon} = \frac{3\,\pi^2}{2} \cdot \frac{c^2}{\varepsilon};$$

We simplify and obtain; (21.5.6) $k \cdot \varepsilon = \frac{3\pi^2}{2} \cdot c^2$;

The product of the mass interaction constant and the permittivity of the vacuum is a constant proportional to the square of the speed of light, both for galaxies and for atoms. In the case of solar and planetary systems, instead of the speed of light, the theoretical maximum orbital speed that characterizes the class or category of the systems considered is taken into account. Let's verify this relationship both in the micro and in the macro.

La pag.14 ; rel;(1.5.1.1) the mass interaction constant for the atom was determined, having the value; $\boldsymbol{k_a} = \mathbf{1.513 \cdot 10^{29}} \left[\boldsymbol{N}.\frac{\boldsymbol{m^2}}{\boldsymbol{kg^2}}\right]$;

From the table of physical constants we have; $\boldsymbol{\varepsilon} = \mathbf{8.85418 \cdot 10^{-12}} \left[\frac{\boldsymbol{F}}{\boldsymbol{m}}\right] \equiv \left[\frac{\boldsymbol{kg}}{\boldsymbol{m}}\right]$ ;

$$\boldsymbol{k_a \cdot \varepsilon = \frac{3\pi^2}{2} \cdot c^2} \; ;$$

Using this relationship we will calculate the equality between the two terms;

(21.5.7) $\boldsymbol{k_a \cdot \varepsilon = 1.513 \cdot 10^{29} \cdot 8.85418 \cdot 10^{-12} = 1.339 \cdot 10^{18}} \left[\frac{\boldsymbol{m^2}}{\boldsymbol{s^2}}\right]$ ;

Or; (21.5.8) $\boldsymbol{\frac{3\pi^2}{2} \cdot c^2 = \frac{3\pi^2}{2} \cdot [2.9979 \cdot 10^8]^2 = 1.3305 \cdot 10^{18}} \left[\frac{\boldsymbol{m^2}}{\boldsymbol{s^2}}\right]$ ;

So the relation for the microcosm is verified, and the small differences consist in the precision of the calculations.

Let's calculate the value of the same relation for the macrocosm;

The value of the gravitational permeability of the macrocosmic vacuum differs from the permeability of the microcosmic vacuum, and was determined using the similarity relations on page 86, tab. 36. for the Galaxy we have;

$$\boldsymbol{\varepsilon_G = 1.993 \cdot 10^{28}} \left[\frac{\boldsymbol{F}}{\boldsymbol{m}}\right] \equiv \left[\frac{\boldsymbol{kg}}{\boldsymbol{m}}\right];$$

(21.5.10) $\boldsymbol{K_G \cdot \varepsilon_G = 6,67 \cdot 10^{-11} \cdot 1.993 \cdot 10^{28} = 1.329 \cdot 10^{18}} \left[\frac{\boldsymbol{m^2}}{\boldsymbol{s^2}}\right]$;

After simplifications and combining terms, we obtain the acceleration relation of the mass interaction field as follows; (21.5.14) $\boldsymbol{a = 3\pi^4 \cdot \frac{(Z_i \cdot \varphi_i)}{R_i{}^2} \cdot \left[\frac{\vartheta_{v,i}^2 \cdot \lambda_{G,i}{}^3}{(Z\uparrow_i)^3}\right]}$;

In this relation we see the ratio between the wavelength of the generating quantum "$\boldsymbol{\lambda_{G,i}}$ " (i.e. the equivalent of the Compton wavelength at the atomic level), and the theoretical maximum charge number "$\boldsymbol{Z \uparrow_i}$" for the cosmic level in the class of the system considered. This ratio represents the very wavelength of the "empty space" that characterizes the field related to the studied body denoted by; "$\boldsymbol{\lambda_{v,i}}$". At the same time, the product between the frequency of the "empty space" denoted by "$\boldsymbol{\vartheta_{v,i}}$" and its wavelength "$\boldsymbol{\lambda_{v,i}}$ " corresponds to the maximum speed of the accompanying wave "; $\boldsymbol{V \uparrow}$" of the respective particle, or of the body that is part of a micro or macrocosmic harmonic system. This accompanying wave has a maximum value less than or at most equal to the speed of light in the case of atomic and galactic systems. And in the case of solar systems or satellite systems, the maximum speed of the accompanying wave represents the maximum speed of a celestial body that is on the fundamental orbit of a cosmic system having a nucleus characterized by a theoretical charge number equal to the maximum "$Z\uparrow_i$" .

In reality, all micro or macro systems never reach a complexity given by the maximum $Z$ charge number because the fundamental frequency of the system becomes equal to the natural frequency of the "empty space" in which it is located, which makes the stability of the system impossible. In this case, the particle or body on the fundamental orbit corresponds to the maximum speed or even the speed of light, depending on the class and level of organization of the system.

A new version of the relation (21.5.14) that provides us with data about the field acceleration of a micro or macrocosmic system is;

(21.5.15) $a = 3\pi^4 \cdot (Z_i \cdot \varphi_i) \cdot \left(v_\uparrow^2 \cdot \lambda_{v,i}\right) \frac{1}{{R_i}^2}$ ; in which; $\lambda_{v,i} = \frac{\lambda_{G,i}}{Z_\uparrow}$ ;

Let's check this relationship in the case of the Sun to see what the acceleration is at the level of the Earth's orbit, knowing that;

Radius of Earth's orbit; $Ri = 1.499 \cdot 10^{11}$ m ;

The Sun's gravitational charge numbe; $Z_s = 740$ ;

The speed correction coefficient for the Sun; $\varphi_s = 50$ ;

Maximum speed for solar systems; $1.98 \cdot 10^6 \ \frac{m}{s}$ ;

Gravitational wavelength of the generating quantum for solar systems; $\lambda_{G,i} = 6.95 \cdot 10^4 \ m$;

Maximum gravitational charge number for the Sun; $Z\uparrow_i = 2.248 \cdot 10^4$ ;

We calculate the acceleration using the relationship (21.5.15)

$$a = 3\pi^4 \cdot (740 \cdot 50) \cdot \frac{(1.98 \cdot 10^6)^2 \cdot 3.0916}{(1.499 \cdot 10^{11})^2} = 5.832 \cdot 10^{-3} \ \left[\frac{m}{s^2}\right];$$

If we calculate the acceleration produced by the Sun's gravitational field on planet Earth using the classical method, we have;

(21.5.18) $a = \frac{k \cdot M.}{R^2} = \frac{6.67 \cdot 10^{-11} \cdot 1.988 \cdot 10^{30}}{\left(1.499 \cdot 10^{11}\right)^2} = 5.901 \cdot 10^{-3} \ \left[\frac{m}{s^2}\right]$;

Here, in both cases, I obtained very close results using completely different relations, which confirms the validity of my relation using the product of the square of the maximum velocity of the category of the system considered and its gravitational wavelength.

**For the hydrogen atom;**

We apply the same relations for calculating the acceleration in the atomic case;

The necessary data taken from the documentation are;
Bohr radius; $\boldsymbol{R_H = 5.291 \cdot 10^{-11}}$ **m ;**
The charge number of Hydrogen; $\boldsymbol{Z_H = 1}$;
The maximum theoretical orbital speed for the atom with the maximum "$\boldsymbol{Z \uparrow}$ " number;
$\boldsymbol{V \uparrow = 2.997 \cdot 10^8 \frac{m}{s}}$ ;
Compton wavelength for proton; $\boldsymbol{\lambda_{C,p} = 1.321 \cdot 10^{-15} m}$;
The theoretical maximum atomic charge number; $\boldsymbol{Z \uparrow_A = 137}$
The wavelength of the "empty space" for the atomic system is;" $\boldsymbol{\lambda_{v,i}}$";

$$\lambda_{v,i} = \frac{\lambda_{C,i}}{Z_\uparrow} = \frac{1.321 \cdot 10^{-15}}{137} = 9.642 \cdot 10^{-18}\ m;$$

**The acceleration is;** $\boldsymbol{a = 3\pi^4 \cdot \left(v_\uparrow^2 \cdot \lambda_{v,i}\right) \frac{1}{{R_H}^2}}$ ; or;

(21.5.19) $$a = 3\pi^4 \cdot \frac{\left(2.997 \cdot 10^8\right)^2 \cdot\ 9.642 \cdot 10^{-18}}{(5.291 \cdot 10^{-11})^2} = 9.0403 \cdot 10^{22}\ \left[\frac{m}{s^2}\right];$$

We must find the same value if we calculate the acceleration with the relation; (21.5.20)

$$a = \frac{v^2}{R_H} = \frac{\left(2.187 \cdot 10^6\right)^2}{5.291 \cdot 10^{-11}} = 9.039 \cdot 10^{22}\ \left[\frac{m}{s^2}\right];$$

The two calculated values for the acceleration in the case of the hydrogen atom are equal, which confirms the validity of the relationship in both the micro and macro.
The product of the square of the maximum velocity and the wavelength of the vacuum are responsible for generating the acceleration field.

## Conclusion

Through this work I hope that I have succeeded in demonstrating the uniqueness of the laws of nature that apply both in the microcosm and in the macrocosm. The difference being that in the microcosm, due to the very small dimensions of the particles and the extremely short duration of events, a statistical study of them is required, while in the macrocosm, at the opposite pole, the dimensions and time being very large, the study of celestial bodies and their systems is done individually, which is why different theories and study methods have been developed. The laws of nature, however, are always the same applied at different scales, and we as observers are always between the two universes of micro and macro cosmos, with different possibilities of knowledge, adapted to each cosmic level in particular.
Although the atomic system is characterized by the electromagnetic vector field, while macrocosmic systems are characterized by scalar gravitational fields, I must mention that with the determination of the equivalence of the electric charge with some intrinsic impulses of the particles, I came to the conclusion that celestial bodies can also be considered gravitational

charges that generate vector fields similar to the microcosm, the difference being in the dimensional scale that we are discussing. Thus, both the scalar field and the vector field represent only two distinct facets of these fields related to particles or bodies belonging to different cosmic levels.

I close this study in the hope that it will open a new window through which to look at the universe as a whole, taking into account the indestructible links between the micro and macrocosm.

Although the two cosmic levels are different from a dimensional and structural point of view, they still have in common the fact that macrocosmic matter is built from microcosmic matter, organized in atomic systems and not only. Just as an atomic system represents a natural harmonic oscillator, so in the macrocosm any cosmic system in turn represents a natural harmonic ensemble.

It seems to me particularly important to verify the hypothesis regarding the existence of several cosmic speeds of propagation of accompanying waves for celestial bodies in the universe, which characterize families of systems, as well as the phenomenon of "dimensional relativity" expressed by the speed coefficient, which provides a new way of looking at the variation of mass and space in the macrocosm depending on this coefficient.

Also very important for the verification of this theory is the discovery of means of measuring the natural pulsation of systems of celestial bodies through the prism of the functioning of harmonic oscillators, and of gravitational waves in the universe.

In fact, each relationship requires a practical verification on new systems, and possibly their completion or adaptation to new conditions. The increasingly perfected observation equipment will, I hope, allow the discovery of new solar systems, on which the current theory can be verified.

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**SYNTHETIC SHEET OF MACROCOSMIC SYSTEMS**
**SYNTHETIC SHEET OF GALACTIC SYSTEMS.**

**The “alpha” mass ratio;α=M/m; α=1836;**

**Similarity coefficient; S=18.04871 ;**

**System category coefficient; βg=1;**

**Interaction constant; K=6.67·10^(-11) ; [(N·m^2)/(Kg^(-2) )]**

**Rest mass of the nucleus for Z=1; M0g=1.81·10^32;Kg;**

**Rest mass of the body gravitating around the nucleus; m0g=9.85·10^28;Kg;**

**Upper limit speed on the first orbit;; V(↑g)=2.997·10^8 m/s;**

**Initial speed; V0≈90m/s;**

**The radius of the fundamental orbit for Z=1, of the “binary” type;R0g=1.527·10^18 m;**

**The maximum number of subsystems that can gravitate around the galactic nucleus; Z(↑g)=3.37·10^6;**

**Radius of the fundamental orbit for the system with max. Z of stars; Rcg=4.529·10^11;m**

**Planck's constant for the galactic system; Hg=8.4·10^49 Js;**

**Maximum orbital period for unitary “Z”; T(↑g)=1.06·10^17s; (3.29.10^9 ani)**

**Minimum orbital period for maximum “Z”;T_(↓g)=9.49·10^3 s; (2.63 ore).**

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**SYNTHETIC SHEET OF STAR SYSTEMS**

**The "alpha" mass ratio;$\alpha=M/m$; $\alpha=1836$;**

**Similarity coefficient; S=18.04871 ;**

**System category coefficient; $\beta_g=1.515147$;**

**Interaction constant; $K=6.67\cdot10^{-11}$;[(N·m^2)/(Kg^(-2) )]**

**Rest mass of the nucleus for Z=1; M0,stea=$9.85\cdot10^{28}$;Kg;**

**Rest mass of the body gravitating around the nucleus; m0,stea=$5.36\cdot10^{25}$;Kg;**

**Upper limit speed on the first orbit;; $V(\uparrow g)=2.447\cdot10^7$ m/s;**

**Initial speed; $V0\approx90$m/s;**

**The radius of the fundamental orbit for Z=1, of the "binary" type; R0,st=$8.316\cdot10^{14}$ m;**

**The maximum number of elementary bodies that can orbit the nucleus; $Z(\uparrow g)=2.752\cdot10^5$;**

**Raza orbitei fundamentale pentru sistemul cu Z max. de stele.; $R_{cg}=3.02\cdot10^9$;m**

**Planck's constant for the stellar system; $H_g=2.52\cdot10^{43}$ Js;**

**Maximum orbital period for unitary "Z"; $T(\uparrow st)=5.77\cdot10^{13}$ s;(1.86 .10^6 ani)**

**Minimum orbital period for maximum "Z"; $T(\downarrow g)=7.75\cdot10^2$ s; (12.9 minute)**

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**SOLAR SYSTEMS SYNTHETIC SHEET**

**The "alpha" mass ratio;$\alpha$=M/m; $\alpha$=1836;**

**Similarity coefficient; S=18.04871 ;**

**System category coefficient; $\beta_{sol}$=2.295663;**

**Interaction constant; K=6.67·10^(-11);[(N·m^2)/(Kg^(-2) )]**

**Rest mass of the nucleus for Z=1; M0,solar=5.36·10^25;Kg;**

**Rest mass of the body gravitating around the nucleus.m0,sol=2.92·10^22;Kg;**

**Upper limit speed on the first orbit; V0,(↑sol)=1.998·10^6 m/s;**

**Initial speed; V0≈90m/s;**

**The radius of the fundamental orbit for Z=1, of the "binary" type; R0sol=4.529·10^11;m**

**The maximum number of elementary bodies that can orbit the nucleus; Z(↑sol)=2.248·10^4;**

**Raza orbitei fundamentale pentru sistemul cu Z max. ; Rcg=2.014·10^7;m**

**Planck's constant for solar systems; Hsol=7.47·10^36 Js;**

**Minimum orbital period for maximum "Z". T=63.396 [s] ;**

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**SYNTHETIC SHEET OF PLANETARY SYSTEMS WITH SATELLITES**

**The "alpha" mass ratio;$\alpha$=M/m; $\alpha$=1836;**

**Similarity coefficient; S=18.04871 ;**

**System category coefficient; $\beta sa$=3.4782618;**

**Interaction constant; K=6.67·10^(-11); [(N·m^2)/(Kg^(-2) )]**

**Rest mass of the nucleus for Z=1; M0,pl=2.92·10^22;Kg;**

**Rest mass of the body gravitating around the nucleus; m0,sat=1.59·10^19;Kg;**

**Upper limit speed on the first orbit; V(↑sat)=1.631·10^5 m/s;**

**Initial speed; V0≈90m/s;**

**The radius of the fundamental orbit for Z=1, of the "binary" type;; R0sat=2.466·10^8 m;**

**The maximum number of satellites "m0" that can orbit the nucleus; Z(↑sat)=1.836·10^3;**

**Raza orbitei fundamentale pentru sistemul cu Z max; Rc,sat=1.343·10^5;m**

**Planck's constant for planetary systems; Hpl,g=2.21·10^30 Js;**

**Maximum orbital period for unitary "Z"; T(↑sat)=1.71·10^7 s; (0.54 ani)**

**Minimum orbital period for maximum "Z"; T_(↓sat)=5.17s;**

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# TABELUL RELATIILOR DE SIMILITUDINE

**CONSTANTA DE SIMILITUDINE S=18.087114 ;** **CONSTANTA DE PROPORTIONALITATE;** $\alpha = 1836$

| DENUMIREA PARAMETRULUI | RELATII DE SIMILITUDINE INTRE SISTEMUL ATOMIC SI GALAXIE | MICRO COSMOS - SISTEMUL ATOMIC | MACRO COSMOS SISTEMUL GALACTIC | SISTEME STELARE MICROGALA XII | SISTEME PLANETARE | SISTEME DE SATELITI |
|---|---|---|---|---|---|---|
| **COEFICIENTUL FAMILIEI DE SISTEME** **j=0 ,1 ,2 ,3** | $\boldsymbol{\beta_j = \sqrt[S]{\propto^j}}$ ; | | **1, 000** | **1.515147** | **2.295663** | **3.4782618** |
| **CONSTANTA DE INTERACTIUNE [m3/Kg.s2]** | $\boldsymbol{K = k_a \left(\frac{1}{\sqrt[3]{\propto^2}}\right)^S}$ ; | $1{,}5157 \cdot 10^{29}$ | $6{,}67 \cdot 10^{-11}$ | $6{,}67 \cdot 10^{-11}$ | $6{,}67 \cdot 10^{-11}$ | $6{,}67 \cdot 10^{-11}$ |
| **MASA DE REPAUS A UNUI CORP ELEMENTAR NUCLEAR** [Kg] | $\mathbf{M_{0,G} = M_p \left(\frac{\propto}{\beta_j}\right)^S}$ ; | $1{,}672 \cdot 10^{-27}$ | $1{,}81 \cdot 10^{32}$ | $9{,}85 \cdot 10^{28}$ | $5{,}37 \cdot 10^{25}$ | $2{,}92 \cdot 10^{22}$ |

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|---|---|---|---|---|---|---|
| **MASA DE REPAUS A UNUI CORP ELEMENTAR [Kg]** | $\mathbf{m_{0,G} = m_e \left(\frac{\propto}{\beta_j}\right)^S;}$ | $0{,}91 \cdot 10^{-30}$ | $9{,}85 \cdot 10^{28}$ | $5{,}37 \cdot 10^{25}$ | $2{,}92 \cdot 10^{22}$ | $1{,}59 \cdot 10^{19}$ |
| **VITEZA MINIMA PROPRIE PRIMEI ORBITE Z=1 [m/s]** | $\mathbf{V_{0,G} = V_{0,a} \left(\frac{2}{\sqrt[6]{\propto}}\right)^S;}$ | $2{,}188 \cdot 10^{6}$ | 90 | 90 | 90 | 90 |
| **NUMARUL "$Z_{\uparrow i}$" MAXIM DE CORPURI DIN NUCLEU** | $Z_{\uparrow i} = Z_{\uparrow a} \left(\frac{1}{2} \cdot \sqrt[6]{\frac{\alpha}{\beta_{i-1}}}\right)^S;$ | 137 | $3{,}37 \cdot 10^{6}$ | $2.75 \cdot 10^{5}$ | $2{,}24 \cdot 10^{4}$ | $1.83 \cdot 10^{3}$ |
| **VITEZA MAXIMA PE ORBITA FUNDAMENTALA PENTRU Z MAXIM;"$Z_{\uparrow}$" [m/s]** | $V_{\uparrow m} = c \cdot \left(\sqrt[3]{\frac{1}{\beta_i}}\right)^S;$ | $2.997 \cdot 10^{8}$ | $2.997 \cdot 10^{8}$ | $2{,}42 \cdot 10^{7}$ | $1{,}98 \cdot 10^{6}$ | $1.64 \cdot 10^{5}$ |

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| **RAZA ORBITEI FUNDAMENTALE PENTRU SISTEMUL BINAR Z=1 [m]** | $\boldsymbol{R_0 = R_a \cdot \left(\frac{\sqrt[3]{\alpha^2}}{4\beta_j}\right)^S;}$ | $\mathbf{0.529 \cdot 10^{-10}}$ | $1.549 \cdot 10^{18}$ | $8.44 \cdot 10^{14}$ | $4.59 \cdot 10^{11}$ | $2.50 \cdot 10^{8}$ |
| **RAZA ORBITEI FUNDAMENTALE PENTRU SISTEMUL CU "$Z_{\uparrow}$" [m]** | $\mathbf{R_{0,G} = R_{o,a} \cdot \left(\frac{\sqrt{\propto} \cdot \sqrt[3]{\beta_{j-1}}}{2\beta_j}\right)^S;}$ | $3{,}861 \cdot 10^{-13}$ | $4{,}59 \cdot 10^{11}$ | $3.07 \cdot 10^{9}$ | $2.05 \cdot 10^{7}$ | $1.36 \cdot 10^{5}$ |
| **LUNGIMEA DE UNDA COMPTON PENTRU UN CORP ELEMENTAR "$M_0$" [m]** | $\boldsymbol{\lambda_{G,M} = \lambda_{a,M} \left(\frac{\sqrt{\propto}}{2}\right)^S;}$ | $1{,}321 \cdot 10^{-15}$ | $\mathbf{1{,}55 \cdot 10^{9}}$ | $\mathbf{1.04 \cdot 10^{7}}$ | $\mathbf{6.95 \cdot 10^{4}}$ | $\mathbf{4.63 \cdot 10^{2}}$ |
| **LUNGIMEA DE UNDA COMPTON PENTRU UN CORP ELEMENTAR ORBITAL„$m_0$" [m]** | $\boldsymbol{\lambda_{G,m} = \lambda_{a,m} \left(\frac{\sqrt{\propto}}{2}\right)^S;}$ | $2{,}426 \cdot 10^{-12}$ | $\mathbf{2{,}88 \cdot 10^{12}}$ | $\mathbf{1.92 \cdot 10^{10}}$ | $\mathbf{1.28 \cdot 10^{8}}$ | $\mathbf{8.54 \cdot 10^{5}}$ |

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| **PERIOADA DE REVOLUTIE LA SISTEM ELEMENTAR CU "Z=1" [s]** | $T_{0,G} = t_{0,a}\left(\frac{\sqrt[6]{\propto^5}}{8 \cdot \beta_j}\right)^S;$ | $1{,}519 \cdot 10^{-16}$ | $1{,}103 \cdot 10^{17}$<br>3.5 miliarde ani | $6{,}00 \cdot 10^{13}$<br>1.9 milioane ani | $3{,}271 \cdot 10^{10}$<br>(1037 de ani) | $1{,}782 \cdot 10^{7}$<br>(o.565ani) |
| **RAZA CORPULUI ELEMENTAR "m" IN STAREA DE REPAUS [m]** | $r_{0m} = r_{el}\left(\sqrt[3]{\frac{\alpha}{\beta_j}}\right)^S;$ | $2{,}817 \cdot 10^{-15}$ | $1{,}342 \cdot 10^{5}$ | $1{,}116 \cdot 10^{4}$ | $0.912 \cdot 10^{3}$ | $0.738 \cdot 10^{2}$ |
| **RAZA CORPULUI ELEMENTAR "M" IN STAREA DE REPAUS [m]** | $r_{0M} = r_p\left(\frac{\sqrt{\alpha}}{2 \cdot \sqrt[3]{\beta_j^2}}\right)^S;$ | $2{,}103 \cdot 10^{-16}$ | $2{,}464 \cdot 10^{8}$ | $1.66 \cdot 10^{6}$ | $1{,}107 \cdot 10^{4}$ | $0.738 \cdot 10^{2}$ |
| **DENSITATEA CORPULUI ELEMENTAR AL ASTRELOR "m" (GAURI NEGRE) [Kg/m3]** | $\rho_{m0} = \rho_{el};$ | $9{,}72 \cdot 10^{12}$ | $9{,}72 \cdot 10^{12}$ | $9{,}72 \cdot 10^{12}$ | $9{,}72 \cdot 10^{12}$ | $9{,}72 \cdot 10^{12}$ |

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| **DENSITATEA CORPULUI ELEMENTAR "M" [Kg/m3]** | $\rho_{Mj} = \rho_p \left(\frac{8\cdot\beta_j}{\sqrt{\alpha}}\right)^S;$ | $4.289 \cdot 10^{19}$ | $2.81 \cdot 10^{6}$ | $5.15 \cdot 10^{9}$ | $9{,}47 \cdot 10^{12}$ | $1.74 \cdot 10^{16}$ |
| **RAZA CORPURILOR CU Z=1,CARE ORBITEAZA IN JURUL NUCLEULUI [m]** | $r_{0r} = r_{el} \cdot \alpha \left(\sqrt[3]{\frac{\alpha}{\beta_j}}\right)^S;$ | $2.817 \cdot 10^{-15}$ | $2.46 \cdot 10^{8}$ | $2.01 \cdot 10^{7}$ | $1.64 \cdot 10^{6}$ | $1.34 \cdot 10^{5}$ |
| **SARCINA GRAVITATIONALA A CORPURILOR ELEMENTARE [Kg.m/s]** | $e_g = e \cdot \left(\frac{\alpha}{\sqrt[3]{\beta_j^4}}\right)^S;$ | $1.602 \cdot 10^{-19}$ | $1.727 \cdot 10^{40}$ | $7.68 \cdot 10^{35}$ | $3.414 \cdot 10^{31}$ | $1.518 \cdot 10^{27}$ |
| **PERMITIVITATEA VIDULUI MACROCOSMIC [kg/m]** | $\varepsilon_g = \varepsilon_0 \cdot \left(\sqrt[3]{\frac{\alpha^2}{\beta_j^2}}\right)^S;$ | $8.854 \cdot 10^{-12}$ | $1.993 \cdot 10^{28}$ | $1.329 \cdot 10^{26}$ | $8.867 \cdot 10^{23}$ | $5.913 \cdot 10^{21}$ |

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| **PERMEABILITATEA PSEUDOMAGNETICA A VIDULUI MACROCOSMIC [s2/kg.m]** | $\mu_i = \mu_0 \cdot \left(\frac{\beta_i^4}{\alpha^2}\right)^S$ ; | $1.256 \cdot 10^{-6}$ | $5.584 \cdot 10^{-46}$ | $1.256 \cdot 10^{-41}$ | $2.827 \cdot 10^{-37}$ | $3.104 \cdot 10^{31}$ |
| **CONSTANTA RYDBERG PENTRU SISTEMELE MACRO COSMICE** | $\Re_g = \Re_a \left(8 \cdot \frac{\sqrt[3]{\beta_j^4}}{\sqrt[6]{\alpha^5}}\right)^S$ ; | $1.097 \cdot 10^{7}$ | $1.511 \cdot 10^{-26}$ | $3.475 \cdot 10^{-22}$ | $7.821 \cdot 10^{-18}$ | $1.757 \cdot 10^{-13}$ |

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