

The understanding of the photon's nature is one of the key problems of the nature of space, and while resolving this problem science has halted on a standard model notion of photon as of an elementary particle with zero charge and zero mass, which is one of the four bosons, associated with electromagnetic field. Photon as they say is porter of light and electromagnetic radiation of any frequency, including radio waves, and possesses both undulate and material properties. It has impulse and energy determined from the relation of Planck

$$E = h\nu \quad (1), \text{ where}$$

$h$  is the constant of Planck and  $\nu$  is the frequency of the examined radiation.

To understand the heap of ideas originated around photon, it is important to realize that in spite of its long ago revealed undulate properties, photon is considered as a particle with a fixed portion of energy, which can keep this portion of energy at least until it meets and interacts with another material particle, no matter how far away would it happen. Photon seems like a corked bottle, filled with a fixed portion of energy ("energy packets" of Planck or "wave packets" of Einstein).

The view of photon as of a corked bottle inseparably follows all the history of its study and has resulted with serious misunderstandings.

If in laboratory conditions a substance, i.e. hydrogen, emits a spectrum of photons with energies and frequencies measurable without any doubts as to the results of these measurements, a rather different situation would occur if an examined radiation comes from distant objects such as the Sun, distant stars, and galaxies. In radiation and absorption spectra of distant objects scientists have learned to recognize by their mutual arrangement, intensities, and other features the already known lines, characteristic for laboratory spectra of hydrogen, helium, iron, and other familiar elements; however the distant objects' lines frequencies, as far as one could evaluate the results of measurements, more or less differed from those obtained in laboratory conditions, more frequently and especially for more distant objects - towards decreasing frequencies, i.e. increasing wave lengths. The described phenomenon was named "red shift" and was explained by means of the ad hoc invented recession of astronomical objects, by which recession photons, no matter from where they come do not lose any bit of their energy. Astronomical objects running away with velocities proportional to the distances between them, the most distant galaxies could move away with velocities comparable with the speed of light. The recession of astronomical objects being stable and continuous, the next and quite logic link in the chain of scientific conclusions became a hypothesis quickly developed to a complete scientific theory about the beginning of the Universe (the Big Bang theory), which as they say happened 13.3 or 13.9 billion years ago. Quite logical would be a prediction of the end of the Universe (such theories also exist), as well as to draw a parallel between so called scientific and religious convictions.

As regards the red shift of the solar radiation, there would be proper to notice that the solar planetary system demonstrating no signs of recession neither from planets nor from any other components, to explain this shift by means of astronomical objects recession is impossible.

Leaving such important problem in abeyance being not the custom of modern science, the explication was found in form of the so called gravitational red shift, which forecasts that massive bodies while emitting photons attract them back to themselves, which increases the wave length and accordingly diminishes the light frequency. Such explication was already found at the end of 18<sup>th</sup> century by John Michel and Pierre-Simon Laplas on the basis of the Newtonian corpuscular theory of light and later supported by Einstein on the basis of the General theory of relativity. To what extent it complies with the modern conception of photon as of particle without charge and mass is under question.

Turning back to the recession of astronomical objects, it would not be out of place to elucidate what kind of data do give to scientists those instruments that help them to investigate radiation spectra of distant astronomical objects: are they data on frequencies of those or other spectral lines or, if to consider the relation (1) these data just reveal values of energy of respective photons (what do the instruments measure: frequency or amplitude of light oscillation?). If to deepen into theoretical principles laid down into all spectroscopic instruments, one may ask a deeper question: why at the border of two media a beam of light composed with photons of one kind is refracted at a different angle as compared to the refraction angle of a beam made with photons of another kind. Which of photon's qualities (energy or frequency) decide how much does it need to be refracted?

Whereas modern science insists that the decisive factor in the refraction of light is its frequency, the common sense suggests that it is rather photon's energy. Then if the instruments' measurements testify to the diminishment of photons' energies, they would in no way testify to changes of frequencies (as well as of wave lengths) of the examined light. If it is so, and I am certain that it is indeed so, there would be no need in looking for any explication of the solar red shift, as well as of that of distant galaxies; then the recession, big bang, and other similar theories will die out by themselves.

A confirmation to the idea that photon may be associated with an uncorked bottle one could find in Compton scattering of X and gamma rays after their meeting with material particles. The said scattering being inelastic, this by itself can testify to the openness of the "bottle" and the result of this scattering is the energy diminishing of X and gamma radiation called the effect of Compton. A part of the photon's energy is transmitted to the scattering electron, which rebounds and ejects itself from the atom while the rest of the energy is carried out by the scattered or "degraded" photon.

The association with an uncorked bottle is also confirmed by the model of photon proposed in my recent publication "PHOTONS, THEIR NATURE, AND MECHANISM OF THEIR FORMATION" <http://www.wbabin.net/physics/dunaev2.pdf> . According to this model photon represents an undulate formation that occupies a certain part of etheric space, which part is characteristic by the absence therein of elons with velocities directed from the center of generative atom or molecule. Photon has a certain form it has obtained due to the peculiarities of its formation by the way of interaction of two primary electromagnetic waves. And if at the beginning of its existence photon may be characterized by total absence of elons directed from the center of generative atom, then while travelling through astronomical distances measured by light years such photon cannot avoid degrading, which would characterize itself by the appearance therein of elons with velocities directed from the rotation center of generative atom or molecule. The "bottle" being open, external factors can influence its interior; and that part of space, which is photon, would always seek to get its properties to match those of the other ordinary parts of space. Here it would be proper to put a question: where is hidden photon's energy and in what way that part of space, which is photon, differs from another but ordinary part of space of the equal form and size? The difference is that as in this ordinary part of etheric space elons are moving from all parts and in all directions, the resulting impulse and energy of this ordinary part of space are null, whereas photon is the same part of etheric space but with an unbalanced integral impulse and integral energy, and the resultants of this

integral impulse or integral energy are not null but a certain amount with a certain direction of action. It would be opportune to say that in spite of Planck had succeed in comprehending quantization of energy, and his followers had done to build up on its basis an idealistic quantum mechanics, they had not understood the nature of the quantization and had not found its limit. As to the limit of quantization of impulse and energy I would see it in finding impulse and energy of a sole elon.

In 1929 American astrophysicist Edwin Hubble on the basis of his own observations as well of those of his colleagues drew a relation between the red shift of distant galaxies and their remoteness (Edward Harrison, The redshift-distance and velocity-distance laws) <http://adsabs.harvard.edu/abs/1993ApJ...403...28H> .

$$z = \text{const} \cdot L, \text{ or}$$

$$z = \frac{H_0}{c} L \quad (2), \text{ where}$$

If to take into a  $z$  is the red shift value, calculated as  $z = \frac{v_{emit}}{v_{obsv}} - 1$ , where  $v_{emit}$  stands for the emitted and  $v_{obsv}$  – for the observed frequencies,  $c$  is the speed of light,  $L$  is the distance to the observed object, and  $H_0$  is the Hubble's constant, which by the calculation results of data obtained in 2009 with Hubble Space Telescope (HST) equals  $H_0 = 74.2 \pm 3.6$  (km/s)/Mpc (km/s per megaparsec). Due to the above dimensions of the Hubble's constant while using the formula (2) the distance to the object of observation must be considered in megaparsecs.

ccount the formula (1) then on the basis of formula (2) one may obtain another relation, which correspond to the expressed ideas of a gradual degradation of photons

$$z' = \frac{H_0}{c} L \quad (3).$$

Here  $z'$  has to represent relative amount of photon's energy degradation  $z' = \frac{E_{emit}}{E_{obsv}} - 1$ , where  $E_{emit}$  and  $E_{obsv}$  stand for energies of emitted and observed photon.

Formula (3) would help to understand that with increasing remoteness of the observed objects the luminosity of the latter would gradually die away up to their total vanishing, which can explain Olbers paradoxes.

According to Edward Harrison (see above) the relation (2) and consequently (3) are linear only at small shifts  $z \ll 1$  and at relatively short distances  $L \ll L_H$ , where  $L_H$  is the distance of Hubble equal to  $L_H = \frac{c}{H_0} = 4228$  Mpc. As to greater distances, here in my opinion, taking into consideration the undulate nature of photon, it would be proper to draw an analogy between attenuation of sound travelling in a real gas and degradation of photon travelling in pseudogas of elonosphaera.

The amplitude change of a decaying plane wave can be expressed as:

$$A = A_0 e^{-\alpha z} \quad (4), \text{ where}$$

$A_0$  is the unattenuated amplitude of the propagating wave,  $A$  is the reduced amplitude after the wave has travelled a distance  $z$ ,  $\alpha$  is the attenuation coefficient, and  $e$  – is the exponential constant. <http://www.ndt-ed.org/EducationResources/CommunityCollege/Ultrasonics/Physics/attenuation.htm>

If to draw a similar formula for photon it would be as follows

$$E = E_0 e^{-\alpha L} \quad (5), \text{ where}$$

$E_0$  – is the energy of emitted photon,  $E$  – is the energy of the photon propagated to the distance  $L$ , and  $\alpha$  – is the attenuation (degradation) coefficient, which has yet to be calculated.

Taking into consideration the formula (1) the formula (5) can be transformed to

$$\nu = \nu_0 e^{-\alpha L}, \text{ or}$$
$$\nu_0 = \frac{\nu}{e^{-\alpha L}} \quad (6),$$

which would mean that if the spectroscopic instruments are graduated, as they are now, in frequencies, on the basis of the frequency  $\nu$ , showed by the instrument, one would be able to find the real light frequency  $\nu_0$ , which would be the same as that obtained during emitting respective photon on the distant object.

#### Conclusions:

- 1) Refractive index directly depends not on light frequency, but on the energy of its photons;
- 2) The light frequencies measured by spectroscopic instruments relate to the real frequencies only if the light comes from relatively short distances; if it comes from distant astronomical objects, instruments' readings can only testify to energies of the arrived degraded photons;
- 3) No matter how great the distances gone by the light, its frequency and wave length would remain unchanged while its photons would gradually degrade losing their energy;
- 4) Photon is not a material particle, and the portion or quant of energy it has obtained during its formation is partly spent by the way of interaction with material particles (Compton effect) or scattered in space while travelling at great distances by the way of interaction with particles of etheric medium;
- 5) Photon is an undulate formation in form of a part of etheric space totally (straight after its creation) or in part (after having gone a certain distance) deprived of elons directed from the center of its generative atom or molecule;
- 6) Degradation of photon travelling through astronomical distances consists in gradual acquisition of elons directed from the center of its generative atom or molecule;
- 7) The theories of expanding Universe, big bang, and other based on the red shift phenomenon have not real theoretical basis;
- 8) The regularities found by Edwin Hubble for red shift calculations are principally suitable for photon degradation calculations.