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The great fallacy of the accelerated expansion of the universe

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Abstract
In the present publication it will be shown that the universe is not expanding at an accelerated rate. The cosmological redshift is explained and calculated for a spherically pulsating universe during the expansion.

Keywords: expansion of the universe, structure of the universe, cosmological redshift, spacetime metrics, magnetic charges, time.

Introduction

Today, cosmology assumes that the universe is expanding at an accelerated rate. This estimation is based on the observation of distant type Ia supernovae. To be able to explain the accelerated growth, the dark energy was introduced. It can be shown here that the velocities of the galaxies with the space remain exactly constant during the expansion of the universe.

1. The extended Minkowski metric

The well-known Minkowski metric has the form in integrated notation:

$$x^2 + y^2 + z^2 = c^2t^2 - s^2 \quad (01)$$

According to this, the space-time structure has four dimensions, three spatial and one temporal, which are in the known mathematical relation (01). Although with the help of the distance square ds^2 the definition of space-like events outside the light cone becomes possible, this metric does not describe the universe completely. In order to consider time two-dimensionally and to derive known fundamental physical relations, the author has established a five-dimensional space-time equation, which has the following form and is hereafter called the Gimsa metric [01]:

$$x^2 + y^2 + z^2 = c^2t^2 - {c_i}^2{t_i}^2 \quad (02)$$

According to this, the space-time structure has five dimensions, three spatial and two temporal, which are in the mathematical relation (02). According to this, there exists an imaginary speed of light c_i and beside the real time an imaginary time t_i. For the imaginary speed of light c_i is valid:

$${c_i}^2 = -c^2 \quad (03)$$

With the imaginary light the instantaneous effect of gravitation already assumed by Newton could be explained [02].

For the second imaginary temporal dimension applies in connection with the real time of an object in the moving state [03]:

$${t_i}^2 = -{t_b}^2 \quad (04)$$

The imaginary time can be divided without contradiction like the known time into the areas: Past, present and future, which must be imaginary then, however.

It can be used to describe space-like events and assign them to individual imaginary time domains that are outside the effect causality of local real events [04].

In case of an object movement in only one spatial direction x can be calculated with the equations (02), (03) and (04) without the spatial directions y and z write:

$$x^2 = v^2t^2 = c^2t^2 - c^2{t_b}^2 \tag{05}$$

By transforming (05), one can very easily obtain the equation for time dilation from the new metric given by equation (02) [05]:

$$t_b = t\sqrt{1-\frac{v^2}{c^2}} \tag{06}$$

This relation cannot be mutual in the universe with massed objects.

It goes with two objects, from which one moves and the other rests, only the time on the object slows down opposite its own rest position, to which energy was supplied and which therefore the speed v has attained. An exchange of the observation position, in that the resting observer is regarded as moved, is inadmissible in the context. No energy was supplied to the resting observer. The equation can be modified naturally after the time span t which passes for the resting observer. And from it follows mathematically correctly $t = t_b/\sqrt{1-\frac{v^2}{c^2}}$ and not surprisingly $t = t_b\sqrt{1-\frac{v^2}{c^2}}$ as Mr. Einstein wanted to make us believe with his wrong "transformation". Because how should e.g. each of two clocks, which are in each case on an inertial system object, be able to slow down opposite to the other one? The logic and the mathematics demand uncompromisingly the principle that from two clocks only one can follow opposite to the other!

The consideration that an reduced time interval t_b is due to the energy input of the moving object can be taken further. Each time span can be defined as a certain number of n of periods T: $t = nT$. Accordingly, with (06):

$$nT_b = nT\sqrt{1-\frac{v^2}{c^2}} \qquad T_b = T\sqrt{1-\frac{v^2}{c^2}} \qquad \text{or} \qquad f_b = \frac{f}{\sqrt{1-\frac{v^2}{c^2}}} \tag{07}$$

A meaningful result: The frequency of all quantum oscillations f_b on the moving object is increased by the energy supply. The expression (07) fits perfectly to the mass increased by motion. The object becomes heavier because the frequencies of its quanta are increased. Consequently, the simple and very important relation is valid for every object:

$$m_b t_b = t\sqrt{1-\frac{v^2}{c^2}}\frac{m}{\sqrt{1-\frac{v^2}{c^2}}} = mt \tag{08}$$

Let's take an atomic clock on the moving object. The resonance frequency, which it possesses, is also increased by the energy supply, it is set only at a higher number of oscillations. The period of oscillation is reduced and therefore the second, which results from an increased number of oscillations at the new resonance frequency, is prolonged.

This is because the number of oscillations determines the length of the second. Therefore, one second turns out to be longer at the increased resonance frequency of the atomic clock than in the rest state of the object. Consequently, time on the moving object passes more slowly compared to its resting state. Because at high object velocity the second has increased, a measured time span consists of fewer and longer seconds than in the resting state of the object. Consequently, the time span turns out to be smaller.

Of course, this doesn't change anything about the growth of the age of space. The respective current age of the universe must be valid uniformly for every place in it and can serve as a generally valid temporal standard at any time.

2. The cosmological red shift and the structure of the universe

The cosmological redshift can explain the escape velocity of galaxies. The core statement is that a more distant galaxy has a higher escape velocity with respect to our observational position.

Since our position should not be special compared to any other, it is assumed that an accelerated expansion of the universe takes place. The simple calculation formula for the redshift z is in wavelength or frequency notation:

$$z = \frac{\lambda_{obs}}{\lambda_0} - 1 = \frac{f_0}{f_{obs}} - 1 \qquad (09)$$

Thereby λ_{obs} is the observed wavelength and λ_0 is the wavelength in the reference system. The relativistic velocity-dependent redshift has the following form when object and observer are moving away from each other:

$$z = \sqrt{\frac{c+v}{c-v}} - 1 \qquad (10)$$

However, this relation, which is supposed to be specifically relativistic, is rejected for application in cosmology on the grounds that the metric our spacetime is not a Minkowski metric. Although also in this publication it is admitted because of the validity of (02) that the Minkowski metric describes our spacetime incompletely, nevertheless it can be shown that equation (10) holds.

From the Doppler effect it is known that the sound frequency of the observer changes f_{obs} decreases at its distance from the source with f_0 decreases as follows [06]:

$$f_{obs} = f_0 \left(1 - \frac{v}{c}\right) = f_0 \left(\frac{c-v}{c}\right) \qquad (11)$$

Thereby c is the speed of sound in the medium. For electromagnetic waves, the propagation speed is the speed of light. Also here a frequency increase occurs at approach and a reduction at distance of the observer. Whose frequency of light is now relativistically reduced according to (07), that of the source f_0 or that of the observer f_{obs} ? The observer moving with the velocity v is more energetic.

Thus, it must be true for relativistic observation with high velocity of the observer:

$$f_{obs} = \frac{f_0}{\sqrt{1-\frac{v^2}{c^2}}}\frac{c-v}{c} = \frac{f_0}{\sqrt{\frac{c^2-v^2}{c^2}}}\sqrt{\frac{(c-v)^2}{c^2}} = \frac{f_0}{\sqrt{\frac{(c+v)(c-v)}{c^2}}}\sqrt{\frac{(c-v)^2}{c^2}} = f_0\sqrt{\frac{c-v}{c+v}} \quad (12)$$

If the source moves away from the observer, the Doppler effect applies:

$$f_{obs} = f_0\frac{1}{1+\frac{v}{c}} = f_0\frac{c}{c+v} \quad (13)$$

Here the source is more energetic because of its movement with velocity v more energetic. Thus, in relativistic observation with high velocity for the frequency f_{obs} of the observer a relativistic reduction must apply:

$$f_{obs} = f_0\sqrt{1-\frac{v^2}{c^2}}\frac{c}{c+v} = f_0\sqrt{\frac{(c+v)(c-v)}{c^2}}\sqrt{\frac{c^2}{(c+v)^2}} = f_0\sqrt{\frac{c-v}{c+v}} \quad (14)$$

Equation (12) and (14) agree, consequently it does not matter here who moves away.

For safety's sake, the approach shall be considered. If the observer approaches the source, his frequency increases f_{obs}. The known Doppler formula is valid:

$$f_{obs} = f_0\left(1+\frac{v}{c}\right) = f_0\left(\frac{c+v}{c}\right) \quad (15)$$

Because the observer is in motion, the relativistic frequency increase must be attributed to him f_{obs} must be attributed to it. For his frequency applies with (15):

$$f_{obs} = \frac{f_0}{\sqrt{1-\frac{v^2}{c^2}}}\frac{c+v}{c} = \frac{f_0}{\sqrt{\frac{c^2-v^2}{c^2}}}\sqrt{\frac{(c+v)^2}{c^2}} = \frac{f_0}{\sqrt{\frac{(c+v)(c-v)}{c^2}}}\sqrt{\frac{(c+v)^2}{c^2}} = f_0\sqrt{\frac{c+v}{c-v}} \quad (16)$$

If the source approaches the observer, on the other hand, the following applies for the frequency f_{obs} according to Doppler:

$$f_{obs} = f_0\frac{1}{1-\frac{v}{c}} = f_0\frac{c}{c-v} \quad (17)$$

Now, because of the movement of the source, it must become more energetic:

$$f_{obs} = f_0\sqrt{1-\frac{v^2}{c^2}}\frac{c}{c-v} = f_0\sqrt{\frac{(c+v)(c-v)}{c^2}}\sqrt{\frac{c^2}{(c-v)^2}} = f_0\sqrt{\frac{c+v}{c-v}} \quad (18)$$

The equations (16) and (18) are in agreement, consequently it does not matter here who moves towards the other. It all fits with the observations of nature. And it has nothing at all to do with the special relativity theory which explains the relativistic connections completely wrong.

It is interesting that the basic principle of a constant product of mass and time according to equation (08) is also valid for the universe as a whole. The product of the mass of the universe and its age, which can be described as its entropy, is constant for all times [07]:

$$m_{uni}t_{uni} = const. \quad (19)$$

That means, the older the universe becomes, the smaller its mass becomes. Although I have discovered this principle already almost 10 years ago, and I could confirm it with quite a few calculations and have documented it in various publications, the general recognition is still missing. With the age of the universe all periods of all oscillating quanta and objects are extended. They become thereby energy-poorer, since their frequency sinks. This also means that all wavelengths must become larger. All object sizes and distances grow with it. The radius of the universe must become larger likewise proportionally with the age of the universe. The universe does not perform an accelerated growth, as it is concluded wrongly from the observation of far away supernova of the type Ia with the postulate of dark energy.

Which velocity is measured with the redshift? With the equations (12) and (14) one comes with (09) to the following equation for the velocity from the redshift z:

$$v = \frac{cz^2+2cz}{z^2+2z+2} \qquad (20)$$

With high values for the redshift in large distance of the measured galaxies, the velocity according to (20) approaches more and more to the speed of light. Only is this a correct measurement?

Today it is claimed that equation (20) is not suitable for cosmological velocity calculation, since it allegedly follows from special relativity, and is not suitable for large distances in the cosmos [08]. As shown above, the equations (12) and (14) follow from a pure Doppler consideration, which was made here for light.

The space-time-structure is not described completely with the Minkowski-metric according to equation (01), nevertheless with (01) and its extension to (02) the equation (20) is correct and applicable. It is suitable for the detection of galaxy movements in space as well as for their movement with space, i.e. with the cosmic expansion.

In [09] I have pointed out and proved mathematically that the ratio of distance to escape velocity of any galaxy related to ours always corresponds to the ratio of space radius to light velocity. Here, the result of every ratio is always the space age. And the space age is the reciprocal Hubble constant, expressed in SI units. This fits consequently to the observation. Since our point of view can be applied to any galaxies, it is universal.

Here I would like to lead a further proof, namely the proof that in our universe the escape velocity and thus the observed redshift of a galaxy in relation to ours is always the same for a fixed distance (see figure 1). Again briefly to the reminder. The described universe is spherical and its center M_P rests. Its finite radius R_P, which results from the product of space age and speed of light, increases with speed of light. Each galaxy has an expansion velocity with space, which depends on where it is located in the universe.

The sphere surface described by the radius of the universe represents an event horizon according to my estimation, as it is known from black holes. It would be possible that a two-dimensional image of all events already happened in the 3-dimensional space exists here. This information was previously in the structure of matter, which decays over time. Since the surface of the universe grows, it behaves like the past which also constantly becomes bigger. Their information could be stored on the event horizon.

The real past of the galaxies in the different distances is visible for us in principle. We see them in a certain space age, which is smaller in comparison with the today's one by the light running time. In different publications I tried to assign the time ranges of the new space-time equation (02), which has the mathematical form of a spherical equation, with their imaginary parts to cosmological structures [04]. For example, if an event occurred 100 years ago at a distance greater than 100 light years, it is in the imaginary past for a current event here on Earth. It could have no influence on the current event. If another event will take place only in 100 years, it cannot be influenced by the current event if it is more than 100 light years away. It is in the imaginary future of the current event here [10]. The event horizon could be formed by the past. If the space pulsates, it is in the expansion phase until the reversal point before the compression.

Let's assume that the future of the universe is reduced to zero at the reversal point of the pulsation and the past is maximum. Then no more events can take place later during the expansion. Therefore, there can be no imaginary future any more. If the past is maximum, there can be also no event which took place in a younger past and which has not affected us here yet. That means also the imaginary past must have become maximum, otherwise the real past would continue to grow. Now the following can be stated:

1. the past grows during the expansion of the universe and possesses a real and an imaginary time part. According to the equation (02) this time part is coupled to imaginary light. It has the property of instantaneous propagation [02], completely absorbs real starlight and also completely emits it in the form of 3-K background radiation with ideal blackbody profile. Using a radiation power balance, this approach has allowed us to determine the number of stars in the universe in good agreement with observation [11]. During the pulsation of the universe, a radiation equilibrium is established. All past information, which was first in the structure of the mass, could be stored on the 2-dimensional event horizon.

2. the future becomes smaller during the expansion of the universe and possesses also a real and an imaginary time part. It could be noticeable in form of the dark mass in the outer area of the galaxies. Here the imaginary light could unfold its instantaneous effect in the form of a gravitational effect.

3. the mass decay postulated by the author could be a neutrino decay, which represent the smallest mass components. In this process, two magnetic monopoles could be created from each neutrino, a north and a south pole, each having a real and an imaginary part [12]. The north poles released during neutrino decay could *erase* the future and the south poles released could *form* the past. The overall magnetic charge is conserved in this process because equal numbers of north and south poles are released. The magnetic monopoles attract each other in case of equal charges and move to the outer regions of the galaxies (north poles) as well as to the event horizon of the universe (south poles) after the mass decay. Different magnetic monopole charges would have to repel each other. Therefore the north and south poles are separated after the mass decay.

So that the universe can pulsate without contradiction, the matter remaining after the mass decay must be converted into antimatter in the reversal point. This can move then backwards in the time. That means, all processes with antimatter run, related to the current time direction, from the future into the past.

The past of the matter decay becomes consequently the future of the antimatter formation. The mass of the antimatter becomes larger thereby, the neutrinos decayed during the expansion into north and south poles unite now to antineutrinos. The past information from the matter stored on the event horizon becomes now structure-forming for the antimatter. The event horizon becomes smaller with the formation of the antineutrinos. The north poles stored in the antineutrinos now erase the future of the antimatter. At the same time, the dark matter as the past of the antineutrinos now becomes larger. The south poles embedded in the antineutrinos now form the past of the antimatter. From a certain size of the mass of the antimatter, this is transformed again into matter, the time flow is directed again into the future and the normal matter decays again...

These considerations allow a natural-scientific justified assumption of the rebirth. All organisms have a material and informal basis and would have to follow consequently the development of the universe.

A pulsation of the universe is already probable because the light, all quanta, all life processes and all celestial bodies oscillate. I have derived the wave equation of the pulsating, spherical universe in [13]. It contains as differential equation of 2nd order the 3 spatial and the 2 temporal dimensions.

The universe could exist as a black hole because of this event horizon. It fulfills the condition: $r_{uni} = GM_{uni}/c^2$. Everything outside the event horizon of the universe is timeless and therefore not defined. Here no events can take place. The question what is outside of the universe is therefore physically senseless. The spatial position of our galaxy in a spherical universe is not clarified. The abnormal giant hole in the universe found by Rudnick, Brown and Williams in 2007 with a diameter of 1 billion light years to a distance of 6 to 10 billion light years could be an indication of a short way to the event horizon [14].

In figure 1, for example, the galaxies G_1 and G_4 with the velocities $|v_1|$ and $|v_4|$ have exactly 75% of the speed of light and the galaxies G_2 and G_3 have only 25% of the speed of light.

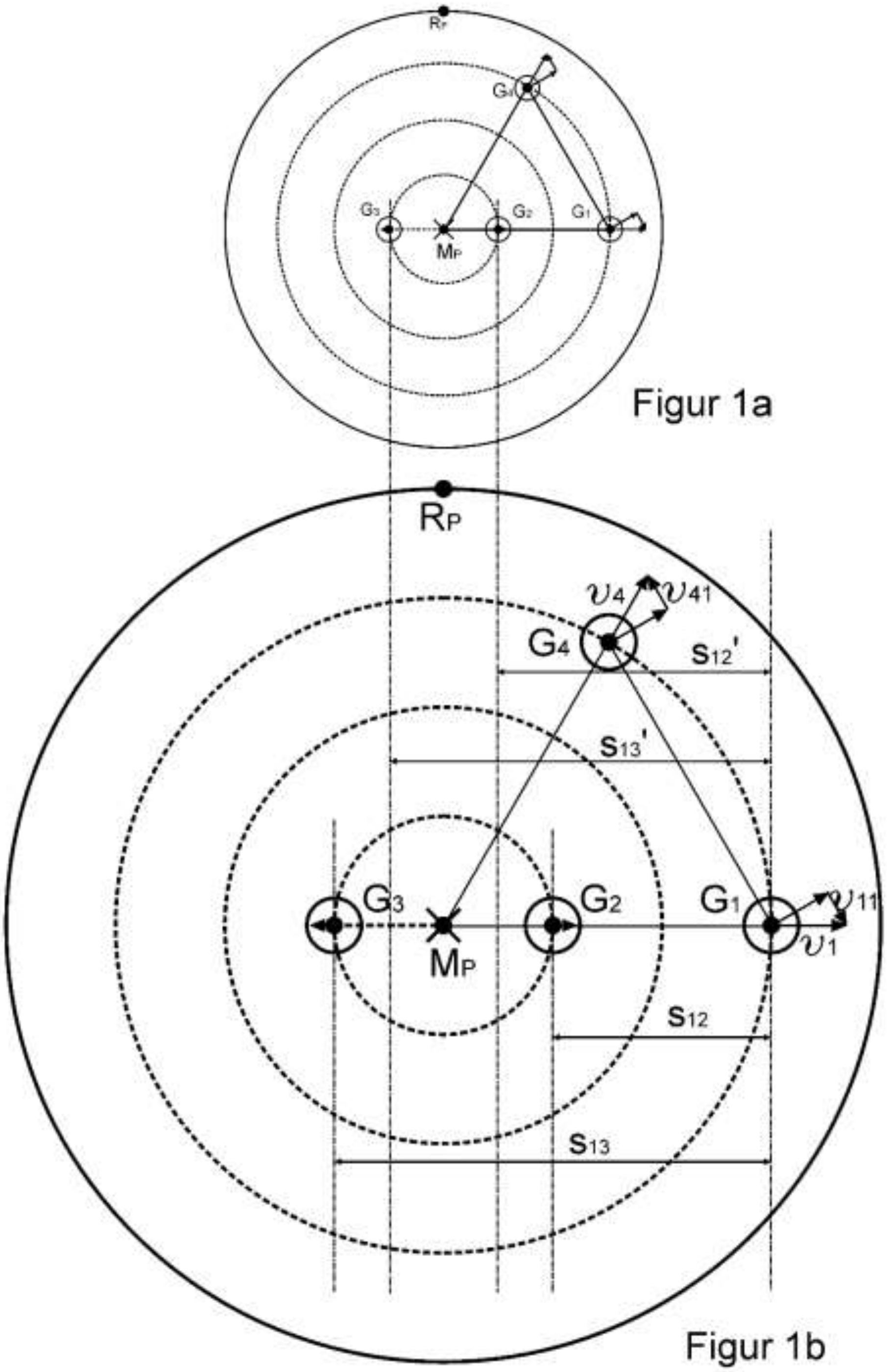
Figure 1a shows the universe at a time when it was half as old as our universe today. Figure 1b shows the universe today.

It can be seen that the radius of the universe half as old is exactly half as large as that of the present universe. All distances have doubled, also the expansion of each galaxy.

The distance s_{12} is the distance between the galaxies G_1 and G_2 , the distance s_{13} is the distance between the galaxies G_1 and G_3 . The distance s_{12}', which is larger than the distance s_{12}, represents the distance between the present galaxy G_1 and the old galaxy G_2. However, this distance refers to the present size of the universe and therefore does not occur in reality. The distance s_{13}', which is smaller than the distance s_{13}, represents the distance between our present galaxy G_1 and the old galaxy G_3. This distance refers also to the today's size of the universe and does not occur therefore in the reality also. Do the distances s_{12}' and s_{13}' have effects on the observed red shifts of the light of the galaxies G_2 and G_3, which was emitted at the time of the half space age?

Since the light path was stretched during the expansion of space in the same way as the galaxy distance, the distances s_{12}' and s_{13}' must not be taken into account when considering the redshifts. It was shifted with the expansion the starting points of the light emitted by G_2 and G_3. From these new starting points the correct observation distances s_{12} and s_{13} to the two galaxies result today.

As already mentioned, the escape velocities of the galaxies G_1 with v_1 and G_4 with v_4 are 75% of the speed of light. They refer to the center of the universe M_P and they always remain constant during the aging of the universe (see figure 1a and 1b). The distance between the galaxies G_1 and G_4 is exactly as large as the two distances of the galaxies G_1 and G_4 to the center of the universe M_P . If also the relative speed is $|v_{11}| + |v_{41}|$ between G_1 and G_4 is exactly as large as that of G_1 and G_4 with $|v_1|$ and $|v_4|$ with respect to the center of the universe, i.e. 75% of the speed of light? Vectorial velocity fractions can be used for the evaluation. The sum of the amounts of the equal velocity vectors v_{11} and v_{41} is the velocity with which the galaxies G_1 and G_4 move away from each other. The geometrical evaluation shows that holds: $|v_{11}| = |v_{41}| = 0{,}5|v_1| = 0{,}5|v_4|$. This means that the relative velocity between both galaxies is $|v_{11}| + |v_{41}|$ is also 75% of the speed of light. And this is true for all times. The equilateral triangle described by the center of the universe M_P , G_1 and G_4 always remains equilateral. Each side becomes larger with the time in the same scale as the space radius. The ratio of the distance between both galaxies G_1 and G_4 to the relative velocity between them must always result in the respective space age (reciprocal Hubble constant). Therefore, the three relative velocities between the vertices of the triangle must always remain constant. Consequently, one <u>cannot</u> speak of an accelerated growth of the universe.



Distances *R* of the galaxies from the centre M_P of the universe

R_P: $R=R_{uni}$

G1: $R=3/4R_{uni}$

G_2,G_3: $R=1/4R_{uni}$

M_P: $R=0$

Velocities υ of the galaxies in the universe

R_P: $\upsilon=c$

G_1: $\upsilon=3/4c$

G_2,G_3: $\upsilon=1/4c$

M_P: $\upsilon=0$

Distances *s* of the galaxies to our galaxy G_1

G_2: $s_{12}=1/2R_{uni}$

G_3: $s_{13}=R_{uni}$

Velocities υ of the galaxies in Relation to our galaxy G_1

G_2: $\upsilon=3/4c-1/4c=1/2c$

G_3: $\upsilon=3/4c+1/4c=c$

Distances between the old and today's universe

$s_{12}'=s_{12}+1/8R_{uni}=1/2R_{uni}+1/8R_{uni}=5/8R_{uni}$

$s_{13}'=s_{13}-1/8R_{uni}=R_{uni}-1/8R_{uni}=7/8R_{uni}$

Figur 1

This shall be explained in more detail by calculations of different distances of galaxies from our observation position. Table 1 shows the calculations which agree with the observations and verify the universe according to figure 1.

In the 1st line the respective distance s of the observed galaxy to ours is defined. In the 10th column of the 1st line a distance is chosen s_{fix} is chosen, which is 99% of the radius of the universe. The 2nd line gives the ratio s/r_{uni} of the distance to the present radius of the universe. The 3rd line shows the velocity of the respective galaxy relative to ours. For this the velocity v_{fix} in the 10th column of the 3rd line is set to 99% of the speed of light. Each further velocity is calculated with the respective distance according to the formula $v = s\, v_{fix}/s_{fix}$. In the 4th line the ratio v/c speed of the galaxy to the speed of light is calculated. It is evident that this ratio agrees with the ratio s/r_{uni} from the 2nd line. The 5th line shows that the ratio $t_{uni} = s/v$ always gives the age of the universe. In the 6th line, the reciprocal value of the space age t_{uni} is calculated as the well-known Hubble constant in SI units. It comes out precisely for all distances with the respective velocities. In the 7th line the redshifts are calculated z are calculated according to equation (10). In the 8th line, a control calculation is performed according to equation (20) for the velocities of the galaxies. The 9th line shows the ratio λ_{obs}/λ_0 of the observed wavelength λ_{obs} to the reference wavelength λ_0. One recognizes that with larger distances the wavelengths λ_{obs} increase, thus are red-shifted. The 10th line shows the respective age of the universe at which the light of the observed galaxy was emitted . It is calculated as follows: $t_{start} = t_{uni} - s/c$. For example, at a small distance s as it occurs in the 1st column of the 1st line, the universe at the time of the light emission, has already almost the present age.

s (m)	6.523E+22	6.523E+24	1.305E+25	3.262E+25	4.893E+25	6.523E+25	9.785E+25	1.174E+26	1.239E+26	1.292E+26
s/r_{uni}	0.001	0.050	0.100	0.250	0.375	0.500	0.750	0.900	0.950	0.990
v (m/s)	1.499E+05	1.499E+07	2.998E+07	7.495E+07	1.124E+08	1.499E+08	2.248E+08	2.698E+08	2.848E+08	2.968E+08
v/c	0.001	0.050	0.100	0.250	0.375	0.500	0.750	0.900	0.950	0.990
t (s)	4.352E+17	4.352E+17	4.352E+17	4.352E+17	4.352E+17	4.352E+17	4.352E+17	4.352E+17	4.352E+17	4.352E+17
Hubble ((m/s)/m)	2.298E-18	2.298E-18	2.298E-18	2.298E-18	2.298E-18	2.298E-18	2.298E-18	2.298E-18	2.298E-18	2.298E-18
z	**0.00**	**0.05**	**0.11**	**0.29**	**0.48**	**0.73**	**1.65**	**3.36**	**5.24**	**13.11**
v control (m/s)	1.499E+05	1.499E+07	2.998E+07	7.495E+07	1.124E+08	1.499E+08	2.248E+08	2.698E+08	2.848E+08	2.968E+08
λ_{obs}/λ_0	1.00	1.05	1.11	1.29	1.48	1.73	2.65	4.36	6.24	14.11
Start age (10^9a)	**13.8**	**13.1**	**12.4**	**10.4**	**8.6**	**6.9**	**3.5**	**1.4**	**0.7**	**0.1**

Table 1: Calculation of redshifts of galaxies at different distances

The following diagram 1 shows the relation between the age of the universe at the time of the light emission of the galaxy observed in each case at a certain distance and the calculated redshift. The calculation agrees very well with the observation. The course of the curve from diagram 1 is known in principle and was determined in such a way also with measurements at galaxies in certain distances.

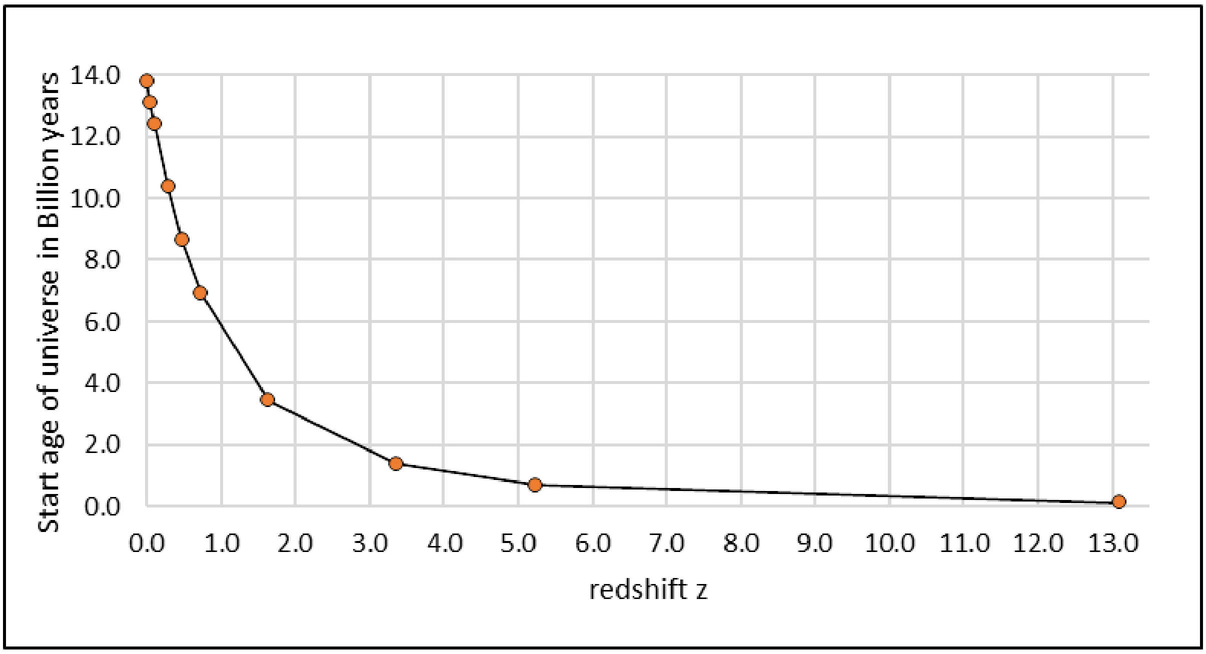


Diagram 1: Age of the Universe at Light Emission and Redshift

Thus, the measured cosmological redshifts not only show the relative velocities between galaxies, but are also a measure of the distances!

3. Real and false constants of nature

In order to give as comprehensive a description of the universe as possible, the temporal behavior of important natural constants already published by me is given here [15].

Time constant are: Electric and magnetic elementary charges, the effective quantum, the speed of light, the fine structure constant, the Boltzmann constant, the influence constant and the induction constant.

Time-variable are: All periods and the space age, all temperatures, all elementary and object masses, the gravitational constant, all object sizes and distances, all frequencies and wavelengths, also the Compton wavelength, the Rydberg constant, the Bohr magneton.

Only if this temporal behavior of the nature-describing constants and definition quantities is taken into account, the unity of quantum physics and cosmology can be established.

4. Conclusions

Only because with increasing distance the relative velocities of the galaxies increase, this does not mean yet that the universe expands accelerated. The escape velocities of the galaxies and each spherical shell of the universe remain constant during its expansion. With the expansion of the universe all masses of the objects must become smaller and all object sizes and the distances must increase.

5. Summary

According to the available calculations it is proved that the universe does not expand accelerated. The dark energy is not needed for the explanation of the behavior of the universe. The calculations made agree with the observations.

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