ANOTHER PATH TOWARDS THE TRUTH ABOUT HOW THE UNIVERSE WORKS?

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ABSTRACT

In the article titled "Each Point of Space in Expansion is the Preferred Reference Frame for Any Object Transiting to that Point", published on March 30th, 2017, I presented a theory that demonstrates the existence of the Preferred Reference Frame and at which speed the Earth moves relative to it. I also stated that further theories about various phenomena of the Universe, may be derived from this theory and that it, therefore, opens a new path towards the truth about how the Universe works.
And now, with this article, I will tray to begin to walk the above path, exposing some hypotheses explaining various phenomena of the Universe, in a way compatible with said theory.
Here are, in short, these hypotheses.

The Universe is exclusively composed of an infinity of space quanta, which tend to expand and thus cause it to expand, as a consequence.

Matter manifests on sets of space quanta, which are compressed and thus enable the neighbouring quanta, and later the quanta further apart, to expand further.

Gravity is the effect of the fact that each object tends to move towards the least compressed space quanta and, therefore, towards other objects.

Speed of light depends on the degree of compression of space quanta in the locations (or points) in which it transits, meaning that the greater the compression, the higher the speed.
But since also clocks move more or less rapidly according to their degree of compression, speed of light results always the same at any location.
Therefore, in the past, when the degree of compression of space quanta was greater, speed of light was also greater.

Cosmological redshift is due to the speed of the location in which the celestial object receiving photons, is moving, compared to the location in which the celestial object emitting it, has moved, in a Universe in decelerating expansion.
In support of this hypothesis, I present two tables that simulate the journey of the photons of a high-redshift galaxy and that of CMBR photons, and, above all, a formula for calculating apparent luminosity, compatible with the observations of the high-redshift type Ia supernovae.

I would like to point out that I haven't mentioned either the dark energy or dark matter, since I haven't considered it necessary for this model of the Universe.

Keywords:
Preferred Reference Frame, CMBR, Cosmic Microwave Background Radiation, space quanta, expansion of the universe, General Relativity, speed of light, redshift, photons, type Ia supernovae, dark energy, dark matter.

1. INTRODUCTION

In the article titled "Every Point of Space in Expansion is the Preferred Reference Frame for Any Object Transiting to that Point" (**8**) I published on March 30th, 2017, I presented a theory that demonstrates the existence of the Preferred Reference Frame and at which speed the Earth moves relative to it. I also stated that further theories about the various phenomena of the Universe, may derive from it and that, therefore, this theory opens a new path towards the truth about how the Universe works.
Now, with this article, I intend to begin to walk that path.
I will therefore expose some hypotheses explaining various phenomena of the Universe, such as its expansion, gravity, speed of light and cosmological redshift, in a way compatible with said theory.

I would also like to point out that I will in many cases speak in the present tense instead of the conditional, not in order to express any certainty, but for simplicity of exposure.

2. A UNIVERSE OF SPACE QUANTA

2.1 Expansion of the Universe

The Universe may be imagined as an immense sphere composed exclusively of an infinity of tiny indivisible particles of an equal amount of space, which, from now on, I will call "space quanta".

By "space" I mean a continuous substance, therefore not made up of particles, that tends to expand. In practice it is the only real substance composing the Universe and, therefore, it must be very different from the matter we are able to observe.

At the time of the so-called Big Bang, the quanta were extremely compressed. Therefore they immediately began to expand, causing the expansion of the Universe, which is still ongoing.

The speed of this expansion tends to be uniform in any location (from now on, I will use the word "location" instead of "point", that I have used in the previous article) in the Universe.
This means that each location moves away from any other location at a speed that tends to depend on distance. The more distant they are, the faster they move away from each other.
So every location can be considered as a center of the Universe, from which all the other locations go away.

As I have written, space expansion speed tends to be the same and, therefore, it isn't literally the same in that, as I shall explain later, space expansion between celestial objects is affected also by matter, which is not distributed in an exactly uniform way throughout the Universe.

2.2 Gravity

There is no vacuum among the space quanta. Therefore if one single quantum compresses and therefore shrinks in size, the adjacent quanta can/must increase in size and thus expand.

Matter is made up of space quanta.
The elementary particles of the so-called standard model of quantum physics, are physical phenomena that, amongst other things, compress space quanta. Therefore a material object contains a huge number of sets of compressed space quanta, that increase the average compression of the space quanta composing it.
Consequently the quanta adjacent to the object, i.e. those situated in the front line (first liner), can/must expand further due to the reduction in size of the quanta of the object. However they are later partially recompressed, because the second-liner space quanta, which are now more compressed because they have not undergone any expansion, expand in turn towards the first-liner space quanta. Later also the quanta in the third line, yet compressed, expand towards those in the second line, and so on, until the quanta ever more distant from the object.
In other words matter squeezes large amounts of space quanta and allows the neighbouring quanta, and then gradually those farther away from them, to expand more.
The result is an environment in which the space quanta situated in the vicinity of matter, are more expanded than those located far from it.
The quanta composing matter, are more compressed than the external ones. However, for the sake of precision, we should say that the average compression of the quanta composing matter, is greater than the average compression of those outside of it. This is because atoms include numerous quanta that could even be more expanded than those outside of it, i.e. those between the nuclei and the electrons, in that they are located closer to the elementary particles.

The sets of quanta composing the atoms, tend to expand in the direction of the most expanded (or less compressed) quanta, as they encounter less resistance to their expansion. Therefore since material objects are made up of atoms, they expand in the direction of the most expanded quanta and thus in the direction of other objects. For this reason every object tends to move towards other objects.

To move an object in the opposite direction than the one in which it would tend to move, i.e. from a point where the quanta are more expanded (e.g. from ground level) to a point where they are less expanded (e.g. 1 m from the ground), a certain force must be applied to gradually increase the compression of the sets of quanta composing the atoms of the object, in order for them to

oppose to the greater pressure of the quanta they encounter as they approach the higher level.
However, more precisely, we should not think of quanta as moving from one point to another, but of quanta compressions as moving from one point to another. Or, better yet, to physical manifestations occurring in different points in space.
Consequently an object of one meter in hight, has its atoms situated in a higher position at a higher mean compression rate, compared to the lower atoms, as the quanta making up the higher atoms, encounter more resistance to their expansion, compared to the quanta in the lower atoms. Therefore, assuming that the object has the shape of a cube, it will have a larger lower surface area than the upper one, because the compression of the quanta situated near the lower surface, is smaller than that of the quanta closer to the upper surface. However, if measured, the two surfaces would still appear to be the same, as also the atoms of the measuring instruments, are subject to expansion of the neighbouring quanta.

All of this justifies gravity in a different but similar way to that hypothesized by General Relativity (GR), in that matter does not bend space-time, but increases the expansion of space quanta, and an object is not guided by space-time curvature, but it is guided by space quanta expansion.
In short, space-time curvature is thus replaced by space quanta expansion. Therefore the mathematics envisaged by GR, should also apply to this hypothesis.

Before concluding this topic, I would like to mention the issue of the combination of the native expansion of space quanta, causing celestial objects to displace apart, with the expansion due to the presence of matter, making them move close to each other. However, at least now, I will not discuss this, especially because of my lack of observational data.

2.3 Speed and frequency of photons, variables

It was experimentally observed that
(1) Gravity affects the flow of time and photon wave frequency (**2**)*.*
However, based on this hypothesis,
(2) Gravity is caused by space expansion.
Consequently, it can be stated that
(3) Space expansion affects the flow of time (the more space expands, the more clocks slow down) *and photon wave frequency*.
However, since it also results that
(4) Photon speed remains unvaried regardless of which location it is measure and, therefore, at any time flow speed, it results that
(5) also photon speed adapts to space expansion, and namely photons move either faster or slower depending on the level of space expansion.
Therefore, in the past,
(6) When space of the Universe was much less expanded, photons moved at a much higher speed than the present, although hypothetical clocks of the time would still measure it at 300,000 km/s (as they would measure time faster because space was less expanded).

In other words, as the Universe expanded, photon speed dropped, although hypothetical clocks would have slowed down and therefore still measured photon speed at 300,000 km/s.

As shown at point 3, space expansion affects photon wave frequency.
More precisely it slows down wave frequency although hypothetical clocks would not be able to detect it, because expansion also slows them down proportionally.
If this were not the case, the frequency of the photons emitted by a given type of source (e.g. hydrogen) and measured by the same clock, would be higher on the top of a mountain (where space is less expanded) than at its foot (where space is more expanded).
Therefore, in the past, when space was less expanded, the frequency of the photons emitted by a given type of source (e.g. hydrogen), was much greater than now and later slowed down, as the Universe became expanded. However, hypothetical clocks would have not been able to detect any deceleration in frequency, as they too would have slowed down proportionally.
Essentially, those photons may themselves be seen as clocks.

In conclusion space expansion does not let them measure, at least directly, any deceleration in photon wave frequency and, consequently, not even the cosmological redshift.

3. Cosmological redshift

The deceleration in photon wave frequency due to space expansion, is known by the Scientific Community (SC) as “cosmological redshift”.
However, in the previous paragraph, I argued that along with said deceleration in frequency, also a deceleration of clocks occurs proportionally and therefore no redshift is detected.
Hence, what could cause the high redshift value detected in photons coming from very distant celestial objects?
It is due to the displacement speed of the location where the celestial object receiving the photon, is moving, compared to the location where the celestial object emitting it, was moving.
Hence said redshift is still due to space expansion, as the expansion stretches the distances between different locations in the Universe, thus increasing the displacement speed of locations in the Universe, however only indirectly.

In support of this hypothesis, I am presenting two tables simulating the journey of the photons of a high-redshift galaxy and that of the photons of the Cosmic Microwave Background Radiation **(CMBR)** and, above all, a formula for calculating apparent luminosity compatible with the observations of high-redshift type Ia supernovae.

3.1 Exemplification of the model of the Universe

In order to better understand the two simulations mentioned above, I will introduce them with a simple exemplification.

Let us imagine the expanding Universe as a large rubber sphere constantly inflating, with numerous points marked on its surface (identifying locations in the space).

Let us imagine a celestial object (e.g. a distant galaxy) as a lorry moving on the surface of our sphere at a speed of 0.1 m/s, remaining in the vicinity of a point.
Now let us imagine Earth as another lorry also moving near a point, at a speed of 0.1 m/s.
Because of the expansion of the sphere, the two points above move apart from one another at a certain speed. Consequently the two lorries move away from one another at the same speed (more or less in function of the direction of their motion).

Now let us imagine photons as a set of cars moving on the surface of the sphere at constant speed, e.g. 1 m/s.
We will now note that, due to the expansion of the sphere surface, the points move apart from one another. Therefore each car will move at a speed of 1 m/s relative to the point over which it passes, however at a different speed compared to the other points marked on the sphere surface.
If a car starts from a point in the sphere (marking the location where the galaxy is moving) to reach another point (marking the location where Earth will move upon its arrival), at the start it will move at a speed of 1 m/s relative to the starting point, however lower relative the arriving point, as it is moving apart from it, due to the sphere's surface expansion.
However, during its journey, its speed relative to the arrival point, will increase due to the constant increase in distance between the point over which it passes (still at 1 m/s) and the starting point. Finally it will reach, at a speed of 1 m/s relative to the arrival point, which will move at a given speed relative to the starting point. Hence the car will move at a speed of more than 1 m/s, of said given speed, relative to the starting point.

3.2 Simulation of the journey of the photons of a high-redshift galaxy

As mentioned above, space expands tendentially at the same speed at any location in the Universe. Therefore any location moves away from any other location, at a speed that depends on distance.
In other words any location in the Universe may be considered as its centre in that any other location moves apart from it, but also because photons that move through it, have the same speed, i.e. 300,000 km/s, in all directions.
However, if these photons move at a speed of 300,000 km/s relative to the location they are covering, and the locations they progressively cover, move increasingly faster from their location of emission, even photons move increasingly faster relative to their location of emission.
For example the photons emitted by a galaxy and going towards the Earth, at a the emission have a speed of 300,000 km/s relative to the galaxy's location (more precisely, relative to the "location where the galaxy is moving", as no celestial object is at rest relative to its location, but we will just call it "location" for the sake of brevity), but far smaller relative to the Earth's location (more precisely, "the location where Earth will be at upon arrival", but we will just call it

"Earth's location" for the sake of brevity), because it is moving apart from the galaxy's location.
However as photons move towards the Earth's location, through locations that move increasingly faster relative to the location of the galaxy, photons move at an increasingly speed relative to the Earth's location, reaching it at 300,000 km/s with respect to it.

Said speed increase, corresponds to the speed of the receiving location, relative to the emitting location. It is used as a factor for calculating the so-called cosmological redshift, indicated by the symbol "z", whose value incremented by 1, corresponds to the ratio between the speed of light and the difference between it and the speed of the receiving location relative to the emitting one **(formula 3.2.1)**

$$\mathbf{1} + \boldsymbol{z} = \frac{\mathbf{c}}{(\mathbf{c} - \mathbf{vr})}$$

Where **"vr"** stands for the speed of the receiving location.
This formula, essentially, corresponds to the Doppler shift formula, which applies to the waves arising in a medium and, therefore, even to this case (The correct formula for the calculation of z features, has the wavelength of the receiving location, as the nominator, and the wavelength of the emitting location, as the denominator. However my formula seems more simple and it works equally, as **c** may be considered as the wavelength of the receiving location and $(\mathbf{c} - \mathbf{vr})$ as the wavelength of the emitting location).
From this formula, also the formula for calculating the speed of the receiving location, can be derived, i.e. (**formula 3.2.2**)

$$\mathbf{vr} = \mathbf{c} - \frac{\mathbf{c}}{\mathbf{1} + \boldsymbol{z}}$$

For the sake of precision, I would like to point out that besides the cosmological redshift, there is also that caused by the motion of the emitting and receiving objects, relative to their respective locations, which in this case is not particularly relevant, but is still comprised in the measured value on the Earth.
For example, a redshift of 0.59 measured on the Earth, indicates that Earth moves apart from the galaxy at a speed of 111,321 km/s.

$$\mathbf{vr} = \mathbf{300,000} - \frac{\mathbf{300,000}}{(\mathbf{1} + \mathbf{0.59})} = \mathbf{111,321}$$

To better explain how this works, using the Excel application, I have drafted a simulation table of the journey towards Earth, of the photons of a high-redshift galaxy, which I am presenting here below.
I drafted this table for the sole purpose of demonstrating the validity of this hypothesis so, even though I have tried to obtain realistic results, I may only present them as an example.
Redshift values are based on an article by astronomer Vincenzo Zappalà (**7**).

JOURNEY TO EARTH OF PHOTONS OF A HIGH-REDSHIFT GALAXY

Time	------------- speed on start location ---				---------- -- distance ----			------- progressive ----------		
Progr.	transit loc.	photons + loc.	Redshift z + 1	Earth loc.	photons + loc.	Earth loc.	diff.ce	diff.ce	phtons + loc.	Earth loc.
A	**C**	**D**	**E**	**F**	**H**	**I**	**J**	**K**	**L**	**M**
Start			**1.590**	**216,850**	**0.000**	**4.883**	-4.883	-4.883	-	4.883
1	**18,217**	**318,217**	**1.450**	**201,774**	**1.061**	**0.673**	0.388	-4.495	1.061	5.556
2	**35,201**	**335,201**	**1.340**	**186,699**	**1.117**	**0.622**	0.495	-4.000	2.178	6.178
3	**51,321**	**351,321**	**1.250**	**171,623**	**1.171**	**0.572**	0.599	-3.401	3.349	6.750
4	**66,640**	**366,640**	**1.175**	**156,548**	**1.222**	**0.522**	0.700	-2.701	4.571	7.272
5	**81,591**	**381,591**	**1.110**	**141,472**	**1.272**	**0.472**	0.800	-1.900	5.843	7.743
6	**96,492**	**396,492**	**1.052**	**126,396**	**1.322**	**0.421**	0.900	-1.000	7.165	8.165
7	**111,321**	**411,321**	**1.000**	**111,321**	**1.371**	**0.371**	1.000	0.000	8.536	8.536

Speed values are expressed in km/s.
Distance values are expressed in billions of light-years.
Time values are expressed in billions of years.

POSTED VALUES:

Speed of Earth at Start	216,850
Initial distance of Earth's location	4.883

I am explaining below the methods by which I calculated the values shown in the table. This is only a general explanation because the entire method would be too complex to describe here (the Excel table I mentioned is available on request).
I would also like to point out that compared with the Excel worksheet based on which the table was drafted, I had to hide three columns, due to lack of horizontal space.
The first one is marked as column **B** and lists photon speed relative to the locations covered, i.e. always 300,000 km/s in each cell.
The second one is marked as column **G** and lists the distance travelled by the photons relative to the different locations, i.e. always 1 billion light-years in each cell.
The third one is marked as column **O** and contains a value for calculating the mean speed of the Earth's location relative to the location of the galaxy, for each one-billion-year period.

First of all, based on the redshift, for each period I calculated the mean velocity at which the locations progressively covered by the photons, move farther from the galaxy's location, using the formulas in 3.2.2 and then entered it in the "speed -- transit loc." column (**C**).
Then I added said speed value to that of the photons compared to the locations covered (300,000 km/s) and entered the result in the cells of the "speed -- photons + loc." column (**D**).
At this point I calculated the distance travelled by the photons, by dividing the values shown in the "speed -- photons + loc." column (**D**) by 300,000, and I entered the results in the "distance -- photons + loc." column (**H**). Then I obtained and entered the progressive values in the "distance -- progressive -- photons + loc." column (**L**).

As can be seen, in the last cell of said column, it results the value of 8.536 billion light-years, which corresponds to the sum of the total distance travelled by the photons, with the displacement distance of the location covered, sum that corresponds to the actual distance between the location of the galaxy and that of Earth.
At this point through my formula for calculating apparent luminosity (3.3.1) – see explanation in paragraph 3.3 (to better explain my formula, I needed the table, so I had to postpone the explanation) – I obtained the ratio between the actual distance and that of the time of photon emission, and I calculated its value of 4.883 billion light-years and expressed it as a posted value.
Then, still using Excel functions, I have varied dichotomically the Earth's speed at Start, until in the last "distance – progressive -- diff.ce" column (**K**) value 0 appears, and thus I obtained the mean speed away of the Earth's location from that of the galaxy, for every period, which are displayed in the "speed -- Earth loc." column (**F**). For the sake of simplicity, I made sure that the variations in speed between the different periods always had the same value. However, with more observational data available, it would be possible to identify a computing system more adherent to reality.
Finally, for each period, I calculated the displacement distance from the Earth's location compared to that of the galaxy, and I entered it into the "distance – Earth loc." column (**I**). I then entered its progressive value in the cells of the "distance -- progressive -- Earth loc." column (**M**).

The table shows that at the start of the journey, the Earth's location is 4.883 billion light-years away from that of the galaxy, and, due to the expansion of space, the Earth's location displaces at a speed of 216,850 km/s from the galaxy's location.
In the following periods the speed at which the Earth's location displaces from that of the galaxy, decreases, and, consequently, space expansion decelerates (this phenomenon is also described in paragraph 3.4).
Finally, when photons arrive at Earth, the Earth's location is 8.536 billion light-years, compared to that of the galaxy, and its displacement speed relative to that of the galaxy, is 111,321 km/s.
During their journey, again due to space expansion, photons also vary in speed with respect to the galaxy's location, however increasing as they travel to locations farther away compared to the galaxy's location and therefore displace at an increasingly higher speed from the galaxy's location, still taking into account expansion deceleration.
Finally photons arrive at the Earth's location at a speed of 300,000 km/s relative to it, but at 411,321 km/s relative to the galaxy's location.

So, how much has space expanded between the start and the arrival of photons?
If at the start of the journey, the Earth's location is 4.883 billion light-years from the galaxy and 8.536 billion light-years at the end of it, the ratio between the two lengths is (8.536 : 4.883), i.e. 1.7482, which corresponds to the space expansion ratio from the start to the arrival of the photons, as the displacement of the two locations is due to space expansion.

3.3 Formula for calculating the apparent luminosity of high-redshift celestial objects

Here below I am presenting a formula for calculating apparent luminosity based on the absolute one, taking the data in the above table as an example.
I consider this important because, according to the SC, based on the apparent luminosity found in high-redshift type Ia supernovae, universe expansion manifests in acceleration rather than in deceleration, as it appears from my hypothesis.
Indeed this is what physicist Matteo Billi writes in his graduation thesis **(5)**:
"SNe are used in cosmology as distance indicators. In 1998, two research teams – the Supernova Cosmology Project and the High-z Supernova Search Team – conducted studies on a sample of SNe in far galaxies at z = 0.2 ÷ 0.9. From this study emerged that apparent luminosity was typically less than 25% compared to the expected values. This indicates that these objects are at a greater luminosity distance than that provided by universe models dominated by matter. This is how the evolution of a universe in a state of accelerated expansion was first determined."
Instead in the simulation presented in the above paragraph, as can be seen from the "speed -- Earth loc." column (**F**), expansion appears to be in deceleration.
Therefore, in order to support the validity of the simulation, here is a formula based on which it appears that the apparent luminosity of type Ia supernovae is compatible with my hypothesis.

For the formula given here, the factors by which absolute luminosity ($\mathbf{L}$) is divided in order to obtain apparent luminosity ($\boldsymbol{l}$) are the following:

1. Area of the sphere surface with a radius corresponding to the distance travelled by photons ($\mathbf{Df}$) relative to the locations progressively covered (due to lack of horizontal space, this distance is not shown in the table, but corresponds to the speed of light, i.e. 7 billion light-years). This is because, as they move, photons are distributed on an ever-larger surface of the sphere, as its radius expands.
However only the distance travelled by the photons relative to the locations covered, should be considered, and not the distance to which the locations displaced relative to the location of the galaxy, as this displacement does not imply photon distribution on a wider area.

2. The photons' redshift ($\mathbf{1}+\boldsymbol{z}$)**,** that is due to the displacement speed of the receiving location relative to the emitting location, because it is effectively perceived on arrival at Earth and must therefore be considered.

3. The ratio between space expansion at the end of the journey ($\mathbf{e}_1$) and at the start of the journey ($\mathbf{e}_0$), (which corresponds to the space expansion occurred during the journey, which is tendentially uniform in any location in the Universe and, therefore, even in the location where galaxy photons have transited – are the last and the first values, respectively, in the "distance -- progressive -- Earth loc." column (**M**), i.e. 8.484 and 4.857), squared.
As a matter of fact, space expansion occurs on three dimensions, and therefore this ratio should be cubed. However radial dimension – i.e. the dimension

causing the reduction in frequency (or wave stretching) of photons, as mentioned above – is compensated by time deceleration and should not therefore be considered.

Summing up what mentioned above about photon wave frequency, I would like to point out that, from the time of emission to that of reception, two types of frequency reduction occur.
The first type is caused by space expansion, factor No 3.
The second type is due to speed, factor No 2.
Since a cosmological redshift is effectively detected, but cannot be due to space expansion, as it is compensated by time deceleration (as shown in paragraph 2.3), it must necessarily be due to the displacement speed between the emitting and receiving location (otherwise what else could it be due to?).
This further demonstrates my hypothesis on the cause of the cosmological redshift.

Therefore, the formula is as follows (**formula 3.3.1**):

$$\boldsymbol{l} = \frac{\mathbf{L}}{\mathbf{4\pi} \cdot \mathbf{Df}^2 \cdot (\mathbf{1} + \boldsymbol{z}) \cdot (\frac{\mathbf{e}_1}{\mathbf{e}_0})^2}$$

Whereas the formula used by the SC, as I found it online (**6**), is as follows:

$$\boldsymbol{l} = \frac{\mathbf{L}}{\mathbf{4\pi} \cdot \mathbf{D}^2 \cdot (\mathbf{1} + \boldsymbol{z})^2}$$

Where, I assume, **D** represents the current distance between the emitting and the receiving location.
Since I could not find an explanation of the formula that, at least, I have understood, I take it as it is and will not explain why the factors exposed to the denominator are used, as I did with my formula.

In order to compare the results of the two formulas, I believe we only need to compare the two denominators and exclude the $\mathbf{4\pi}$ factor, since it is there in both.
I would like to point out that the values of cosmological redshift (**0.59**) and current distance between the transmitting and receiving location (**8.68**) were derived from the article by Zappalà (**7**) above and relate to the photons issued 7 billion years ago by a celestial object.
I chose a redshift of 0.59 (and therefore the photons issued 7 billion years ago by a galaxy) as it is the closest value to the average between the minimum and maximum redshift mentioned in Matteo Billi’s thesis (**5**), i.e. (0.2 ÷ 0.9). Therefore also 25% less luminosity, as mentioned in the thesis, should apply, because it should correspond to an average of reductions in luminosity.
The expression used in my formula, i.e.: $\mathbf{Df}^2 \cdot (\mathbf{1} + \boldsymbol{z}) \cdot \left(\frac{\mathbf{e^1}}{\mathbf{e^0}}\right)^{\mathbf{2}}$, gives:

$$7^2 \cdot (1 + 0.59) \cdot \left(\frac{8.536}{4.883}\right)^2 = 7^2 \cdot 1.59 \cdot 1.7482^2 = 49 \cdot 1.59 \cdot 3.0562 = \mathbf{238{,}108}$$

The expression used by the SC's formula, i.e.: $\mathbf{D}^2 \cdot (\mathbf{1} + \boldsymbol{z})^{\mathbf{2}}$, gives:

$8.68^2 \cdot (1 + 0.59)^2 = 75.3424 \cdot 2.5281 = \mathbf{190,473}$

By comparing the two results, my formula results in an apparent luminosity of 25% less than that given by the formula used by the SC:

$(238{,}108 - 190{,}473) : 190{,}473 = \mathbf{25}\%$

This value corresponds to that derived from the average observation, compared to what expected according to Billi's thesis (**5**).

For the sake of accuracy, I would like to point out that expansion value (factor 3) was assumed by taking into account the result of my formula (i.e. 25% less apparent luminosity than the expected values, which I assumed to be those resulting from the formula used by the SC).
However, considering the quantity and quality of the factors in my formula, compared to those in the SC's formula, it appears that even real values would give a lower value of apparent luminosity. Moreover, even using values not significantly different from those contained in Zappalà's article (7), still trying to obtain 25% less apparent luminosity, I could not obtain a simulation of the photons' journey that may be considered reasonably acceptable.
Anyhow this result may also be seen as the possibility offered by the formula I am presenting, to obtain the ratio between space expansion at the moment of photons emission and space expansion at the time of photons reception, knowing the ratio between absolute and apparent luminosity, the time when the photon started and its redshift.
Having more than one case available, would help understanding more clearly how space expanded in the past (and therefore to hypothesize how it will expand in the future) and this would pave the way for further knowledge of the functioning of the Universe and, as a result, for further evidence of my hypothesis.

3.4 Simulation of the journey of photons of the Cosmic Microwave Background Radiation (CMBR)

According to the Big Bang theory, about 380,000 years after its expansion began, the Universe became transparent to radiation, and therefore a huge amount of photons began to propagate freely in it **(3, 4).**
Photons started from different locations in the Universe and travelled in random directions. Therefore part of them travelled in the direction of the Earth's location.

Since then said photons – known as CMBR – have continued to arrive at Earth, starting with those coming from the nearest locations, gradually followed by the farther ones.
During their journey, photons travelled to locations which, due to space expansion, moved increasingly faster away from their starting locations and therefore increased their speed relative to said locations, until they reached the

Earth's location at a speed of 300,000 km/s, however far greater than their starting locations.
And increasing speed also increased the redshift.

During this time, space has continued to expand and, consequently, the displacement speed of the Earth's location from the starting location of CMBR photons, when they arrived at Earth, has increased
Hence, also redshift has progressively increased to reach its present values of around 1,100.
Therefore by applying the formula 3.2.2 shown in paragraph 3.2, the speed of the Earth's location relative to the starting locations of the CMBR photons, is approximately 299,727 km/s at the time of their arrival at Earth.

$$\mathbf{vr = 300000 - \frac{300,000}{(1 + 1,100)} = 299,727}$$

Working on simulations, I found that if we assume that the Earth's location displaces away from the photons' starting locations at a constant speed of approx. 300,000 km/s, photons would reach it in few time and not in the approx. 14 billion years of life of the Universe, as it should be. The same would also happen even assuming a steady increase in the Earth's displacement speed as if the expansion of the Universe occurred in acceleration.
Instead, I found that if the expansion of the Universe occurred in deceleration, a rendezvous would be possible.
Therefore I must conclude that universe expansion occurs in deceleration, as it also results from the simulation of the journey of the photons of a high-redshift galaxy.

To demonstrate further and more exhaustively the validity of this hypothesis, I have drafted a table that simulates the journey of CMBR photons from their starting location to the rendezvous with the Earth's location, assuming variations in photon speed (caused by the motion of the locations they progressively cover) and to the Earth's location relative to the starting location.
At a glance it appears that the Earth's location initially moved at a higher speed and distanced the photons, which later caught up the delay and reached it.
Of course the data in the table are just by way of example.
As for redshift values, I based on the article by astronomer Vincenzo Zappalà (**7**).

JOURNEY OF THE CMBR PHOTONS TOWARDS THE EARTH

time	----- speed at start location	-------------			------------------ distance --			--------- progressive ---------		
	Transit	phtons	Redshift	Earth	Phtons	Earth			Phtons	Earth
Progr.	loc.	+ loc.	1 + z	loc.	+ loc.	loc.	differ.	differ.	+ loc.	loc.
A	**C**	**D**	**E**	**F**	**H**	**I**	**J**	**K**	**L**	**M**
Start			1,100	683,400		0.010				0.010
0.5	540	300,540	8.260	669,697	0.501	1.116	- 0.615	- 0.615	0.501	1.116
1.0	39,814	339,814	4.810	655,995	0.566	1.093	- 0.527	- 1.142	1.067	2.209
2.0	63,492	363,492	2.640	628,590	1.212	2.095	- 0.884	- 2.026	2.279	4.305
3.0	93,458	393,458	1.780	601,184	1.312	2.004	- 0.692	- 2.718	3.590	6.309
4.0	118,110	418,110	1.300	573,779	1.394	1.913	- 0.519	- 3.237	4.984	8.221
5.0	139,535	439,535	1.000	546,374	1.465	1.821	- 0.356	- 3.593	6.449	10.043
6.0	159,574	459,574	0.760	518,969	1.532	1.730	- 0.198	- 3.791	7.981	11.772
7.0	179,104	479,104	0.590	491,564	1.597	1.639	- 0.042	- 3.833	9.578	13.411
8.0	197,368	497,368	0.450	464,159	1.658	1.547	0.111	- 3.722	11.236	14.958
9.0	215,054	515,054	0.340	436,753	1.717	1.456	0.261	- 3.461	12.953	16.414
10.0	231,660	531,660	0.250	409,348	1.772	1.364	0.408	- 3.053	14.725	17.779
11.0	246,914	546,914	0.180	381,943	1.823	1.273	0.550	- 2.504	16.548	19.052
12.0	262,009	562,009	0.110	354,538	1.873	1.182	0.692	- 1.812	18.422	20.233
13.0	277,778	577,778	0.050	327,133	1.926	1.090	0.835	- 0.976	20.347	21.324
14.0	292,683	592,683	0.000	299,728	1.976	0.999	0.977	0.000	22.323	22.323
R.V.	299,728	599,728		299,728						

Speed values are expressed in km/s
Distance values are expressed in billions of light-years
Time values are expressed in billions of light-years

POSTED VALUES:

Speed of Earth at Start	683,400	Initial dist. of Earth's loc.	0.010

Calculation methods are similar to those contained in the section on the journey of photons of a high-redshift galaxy.

4. CONCLUSIONS

With my article "Every Point of Space in Expansion is the Preferred Reference Frame for any Object Transiting to that Point" I hope I have opened a new path to the truth about the functioning of the Universe, and in this article I have presented some hypotheses on certain physical phenomena in line with said theory, that I am briefly summarising here below.

4.1 Expansion of the Universe

The Universe is made up of infinity of tiny particles of equal amount of space (a substance that has the tendency to expand), which I call "space quanta". Space quanta tend to expand unceasingly, thus causing the expansion of the Universe.

4.2 Gravity

Matter is made up of dynamic sets of compressed space quanta, which allow for a greater expansion of the neighbouring quanta and then, progressively, of the more distant ones.
Each material object tends to move to places where space quanta are more expanded, i.e. towards other material objects.

4.3 Variable speed of light

Speed of light depends on the expansion of space quanta of the locations in which they transit. However since also clocks move in function of said expansion, if measured, both the speed and frequency of light results always the same.
Therefore, in the past, when space expansion was smaller, speed of light was greater.

4.4 Cosmological redshift

Cosmological redshift is due to the speed of the location of the celestial object receiving the photon, relative to the location of the celestial object that emitted it.
In support of this hypothesis, I have presented two tables that simulate the journey of the photons of a high-redshift galaxy and that of the photons of CMBR, and, above all, a formula for calculating the apparent luminosity of a high-redshift celestial object, that justifies the luminosity found in the type Ia supernovae, with an expansion of the Universe in deceleration, as it results based on the above simulations.

4.5 A last observation

I would like to point out that in this article I haven't mentioned either the dark energy or the dark matter, since I haven't considered them necessary for this model of Universe.
The dark energy is not mentioned because the expansion of the Universe ought to be justified by the expansion of space quanta (paragraph 2.1).
The dark matter instead has not found room in my article because certain motions of the outer arms of the spiral galaxies, perhaps could be justified by the "combination of the native expansion of the space quanta, which distances the celestial objects, and the expansion due to the presence of matter, which makes them closer. " (Paragraph 2.2).

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