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QUANTIC RELATIVITY IN A SPACE-TIME ENTIRELY QUANTIFIED AND STRUCTURATED IN EVTD^2 ENTITIES

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Abstract: *Taking relativity into account in a quantic space-time leads to a new physics. In fact, the energetic EVTD^2 entities theory which would structure this space-time, produce for the photon propagation a specific series of original and notable behaviors and particularities. It can be cited, among others, that the light speed would be not constant according to the trajectory in this space-time – it could have a variation till an instantaneous speed due to instantaneous transitions (TI) through the quanta of the space-time. The finite light speed c will be obtained as the trajectory duration being the sum of temporal transitions (TT) through the quanta. Irregular times for the different speeds moving parts through quanta are produced by this particular discontinuity. Symmetrical characteristics will appear in the thinking experience of restraint relativity.*
Key words: *Quantic relativity, EVTD^2 theory, light speed in quantic space-time, instantaneous transition (TI), temporal transition (TT).*

1. INTRODUCTION

Before 1905 the relativity used to be classical or Galilean, and after this date the restraint relativity is current. Our days, in 2013, and inside the hypothesis of an entire dimensionally and timely quantified space-time, the quantified relativity could be applied. For this, it would be sufficient that, someday, the related theory be proved as real: that means the one of the EVTD^2 entities that would structure all spaces-times – on one side, the vacuum without any condensed matter, as well as the vacuum inside the matter itself. Thus, all space-time will be considered as structured in cubic energetic EVTD^2 entities of about $0,5\cdot10^{-105}$ m^3. The present paper is a logic consequence of the [1].

This quantic structure states as base for the recent EVTD^2 entities theory [1-9] and represents an ultra fine structure of a juxtaposition of very little cubes of side equal to the Plank half-length, submitted on the three axes to vibrating alternated phases of an primary electromagnetic wave (EMW) at Planck's frequency and with longitudinal propagation.

We intend to study the quantic relativity, especially the dealt and observed temporal evolutions, in parallel with the well known thinking experience of restraint relativity: for remembrance, the train that has a vertical light beam reflecting in a mirror just above the source *S*. The mirror will direct the beam to a receiver *R* placed in the very neighborhood of the source and, this allows to determine the time to go of the beam. In the train is a ticket controller and on the platform of the railway station, the station manager. There are two referential – those of the platform of the railway station ant the one of the train. As the train passes through the station with a speed *v*, the station manager sees the light beam as it is classically represented in the figure 1. It is to be deduced, in the restraint relativity, that for the station manager and its referential the time seems to be extended because of the more or less oblique light beam, in report with the train speed.

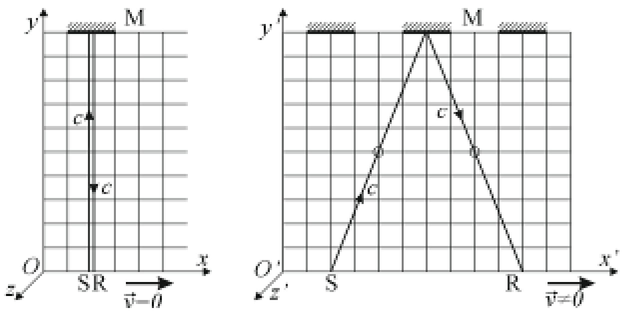

Fig. 1. Analogy with thinking experience of restraint relativity but for a space-time structure of juxtaposed cubes, bi-dimensionally represented by squares.

For this study, an identical thinking experience will be transposed more adapted for the very little cubes EVTD^2. As to simplify, very little dimensions will be considered (in the vicinity of a small number of EVTD^2 entities) and the adopted speeds of moving elements (carrying light devices) will be quite closed to the light speed *c*. The different heights *h* of the beam up to mirror and the considered speeds *v* will be thus represented by a limited number of entities EVTD^2.

Before to undertake an analysis of the temporal evolutions for different speeds of mobiles moving in this quantic space-time, it should be noted the specific particularities of light propagation in a such quantic environment.

2. SPECIFIC PARTICULARITIES OF LIGHT PROPAGATION IN A SPACE-TIME FORMED BY EVTD^2 ENTITES

It was already demonstrated that in thus defined juncture, the speed of all electromagnetic waves is not continuous but discontinuous. [10 and 11] It is done by instantaneous speed trances, cut by stopping time at each browsed EVTD^2 entity, before passing in the neighbor entity and after the changing of their phases initiated by EMW. This instantaneous speed inside each EVTD^2 is established because of the temporality of all points inside the same entity. [1-9] In reality all points of an entity are in phase and if one of them is touched, all other will feel instantaneously the same shock. The base of these considerations lies on the fact that the photon still is not thought of as a particle or an energy speckle but, more precise, he is identified as an impulse of an electric and magnetic (electromagnetic) effect that means *EE*, propagating in an adapted environment as it is formed by EVTD^2 entities, composed from electromagnetic energy. Thus, the study [10] leads to leads to admit that the considered route moves at instant speed and the duration of this course is the sum of all stop times, in fact imposed at every border of covered entities. So it gets the finite value of *c* the light speed (used in the Lorentz transformation) arising from the ratio between the length of the journey, travelled at the instantaneous speed, and the duration of the trip (sum of stop times). This is represented in figure 2.

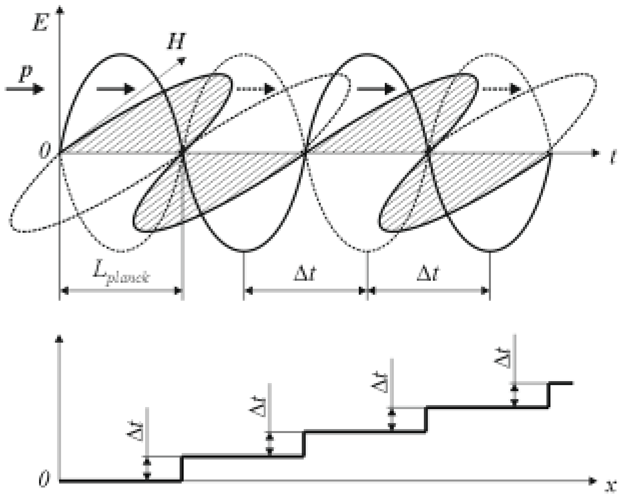

Fig. 2. Alternations of displacements and blockages "immobility" of the *EE* propagation through EVTD^2 giving the duration of $TT = \Delta t$. [10]

On the other side, it the initiating paper [1] was specified that the light speed can be instantaneous on several EVTD^2 travelled consecutively, under a single and unique geometrical configuration. To do this, it is therefore imperative that the trajectory of the light perfectly follow the diagonal of each of the EVTD^2, as the diagram of figure 3 represents it in bi dimensional. Indeed, this particular trajectory allows the light to continue his journey without no time to stop at each edge of the crossed EVTD^2. This transition in each entity is done in the same phase state, without any blocking time, as is the case in the classic situation of journey. Each of the passages without blocking can be defined by the term instantaneous transition *TI*. While other transitions, with blocking, can be defined by the temporal transition term i.e. *TT*. Therefore, in the quantum propagation of light in a such quantum space-time, there are several possibilities with regard to its speed which can be finite or infinite value (*v* instant). Who recalls, especially, *for c^2: having an **infinite value in the Galilean transformation***. So, the conjuncture of instant light speed has already been considered in the past.

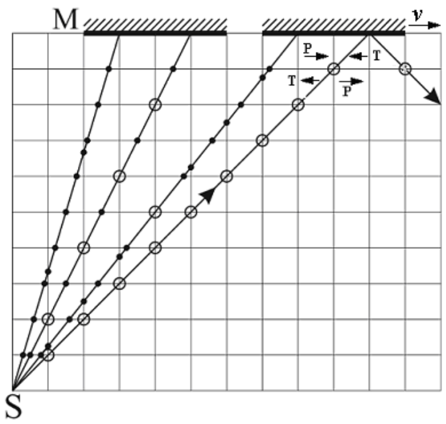

Fig. 3. Different options for the journey through the EVTD^2 which gives various cases of EE propagation. The two types of transitions are represented by points for the *TT*, while those that are instant the *TI,* are circular.

So, any light trajectory, in a quantum space-time EVTD^2, that is slightly tilted relative to the well regular structure of the EVTD^{2}entities may include a certain assortment of the respective numbers of *TI* and *TT*. The downtime represented by a *TT* will be, in EVTD^{2}entities theory, very close to the Planck's half-time. That means, it here corresponds to the half period of the wave EMW ($T_{OME}/2$) or its equivalent *TT* which is defined using the EMW frequency:

$$f_{OME} = \frac{299792458}{1{,}61624 \cdot 10^{-35}} = 185487587{,}24 \cdot 10^{35}\, Hz,$$

hence:

$$2\,TT = T_{OME} = \frac{1}{f_{OME}} = 5{,}391196 \cdot 10^{-44}\, s,$$

time very close to Planck's with the value: $t_P = 5{,}391121(40) \times 10^{-44}\ s$.

So, the stop time for a single *TT* (corresponding to the time for a period of T_{OME}) will be:

$$\textit{\textbf{Time for one TT}} = T_{OME}/2 = 2{,}695598 \cdot 10^{-44}\ s.$$

Essential particularities for the continuation of the study having been recalled, it is then possible, to make the analysis of different concrete cases of entire numbers constituting the heights *h* and possible speeds *v* in the thinking experiment.

3. SPECIFIC STUDY FOR *h* HEIGHTS AND *v* SPEEDS CASES

Firstly, two cases should be differentiated: the first relates to the values of *h* considered as integers odd number of entities EVTD^2 like, for example, 27, 29 and 31, presented in table 1. Then there is interest in *h* with values in integers even numbers of entities, as: 20,28 and 60, mentioned in table2. The results (number of *TT* and *TI*) were obtained by graphical study of the light trajectories.

The speeds considered for each of six previous studied cases are, respectively, between one entity and each studied numbers of entities for *h*. Thus, we consider, for example, for each value (*n*) of *h* all routes of the light beam for the *n* different speeds of mobile. This is in accordance with the representation of the light paths schematized in figures 1 and 3.

Table1. Case of *h* as integer odd number of entities.

H	v	TI	TT	H	v	TI	TT	H	v	TI	TT
27	1	0	26	29	1	0	28	31	1	0	30
	2	0	27		2	0	29		2	0	31
	3	2	24		3		30		3		32
	4	0	29		4	0	31		4	0	33
	5	0	30		5		32		5		34
	6	2	27		6	0	33		6	0	35
	7	0	32		7		34		7		36
	8	0	33		8	0	35		8	0	37
	9	8	18		9		36		9		38
	10	0	35		10	0	37		10	0	39

	11	0	36
	12	2	33
	13	0	38
	14	0	39
	15	2	36
	16	0	41
	17	0	42
	18	8	27
	19	0	44
	20	0	45
	21	2	42
	22	0	47
	23	0	48
	24	2	45
	25	0	50
	26	0	51
	27	26	0

	11		38
	12	0	39
	13		40
	14	0	41
	15		42
	16	0	43
	17		44
	18	0	45
	19		46
	20	0	47
	21		48
	22	0	49
	23		50
	24	0	51
	25		52
	26	0	53
	27		54
	28	0	55
	29	28	0

	11		40
	12	0	41
	13		42
	14	0	43
	15		44
	16	0	45
	17		46
	18	0	47
	19		48
	20	0	49
	21		50
	22	0	51
	23		52
	24	0	53
	25		54
	26	0	55
	27		56
	28	0	57
	29		58
	30	0	59
	31	30	0

Tableau 2. Case of *h* as integer even number of entities.

H	v	TI	TT
20	1	0	19
	2	1	18
	3	0	21
	4	3	16
	5	4	15
	6	1	22
	7	0	25
	8	3	20
	9	0	27
	10	9	10
	11	0	29
	12	3	24
	13	0	31
	14	1	30
	15	4	25
	16	3	28
	17	0	35
	18	1	34
	19	0	37
	20	19	0

H	v	TI	TT
28	1	0	27
	2	1	26
	3	0	29
	4	3	24
	5	0	31
	6	1	30
	7	6	21
	8	3	28
	9	0	35
	10	1	34
	11	0	37
	12	3	32
	13	0	39
	14	13	14
	15	0	41
	16	3	36
	17	0	43
	18	1	42
	19	0	45
	20	3	40
	21	6	35
	22	1	46
	23	0	49
	24	3	44
	25	0	51
	26	1	50
	27	0	53
	28	27	0

Tableau 2. Continuation.

H	v	TI	TT		H	v	TI	TT
60	1	0	59		60	31	0	89
	2	1	58			32	3	84
	3	2	57			33	2	87
	4	3	56			34	1	90
	5	4	55			35	4	85
	6	5	54			36	11	72
	7	0	65			37	0	95
	8	3	60			38	1	94
	9	2	63			39	2	93
	10	9	50			40	19	60
	11	0	69			41	0	99
	12	11	48			42	5	90
	13	0	71			43	0	101
	14	1	72			44	3	96
	15	14	45			45	14	75
	16	3	68			46	1	102
	17	0	75			47	0	105
	18	5	66			48	11	84
	19	0	77			49	0	107
	20	19	40			50	9	90
	21	2	75			51	2	105
	22	1	78			52	3	104
	23	0	81			53	0	111
	24	11	60			54	5	102
	25	4	75			55	4	105
	26	1	82			56	3	108
	27	2	81			57	2	111
	28	3	80			58	1	114
	29	0	87			59	0	117
	30	29	30			60	59	0

Therefore it is possible to verify, for each of considered routes, for each case of *h*, the respective different numbers of specific transitions *TI* and *TT* and, these numbers are mentioned in both tables 1 and 2. So for the duration of each of beam trajectory, then just multiply the number of *TT* by the correspondent value of the *TT* time, or $T_{OME}/2$ calculated above. In most of studied cases, the number of *TT* presents quite often irregular evolution related to each of the numbers of respective *IT*. Indeed only the cases of 29 and 31 are completely devoid of *TI*, which makes regular progression of the *TT* with the increase in the number of entities for a growing speed *v*. So for these case (39 and 31) will be initiated a particular rule that will evolve into a general one. So, with regard to the determination of the respective numbers of *TT* for two cases of *h* (29 and 31), **where there's not *TI***, according to the charts, immediately verifiable rule is, for the different values of *v*, as follows:

$$\textbf{\textit{TT number}} = h + v - 2 \ (\text{for } TI = 0).$$

But it turns out that this particular rule for cases where there are no *TI* in the trajectories, becomes the indispensable basis of rule extended to all cases of routes taking into account the number of *TI* determined for each case. Indeed it is enough to notice that for the existence of a *TI*, two units must be subtracted from the overall number of *TT* in question (given by the special rule): because the beam pass from an entity to the third one avoiding two stops *TT*. Therefore the general rule takes the following turn (the essential condition being to determine the respective number of *TI*) as to avoid the graph:

$$\textbf{\textit{TT number}} = h + v - 2 - 2TI = h + v - 2(TI + 1).$$

It should be noted that there *one or more TI appear on the given light path*, it is imperative that the integers of EVTD^2 of a *certain h and one of its horizontal speeds v* ***have one or more common divisors****, otherwise there is no TI*. If the case is positive we will try to formulate a rule to know, without resorting to graphics, the corresponding number of TI for a particular route.

- **Case 1**: For example, if *h*=20, hence *v/h* = 2/20 = 1/10. Further, the two previous fractions denominators we be considered, i.e. here, *h* and 10 to do the ratio *h/*10 = 20/10 = 2. Finally just subtract the unit to the found value to get the correspondent number of TI: 2-1=1*, being what is found by the graphical verification.* The following explanation for the subtraction of the unit from the previously found number of *TI* can be given: the last of the *TI* obtained by the last report is not took into account, in this procedure. In fact the latter is inherent on the mirror, i.e. that is for the last EVTD^2 of *h* (here, the 20th).
- **Case 2**: *h*=27 and *v*=9, hence *v/h*=9/27=1/3. Further, the two previous fractions denominators we be considered, i.e., *h* and 3 to do the ratio *h/*3 = 27/30 = 9. Finally just subtract the unit to the found value to get the correspondent number of TI: 9-1=8*, being what is found by the graphical verification.*

By the establishing this rule for obtaining the *TT*, without using the graphical study, it is possible to determine half time of route for the light beam from the thinking experience for various mobile speeds in one such space-time EVTD^2-formatted. Thus variations of different durations of each routes correlated to the different speeds of the mobile (or train) will indicate time variation for the mobile compared to the journey time of the vertical beam for zero speed (or platform station and for his manager). The reference time is correlated here at the zero speed or at the time of the station: this being given by the number of TT of vertical path multiplied by two. It is to note that the time for a vertical route refers to the light speed as now allowed because there are not *TI* on this type of trajectory. But it is obligatory to clarify, as a result of this study and with the assumptions that have been preset, that light speed *c* is not a constant and it depends on the circumstances faced by the shock impulsions of *EE* following the mobile routes dependent of velocity *v*. So, the consideration of an entire quantified space-time and of a photon being a successions of shocks-impulsions with *EE* effect omen the premises for some new physics that is strongly expected by physicists. Thus in this study, it is clear that the length of the route is not the primordial parameter because it is always done anyway at instant speed. The journey time is only the sum of *TT* if they exist. *The essential characteristic resides more in the duration of the trip which is no more automatically connected to its length as in relativity*. But, in a such space-time, it is function of circumstances inherent to the mobile speed that are correspondent to the obliquity of the light beam, resulting in the quantum space-time EVTD^2 formatting.

4. ORIGINAL FEATURES OF LIGHT TI AND TT EVOLUTIONARY CONJONCTURES IN A QUANTUM SPACETIME

Always in the extension of the study, it highlights for all cases that *if the speed v is represented by an identical number of EVTD^2*

as h, the light trajectory is in very specific conditions. On the graph it is shown that while the path of the beam is performed entirely at instant speed, there is only TI for this kind of route. *In conclusion for a mobile which would have a particular speed for each h case of the experimental configuration, the time would not flow. The light or electromagnetic information specific to this mobile would then be transmitted instantly in an 45° inclined direction to its own direction of propagation*. In a such quantic space-time should no longer think in length and speed, but it is better to be interested about the number of *TI* and especially of the total number of *TT* who is experienced by the light beam during the considered journey. Thus, the time evolutions for the considered speed in a such space-time will be known.

In the graphic representations of *TT* number (figure 4), for each *v* value of cases *h=29* and *h=31* which are primes, it note the growth with an additional *TT* for each immediately superior to *v* value. This complies with the above relationship: ***TT number*** $= h + v - 2\ (TI = 0)$.

A little further away, it will be seen that this common law appears in his own way also for graphical representations of *TT* distributions admitting *TI* transitions for values of *h* with common divisors such as *h* = 60.

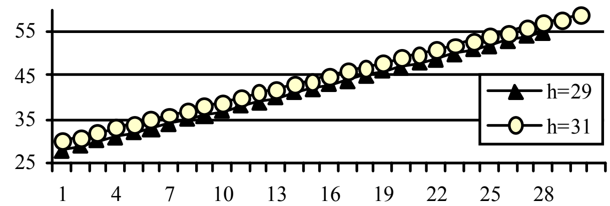

Fig. 4. Linear and parallel distributions of *TT* number respectively for cases *h=29* and *h=31.*

This is, in particular, highlighted in figure 7 where for certain values of *v*, without *TI*, corresponding points are aligned to a straight line with the same slope as the cases 29 and 31. In the cases studied here, *where the h value in number of EVTD² is not a prime one (as 29 and 31), the graphic representation, highlights the evolution of the number of TI for different speeds v of each case quite remarkable and original*. Indeed ***there are symmetric distributions on each sides of the median values of the*** *v* ***for the cases where*** *h (as number of EVTD²)* ***admits dividers*** (Fig. 5, a, b, c and 6). Thus, for the cases studied here, the *TI* repartition for *h=60* (figure 6) shows the more symmetrical figure by the amount of points and their perfect symmetry (mathematical).

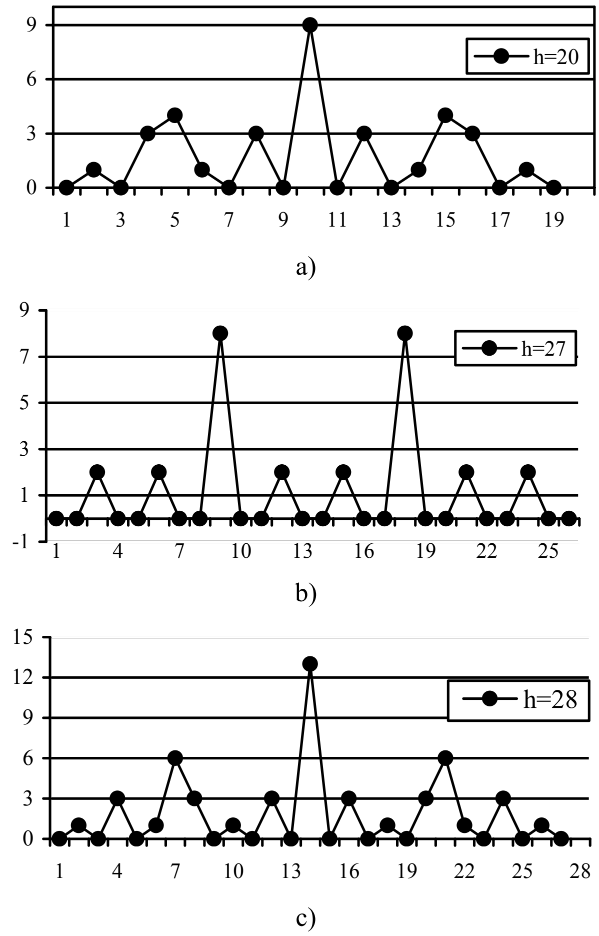

Fig. 5. Symmetrical distributions of the *TI* (for *v*) in three cases of *h* values admitting dividers : *h*=20 (a); *h*=27 (b); *h*=28 (c).

The comparison of curves representing, on the one hand, *TI* for *h* = 60 in figure 6 and, on the other hand, the *TT* also in case *h* = 60 allows to highlight the symmetries inherent around their central *v* values and more global symmetries that are be correlated between these two representations. More in figure 8 where are represented the total values of *TT* for *h* = 60, the curve is recovered from the same normal representation (in figure 7), reveals some “correspondence” with figure 4 where it can be notice the same slopes of progressions of the respective *TT* (with no *TI*).

Indeed, in regard to symmetry in *mirror* of antagonistic transitions TT and TI of figures 6 and 8, this is perfectly understandable since there's only two types of transition (*TT* and TI) for the light beam through the cubic system of EVTD².

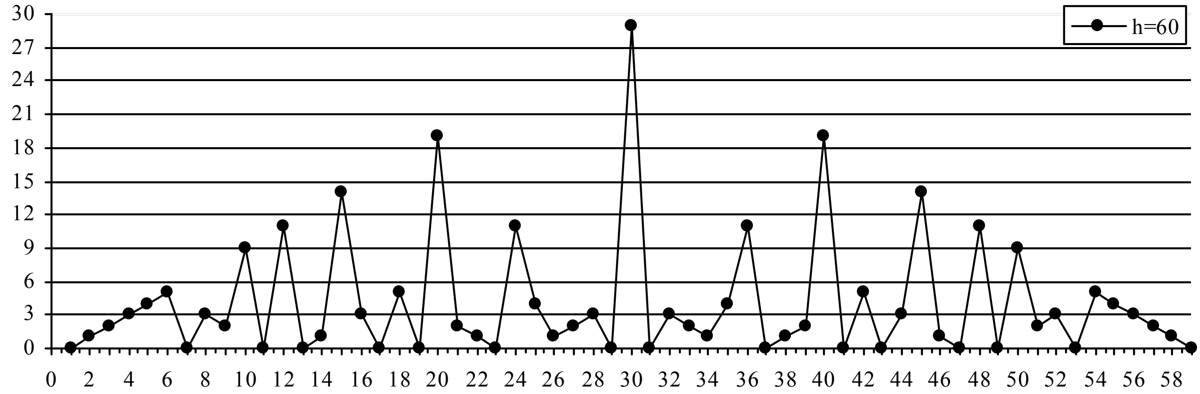

Fig. 6. Symmetrical distributions of *TI* (for the *v* and around the central value of 30) in the case of *h* = 60 which admits multiple dividers.

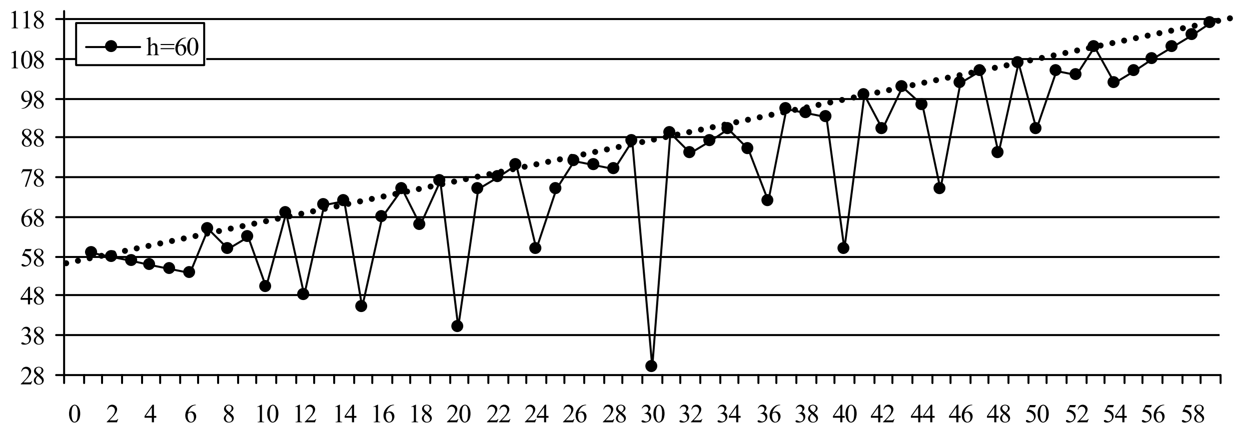

Fig. 7. Representation of the sums of the *TT* in the case of *h* = 60. The line connecting some points represents the regular slope of a steady increase of the *TT* in cases where there are no *TI*.

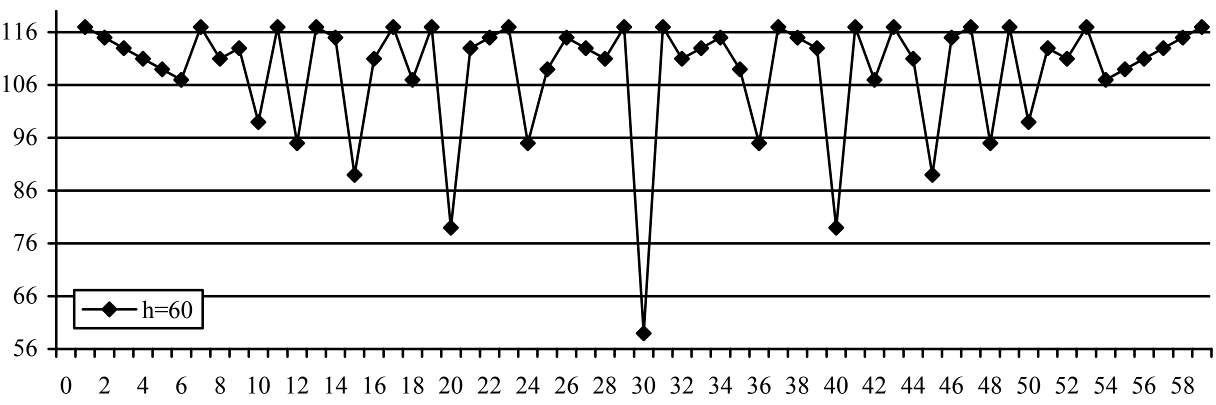

Fig. 8. Representation of the distributions in *TT* of figure 6, but where the line of previous regular slope has been rectified in alignment on the value of 117 *TT* for *v* = 58. There is symmetry in mirror of this curve upright from the curve representing the *TI* of figure 5.

So when the number of one of the transitions (for the same system) and for a given value of *v* is large it will automatically ensue that the number of the other type of transition will be relatively low. This will represent a maximum for one and a certain minimum to the other:

hence the correspondence by pseudo mirror effect.

5. CONCLUSION

The study of quantum gravity in conjunction with the thinking experiment of relativity allows to highlight the particular circumstances sometimes unexpected and original. This concerns the propagation of a very narrow light beam in a quantum space-time structured entities EVTD^2. The speed of light is not constant; it may be plural and irregular values or instantaneous value: which reminds the Galilean transformation where c^2 is considered of infinite value. Quantum relativity takes into account, depending on the circumstances, either the Lorentz transformation where the velocity *c* is finite; either the Galilean transformation for the instantaneous speed. Special symmetries are observed in the distributions of certain characteristics of the different case of length *h* of the beam in correlation with the speed *v* of the mobile. It is to note that the thinking experience, here studied, would be valuable only in the cases where are not *TI*. Otherwise, the receiver would not be in the good position to receive the light beam.

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Relativitatea cuantică într-un spațiu-timp complet cuantificat și formatat în entități EVTD^2

Implementarea relativității într-un spațiu-timp cuantic conduce spre o nouă fizică. De fapt, teoria entităților EVTD^2 care ar structura acest spațiu-timp induce, pentru propagarea fotonului, o serie de aspecte și caracteristici complet originale și remarcabile. Se pot cita, printre altele, viteza luminii care nu ar fi constantă în funcție de traiectoriile urmate în acest mediu. Viteza finită a luminii *c* se obține ca durată a parcursului prin suma tranzițiilor temporale (*TT*) prin cuante. Această discontinuitate particulară atrage după sine un timp neuniform pentru mobilele care se propagă prin aceste cuante cu viteze diferite. În experiența logică a relativității restrânse se manifestă caracteristici simetrice.

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