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The refinement of Hubble's Law
On the redshift in the spectra of distant galaxies

Burago SG Moscow
Aviation Institute (National Research University, Moscow Aviation Institute)
buragosg@yandex.ru

Abstract

The article shows that the Hubble law is only the first approximation to a law that correctly reflects the processes in nature, leading to a red shift in the spectra of distant galaxies. The cases is Indicated, which that do not fit into this law. the true law is received and and given In the article. It is shown that it eliminates contradictions between astronomical observations and calculations under this law.

The redshift in the spectra of distant Galaxies

The most exciting challenge of modern physics and astronomy is the mystery of the red shift in the spectra of distant galaxies, without a doubt. Essence of the phenomenon of red shift in the spectra of distant galaxies lies in the fact that the spectral lines of almost all distant galaxies are shifted towards the red part of spectra compared to the spectrum of nearby galaxies. The shift of spectral lines grows with increase of the distance to galaxy. In 1930 E.Habbl has derived from observations of the relation between redshift and distance for galaxies [1,2]:

$$\Delta\lambda / \lambda = H^* \cdot L \qquad (1)$$

Where H^* is the redshift constant. As indicated in [1], originally Hubble determined its value as 500 [km /s·Mpk] (kilometers per second per megaparsec). This corresponds to the value $H^* = 5{,}62 \cdot 10^{-28}$ [sm^{-1}]. The distance L is expressed in centimeters.

In accordance with the Doppler principle, redshift is explained as the result of radial movement of galaxies in the direction from the observer, which arose as a result of the explosion so-called big "first atom" , i.e. Superheavy hypothetical elementary particle. According to this theory, the fragments of the exploded "first atom", having the highest speeds, flew away from the epicenter of the "big bang" farther than the others. The fragments having the lower speeds flying, namely the Earth, the Sun and the entire Milky Way are flying somewhere in the middle. In accordance with these views, Hubble's law was often written and understood in the following form

$$\Delta\lambda / \lambda = H^* \cdot L = H \cdot t \,, \qquad (2)$$

Here $H \approx 3\times10^{-18}[1/s]$ is the Hubble constant, $H^* = H/C \approx 10^{-26}[m^{-1}]$, $L[m]$ is the distance from the galaxy to the Earth, $t = \frac{L}{C}[s]-$ is the time for travel of light from the galaxy to the Earth.

However, soon the galaxies began to find, whose the red shift in the spectra began to correspond to superluminal velocities. Which is unacceptable for the theory of relativity A. Einstein. Therefore, the Hubble constant was adjusted downwards. In the book [1] it is said that at the present time the most probable value of the quantity H^* is in the range $H^*=(1,125\div0,805)\cdot10^{-28}$ [sm^{-1}]. In the book [2] the Hubble constant is already 65 km / (s·Mpk) or H = $0.73\cdot10^{-28}$ [sm^{-1}].

It seems that if in the future, with the growth of the capabilities of observational astronomy, the some other very remote object will be found, that is flying at a superluminal velocity and thereby is violating the basic postulate of the general theory of relativity, to the Hubble constant again must be should be corrected on the magnitude. Or the relativists will have to come up with some questionable cunning trick based on the theory of relativity, justifying the observed discrepancy with the observed facts of large redshifts. Indeed, in order to avoid violating the postulate of the theory of relativity about the impossibility of exceeding the speed of light in emptiness by radiating objects, another formula for the Doppler law was soon invented in the theory of relativity [2]. This formula did not allow the speed to exceed the speed of light

$$\frac{V}{C} = \frac{(\Delta\lambda/\lambda+1)^2-1}{(\Delta\lambda/\lambda+1)^2+1} \qquad (3)$$

The another obvious inconsistency between the Hubble formula and the results of astronomical observations is also known. Well is studied and known fact of a convergence of our the Milky Way and the Andromeda galaxy. The observations show that the the Andromeda Galaxy is approaching to us at a speed of 400,000 [km / h]. After a period of 3 [billion years] will the clash of these two the galaxies. This fact was dismissed by the words "distant galaxies" introduced in the formulation of Hubble's law. As if in the Universe some laws act far from the Earth and absolutely other laws operate near to the Earth. The Earth in this case acts as the center of the universe. This the observational fact leads us to the doubt a correctness of the of law Hubble and the theory Big Bang.

In 2011 the Nobel Prize in Physics was awarded for the discovery of accelerating an expansion of a universe over time near the boundary of the universe to Americans Saul Perlmutter of the University of California at Berkeley (led supervisory project "Supernovae to Cosmology") and Adam Reyes from the Johns Hopkins University in Baltimore (the project "Search supernovae at high redshifts "). And Brian Schmidt of the Australian National University (project "Search supernovae at high redshifts"). This also contradicts the Hubble formula. Nevertheless, physics recognized that at very great distances the universe expands much faster than predicted by Hubble's linear law, although this hypothesis has not been explained.

A essence of their a research, as I understand it, was that they observed a supernova explosions with a large a red shifts in a spectra. They used two methods to determine a distances to these objects:

-First the a distance was determined as a distance by the redshift in the spectra on the basis of the Hubble law $L = \frac{\Delta\lambda/\lambda}{H^*}$, Where $H^*=10^{-26}$[1/m] is the Hubble redshift constant.

-Second consisted of observations of brightness of supernovae of a type La, which have a property of the "standard candles", i.e they have approximately a same luminosity, wherever they are. Then, according to a observations of a gloss can determine a distance to them. To a surprise a researchers, these methods have a different distances for a same stars. The differences were so great that they can not be attributed to a measurement error. Analyzing a data, these researchers concluded that at a very large distances the universe is expanding much faster than predicted by Hubble's law.

In our view, this a conclusion is erroneous. Let's repeat, that the law itself Hubble did not say that an universe is expanding. He had just established a link between a distance from a Earth to distant galaxies and a redshift in a spectra of a light coming from these galaxies. The belief that a universe is expanding emerged in the course of an interpretation of the law Hubble by the law Doppler. A analogy was drawn between a change in a wavelength of a light $\Delta\lambda$ and a removal rate of a light source from an observer V under the law Doppler.

At present, a paradoxical situation has developed in physics. The scientific community had believed in Hubble's law as in an unquestionable truth. This law, in their opinion, determines the the real phenomena of nature, instead to order to understand that Hubble's law does not accurately reflect the processes taking place in the universe and that it is only some the approximation to the truth.

The physical nature of the light and the laws of its propagation in space is very well studied in terrestrial conditions. But it has been poorly understood that is happens with a quantum of the light during its long movement, which is measured in billions of the light distant years from the star to the observer on Earth.

In this article is assumes that the space between a baryon bodies of the universe is filled with dark matter. Dark matter is in a gaseous state. It is invisible, just as a people do not see the surrounding air. It is not has the smell and the taste. The research based on the assumption about the interaction of a dark matter and of a baryonic matter.

It is accepted that a quantum of a light is a chain of a photons (which are interconnected by electromagnetic forces). They have a mass, a momentum, a kinetic energy and are it subjected to the force of gravity. They also interact with the dark matter. This an article is attempt to identify the quantitative effect of the dark matter in the universe on the propagation of the light from the distant stars for a great time of movement of the light wave to an observer on the Earth.

It is assumed that the all baryonic bodies down to the elementary particles, including a photons of a light, continuously is absorbing a dark matter, which then is converted into the matter, passing from a gaseous state in a liquid state and then in a solid state.

Contrary to the established idea of the invariable of elementary particles in time, they are not invariable formations. (At the time of Ancient Greece, the atom was naively considered such an indivisible and unchangeable elementary particle). Over time, all the bodies of the Universe right up to elementary particles increase their mass due to interaction with the dark matter of the surrounding space.

Under certain a conditions, a baryonic bodies partially or completely is decaying on the atoms of a dark matter. Thus there is an eternal cycle of a matter and an energy. The internal energy of a dark gas is a energy of the cosmos. She is huge. The process of an absorption dark gas by a baryon bodies is a prerequisite for the existence of a bodies. When it is violated a body is destroyed, totally or partially returning to the dark gas.

The law of change a mass from time was obtained by us earlier [3,4]:

$$m = m_o \cdot e^{\frac{\alpha \cdot t}{k}} \qquad \textbf{(4)}$$

A quantity m_o is the mass of the body at the time t = 0, i.e. at the reference time. The minus sign in the right-hand side is omitted, since a direction of the velocity to the center of the body was specified by the words. According to [3,4] a value $\frac{\alpha}{k} = 2{,}97 \cdot 10^{-18}[c^{-1}]$. The equation (4) is defines the law of the increase of a mass all the bodies of the universe with a time.

Reducing the speed of light as you move away from Source of light

Leaving the emitting atom with speed $C = 3 \cdot 10^8$ m/s, the photons of light on the wavelength of the light are carrying with them the amount of the movement J. This amount of movement is equal to the mass m_o is multiplied on the speed of the light photons C

$$J = m_o C = m \cdot C' = Const \qquad (5)$$

But the mass of the photon, as well as all other baryon bodies is increases with a time due to the absorption of a dark matter from the environment according to the revealed law (4). Since the mass of the photon is increases, the the speed of a light C' is reduced, because the amount of a movement is remains constant

$$C' = \frac{m_o C}{m} = \frac{m_o C}{m_o e^{\frac{\alpha}{k}t}} \approx \frac{C}{1 + \frac{\alpha}{k}t} \qquad (6)$$

Here $C = 3 \cdot 10^8 [m/s]$ - speed of a light in a time t=0. This is the same as that speed light on the Earth. Value $\frac{\alpha}{k} = 2{,}97 \cdot 10^{-18} c^{-1}$ is very small [3,4]. It was obtained by us from an analysis of the changes in the motion of the moon occurring during a long time of observations of this cosmic object. Therefore, in most the cases, the increasing the mass of a photons due to inflow of a dark matter can be neglected. However, this growth can affect on the speed of the photon of a light from a distant light to an observer on Earth.

Recall that 1billion.years = $3{,}15 \cdot 10^{16} s$. Consequently, after 1billion.years according to the formula (4) the speed of a photon of a light $C' = 2{,}74 \cdot 10^8 [m/s]$- is that quite a bit different from the Earth's speed of a light. After 10 billion.years the speed of a light $C' = 1{,}53 \cdot 10^8 [m/s]$, who came to us from a distant star, will be only half the initial velocity. After 15 billion.years the speed of a photon light $C' = 1{,}25 \cdot 10^8 [m/s]$, that came from the outskirts of the universe will have a velocity, that slightly more than 40% of the Earth's speed of a light. From formulated law of reducing the speed of a light in the course of its the propagation from a distant star to the Earth you can draw some important conclusions

Red shift in the spectra of distant galaxies. The problem of expanding the universe

The reviewed a phenomenon reducing of a speed of a light on its way from a distant stars or a distant galaxies allows us to find another a explanation for Hubble's the law, rather than an extension of a space of a universe in accordance with the law the Doppler and theory of the Big Bang. To a sober-minded man is hard to agree with the idea "big bang", which advocated by a relativists, so that all a matter and energy of the universe must was fit in a tiny elementary particle incredible density. There is a huge amount of a scientific works that quite seriously substantiate a processes that allegedly was occurred a billions of years ago, immediately after the "big bang". We offer a different, more natural a explanation for a phenomenon of "red shift in the spectra of the distant galaxies," Hubble's discovery. It does not require an exotic explanations of this a phenomenon by the "big bang."

A speed of a light wave according to the formula (6) decreases over a time

$$C' = \frac{C}{1 + \frac{\alpha}{k} t} \tag{7}$$

Consequently, the number of the waves which pass beside a device of the observer will be determined by a expression

$$\nu' = \frac{C'}{\lambda} = \frac{C}{(1 + \frac{\alpha}{k} t) \cdot \lambda} = \frac{C}{\lambda'} \tag{8}$$

In which the new wavelength λ' after time elapses

$$\lambda' = (1 + \frac{\alpha}{k} t) \cdot \lambda \tag{9}$$

Obviously, the number of waves has decreased, and the wavelength has increased by an amount $\Delta\lambda$

$$\Delta\lambda = \lambda' - \lambda = (1 + \frac{\alpha}{k} t)\lambda - \lambda = \lambda \cdot \frac{\alpha}{k} t \text{ ,} \tag{10}$$

From location

$$\frac{\Delta\lambda}{\lambda} = \frac{\alpha}{k} t = \frac{1}{C} \cdot \frac{\alpha}{k} \cdot C \cdot t = H^{*} \cdot L \tag{11}$$

Those, we obtained an exact expression form of the Hubble law, in which $H^* = \frac{1}{C} \cdot \frac{\alpha}{k} = 10^{-26}$ [1/m].

However, a more correct result will be obtained if one does not resort to the expansion of the quantity in the series $e^{\frac{\alpha}{k}t}$ in expression (6). In this case, the current value of the speed of light at any time will be written not by the formula (7), but by the formula

$$C' = \frac{C}{e^{\frac{\alpha}{k}t}} \qquad (12)$$

The new wavelength after time elapses

$$\lambda' = e^{\frac{\alpha}{k}t} \cdot \lambda \qquad (13)$$

The wavelength will increase by an amount

$$\Delta\lambda = \lambda' - \lambda = e^{\frac{\alpha}{k}t} \cdot \lambda - \lambda = \lambda(e^{\frac{\alpha}{k}t} - 1) \qquad (14\ )$$

The number of waves passing by the observer's device will be determined by the expression

$$\nu' = \frac{C'}{\lambda} = \frac{C}{e^{\frac{\alpha}{k}t} \cdot \lambda} = \frac{C}{\lambda'} \qquad (15)$$

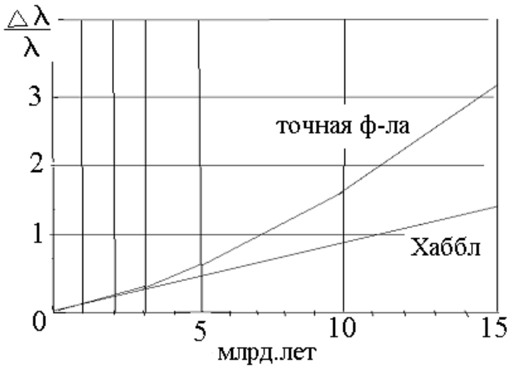
The Hubble law for the Increments of length of the light wave in this case is written in the following form

$$\frac{\Delta\lambda}{\lambda} = e^{\frac{\alpha}{k}t} - 1 = e^{H^* \cdot L} - 1 \qquad \mathbf{(16)}$$

This new version of Hubble's law more correctly reflects the realities of the world around us.

Returning further to the more accurate form of the Hubble law (16), we note that, in the course of time, unlike the Hubble law (1), the wavelength increases nonlinearly. Than more a light wavelength is on way, then she more intense increases its length This is explained by a growth of a mass of a photons that make up a light waves. And this does not mean that an universe is expanding. And this does not mean that an universe is expanding. Especially that it does not mean that this expansion occurs the more intense than the farther away it is moved outside the boundary of an universe.

Fig.1 shows a comparison of a increase in a length of a light waves received by the formulas (1) and (16) as a function of distance from a source of a radiation and a time by the propagation of a light from a distant galaxies to the Earth. It can be seen from the graph that after a long time, i.e. when approaching the visible edge of the universe, the wavelength increases more intensively than predicted by Hubble's law (1)



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However, if we take the viewpoint of the supporters of the Big Bang theory and, according to the law (16), interpret the accelerated increase in wavelength as an increase in the rate of removal of galaxies from the observer on Earth, It will seem, that the universe expands more rapidly as it approaches its outer boundaries. But this will lead to erroneous conclusions

Bibliography

1. Bronshten VA Hypotheses about the stars and about the Universe- M .: Science, 1974.
2 Agyekyan TA Stars, galaxies, metagalaxy.-M .: Nauka, 1981.
3. Burago S.G. Gravity, dark matter and dark energy balance. The General Science Journal. Astrophysics. 2014. April. pp. 20. ResearchGate. Working Paper Oct 2016 . DOI: 10.13140/RG.2.2.16857.52327
4. Burago S.G. The cosmic objects into the continuum dark matter. ResearchGate. Working Paper DOI: 10.13140/RG.2.2.21497.88160