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The Non-cosmological Redshifts Contradict the Big Bang Paradigm

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Abstract

In this paper are reviewed the major causes which produce the redshift of the cosmic radiation. It is proposed a classification of the reshifts in velocity related and intrinsic and thei characteristics are analized. After this analysis it is concluded that the radiation redshift is a multicausal loss of its energy and as a consequence a multicomponent one. The radiation redshift which emerge at the observer as a total redshift has velocity related and non velocity related causes which are not related to a supposed expansion. Consequently the fundamental argument on which the cosmological models with expansion were build seems to be due to a peculiar interpretation of the observational data.

Key words: *velocity related redshift, intrinsic redshift, total redshift*

The radiation redshift and its meaning

It is known the fact that the principal source of astrophysical informations is the electromagnetic radiation emitted by the matter in the form of plasma from stars and hot gas cosmic clouds.

After Fizeau and Huggins have discovered a slight movement towards red of some lines in the spectra emitted by the luminous stars, Slipher used this movement to measure the velocities of the galaxies. Thus this movement became one of the most frequently measured characteristics of the radiations. Beyond being a simple routine measurement, the redshift was at the basis of a series of scientific theoretical investigations concerning the causes and the consequences of its values, which are in turn dependent of the space geometry. From this reason, the redshift problem became one of the crucial problems of astrophysics. The resolution of this problem has decisively influenced the twentieth century cosmology and it was one of the fundamental pillars of the Big Bang paradigm.

The electromagnetic radiation is a discontinuous emission, in the form of quanta (photons) which differ by their energy ε. This energy is proportional with their frequency ν and a constant h – the Plank constant:

$$\varepsilon = h\cdot\nu \,. \tag{1}$$

In the same time the quanta of the electromagnetic radiation possesses wave properties, i.e. it is moving as waves with the speed of light $c=2.99792458\cdot10^{8}$ $m\cdot s^{-1}$. If we note the wavelength with λ and with ν the frequency, we can write:

$$\lambda \cdot \nu = c \text{ or } \nu = \frac{c}{\lambda} . \quad (2)$$

Introducing the expression for ν from (2) in (1) we obtain:

$$\varepsilon = h\frac{c}{\lambda} \text{ or } \lambda = h\frac{c}{\varepsilon} . \quad (3)$$

From here results that the redshift which indicates an increase of the wavelength has also the physical significance of an energy loss of the radiation, during its travel from the source to the observer. From this reason, the key of the redshift problem resides in the causes which determine the radiation energy loss during its travel. There can be many such causes. That is why, according to the nature of the causes there can be many types of redshifts. Each of them can represent a partial component of the total redshift.

If we note with λ_0 the wavelength of a monochromatic radiation, from the spectrum of a source, radiation received by the observer and with λ the wavelength of the same monochromatic radiation at the moment of its emission at the source, the relation for defining the redshift z is:

$$z = \frac{\lambda_0 - \lambda}{\lambda} . \quad (4)$$

We replace in (4) the expressions of λ and λ_0 with the value resulted from (3) and we obtain:

$$z = \frac{\varepsilon - \varepsilon_0}{\varepsilon_0} , \quad (5)$$

or:

$$\Delta\varepsilon = \varepsilon - \varepsilon_0 = z\varepsilon_0 , \quad (6)$$

where ε_0 and ε are the energies of the radiation quanta from the receiver and the emitter respectively.

A series of authors [1, 2, 9, 15, 16, 17, 22] which have approached in the last decades the problem of the redshift radiation, have taken into consideration more insistently the so called noncosmological redshifts. These redshifts gathered together can form into a serious alternative to the cosmological redshift.

From a causal point of view we can distinguish the following types of redshifts:

1. Kinetic redshifts, caused by the Doppler-Fizeau effect:

    1.1. Velocity related redshifts – caused by the relative speeds of the radiation sources and observers;

    1.2. The rotational redshift – caused by the rotation motion of the Metagalaxy;

2. The geometrical redshift – caused by the configuration and expansion of space (the cosmological redshift);

3. Interaction redshifts:

    3.1. Caused by the interaction between the photons, or between photons and other particles (redshifts caused by the Compton Effect);

    3.2. Caused by the interaction between the gravitational field and photons (redshifts caused by the Einstein Effect);

3.3. Caused by the interaction between the magnetic field and the photons (redshifts caused by the Zeeman Effect);

3.4. Caused by the interaction between the electric field and the photons (redshifts caused by the Stark effect);

4. Intrinsic redshifts – caused by the time variable properties of matter, from its formation to the reception in the form of radiation at the observer.

Kinetic redshifts

The kinetic redshifts are considered those redshifts, which have their causes in the existence of a relative motion, recession or approach, between the source of radiation and the observer. They emerge if the two entities are not in relative repose one compared to the other. The explanation for this type of redshift is given by the Doppler-Fizeau effect. This is a physical effect; due to this physical effect the vibration frequency of an oscillatory perturbation (electromagnetic wave, sound wave, etc.) received by an observer is different from the vibration frequency emitted by the source, smaller or greater, depending on how the source is relatively approaching or receding from the observer.

The relative movement between the two bodies which belong to the Universe can be due to some local causes or to some global causes at the Metagalaxy scale. Among the local causes we mention the rotation of the galaxies or the relative translation movement between the galaxies in the clusters or superclusters and also the quasar ejection from the active galactic nuclei. The principal global cause for the kinetic redshift is the Metagalaxy rotation. To differentiate these causes we shall name the two types of kinetic redshift: velocity related redshifts and rotational redshifts.

Velocity related redshifts

Let v be the propagation speed of a wave, V the speed of the wave source and V_0 the speed of the observer, on the source-observer sight direction. Between the frequency of the received vibrations V_0 and the frequency of the emitted vibrations at the source we can write the relation:

$$\nu_0 = \nu \bar{i} \frac{v \pm V_0}{v \mp V}. \tag{7}$$

Here $\bar{i}$ is the direction of the versor given by the visual range towards the source. The +/- signs from above the fraction line are valid in the case when the radiation source is approaching the observer and the -/+ signs from below the fraction line are valid in the case when the source and the observer are receding one from another.

The vibrations of the electromagnetic radiations are moving with the speed of light c, in all directions and the scalar of the relation (7) becomes:

$$\nu_0 = \nu \frac{c \pm V_0}{c \mp V}. \tag{8}$$

This equation valid in the Newtonian mechanics, is compatible with the cases in which the speeds of the radiation source and of the observer are relatively small ($V, V_0 \ll c$).

We make in (8) the substitution $\frac{c \pm V_0}{c \mp V} = A$ and we obtain:

$$\nu_0 = \nu \cdot A \text{ or } \nu = \frac{\nu_0}{A}. \tag{9}$$

We subtract ν_0 from both sides of the equation (9) and we substitute the frequency with the expressions from (2). We obtain:

$$\frac{c(\lambda_0 - \lambda)}{\lambda_0 - \lambda} = \frac{c}{\lambda_0}\left(\frac{1}{A} - 1\right). \tag{10}$$

Next we multiply both sides with λ_0 and we make the necessary simplifications so that it results:

$$\frac{\lambda_0 - \lambda}{\lambda} = \frac{1}{A} - 1 , \tag{11}$$

which, taking into consideration equation (4) and the substitution for A can be also written:

$$z + 1 = \frac{c \mp V}{c \pm V_0} \tag{12}$$

The -/+ signs from above the fraction line correspond to the approaching of the source towards the observer, which leads to negative redshifts (blueshifts) and those from below the fraction line corresponds to the recession of the source from the observer, which leads to positive redshifts.

In the case when the movements of the source and the observer are done in random directions which determine the α and β angles with the visual direction (fig. 1), the equation (12) becomes:

$$z + 1 = \frac{c \mp V\cos\alpha}{c \pm V_0 \cos\beta} \tag{13}$$

Equation (13) corresponds to the velocity redshifts connected with the Doppler-Fizeau non-relativist effect.

If the observer and source velocities are high and they are close to the speed of light it is necessary to apply the special theory of relativity to the Doppler Effect. Thus we use the Lorentz transforming equations and from (12) and (13) we obtain:

$$z + 1 = \frac{\left(1 \mp \frac{V}{c}\right)\left(1 - \frac{V^2}{c^2}\right)^{-1/2}}{\left(1 \pm \frac{V_0}{c}\right)\left(1 - \frac{V_0^2}{c^2}\right)^{-1/2}} , \tag{14}$$

respectively

$$z + 1 = \frac{\left(1 \mp \frac{V}{c}\cos\alpha\right)\left(1 - \frac{V^2}{c^2}\right)^{-1/2}}{\left(1 \pm \frac{V_0}{c}\cos\beta\right)\left(1 - \frac{V_0^2}{c^2}\right)^{-1/2}} . \tag{15}$$

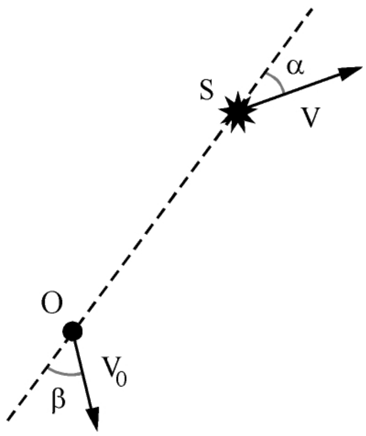

Fig. 1. The source S is moving with the speed V compared to the observer O which is moving with the speed V_0. The two speed vectors V and V_0 make the angles α respectively β with the visual direction

For the stars from our galaxy which have v<<c the redshifts caused by the Doppler-Fizeau effect are very small $z \leq 0.001$.

The spectroscopic method was used for the first time for measuring of the radial speeds in 1912 by V. Slipher in the case of the nebula from Andromeda. With this occasion it was established that it presents a spectral shift to violet which corresponds to a radial speed of approaching towards our galaxy of ~300 $Km \cdot s^{-1}$. In the next two years he has already measured 13 radial speeds [14]. With the increasing number of such measurements it become clear the fact that the shifts to red are prevalent. The measurements have indicated bigger and bigger values as the investigated galaxies were more far away. Thus the observational data indicated a back away of the galaxies. The investigations made by Slipher were continued by M.L. Humason and E. Hubble. Humason which has used the Hooker reflector on Wilson Mountain, has managed until 1930 to determine a redshift z=0.07 which corresponds to a receding velocity of 20000 Km s^{-1}. Between 1931-1936, Humason alone or with Hubble has managed to determine recession speeds as high as 40000 Km s^{-1} (z=0.143). Later in 1949, after the Schmidt reflector with a diameter of 5m, was brought into service on the Plaomar Mountain, Humason managed to determine seeds of 60000 Km s^{-1} corresponding to a redshift of $z \cong 0.225$. Compared with the local group galaxies which have small redshifts (z~0.1), the other ten thousands of galaxies investigated until the end on 1980 have also shown moderate redshifts ($z \leq 2$). Even the most faraway galaxies discovered to this date have $z \leq 1$.

In the ninth decade of the twentieth century there have been made a lot of efforts for discovering galaxies with higher redshifts: $z \cong 1$. It was necessary to overcome a new technological frontier through the introduction in use of the Keck mirror telescope from Hawaii and of the Hubble Space Telescope (HST) in 1990. The investigation techniques have been also improved through the introduction of the method based on “Lyman break” by Chuch Steidel and his colleagues from the Californian Institute of Technology [24]. Thus it has been possible in the period 1996-1998 to discover and to study the galaxies from the Hubble Deep Field (HDF) with redshifts over z~3,5. This hunting of faraway galaxies initiated at the beginning of the nineties by S. Lilly from the Hawaii University and R. Ellis from the Durham University (Great Britain) has continued. Through long time exposures (over 11 days) and through the combination of the images taken by two devices: the advanced research camera (ACS) and the multi-object spectrometer NICMOS it has been succeeded to approach also the Hubble Ultra Deep Field (HUDF) after 2000. Thereby there were identified dim objects with redshifts z~6-7, located at a distance of 13 billions light years. This research goes on. It is has been predicted that in the next years there will be identified objects in the redshift range z=7-12. After some researchers, the highest redshift could be that of the cosmic microwave background z≈1000 [24].

On the basis of the measurements made until 1929 and of the magnitude-distance and magnitude-velocity correlations, Hubble has established the linear law that bears his name. According to this law, one of the most faraway cosmic objects known, the quasar SdSS J10444-0125, located at a distance of ~ $4 \cdot 10^3$ Mpc, is receding with a speed of $2{,}968 \cdot 10^8$ m s^{-1} which represents 99% from the speed of light. All the objects located beyond ~4200 Mpc should have receding speeds greater that speed of light. The exceeding of the speed of light, which is a limit speed, is not possible. In this case, or the Universe is limited to a radius of ~4200 Mpc or the Hubble law must be put under examination.

A large number of astronomers have brought into attention that Hubble law is not accurate. For example the speeds of the twenty dwarf galaxies from the Local Group, located at less than 3 Mpc from us, are much smaller than the speeds that result from the Hubble law. Their redshifts are caused rather by some local relative movements which can generate even negative redshifts. As far back as 1935 R.J. Trumpler has pointed out in the galactic clusters from the Milky Way nine stars with redshifts greater than their clusters. Later Frindley and Freundlich (1954) and H. Arp [1] have pointed out that the young stars O, OB and B with bluish white color and high temperatures at which the He II (O stars) and He I (B stars) absorption lines are present have redshifts greater than the rest of the stars from their clusters and the surrounding gas clouds.

After the discovery of the quasars in 1963, more astronomers have reported that their redshifts are not correlating with the distances at which they are supposed to be [1][4]. In more of his papers H.Arp [1][2] has commented the spatial association of some large Seifert galaxies with a low redshift with smaller companion galaxies but with greater redshifts. He has also noted the presence of some quasars or quasi-quasars with much higher redshifts located in the proximity of some galaxies with low redshift. For that matter the distribution diagram of the quasar redshifts with their magnitude show a very large scatter and has no affinity with a linear distribution.

All these observational data are counterarguments for the exclusivity of the velocity redshifts caused by the Doppler-Fizeau effects.

The rotational redshift

In the case of the Metagalaxy in rotation with the angular speed ω, M. Ionescu and M. Ciocîrdel [9] have pointed out that the radiation is crossing from the source to the observer a distance greater than the real difference between them. This positive path difference is given by the equation:

$$\Delta R = R\cos\varphi\sqrt{2\left(1-\cos\omega\left(t_0-t\right)\right)}\,, \tag{16}$$

where R is the vector radius of the observer from the center of the Metagalaxy, φ is his metagalactic latitude and $\omega(t\text{-}t_0)$ is the metagalactic longitude angle travelled by the observer between the moment t when the radiation is emitted and the moment t_0 when the radiation is received. This path difference has the significance of a recession of the observer from the source and corresponds to a receding speed whose radial component along the visual radius is:

$$V_r = \frac{\Delta r}{t_0 - t}\cos\beta\ , \tag{17}$$

where β is the angle between the visual radius and the tangential speed vector of the observer V_0 on a circle with the radius $r_0=R_0\cos\varphi$ (fig. 2). In this case, because the real distance between the source and the observer is not changing, we can consider V=0 in equation (15):

$$z+1=\frac{1}{\left(1+\frac{v_r}{c}\cos\beta\right)\left(1-\frac{V_r^2}{c^2}\right)^{-1/2}} \quad . \qquad (18)$$

Equation (18) is similar with presented by L.P. Forminski for the transversal Doppler Effect [6].

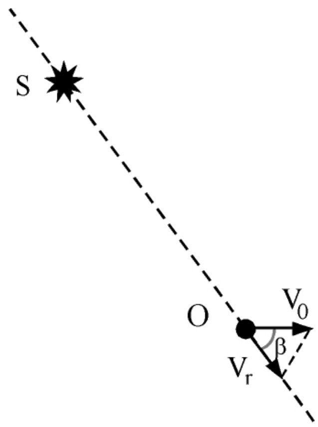

Fig. 2. The radial velocity V_r of the observer recession caused by the rotation movement of the Universe

The cosmological redshift

The Hubble linear law: $v=H_0\cdot d$, with all its no concordances mentioned in the 2.1. paragraph, along with the Robertson-Walker metrics which describes a space in expansion, have composed the key arguments for the cosmologic model of an Universe in expansion. The receding speed of the galaxies in real terms is jus an illusion. The galaxies are not backing away from each other but literally the space between them is expanding. This phenomenon has also the appearance of a Doppler-Fizeau effect. The expansion is an intrinsic property of the space-time. That is why the redshift generated by it is due to a certain space geometry and it was considered as a special type of geometric redshift in contrast with the velocity related redshifts. On this type of redshift were founded the FRW cosmological models and from this reason it is named cosmological redshift [15].

The space expansion was supposed by lack of other arguments, to causally explain the higher receding velocities with the distance. It also offered an elegant solution for the problem of gravitationally collapse. The expanding action of space is opposed to that of the gravitational force and it has the role to maintain the Universe in an equilibrium state. This was an additional reason for the idea of expansion to be adopted.

Let us suppose that the Universe space in expansion is dilating with a rate a m s^{-1} and that in this space are a point source of radiations and a point observer O (fig. 3). At the moment t the source S emits a radiation towards the observer O with the speed of light c. This radiation is received by the observer in the moment t_0, after it has crossed the space $\overline{SO_0}=R_0$, greater than the real distance between the source and the observer SO=R, from the moment of the emission. This increase in the distance is due to the space expansion. The increase in the distance traveled by the radiation is $\Delta R = \overline{OO_0} = R_0 - R = a(t_0 - t)$, where a is the expansion speed.

In relativistic conditions we introduce this equation for speed in (14) and we obtain:

$$z+1 = \frac{\left(1 \mp \frac{a}{c}\right)\left(1 - \frac{a^2}{c^2}\right)^{-1/2}}{\left(1 \pm \frac{a}{c}\right)\left(1 - \frac{a^2}{c^2}\right)^{-1/2}} = \frac{c \mp a}{c \pm a} \tag{19}$$

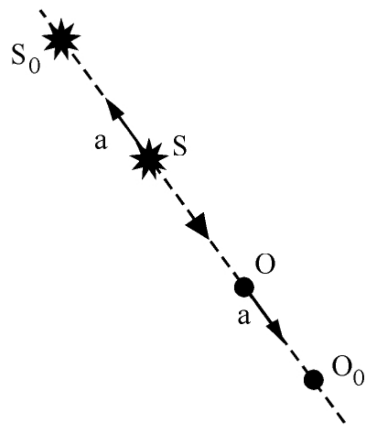

Fig. 3. The distance $\overline{SO_0}$ traveled by the radiation in a time interval t_0-t in a Universe in expansion with the expansion rate a

We find that equation (19) is similar with (12) and that as a function with the value $\frac{a}{c}$ which can be between 0 (a=0 no expansion) and 1 (a=c the expansion has the speed of light) z can have values between -1 and ∞ ($-1<z<\infty$). To a cosmological redshift 0 corresponds the absence of Universe expansion.

The observational data prove to us that the galaxies from the Local Group located at a distance R≤3 Mpc from us, are not in accordance with the Hubble law and as a consequence they have not cosmological redshifts. In turn, Hubble linear law can be verified with the galaxies from the Local Supergroup and from its proximity (R~100Mpc). As the cosmic objects are more distant so is greater their deviation from the linear law.

Though immediately after the discovery of the first quasars SC273 and 3C48 in 1963, the numerous attempts to verify the Hubble law have not given good results in these cases. The conclusion reached by numerous researchers which have studied the quasar redshifts, now known as many as tens of thousands but also for other distant bodies was that they don't have cosmological redshifts [1, 2, 3, 4, 8, 15].

Regarding the space expansion a big problem appears. Let us suppose the following mental experience: Let us suppose that in the Universe there are beside us other observers located at very long distances from our galaxy. In accordance with the cosmological principle, they should observe in the Universe the same phenomena which we observe. Studying the redshift of our galaxy they could find about it the same thing that we can find about their galaxy i.e. our galaxy and those from the Local Group are receding with a very high recession speed.

Why we do not also see this phenomenon? In the same way, different observers located at different distances from our galaxy will find for it different recession velocities. Why?

On the other hand, some large sectors of the universal space are subject to collapse to form galaxies, clusters and superclusters of galaxies or even black hole. Here a great contradiction appears: during all the universal space might expand due to an intrinsic property of it, parts of the same space with large dimensions do not expand, instead they have a motion opposed to the expansion.

The supporters of the expansion explain this phenomenon through the fact that in the sectors with matter density excess, strong chemical bonds and gravitational forces act opposing to the expansion.

These few observations based on the numerous deviations from the Hubble law account for a doubt regarding the real expansion of the space and therefore of the cosmological redshift. From this reason numerous researchers [1, 2, 9, 15, 16, 17, 22] have searched for alternatives to the cosmological redshift.

The interaction redshifts

The interactions of the electromagnetic radiations with the elementary particles, atoms, other radiations or force fields have as consequences the partial loss of energy and the decrease in frequency for these electromagnetic radiations. This decrease in frequency can be observed through redshift.

The redshift caused by the Compton Effect

The effect that bears the name of the American physicist A.H. Compton was discovered in 1922-1923 after some X-ray scatter experiments on electrons. This effect represents one from the possibilities of partial absorption of the electromagnetic radiation by the matter. This absorption has as consequence the decrease in energy for the radiation.

At that time the astronomers who discovered the redshift already interpreted it through the known effect Doppler-Fizeau. They considered it to be a velocity related redshift. For a long time they have not known the Compton effect and when they heard about it they did not take it into consideration because it was generated by the X-rays and they were working only in the range of luminous radiations. At the beginning of the radiation discovery it was not known that all of them belonged to the same large electromagnetic spectrum and that the fact which differentiated them was their energy. Later when the astrophysicists have begun to receive informations from the entire electromagnetic spectrum, the FRW cosmological models were in fashion and accepted by all the most of the cosmologists. Thus at that time it was difficult if not impossible to discuss and to accept a causal alternative for the redshift which contradict these models. That is why the Compton Effect was neglected for a long time.

However during the ‘70s were made some sporadic attempts to take into consideration this effect in the case of solar radiations [11]. In spite of the fact that many well known researchers have emphasized the necessity of finding some alternative causes to the cosmologic redshift [1, 2, 3, 4, 12, 15], they have avoided the Compton effect which was only mentioned. Based on the observational data they rather accepted as alternatives velocity related redshifts for the ejected quasars from the active galactic nuclei and old galaxies, gravitational redshifts or intrinsic redshifts.

But what is the Compton Effect? And how could it determine the redshift of the radiation?

The Compton Effect is an energy loss of the radiation caused by an elastic collision with a micro-particle (electron, proton, atom) or with another incident radiation. As a consequence of this collision a quantum is deviated and the path travelled by it becomes longer. And so, it remains behind the block to which it belonged.

Let us suppose that a radiation quantum q which travel with the speed of light c, has an energy $\varepsilon_1 = h\nu_1$ and a wave length λ_1 and that it collides with a microparticle μ. In the arrival moment at the impact it has a mass m_1 and a speed v_1. After the collision, both are scattered and they continue their travel on other directions and in other energetic states (fig. 4). The quantum will have the energy $\varepsilon_2 = h\nu_2$ as a consequence of the transfer of some part of its energy to the microparticle. In a corresponding manner it will also change its wave length from λ_2 to λ_2. Thus, in turn the microparticle will gain a speed $v_2 > v_1$ and an inert mass $m_2 > m_1$.

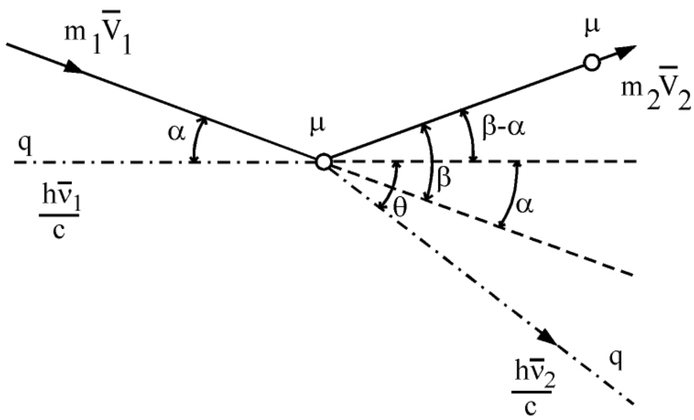

Fig. 4. The sketch of an elastic collision of a electromagnetic radiation quantum q having the energy ε=hν and the wavelength λ with a microparticle μ having the mass m and the speed v. After the collision both are deviated from their initial direction and they are changing their energy state. The deviated quantum will have a smaller energy because of some energy transfer to the microparticle (the Compton Effect)

In the classical physics (v_1, $v_2 \ll c$) m1 is equal with m2 and the kinetic energy of the microparticle is:

$$\varepsilon_c = \frac{1}{2} mV^2, \tag{20}$$

and the impulse is:

$$p = m \cdot v\ . \tag{21}$$

The energy and impulse conservation laws condition that the total energy and total impulse of the system which collides: the quantum-microparticle, to be conserved after the impact. Any energy gain Δε or impulse gain Δp of one from the two components of the system is found a loss at the other component.

In the case of our system the energy conservation law can be written as:

$$h\nu_1 + \frac{1}{2} mV_1^2 = h\nu_2 + \frac{1}{2} mV_2^2, \tag{22}$$

where $m=m_1=m_2$.

In the same way the impulse conservation law is written:

$$\frac{h\overline{\nu}_1}{c}+m\overline{V}_1=\frac{h\overline{\nu}_2}{c}+m\overline{V}_2 . \tag{23}$$

Equation (23) is a vectorial equation and it can be written as two scalar equations if we project the impulse vectors on two orthogonal directions: the initial propagation direction of the radiation and a direction perpendicular on it:

$$\frac{h\nu_1}{c}+mV_1\cos\alpha=\frac{h\nu_2}{c}\cos\theta+mV_2\cos(\beta-\alpha) , \tag{24}$$

$$m_1V_1\sin\alpha=\frac{h\nu_2}{c}\sin\theta-mV_2\sin(\beta-\alpha) . \tag{25}$$

The equations (22), (24) and (25) arranged in accordance with the terms of the two entities q and μ can be written:

$$h(\nu_1-\nu_2)=\frac{1}{2}m(V_1-V_2) , \tag{26}$$

$$h(\nu_1-\nu_2\cos\theta)=mc[V_2\cos(\beta-\alpha)-V_1\cos\alpha] , \tag{27}$$

$$h(\nu_2\sin\theta)=mc[V_2\sin(\beta-\alpha)+V_1\sin\alpha]. \tag{28}$$

With equations (26) and (28) in equation (5) we obtain:

$$z=\frac{\varepsilon_1-\varepsilon_2}{\varepsilon_2}=\frac{(v_2-v_1)\sin\theta}{2c\,[V_2\sin(\beta-\alpha)+V_1\sin\alpha\,]} . \tag{29}$$

In the relativistic physics at very high speeds v_1, v_2 which are close to the speed of light, the inert mass of the particle depends on its speed v_i and it is connected with the inert mass m_0 by the equation:

$$m_i=m0\frac{1}{\sqrt{1-\frac{v_i^2}{c^2}}}=m0\frac{1}{\sqrt{1-V_i^2}} , \tag{30}$$

where $V_i^2=\frac{v_i^2}{c^2}$. In this case the kinetic energy variation after the collision is:

$$\Delta\varepsilon_c=m_2c^2-m_1c^2=m_0c^2\left(\frac{1}{\sqrt{1-V_2^2}}-\frac{1}{\sqrt{1-V_1^2}}\right) . \tag{31}$$

In this case equation (29) become:

$$z=\frac{\left(\frac{v_2}{\sqrt{1-V_2^2}}-\frac{v_1}{\sqrt{1-V_1^2}}\right)\sin\theta}{2c\left[\frac{v_1}{\sqrt{1-V_1^2}}\sin\alpha+\frac{v_2}{\sqrt{1-V_2^2}}\sin(\beta-\alpha)\right]} . \tag{32}$$

From the equations (29) and (32) it results that the redshift is higher as the speed gain of the microparticle after the collision is higher and the spreading angle is higher. In fact the radiation is traveling as quanta packages and through the scatter of some of these quanta, their number decrease on a traveling direction and thus its energy decrease. This is the physical explanation for the radiation redshift through the Compton Effect.

If we note with ψ the probability that a quantum to encounter and to collide with a microparticle on the travelled distance unit, this probability increase proportional with the number N of microparticles which exist in the volume unit.

$$\psi \propto N . \tag{33}$$

This total probalility ψ also increases proportionally with the travelled distance D:

$$\psi \propto N \cdot D . \tag{34}$$

In other words the redshift caused by the Compton Effect increase proportional with the distance and from this reason it acts similarly to the cosmologic redshift. From here it results that it may be an alternative to the cosmological redshift.

The gravitational redshift

Many researchers mention the possibility of the spectral line shift for the electromagnetic radiations due to the difference of the gravitationally potential between the region in which the radiation source is found and that in which the observatory is found [3, 15, 16, 17].

For example Potter and Preston which have approached cosmology through The Quantum Celestial Mechanics (QCM) have interpreted the redshifts of the SNe1a distant light sources in the Universe as being gravitational redshifts. They claim that a high negative gravitational potential determines a non-linear redshift with the distance which corresponds to an apparent gravitational repel [16, 17]. That is why to explain the apparent recession of the galaxies there is no need for space expansion.

The magnitude and spatial distribution of the gravitationally potential in the Metagalaxy can considerably influence the radiation redshift. If we consider the Metagalaxy as a homogeneous sphere with the radius RMG and the mass MMG, the gravitational potential for a point located on its surface or outside it is given by Newton's formula:

$$W = -\frac{G \cdot M_{MG}}{R_{MG}} , \tag{35}$$

where: G is the gravitational constant. In a point in the interior of the Metagalaxy located at the distance R compared to its supposed center, the gravitational potential is:

$$W(R) = -\frac{GM_{MG}}{2R_{MG}}\left[3 - \left(\frac{R}{R_{MG}}\right)^2\right] . \tag{36}$$

We can observe that if R=RMG the equation (36) is identical with (35), and if R=0 we have:

$$W(0) = -\frac{3}{2}\frac{GM_{MG}}{R_{MG}} ,$$

and this means that in the center of the Metagalaxy the gravitational potential in absolute value is 1.5 times bigger that at its periphery.

Consequently in accordance with equation (36) the gravitational potential decrease in absolute value from the center of the Metagalaxy to its periphery after a non-linear law, and beyond this periphery after a linear law to the infinite where it will be 0 ($W(\infty)=0$).

Beside the global gravitational potential of the Metagalaxy, around the large matter concentrations as the giant galaxies, the galactic clusters and superclusters it also exists a local gravitational potential which is overlapping over the global one and it is adding to it:

$$W_t = W(R) + W_L , \tag{37}$$

where: W_t is the total potential, W(R) is the global potential of the Metagalaxy at the distance R from its center and W_L is the local potential.

In the General Theory of Relativity it is indicated that the speed of light from one point located at a distance R from the center of the Metagalaxy is given by the Einstein formula:

$$c(R) = c_\infty\left(1 - \left|U_t(R)\right|\right) , \tag{38}$$

where: c(R) is the local speed of light, c_∞ is the speed of light at infinite where W=0, and $U_t(R)$ is the total reduced gravitational potential of the place $U_t(R)=W_t(R)/\ c_\infty$.

If we take into consideration the relation (38), the relation (2) can be written for the source and the observer as:

$$\lambda \cdot \nu = c_\infty\left(1 - \left|U_t(R)\right|\right) \quad \text{and} \tag{39}$$

$$c(R) = c_\infty\left(1 - \left|U_t(R_0)\right|\right),$$

where $U_t(R)$ and $U_t(R0)$ are the gravitational potentials reduced for the source and the observer.

In this case we can write equation (4) for the redshift, introducing in it the equations (39). Equation (4) becomes:

$$z + 1 = \frac{\nu\left(1 - \left|U(R)\right|\right)}{\nu_0\left(1 - \left|U_0(R_0)\right|\right)} . \tag{40}$$

The value for the redshift caused by the Einstein Effect is higher as the gravitational potential of the radiation source is higher compared with the gravitational potential at which the observer is located. Because the gravitational potential varies non-linearly with the distance also the gravitational redshift increase non-linearly with the distance. The center of the Metagalaxy and the great local concentrations of matter play the role of powerful attractors which act upon the radiation decreasing its frequency and increasing its wavelength. It this way the metagalactic gravitational field has the role of a damper for the electromagnetic radiation.

The redshift caused by the electric and magnetic fields

In an Universe composed mainly of plasma there are strong electric and magnetic fields related to the stars, galaxies, the galactic gas and dust discs and the intergalactic hot gas clouds. As a consequence the electromagnetic radiations are emitted from regions with a high electric potential W_e and a high magnetic potential W_m. The radiations undergo the effects of these high potentials but also the effects of the potential variations during their travel.

There are known the actions of some strong fields upon the radiation even during its emission. In the case which the radiation source is found in a strong electric field the emission spectral lines are decomposed in more components that are shifted compared to the base line (the Stark Effect). In the same way in the case of the existence of a strong magnetic field a decomposition of the emission spectra takes place (the Zeeman effect). The most simple case of these effects is the duplication of the spectral lines on the direction of the field force lines and their spit in three on a perpendicular direction. In this way the electromagnetic radiation is polarized. The Zeeman and Stark shifts are proportional with the intensities of the electrical and magnetic fields.

A series of relative recent studies have pointed out a rotation in the rotation plane of the electromagnetic waves at cosmological distances [20]. Among the causes of this phenomenon which has implications on the radiation energy may also be the actions of the electric and magnetic fields which are travelled by the radiation.

If the radiation source is found in a high electric potential and the observer in a low electric potential, a field circulation between the variation limits will be recorded on the source-observer direction:

$$W_e - W_{e_0} = -\int I_x dx \quad , \tag{41}$$

where: W_e is the electric potential at the radiation source, W_{e_0} is the electric potential at the observer and I_x is the field intensity component in the x direction (the source-observer direction).

In the same way, in the case of the gravitational potential difference a radiation redshift can emerge. It has the form:

$$z + 1 = \frac{\nu\left(1 - \left|U_e(R)\right|\right)}{\nu_0\left(1 - \left|U_{e_0}(R_0)\right|\right)} \quad , \tag{42}$$

for the electric potential difference, or:

$$z + 1 = \frac{\nu\left(1 - \left|U_{m_0}(R)\right|\right)}{\nu_0\left(1 - \left|U_{m_0}(R_0)\right|\right)} \quad , \tag{43}$$

for the magnetic potential difference.

The intrinsic redshift

Starting with 1972 F. Hoyle and J. Narlikar have pointed out that the cosmologic redshift in a FRW Universe can be interpreted also in a different way from the expansion view. Such a redshift ca be determined by a variable mass which is moving in a flat Minkowsky space-time. In this way instead the notion of Universe in expansion was replaced by the notion of mass in constant growth in a flat space [1].

From a mathematical point of view the two approaches are equivalent.

This idea was renewed by H. Arp who observed that the young O, OB and B stars have higher redshifts compared to the galactic nucleus or to the dust and gas coating to which they belong [1]. H. Arp supposed that there is even a relation between the matter redshift and the time passed from the moment when the matter was emitted. This relation is:

$$\frac{1 + z_1}{1 + z_2} = \frac{t_2^2}{t_1^2} \quad , \tag{44}$$

where: z_i (i=1,2) is the matter redshift created at the time t_i. This is for the case of an Universe in which the matter is continuously created.

Using some relativistic relations H. Arp has managed to give a different interpretation for the mass and redshift. In this interpretation the particle mass is not constant and it is a time function m=m(t), and the redshift is not distance dependant but it depends on the time when the radiation was emitted. In other words z is not z(R) but z=z(t).

This type of redshift which is related with the time when the radiation was emitted and with the matter properties at that time is the intrinsic redshift of matter.

Conclusions

As it was pointed out above, there are many causes with different origins that can determine the electromagnetic radiation redshift. What we observe now at the reception of the radiation is a total redshift resulted from the summing of the redshift partial effects, each effect having its own value and signification.

If every process that can determine a radiation redshift has as result a decrease with $\Delta\varepsilon_i$ of its energy, the total decrease in energy will be:

$$\Delta\varepsilon_t = \sum_{i=1}^{n} \Delta\varepsilon_i \ , \qquad (45)$$

and the equation (5) can be written as:

$$z = \frac{\sum_{i=1}^{n} \Delta\varepsilon_i}{\varepsilon_0} \ , \qquad (46)$$

where ε_0 is the energy of the photon which is received by the observer.

We believe that the interpretation of this process which is more complex that it is at the first glimpse is an exclusivist and unilateral manner does not correspond to the reality.

Many from the causes that determine the radiation redshift (the Metagalaxy rotation, the Compton Effect, the metagalactic gravitational field) act in accordance with linear or non-linear laws which are proportional with the distance. All these causes determine similar effects to the cosmological redshift. Other factors that cause redshift (the relative speeds between the parental galaxies and the companion galaxies, the gravitational, electrical and magnetic local potentials, the different ages of the matter etc) act in accordance with other laws which do not involve the distance. This facts could explain the testing domain for the Hubble law and also the numerous deviations from it. Thus, for example, can be explained the large dispersion of some distant cosmic objects (e.g. quasars) in a redshift-distance diagram.

The new interpretation which we propose for the redshift as a complex process of decreasing the radiation energy during its travel from the source to the observer, can be an alternative to the cosmological redshift. From this perspective, the FRW Cosmological Models, including the HBBM paradigm are losing their principal pillar of support.

Therefore it is necessary to search and to argue for some new cosmological models. A cosmological model of a Universe composed by plasma in various energetic states seems to be more close to the reality. In such a model, the mater could be continuously created in some creation centers. Candidates for these centers could be the active galactic nuclei (AGN), the black holes and some old super-giant galaxies. Such a model could be safe from some controversial problems such as: those related to the singularity, the Universe creation and its death.

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Redshift-urile noncosmologice contrazic paradigma Big Bang-ului

Rezumat

În lucrare se trec în revistă cauzele majore care produc redshiftarea radiaţiilor cosmice. Se propune o clasificare a redshifturilor în redshifturi viteziste şi intrinseci şi se analizează caracteristicile lor. În urma acestei analize se concluzionează că redshiftul radiaţiei, este o pierdere de energie a ei, multicauzală şi în consecinţă multicomponentă. Redshiftul radiaţiei care apare la observator ca un redshift total are cauze viteziste şi neviteziste ce nu sunt legate de o presupusă expansiune. Prin urmare, argumentul fundamental pe care s-au construit modelele cosmologice cu expansiune, redshiftul cosmologic, pare a fi datorat unei anumite interpretări a datelor observaţionale.