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PHENOMENA IN BODIES' FREEFALL BY EVTD2 GRAVITY IN ENERGETIC QUANTIC SPACE-TIME FORMATTING POTENTIALS IN QUANTIC ENERGY LEVELS

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Abstract: *Whereas the fall of bodies, and more generally gravity, in a fully quantum space-time, this leads to a new physics that is also dependent on quantum distribution of energy spreads in it. A new geometry should be implemented in the very small dimensions of such space-time [1]. Indeed, the theory of energetic entities EVTD^2 structuring this space-time allows phenomenological explanations for observed behaviors, depending on the case, between two masses more or less distant one from the other. The understanding of these interfering in freefall phenomena, supposes to take into account the particular conditions of quantum gravity in EVTD^2 in the particular work of EMW who initiates the gravitation force [2-8]. The explanation of the free fall mainly concerns the quantum levels of active potential on scalable length segments, which participates in the acceleration of free fall. Next paper [19], in this review, provides explanations and additional numerical checks by taking into account the quantum h.*

Key words: *fully quantic space-time, quantic gravity EVTD^2, EVTD^2 entities theory, substratum.*

1. INTRODUCTION

Currently, observations on the fall of bodies in vacuum have not really phenomenological explanation about this type of process of gravitation, more as Newton's law is in default. Indeed, the mass of bodies that fall on Earth does not matter because they all fall with the same acceleration of $9.81\ m{\cdot}s^{-2}$. Therefore, must say that Newton's law is suitable only when bodies are enough distant one from the other. But as soon as the masses are sufficiently different, and the space between the two bodies shrinks strongly, then, the relationship is in disagreement with the experimental results (the masses of the bodies that fall are no more representative).

The gravity and the free fall of bodies will be studied in a fully quantum space-time in dimensions, time and also in component diffuse energy. This will be undertaken in an attempt to explain the why and the how of results from various physical phenomena relating to the case of gravity between two masses. In the context of the EVTD^2 entities theory [9-15], diffuse energy is the base of what has been called *substratum*: which would be the common *substratum* representative for the black matter and also for dark energy [3] and [16]. Indeed they do differ only by pressures, respectively positive and negative, that can exist in the EVTD^2 entities. The whole space-time will be therefore considered as being formatted into cubic energetic entities EVTD^2 with a particular volume of approximately $0.5 \div 10^{-105}$ m^3 and where the energy of the *Substratum can exist only with well-defined quantum levels*. The *Substratum* energy is the result of actions in vibratory alternating phases of a parent electromagnetic wave (EMW) on Planck

frequency, and spreading longitudinally. This *Substratum* represents a neutral substance at the electrical level that emits no light, wherefrom the qualifiers of dark matter and dark energy how they are currently named in physics. So there's not, in this *Substratum*, moving negative charge adapted to create lights as does the electron in condensed matter. It may that lights should be initiated within an electrically neutral particle and the part in positive equivalent charge emits lights in exact opposite phase with the negative part and, so interference is destructive and therefore no light is emitted outside of these constituent particles of *Substratum*?

On EVTD^2 entities theory, condensed matter, i.e. the mass, is specifically a concretization and concentration of energy do what would be $E = mc^2$. This famous relationship was very easily demonstrated in [17] by simple use of bases and consequences of this theory. In addition, always in theory EVTD^2, full and strict equivalence between inertial and gravitational mass, has been demonstrated [18]. It follows that when two energy levels (masses) are sufficiently close one to another they will initiate, mutually reciprocal actions throughout the surrounding area. These are relating to certain changings to the hierarchy of their quantum energy levels distributions concerning their own gravitational fields which, thus, are be disturbed each other. Indeed, in mechanics, the peculiarity that is recognized to ***energy*** is its ***potential to perform work***. If, two of these similar phenomena are face-to-face, it is likely *a sort of competition between these two differ-rent potential, to do work*, so to arise and act one or more forces. These forces, intrinsic to the various circumstances of gravity emergence between two masses, will be dependent on the distributions and locations of the quantum energy levels of the masses themselves, but also those of interlayer space-time representative for gravitational fields initiated by the masses. So, it is logical to think that *generated gravitational fields are also in energy, quantum composition, since they are superposed on the quantum space structure EVTD^2* to whom is combining intimately. Finally, the engine generating the forces resulting from gravity, *can be only the engine that originally creates the quantum structure in EVTD^2 of energetic space-time*, i.e. the vibrating action of EMW on *Substratum* [2-15]. As to better understand the bodies' free fall it should therefore initially at best interpret the general process of EVTD^2 gravity which is triply quantum (in space, time and energy), and this, following the EVTD^2 structure, which follows publications [2-8]. Further, the proposal of phenomenological explanation of the bodies' free fall will become a specific extrapolation of quantum gravity thus understood. This will be, here, the case of two bodies whose masses are grossly different in value and excessively close, one to another. This will induce *very specific consequences with respect to the different potential and achievements, various features, perennial work of EMW, which are related to the generation of gravity in this case*.

2. QUANTIC GRAVITY BY A HIERARCHY IN SUBSTRATUM ENERGY QUANTA, REPRESENTATIVE OF GRAVITATIONAL FIELDS

Physics shows that the gravitational field G derives from a gravitational potential V, wherefrom the relationship: $G = -grad\,V$. It follows that the allocation of gravitation potentials of for an isolated mass is of the form:

$$V = -\frac{G_N.m}{d} + C^{ste}.$$

As has been suggested, here, it is assumed that this gravitational potential is quantum-based (its quantum will be specified by ΔV_q) as to be in agreement with quantic gravity. Therefore, it will result that the energy distribution of a same potential level V, i.e. $n \cdot \Delta V_q$ (where n is a natural number in quanta of energy equivalent) can be expressed by the expression (1):

$$n.\Delta V_q = -\frac{G_N.m}{d_n} = -\frac{G_N.E_m}{c^2}\frac{1}{d_n}, \qquad (1)$$

with: $m = E_m / c$ and considering C^{ste} as zero to simplify. Expressing the level of the quantum

potential immediately above, i.e. in this case ($n+1$), ΔV_q it is written according to (1):

$$(n+1)\Delta V_q = -\frac{G_N . E_m}{c^2}\frac{1}{d_{n+1}},$$

with: $A = -\frac{G_N . E_m}{c^2} = -G_N . m$, and for a given mass m will be:

$$d_{n+1} = \frac{A}{(n+1)\Delta V_q}.$$

Similarly:

$$d_n = \frac{A}{n.\Delta V_q}.$$

If one wants to express the distance along which the quantum level ($n \cdot \Delta V_q$) was established and continues up to the next superior one (i.e. ($n+1$) ΔV_q n) it shall be given by the following equation (2):

$$d_n - d_{n+1} = \frac{A}{\Delta V_q}\left(\frac{1}{n} - \frac{1}{n+1}\right) = \frac{A}{\Delta V_q}\frac{1}{n(n+1)}. \quad (2)$$

The corresponding segment length for the established quantum level ($n \cdot \Delta V_q$) is proportional for this case on the common value ($A/\Delta V_q$) but also, it is inversely proportional to the number resulting from the product in natural numbers: $n \cdot (n+1)$. By a similar approach, the segment, on d, relative to quantum level $(n+1) \cdot \Delta V_q$ can be expressed from (2) by analogy:

$$d_{n+1} - d_{n+2} = \frac{A}{\Delta V_q}\left(\frac{1}{n+1} - \frac{1}{n+2}\right) = \frac{A}{\Delta V_q}\frac{1}{(n+1)(n+2)}. \quad (3)$$

The analogous calculus for quantum level ($n+2$) ΔV_q drives to correspondent segment length:

$$d_{n+2} - d_{n+3} = \frac{A}{\Delta V_q}\left(\frac{1}{n+2} - \frac{1}{n+3}\right) = \frac{A}{\Delta V_q}\frac{1}{(n+2)(n+3)}. \quad (4)$$

So we find that on d, the segments' length on which rule different successive quanta levels of quantic gravitational potential are not constant between them: there is a change in the length of these segments which translates to, either by an increase or a decrease, following the direction of change in the intrinsic value of these levels. The evolution of each of these particular lengths, for example, decreases as the level in quanta of potential increases. I.e., this happens closer to the mass that generates the gravitational field. The opposite effect occurs but in moving away from the reporting mass. This particular consequence of quantum and longitudinal distribution on d, of gravitational potentials levels, represented in energy equivalent, can be shown very simply in arbitrary, but nevertheless significant values (figure 1, a, b). These two schemas are supposed to represent very briefly the allure of the potentials of the Earth and of the body in a fixed position, before its free fall.

The previous expression of A is a constant value for a specific case of mass with its equivalent energy (E_m). The quantum of gravitational potential (ΔV_q) is consistent, in this configuration, with the corresponding potential energy quantum (ΔE_q). For *this moment they are not determined values*: this will be one of the applications in the connected paper [19]. This potential energy (ΔE_q) can be assimilated to *Substratum* excited by the EMW constant vibrational state. This substratum will be of a well determined quantity and, thus, it would generate a corresponding vibrating energy quantum (ΔE_q). So it composes and also represents, by its multiple variable assembling, the bases of the field's gravity potential given by a mass and the generic work of EMW.

The parts a and b of figure 1 represent very schematically, respectively, the pseudo repartitions of the two gravitational fields in their different energetic quantic levels in *Substratum* when the two considered mass are isolated in space. These two distributions are respectively the potential energies from the surface of the Earth as well as in reverse, since a motionless body that will be released, then, in free fall.

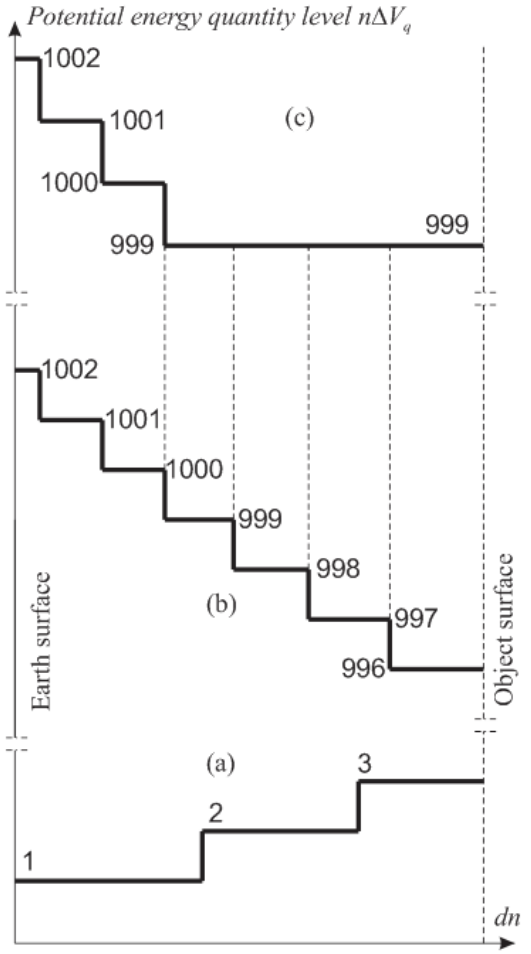

Fig. 1. Simplified and highly zoomed representation in quantic level repartition of gravitational quanta potential of Earth and freefalling body simulation: the two independent potential repartitions for isolated mass (a) and (b); resulting superposed repartition of the two previous (c).

The diagram of Figure 1, c wants to represent at any given time the overlay of these two quantum energy potential distributions, just before the body releasing. Certain quantum levels blend segment by segment where is possible from the point of view of quantic mechanics. But it should be kept in mind that between the Earth and the little body which will released is the organization of the potential energy of the Earth which predominates. It imposes the evolution direction of phenomena related to the quantic gravity before and during the freefall. Contrarily, for the small body potential energy distribution (hierarchy), it will be strongly disturbed and this will initiate less intense events. But these will tend, however, to balance the disruptive upheavals of its normal distribution of energy around him, structured by its quantum potential.

Normally the solution for the body, in order to regain its consistent hierarchical distribution, would be to move away enough of the Earth, in this case, disruptive. And this up to no longer be subjected to his too great influence. But, contrarily, it happens not so in the reality of natural phenomena because, in quantum gravity EVTD[2], on and around the line *d*, joining the two masses gravity centers, *there is the EMW work of amalgam creating positive compression pressure* [2-9] *in well-defined vortex*.

There are two components of this steadfast vibration work depending on the frequency of Planck [2-9]. On the one hand, there are, predominantly, the predominant compaction work of EMW in relation to the very high energy concentration of the mass Earth. On the other hand and, much more modestly, is generated the OME work, for compaction on *d* and especially around the surface of the object - so that it can find, if possible, its correct quantum hierarchy of its gravitational potentials levels. The diagram in Fig. 1, c represents one of the possibilities of resulting quantum levels organization but, similarly to any other, the hierarchy of the potentials of each of the interacting masses is then no more consistent. It is therefore that, for the Earth and for any other body, *especially their gravitational potentials, which are intimately related to each of the masses, and their fields are disturbed and therefore non-compliant in accordance with their principles* by the mutual influences. This will induce an instability in the position of the body -it will be minor for the great mass of the Earth, but with regard to the little body should be *ready to obey, upon its release,* ***the community stresses deriving from the relative displacements of the potentials***. These two levels of disturbance will trigger the work of remodeling and transfer of some quanta of energy potential to segments on *d* to reinstate, if possible, two suitable hierarchies. But each made quantum amalgam will cause a displacement to the terrestrial ground of the body's equipotential, and thus it will be more close to Earth, wherefrom fall. But in this case, for the body in free fall, the problem of the correct restoration of its quantum potential

hierarchy is each time changed. *But it can never be restored correctly*, even when it will arrived on the ground where it will be still strongly attracted to contact the ground. The same circumstances, for the equipotential repartition on the Earth, they do not have any possibility to or slow-down of the body fall. Contrarily, ***it is easy to understand the why of the acceleration in body's freefall***.

Indeed, just noticed (this was demonstrated above) there, too, a gradual shortening of the different segments on *d* (of Earth quantum potentials) which are followed by the body in its fall. ***Different quanta of energy compaction occur more rapidly during the progress of the fall what actually generates the observed acceleration of the fall of any body movement***.

We remind that the frequency of EMW is constant (Planck frequency) so it is not the cause that produces the acceleration. In the same moment, EMW works in simultaneous compaction along the distance between the surface of the Earth and the body, where the process has priority and is done in accordance with the established process. Referring to Fig. 1, c, it is to note that, for Earth, the quantified levels segments near the body are longer than near its ground. As it is the body that fall, it is he who shall perform, at the beginning of his fall, the route of the segments that require ***more time of compaction of quantum levels work*** to be integrated into those of neighbor in the direction towards the ground. It is right to think that *the compaction of the quanta of energy of a segment to its neighbor will begin by the end opposite to the receiving segment*. In addition, the compaction of an $EVTD^2$ quantum (ΔE_q) in its neighboring $EVTD^2$ will always will last a constant number of EMW periods and so on. So *a longer segment, particularly in the number of $EVTD^2$, will require the use of more frequencies of EMW to finalize this compaction work of the segment in its immediate neighbor*, a little shorter than him. So the duration of the corresponding compaction work will always be more long (less effective) early in the fall as it progresses. It is to note also that ongoing fall, the number of possible simultaneous compaction becomes increasingly large and also faster individually and temporally. So, ***there are these two circumstances that cause the acceleration of the body fall*** on the Earth of 9.81 m/s^2. It is then understandably, that *having not taken into account the low mass of the body compared to very substantial of the Earth, any body will freefall in the same way without obeying the relation of Newton*. It is therefore, why the freefall near a celestial body is identical and of same acceleration for all bodies.

3. SPECIFIC FEATURES FOR BODIES AWAY WITH A RESULTANT ZERO EQUIPOTENTIAL

It can be considered, for this case, the quantum gravity (in potential quantum energy levels) of two stars, for example. The relationship of Newton applies here correctly. Overall, illustrative and convenient representations, for the ongoing problem of the curves for each individual potential of energy at quantum levels distribution *for each isolated body*, are basically shown on figure 2, a.

Quantum levels individualized for the isolated corps in stairs and thin levels in the representation of the global curves (Fig. 2, a) only appear on figures 2, b and 2, c. These are further magnified only on a short length that will be the close environment of point *R* the zero potential resulting. This only is in consideration of the superposition of each of these quantum energies. The latter is illustrated in Fig. 2 c, in analogy with the Fig. 1 c, which gives the superposition of the two distributions around *R* (coordinate d_R on the straight line joining the two centers of gravity) of the quantum potential energy of each of the bodies. It is around the area of the zero resulting potential *R*, where the two potential distributions of each star intersect, and compression phenomena (for the respective quantum energies) can initiate and implement by the vibratory action of EMW. The multiple compaction phases will move, in corollary and appropriate manner, the equipotential curves of each body (based on the previous case). This will therefore initiate intrinsic motion of stars, one towards the other. Such it will follow a move of corresponding intersection *R* following the variations of energetic and spatial

circumstances. But as soon as the potential quantum energy levels of each bodies do no more intersect, *this will become a phenomenon of free fall* and so there will be the previous case. Indeed, for a given configuration, the maximum quantum level of less mass body is less than the lowest quantum level of the highest mass.

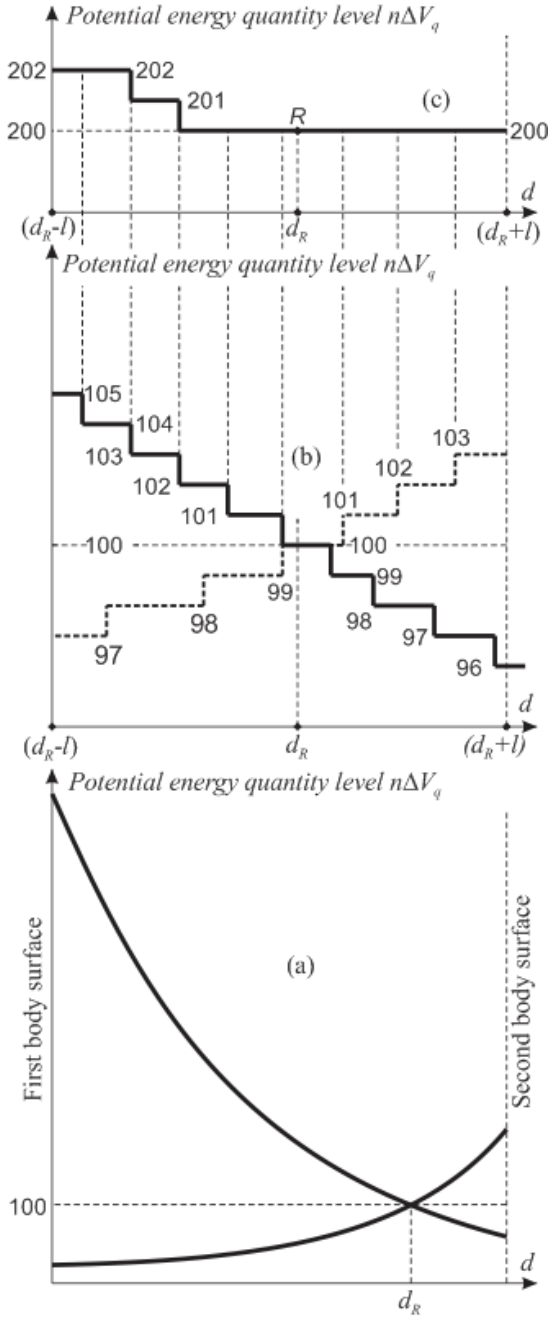

Fig. 2. Comprehensive and illustrative representations of the potential energy at quantum levels distributions for two individual and isolated body (a); convenient illustration on two sides of d_R of individual hierarchies and without reciprocal influence of each isolated quantum potentials (b); the superposition of these potentials on the same small length around d_R (c).

So the point *R* can no longer exist between two hierarchical distributions. In Fig. 2, c, around the point *R* there is (as under the freefalling body Fig. 1 c) a tray of a single level in quanta of energy. It is spread over multiple segments of lengths representative relating to the potential quantum levels. This resulting geometrical and energetic conjuncture, is non-compliant for the two hierarchy of the two bodies' potentials. This will initiate and provoke, even more, the actual work of selective compaction of EMW, because the phenomenological structure of the proper hierarchy of levels requires compliance with this rule – wherefrom, physical phenomena will be activated to ensure properly restructure the hierarchy of energy levels. They must be distributed as much as possible in accordance with to the common law, in the interval between the bodies. Indeed it is, in this case, only transfers of quanta of energy at the right times and in the right places.

But the developments of conjunctures always lead a force of gravity acting (or potential) and the approximation to commit until the possible contact between the bodies.

As long as *R* exists there is a part of the quantum plateau located also on the side of the body of greater mass, referred to *R*. Thus the compaction of this side will also lead to a bigger mass body movement to the other, until the moment when becomes a freefall. Then from there, only the least mass body approaches effectively and the higher mass body is remaining virtually stable.

4. CONCLUSION

It is the gravitational organization of the Earth which, with the vibratory compaction of EMW work, *requires a unique process for the free fall of bodies*. Indeed we can say that, in the context of the distributions, in energy and quantum levels graded potentials consideration, it is in perfect harmony with the structuring of quantum space-time EVTD[2]. EMW work permanently and imposes the constant frequency of vibratory mechanical and electromagnetic work. It is activated if needed, in relation to the levels of gravitation potentials on scalable length segments in space and particularly near the

Earth's surface. So much so that this process is universal on the surface of any star as also on the surface of the Moon, for example. There, acceleration of fall is approximately 6 times less than on Earth, due only to different characteristics in respective values. In particular, for the quantum levels of energy but mainly because of the different hierarchy of the length of the space segments, supports of lunar potential quantum levels. In *all these freefall cases it is noted that there is no resultant zero equipotential between the stars and other much lighter bodies*, near their surfaces.

In the general case of two bodies sufficiently away one from the other, the analysis around the resulting zero potential, by quantum EVTD^2 gravity, suggests a phenomenological explanation of the respective quantities of the bodies approach. For this, they must be appreciate lengths, on one side and the other of zero potential of uniform level in quanta of resulting potential energy. More these uniform level lengths, are large and particularly on the side of one of the two bodies, more the approach of it will be important in report with the movement which is caused to other normally more massive body.

In paper [19], that follows this one, published in the same journal, assigning a value for quanta ΔV_q and ΔE_q, is done with the value of the Planck h quantum. The correlation with the photon (quantum energy) has guided the choice of this value to specify the potential quantum levels of quantum gravity EVTD^2. This choice turned out to be wise, in the sense that there are good correlations between the results obtained for the lengths of the calculated levels and dimensions of EVTD^2 entities that served as basis for this approach. The results lead to a common rule that indicates that *on a celestial body, longer lengths of quantum levels in its potential energy are large and less the acceleration of free fall is strong and vice versa*.

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Fenomene în căderea liberă a corpurilor prin gravitaţie EVTD² într-un spaţiu-timp energetic cuantificat ce formatează potenţialele în niveluri energetice cuantificate

Rezumat: Considerarea căderii corpurilor şi, mai general, a gravitaţiei, într-un spaţiu-timp complet cuantificat conduce la o nouă fizică ce este tributară şi de repartiţia cuantică a energiei difuze în interiorul lui. În cadrul micilor dimensiuni dintr-un astfel de spaţiu-timp trebuie considerată o nouă geometrie [1]. De fapt, teoria entităţilor energetice EVTD², ce structurează acest spaţiu-timp, permite explicaţii fenomenologice pentru comportamentul observat, în cazuri specifice, dintre două mase mai mult sau mai puţin îndepărtate una de cealaltă. Înţelegerea acestor fenomene ale căderii libere revine la luarea în considerare a gravitaţiei cuantice în EVTD², în lucrul mecanic particular al OME ce iniţiază forţa gravitaţională [2-8]. Explicarea căderii libere se referă în principal la luarea în considerare a nivelurilor cuantice a potenţialelor active pe segmente de lungimi evolutive ce participă la accelerarea căderii libere. Lucrarea următoare [19] din acest volum aduce explicaţii şi verificări numerice suplimentare prin luarea în considerare a constantei cuantice *h.*

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