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RECONSIDERATION OF ELECTROSTATIC INTERACTION IN QUANTUM EVTD^2 THEORY - ITS NEW APPROACH IS STRONGLY ANALOGIC WITH THE NEW GRAVITY. IT WOULD BE NO MORE DIRECT INTERACTIONS BUT EMW WORK IN INTER CHARGES ZONES

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Abstract*. A revisit of the classic electrostatic interaction is here taken in a parallel approach with that classic analog on the gravitational interaction. New used physics is that of EVTD^2 entities that is in the framework of a tri-quantum space-time where gravity, electrostatics and magnetism fit at best. It was found, in the area of the zero resulting potential that levels of electrostatic quantic potentials lengths are calculated identical as their related "frequencies" in energy levels per meter n_{qe} and p_{qe} representing the averaged linear density energy to each of the relevant charges. But these calculations have found their confirmation in the use of electron Volt (eV) as quantum value for the electric potential hierarchy levels in the field. This is in analogy with the reconsideration of quantum gravity that uses h. There are the EMW compaction on Substratum which must generate all this.*

Key words*: electrostatic interaction, quantic potential, quantic compaction, electrostatic quantic force EVTD^2, quantic Substratum, EVTD^2 entities theory.*

1. INTRODUCTION

The present paper on the reconsideration of electrostatic interaction continues and makes a parallel to those on the reconsideration of gravitational interaction [5-11]. The conclusions of recent studies on the gravity suggest the reconsideration of gravitational attraction as a result, in priority, of two specific attractions of each of masses from "a little black hole" that would be positioned on the zero resulting potential. The "engine" of these attractions, i.e. the EMW would exercise positive pressures (by compacting) initiating constant effects of masses approach, suggesting that there is a direct interaction between them [1-4]. Mathematical expression of the *Q* charge potential in a point positioned at certain distance, is analogous to those of gravitational potential. It is the same for expressions of Newton and Coulomb's laws: it is recognized that there exists a parallelism between gravitation and electrostatic.

All these are in order to fix the fundamentals of quantum gravity EVTD^2 based essentially on quantum potentials (in levels and in diffuse energy) and the compaction work of these potentials by *longitudinal vibration* of EMW (Electro-magnetic Mother Wave). Compacting is done by intermediary of *Substratum* of the space [12-19] that is the tri-quantic structure of EVTD^2 and, thus, of the Coherent Background (dimension, time, energy). As any electric charge is carried by a mass, the corresponding energy levels at its potentials are in a regressive hierarchy outwards from the mass and they overlap with the quantum energy levels of the electric field of the charge itself. The overlapping of the two sources of quantum levels integrates with the time-space structure in EVTD^2 which is also and above all of electrostatic nature [12-19].

The EMW is also" the engine" generating the attraction and repulsion forces for electric charges by compacting and approach of each electric quantified potential relative and intimate linked to each charge. Thus, an action on a potential will be automatically reflected on the charges themselves. According to [1-4], the length of these different segments (or quantic levels of electric potentials) is scalable and calculable depending on the case but, as a rule, the length of levels increases with the distance from the considered charge.

Furthermore, later in this study, it is proposed that the Coulomb force f_e be written in equivalent energy, analogous to those of photon. Indeed this formulation becomes: $f_e=n_{qe}\cdot h$, i.e. the product of Planck's quantum h and a "frequency" that is relative in energetic levels per meter n_{qe} (representing an average linear density of attraction or repulsion to each of the concerned charges). But, as calculi will demonstrate, using h will be proved contrary to EVTD[2] entities theory. Therefore, using a quantum more directly linked to the electric field and considering the electron-volt (eV) instead of h, the calculi will become concluding and coherent in EVTD[2].

2. ELECTROSTATIC POTENTIAL EQUALITY IN A POINT BETWEEN TWO DIFFERENT CHARGES

Electric field E derives from a scalar potential $E=-grad\,V$, its field lines are normal to the equipotential surfaces and, so: $dV=-\vec{E}\cdot d\vec{r}$. The electrostatic potentials V, for an isolated charge, Q is: $V=-\dfrac{Q}{4\pi\varepsilon_0 . r}$, where ε_0 is the vacuum permittivity and r is the distance from the charge to the considered point. The Coulomb law express the attraction or repulsion force as: $f_e=\dfrac{q_1 q_2}{4\pi\varepsilon_0\cdot r^2}$, analogous in form to the gravitational force.

The assumption used successfully in [1-4] that the gravitational potential is quantum-based (its quantum was specified by $\Delta Vq = h$, in accordance with quantum gravity and the associated electromagnetic field) may be again tested in electrostatics. By this (without taking the value of h, for the moment) it will, therefore, result that the energy distribution of a certain electrostatic quantum potential level V, for example $n\cdot\Delta V_q$ (where n is a natural number of equivalent energy quanta) can be expressed as (1):

$$n\cdot\Delta V_q=-\frac{Q}{4\pi\varepsilon_0\cdot r_n}, \qquad (1)$$

with r_n, the distance of the n level till the source charge. Expression of the next superior quantic potential level: $(n+1)\cdot\Delta V_q$ will be in absolute value:

$$(n+1)\Delta V_q=\frac{Q}{4\pi\varepsilon_0\cdot r_{n+1}}\ .$$

For a given q_1 charge, noting by $C=\dfrac{q_1}{4\pi\varepsilon_0}$, the expression of the distance between this superior level to the source is: $r_{n+1}=\dfrac{C}{(n+1)\Delta V_q}$. Analogous, $r_n=\dfrac{C}{n\cdot\Delta V_q}$.

Then the distance on which the quantum level $n\cdot\Delta V_q$ is settled and continues till the very next $(n+1)\cdot\Delta V_q$ will be:

$$r_n-r_{n+1}=\frac{C}{\Delta V_q}\left(\frac{1}{n}-\frac{1}{n+1}\right)=\frac{C}{\Delta V_q}\frac{1}{n(n+1)}. \qquad (2)$$

The segment of length, where this quantum level is settled ($n\cdot\Delta V_q$), is proportional, for this case, on the one hand, to the common value ($C/\Delta V_q$) but also, on the other hand, it is inversely proportional to the natural number resulting from the product in natural numbers $n(n+1)$. By a similar approach, from (2), can be expressed the quantum level length segment $(n+1)\cdot\Delta V_q$:

$$r_{n+1}-r_{n+2}=\frac{C}{\Delta V_q}\frac{1}{(n+1)(n+2)}\ . \qquad (3)$$

From equation (1) it is possible, by the same approach, to determine the energetic quantum levels $p \cdot \Delta V_q$ length placed at a distance d to the source charge q_2. Considering the notation $D = \frac{q_2}{4\pi\varepsilon_0}$, results: $d_p = \frac{D}{p \cdot \Delta V_q}$, $d_{p+1} = \frac{D}{(p+1)\Delta V_q}$. The quantum potential levels length are analogous to the previously determined values:

$$d_p - d_{p+1} = \frac{D}{\Delta V_q}\left(\frac{1}{p} - \frac{1}{p+1}\right) = \frac{D}{\Delta V_q}\frac{1}{p(p+1)},$$
$$d_{p+1} - d_{p+2} = \frac{D}{\Delta V_q}\frac{1}{(p+1)(p+2)}.$$

The electrostatic interaction is presently accepted as accomplished by the photon. According to this, the electromagnetic energy is also participating to this interaction. Thus, it is not inconsiderate, to take the hierarchy of the quantum electrostatic potentials levels in base value, like those of Planck quantum h, as it was very well integrated in gravity consideration [1-4]. It follows that it will be noted as $\Delta V_q = h$ and, the quantic levels will be, respectively:

$$\begin{aligned} r_n - r_{n+1} &= \frac{C}{h}\frac{1}{n(n+1)}, \\ d_p - d_{p+1} &= \frac{D}{h}\frac{1}{p(p+1)}. \end{aligned} \qquad (4)$$

More, it must be noted that the natural numbers n and p will have very high values and, thus the products $n \cdot (n+1)$ and $p \cdot (p+1)$ could be approximated by n^2 and, p^2. Noting: $C_h = \frac{C}{h}$ and $D_h = \frac{D}{h}$, hence:

$$\begin{aligned} r_n - r_{n+1} &\approx \frac{C}{h.n^2} \approx \frac{C_h}{n^2}, \\ d_p - d_{p+1} &\approx \frac{D}{h.p^2} \approx \frac{D_h}{p^2}. \end{aligned} \qquad (5)$$

The electron's and electron-volt's charges have the same value: $q = eV = 1.60 \cdot 10^{-19}$ C; the vacuum permittivity is $\varepsilon_0 = 8.85418 \cdot 10^{-12}$ $A^2 \cdot s^4 \cdot Kg^{-1} \cdot m^{-3}$ and, Planck's constant is $h = 6.626068 \cdot 10^{-34}$ J·s. If we search the energetic quantum potential levels lengths, representative for the case of two equal, opposite charges in the area of their zero resulting potential, we would find that they are equal. Indeed the charges are of the same value and the approach is similar to the calculation that has been made for the area of the zero resulting potential in gravitation and, more, for different masses. And even, considering the correspondence between the two approaches: one hand, the gravitation potentials levels lengths and on the other hand, the electrostatic potentials levels lengths, we must find equal lengths for respective levels corresponding also to face-to-face different charges.

It is what will be undertaken in parallel with the calculation of application relative to the gravity which was done in papers [3-4]. Numerical values to the opposite and different charged must be assigned. Thus, for example, for numerical applications, the negative charge will be q_1=16 C and the positive one, q_2=2 C. they will be separated by a 10 cm distance.

Firstly, it is necessary to determine the position of zero resulting potential (point O), between the charges. That means that if we would place in the zero resulting potential two charges of value unit, they will be attracted, respectively, by the initial charges (placed at the distances r_{n0} and d_{p0} to O) with the same acceleration. The corresponding Coulomb forces, acting on each of the supplementary charges will be equal and would allow to write the same form as for gravitational forces, in a similar case:

$$f_{e+} = \frac{q_1}{4\pi\varepsilon_0 \cdot r_{n_0}^2} = f_{e-} = \frac{q_2}{4\pi\varepsilon_0 \cdot d_{p_0}^2},$$

wherefrom,

$$r_{n_0} = d_{p_0}\sqrt{\frac{q_1}{q_2}} = d_{p_0}\sqrt{\frac{16}{2}} = 2.828427 \cdot d_{p_0}.$$

With: $r_{n_0} + d_{p_0} = 0.1\ \text{m} = r_{n_0}(1 + 0.353553)$, we find, respectively:

$r_{n_0} = \dfrac{0{,}1}{1.353553}\ \text{m} = 7.387961\ \text{cm}$ and d_{p0} is: $d_{p_0} = 2.612038\ \text{cm}$. We can calculate: $R_{eh} = \dfrac{1}{4\pi\varepsilon_0 \cdot h} = 1.356392 \cdot 10^{43}$. This gives:

$$C_h = R_{eh} \cdot q_1 = 1.356392 \cdot 10^{43} \cdot 16 = $$
$$= 21.702286 \cdot 10^{43};$$
$$D_h = R_{eh} \cdot q_2 = 1.563929 \cdot 10^{43} \cdot 2 = $$
$$= 2.712785 \cdot 10^{43}.$$

In addition, we can write the natural numbers n_0 and p_0 representative of numbers in h potential quantum placed at the distances r_{n0} and d_{p0} to O, i.e. $n_0 = \dfrac{C_h}{r_{n0}}$, and $p_0 = \dfrac{D_h}{d_{p0}}$.

Then we assess:

$$n_0 = \frac{21.702286 \cdot 10^{43}}{7.387961 \cdot 10^{-2}} = 2.937520 \cdot 10^{45}.$$

According to [1] and [2], it is possible to determine the positions of immediate neighbor quantic potentials relative to n_0 and p_0 on two sides of zero resulting potential. It will be about the decreasing quantic levels (n_0-*1*) and (p_0-*1*) relative to charges (-16 C) and (+2 C). This is written, always in agreement with (1) and (2) as:

$$r_{n_0} = \frac{C_h}{n_0}, \quad r_{n_0-1} = \frac{C_h}{(n_0 - 1)},$$
$$d_{p_0} = \frac{D_h}{p_0}, \quad d_{p_0-1} = \frac{D_h}{(p_0 - 1)}. \qquad (6)$$

Then, we can give the distance for what the quantum level $h \cdot n_0$ exist till the beginning of the immediately inferior neighbor $h \cdot (n_0\text{-}1)$. This length will be:

$$r_{n_0-1} - r_{n_0} = C_h\left(\frac{1}{n_0 - 1} - \frac{1}{n_0}\right) = \frac{C_h}{n_0(n_0 - 1)} \approx \frac{C_h}{n_0^2}.$$

In an analogical manner, for the level length $h \cdot p_0$ in the limit of energetic quantic value $h \cdot (p_0\text{-}1)$:

$$d_{p_0-1} - d_{p_0} = D_h\left(\frac{1}{p_0 - 1} - \frac{1}{p_0}\right) = \frac{D_h}{p_0(p_0 - 1)} \approx \frac{D_h}{p_0^2}.$$

The n_0 and p_0 values are very high and the used approximations are here justified. Numerical values of the two quantic levels, calculated in O for the positive and negative charge are:

$$r_{n_0-1} - r_{n_0} \approx \frac{21.702286 \cdot 10^{43}}{0.115887 \cdot 10^{90}} \approx$$
$$\approx 1.872595 \cdot 10^{-47}\ \text{m},$$
$$d_{p_0-1} - d_{p_0} \approx \frac{2.712785 \cdot 10^{43}}{0.269657 \cdot 10^{90}} \approx$$
$$\approx 10.06013291.10^{-47}\ \text{m}.$$

It is visible that *calculated levels values are not equal* and, more, *they are well below* 10^{-35}, the value of an EVTD[2], which ***is proved incompatible with this theory***. Therefore, it is necessary to reconsider this approach which gave appropriate and encouraging results for gravitation. In electrostatic attraction and repulsion there is on one hand, the fact that charges are priorities with their respective electric fields and on the other hand, the fact that they are carried by mass particles. These masses, by their presence, initiate gravitational forces that are adding to the electrostatic effects. This was shown in [1-4]: the h Planck constant structures and creates the hierarchy of energetic quantum gravitational potentials, in this case. But nothing prevents thinking that the quantification of the electric potential levels of the field is not, ultimately, structured by h but by another quantity directly related to the electric vector and, little enough as to be considered in the phenomena animating very little dimensions. Then comes to mind an electrical quantity: ***it is the electron volt eV= $1.6 \cdot 10^{-19}$ C***. Calculations will be adopted taking

into account only the impact of this constant change. The initial expression of R_{eh} then becomes:

$$R_{eV} = \frac{1}{4\pi\varepsilon_0 \cdot 1.6 \cdot 10^{-19}} = 5.617224 \cdot 10^{28} ,$$

which gives:

$$C_{eV} = R_{eV} \cdot q_1 = 5.617224 \cdot 10^{28} \cdot 16 = \\ = 89.875597 \cdot 10^{28},$$

$$D_{eV} = R_{eV} \cdot q_2 = 5.617224 \cdot 10^{28} \cdot 2 = \\ = 11.234449 \cdot 10^{28}.$$

Further,

$$n_0 = \frac{89.875597 \cdot 10^{28}}{7.387961 \cdot 10^{-2}} = 12.165141 \cdot 10^{30},$$

$$p_0 = \frac{11.234449 \cdot 10^{28}}{2.612038 \cdot 10^{-2}} = 4.301027 \cdot 10^{30}.$$

The determinations of the respective levels in point *O* will be therefore given by:

$$r_{n_0-1} - r_{n_0} = \frac{C_{eV}}{n_0(n_0-1)} \approx \frac{C_{eV}}{n_0^2},$$

$$d_{p_0-1} - d_{p_0} = \frac{D_{eV}}{p_0(p_0-1)} \approx \frac{D_{eV}}{p_0^2}. \quad (7)$$

The calculated levels lengths will be:

$$r_{n_0-1} - r_{n_0} \approx \frac{89.875597 \cdot 10^{28}}{(12.165141)^2 \cdot 10^{60}} \approx \\ \approx 6.073057 \cdot 10^{-33} \text{ m},$$

$$d_{p_0-1} - d_{p_0} \approx \frac{11.234449 \cdot 10^{28}}{(4.301027)^2 \cdot 10^{60}} \approx \\ \approx 6.073057 \cdot 10^{-33} \text{ m}.$$

So, we can say that ***with l'eV=1.6·10^{-19} C as quantic constant*** of electrostatic potential levels, ***the zero resulting potential initiates in its area a remarkable equality between the two length of respective levels of each considered charges.*** This will be fortiori the same for negative or positive charges with the same value.

3. IN ZERO RESULTIN POTENTEIAL n_{qe} AND p_{qe} (AVERAGE REPARTITIONS) OR "FREQUENCIES" ARE EQUAL

In the environment of electric charges, the quantic electromagnetic space-time in EVTD[2] is also characterized by an additional repartition in energetic quanta *eV*, electron volt. It should be tried, if it is possible, to highlight such an energetic type characteristic, on the zero resulting potential. In a thought experiment, if two equal opposed charges (to simplify, for example, of value, q_0 = 1 C) would be placed on the zero resulting potential, properly exercised gravity forces then are equal:

$$f_{e-} = \frac{q_0 \cdot q_1}{4\pi\varepsilon_0 \cdot r_{n_0}^2} = f_{e+} = \frac{q_0 \cdot q_2}{4\pi\varepsilon_0 \cdot d_{p_0}^2}. \quad (8)$$

Multiplying the fraction by *e*V value, we can write, with q_0=1 C:

$$f_{e-} = \frac{eV \cdot q_1}{eV \cdot 4\pi\varepsilon_0 \cdot r_{n_0}^2} = f_{e+} = \frac{eV \cdot q_2}{eV \cdot 4\pi\varepsilon_0 \cdot d_{p_0}^2},$$

$$f_{e-} = \frac{eV \cdot q_1}{eV \cdot 4\pi\varepsilon_0 \cdot r_{n_0}^2} = \frac{C_{eV}}{r_{n_o}^2} eV = \frac{n_o}{r_{n_o}} eV ,$$

with: $C_{eV} = n_o \cdot r_{n_o}$.

Defining $\frac{n_0}{r_{n_0}} = n_{qe}$, we can then write: $f_{e-} = n_{qe} \ . \ eV$.

Analogous, for f_{e+}:

$$f_{e+} = \frac{eV \cdot q_2}{eV \cdot 4\pi\varepsilon_0 \cdot d_{p_0}^2} = \frac{D_{eV}}{d_{p_o}^2} eV = \frac{p_o}{d_{p_o}} eV ,$$

with: $D_{eV} = p_o \cdot d_{p_o}$.

If we note $\frac{p_0}{d_{p_0}} = p_{qe}$, results:

$$f_{e+} = p_{qe} \cdot eV . \qquad (9)$$

Further, the values for n_{qe} and $p_{qe,}$ are determined, respectively by the expressions:

$$n_{qe} = \frac{n_0}{r_{n_0}} = \frac{C_{eV}}{r_{n_0}^2} = \frac{89.875597 \cdot 10^{28}}{(7.38796125 \cdot 10^{-2})^2} = 1.64661691 \cdot 10^{32}$$

and

$$p_{qe} = \frac{p_0}{d_{p_0}} = \frac{D_{eV}}{d_{p_0}^2} = \frac{11.234449 \cdot 10^{28}}{(2{,}612038 \cdot 10^{-2})^2} = 1{,}646616 \cdot 10^{32}.$$

As expected of the equal forces f_{e-} and f_{e+}: $f_{e-} = n_{qe} . eV = f_{e+} = p_{qe} \cdot eV$, ***we find the numerical equality:*** $n_{qe} = p_{qe}$**.** These results thus confirm the adopted approach.

They represent, respectively, the quotient between on the one hand, the natural number of energy level in quanta *electron volt*, in the considered zero resulting potential point *O*, generated by each charge in relation to the distance from *O* to itself. These n_{qe} and p_{qe} *represent the average linear reparations of natural numbers of quantic levels* n_0 *and* p_0 *in report to distances (in meters) between the zero resulting potential and the gravity center of each of charges.* The average linear repartitions can be understood *as pseudo "frequencies" that are not depending on time (waves) but on dimensions.* Thus, is possible an analogy with the temporal frequency of an electromagnetic wave whose product with *h* gives the energy of the wave: $E_{Photon}=f \cdot h$. With regard of electrostatic force between two charges, it is, here: $f_{e-} = f_{e+} = n_{qe} \cdot 1.6 \cdot 10^{-19} = p_{qe} \cdot 1.6 \cdot 10^{-19}$,

i.e. the quantified electrostatic forces are, then, multiples of "spatial frequencies" with the value of electron volt (eV). This represents a certain parallel with the photon and the same approach as for gravity, as mentioned in [3]. This energetic expression of f_e clearly shows that the final attraction or repulsion between two charges, as equivalent to the energy concentrations [20], is in priority depending on quantic levels, on their zero potential, in the reciprocal average linear densities. Indeed, one conclusion of [20] was to demonstrate that: $E = q\frac{c^2}{\sqrt{\alpha}}$ with $E = \sqrt{E_e \cdot E_p}$, E_e being the electron's energy and, E_p those of the proton's, while numerical value of α being: $\alpha = 1.779 \cdot 10^{19}\, C^2/kg^2$.

4 CONCLUSIONS

The previous use of *h* Planck quantum, in order to establish a hierarchy in energetic quantic gravitational potentials [1-2], ***does not integrate at all, here, in electrostatic quantum interaction***. It was necessary for any correlation, in these determinations relative to the electrostatic interaction in EVTD^2 of a value, it was proved that a more sensible value would be ***the value of electron volt eV, considered as basic quantum of quantified electric fields***. This use has been confirmed and consolidated the electrostatic fields' quantification implementing to calculate the lengths of the quantum potentials levels and averaged linear densities, or "frequencies" n_{qe} and p_{qe}. These results are intrinsic to the zero resulting potential between two charges, creating, as in gravity, a very special area for the appearance of specific electrostatic forces phenomena. It may be surely implemented in the logical assumption that it is, once more, adapted compaction of quantum levels in the charges fields by the "universal motor" that should represent the EMW. If this is the case: the classical electrostatic interaction (different of the quantic one in EVTD^2) will not be a direct one but a consequence of the approaches or repulsions consequences, directly coupled to the area's specific phenomena of the zero resulting electric potential. This new EVTD^2 physics based on energetic tri quantum space-time, allows good numbers of correlated understandings that bring a unique knowledge about the phenomena that are not sufficiently explained by current physics. As for example, as has been shown, there is a way to express

the Coulomb force f_e, by a product of a "frequency" n_{qe} or p_{qe} (that are equal) by the electron volt quantum: $f_e = n_{qe} \cdot eV$.

This goes to and in the uniqueness of the quantified energetic space-time approach in various levels *h*, *eV* and, surely, a magnetic quantum, as Tesla's submultiple, which opens research topics in order to better correlate the electromagnetic wave with quantic gravitation, electrostatics and, quantic magnetism. But nothing could be done without the "universal motor" of it all these: structuring and working potential of EMW that format permanently at the speed *c* in this case, a well-adapted tri-quantum space-time. As much as it is of electromagnetic structure in longitudinal vibration "push" and "pull", gravitation, electrostatics and magnetism are in perfect correlation in this Coherent Background.

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Reconsiderarea interacțiunii electrostatice în teoria cuantică EVTD^2 - noua abordare este foarte asemănătoare cu noua gravitație. Un ar mai exista interacțiuni directe ci doar lucru mecanic adaptat al EMW în zonele intre sarcini

În această lucrare este prezentată o reconsiderare a interacțiunii electrostatice clasice printr-un demers paralel cu acela referitor la interacțiunea gravitațională clasică. Noua fizică utilizată este cea a entităților EVTD^2 care acționează într-un spațiu-timp tri-cuantic unde gravitația, electrostatica și magnetismul se inserează perfect. S-a găsit că, în zona potențialului rezultant zero, lungimea palierelor potențialelor cuantice electrostatice este calculată în același mod, astfel încât "frecvențele" lor relative, în nivel energetic, pe metru n_{qe} și p_{qe} reprezintă densitatea liniară medie a energiei pentru fiecare sarcină considerată. Dar aceste calcule s-a confirmat prin folosirea electron-voltului (eV) ca valoare cuantică pentru ierarhizarea nivelelor potențialelor câmpului electric, în analogie cu reconsiderarea gravitației cuantice care a folosit constanta universală *h*. Toate acestea ar putea fi generate de compactarea EMW și de către *Substratum*.

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