

ELECTROMAGNETIC RADIATION OF PHOTON AND PHOTONLESS NATURE. SKY OF OLBERS

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The Summary

The photon radiation is generated in atoms and molecules of matter and besides visible light it contains infrared or thermal radiation, ultraviolet, X- and γ - rays, as well as radio emissions coming to us from astronomical objects. The photonless radiation includes radio waves and high frequency radiations generated with oscillators and other manmade instruments. Ultraviolet and X- and γ - rays are associated with initial lines of high numeric radiation series, the series associated with ultraviolet having lower numbers as compared with X- and γ - rays. Photons of high numeric series are formed with very low frequencies and are highly distanced along their propagation radii. Radio emissions of astronomical objects are ultraviolet and X- and γ - rays, formed in atoms and molecules of their matter, those emissions as they come to us from distant and most distant objects being weakened while overcoming the respective distances. The cosmic microwave background radiation is a remnant of the emissions from super distant and invisible stars.

According to modern scientific views the known varieties of electromagnetic radiation that is radio waves, infrared or thermal radiation, visible light, ultraviolet radiation, X- and γ - rays differ by frequencies and energies of their photons, which in accordance with Planck-Einstein equation http://en.wikipedia.org/wiki/Planck_constant are calculated as

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

E is photon's energy, ν – radiation frequency, and h is the Planck constant, which equals $h = 6.62606896 \times 10^{-34}$ j s. The indicated relation was laid to the foundation of the quantum mechanics created at the beginning of the 20th century, and its correctness along the last 100 years has not arisen any doubts.

The detailed data given by modern science relative to different kinds of electromagnetic radiation are collected in the Table 1, borrowed from the site http://en.wikipedia.org/wiki/Electromagnetic_radiation. The Table uses the following abbreviations:

γ = [Gamma rays](#)

HX = Hard [X-rays](#)

SX = Soft X-Rays

EUV = Extreme [ultraviolet](#)

NUV = Near ultraviolet

[Visible light](#)

NIR = Near [infrared](#)

MIR = Moderate infrared

FIR = Far infrared

[Radio waves:](#)

EHF = [Extremely high frequency](#) (Microwaves)

SHF = [Super high frequency](#) (Microwaves)

UHF = [Ultrahigh frequency](#)

VHF = [Very high frequency](#)

HF = [High frequency](#)

MF = [Medium frequency](#)

LF = [Low frequency](#)

VLF = [Very low frequency](#)

VF = [Voice frequency](#)

ULF = [Ultra low frequency](#)

SLF = [Super low frequency](#)

ELF = [Extremely low frequency](#)

CLASS	FREQUENCY	WAVELENGTH	ENERGY
Y	300 EHz	1 pm	1.24 MeV
HX	30 EHz	10 pm	124 keV
SX	3 EHz	100 pm	12.4 keV
EUV	300 PHz	1 nm	1.24 keV
NUV	30 PHz	10 nm	124 eV
NIR	3 PHz	100 nm	12.4 eV
MIR	300 THz	1 μm	1.24 eV
FIR	30 THz	10 μm	124 meV
EHF	3 THz	100 μm	12.4 meV
SHF	300 GHz	1 mm	1.24 meV
UHF	30 GHz	1 cm	124 μeV
VHF	3 GHz	1 dm	12.4 μeV
HF	300 MHz	1 m	1.24 μeV
MF	30 MHz	10 m	124 neV
LF	3 MHz	100 m	12.4 neV
ULF	300 kHz	1 km	1.24 neV
VLF	30 kHz	10 km	124 peV
SF/ULF	3 kHz	100 km	12.4 peV
SLF	300 Hz	1 Mm	1.24 peV
ELF	30 Hz	10 Mm	124 feV
	3 Hz	100 Mm	12.4 feV

In spite of the data of the Table 1 is in full harmony with the above formula (1) they might be interpreted with precautions.

The first one concerns the radio waves, which if to believe the Table, do not depend on the source of their generation and have the same photonic nature as the ordinary light. Such a position does not agree with the scheme of photon's generation exposed in my previous article "PHOTONS, THEIR NATURE, AND MECHANISM OF THEIR FORMATION" <http://wbabin.net/physics/dunaev3.pdf>, according to which the only known way of forming photons is their creation in atoms and molecules by the way of cooperation of two primary waves created due to the rotation of the orbital electrons. The said scheme operates by formation of the solar radiation, as well as of that one that comes to us from the most distant places of the Universe and contains among other fractions those with radio frequencies.

In spite of that the Table, as well as other official sources do not make difference between the above specified natural radiation formed in atoms and molecules and those radio waves that are created by man on the Earth, it seems that such a difference needs to be accounted for. Let us begin with the idea that the artificial electromagnetic oscillations being of wave nature, they have very much in common with other kinds of wave oscillations, and in the first place with sound oscillations propagating in gaseous media; and this might be explained by incontestable analogies between real gases and that pseudogas which makes etheric medium. Science has been long ago imagining sound as a longitudinal wave propagating in a gaseous medium with the same velocity in all directions from its generative source, and it can be visualized as a sequence of embracing this source spherical surfaces of gradually increasing diameter and of repeatedly either increased or diminished pressure.

One may imagine an analogues picture relative to radio waves created by standard radio, television, wireless communications, and similar signals transmitters, independently of their propagation either in

terrestrial atmosphere, or in open cosmos. The depicted group of electromagnetic waves is **photonless** by their nature, and similarly to sound is characterized by relatively small propagation range, in contrast to visible light that belongs to **photon** kinds of electromagnetic radiation.

A known source of generation of photon waves are atoms and molecules, in which the photons are generated due to the encounter rotation of electrons practically on the same orbits but with different velocities. I don't know any other mechanism of photons' generation. Besides the visible light the photon radiation consists of infrared, ultraviolet, X- and γ - rays. Those radio waves that come to us from the Sun and other space objects also without doubts belong to the photon radiation.

With further reference to geometry I once again emphasize that the photonless radiation spreads by spherical waves with intensities inversely proportional to squared distances to their sources, whereas the photon radiation, the intensity of which do not practically change even at comparatively important distances, propagates along radii the number and direction of which are determined by their creation.

It would be appropriate to remember the described in the above mentioned source primary waves that have form of Archimedean spirals and spread in the plane of orbiting of the atomic or molecular electrons, that is those waves, the intersection of which entail the formation of photons and which themselves do not belong neither to photon nor to photonless waves in the meaning of terms used in this article.

In my precedent work "REAL SENSE OF ELECTRIC CHARGE" <http://wbabin.net/physics/dunaev4.pdf> there was given the formula (2a), which in the physics of ether system determined the coulomb force applied to orbital electron of hydrogen atom

$$F = \frac{\rho s_p s_e}{\pi D^2} = \frac{\rho \eta s_e^2}{\pi D^2}, \text{ where}$$

ρ stands for etheric pressure, s_p and s_e – diametric section areas respectively of proton and electron, η – relation between diametric section areas of proton and electron that is between their masses, and D - distance between the nucleus and electron (orbit's radius). If to use this formula to calculate the coulomb force acting on electron in a hydrogen molecule, then due to the doubling of protons' number the factor η has to be doubled.

During an electronic cycle while pushing electron to the molecular nucleus along the entire orbit long of $2\pi D$, the coulomb force will accomplish a work

$$W = 2 \frac{\rho \eta s_e^2}{D}, \text{ the kinetic energy of electron equaling}$$

$$E = \frac{s_e v_e^2}{2} = \frac{s_e D^2 \omega^2}{2}.$$

Relation between the work, accomplished by the coulomb force and the electron's energy will make

$$\frac{W}{E} = \frac{4\rho\eta s_e}{D^3\omega^2} = 4\pi \quad (2).$$

The last can be inferred from that the Kepler constant for hydrogen molecule agrees with the equation $D^3\omega^2 = \frac{\rho}{\pi}\eta s_e$ that in its turn infers from the balance equation of acting on electron coulomb and centrifugal forces $\frac{\rho\eta s_e^2}{\pi D^2} = s_e D\omega^2$.

The work W of pushing the orbital electron to the molecular nucleus is made on account of ether's energy. On the other hand, the accomplished work transfers to the energy of photons, which photons transport it

up to the encounter with other objects, to which this energy also transfers with accomplishing a work. The said transformations are embodiments of the Energy conservation Law.

While calculating energies of atomic and molecular electrons one needs to account for the thermal rotation of the atoms and molecules themselves, which according to my article "PHOTONS, THEIR NATURE, AND MECHANISM OF THEIR FORMATION" <http://wbabin.net/physics/dunaev3.pdf> occurs in a hydrogen molecule with a frequency $\nu_m = \frac{m}{n} R_H c$, where m and n – integers of the Balmer-Rydberg formula, R_H – Rydberg constant, and c – speed of light in vacuum.

If an electron belongs to a molecule rotating with frequency $\nu_m = \frac{m}{n} R_H c$, and if for more simplicity to assume that alterations of the rotation frequency do not affect the dimension of the electron orbit radius, the velocity of its rotation in the absolute coordinate system depending on the rotation's direction would be either $v(1 + \frac{m}{n})$, or $v(1 - \frac{m}{n})$, where v is the circular velocity of the electron in the coordinate system associated with the molecule. Then taking to account that according to my earlier article "QUANTUM MECHANICS' FOUNDATION, HOW STRONG IS IT?" <http://wbabin.net/physics/dunaev1.pdf> the energy of orbital electron of a hydrogen molecule is equal to the product of its rotation frequency and the constant of Planck, the energy of both electrons of the hydrogen molecule will equal

$$E_{2e} = m_e v^2 \left(1 + \frac{m^2}{n^2}\right) = 2hR_H c \left(1 + \frac{m^2}{n^2}\right) \quad (3), \text{ where}$$

m_e stands for electron's mass.

Multiplied by 4π , this energy will equal the work spent by ether to execute one cycle of electrons' rotation (that is to bend during this cycle their rectilinear trajectories to circular). It is just the same work that transmutes itself to the energy of photons during one cycle of the electrons' rotation. If to divide this work by $2n$ directions along which the photons run out (see "PHOTONS, THEIR NATURE, AND MECHANISM OF THEIR FORMATION" <http://wbabin.net/physics/dunaev3.pdf>) we would obtain the energy taken away from the molecule during one cycle of the electrons just in one direction

$$E' = 2hR_H c \left(1 + \frac{m^2}{n^2}\right) \cdot \frac{4\pi}{2n} = \frac{4\pi}{n} hR_H c \left(1 + \frac{m^2}{n^2}\right) \quad (4).$$

After dividing the obtained quantity by the light frequency along one direction, which is determined from the Balmer-Rydberg formula $\nu = R_H c \left(\frac{1}{m^2} - \frac{1}{n^2}\right)$, we will obtain the value of a quant of energy that is the energy of one photon

$$e' = \frac{\frac{4\pi}{n} hR_H c \left(1 + \frac{m^2}{n^2}\right)}{R_H c \left(\frac{1}{m^2} - \frac{1}{n^2}\right)} = \frac{4\pi m^2 (n^2 + m^2)}{n (n^2 - m^2)} h \quad (5).$$

The spectrum of hydrogen molecule electromagnetic radiation consists of series of spectral lines determined by the numbers m , and in principle the number of possible series is in no way limited. The number n determines a spectral line inside a series, and in principle the number of lines in a series is also unlimited, although the radiated energy being divided by $2n$ directions, the most energetic are the lines with minimal n .

The Table 2 contains data about photons of most energetic first (lines without index "a") and second (with index "a") spectral lines of different series of the hydrogen molecule radiation spectrum. In particular, lines 1, 1a contain indexes of spectral lines in form of relation $\frac{m}{n}$, lines 2, 2a – values $\frac{e'}{h} = \frac{4\pi m^2 (n^2 + m^2)}{n (n^2 - m^2)}$, lines 3, 3a – photons' energies in eV s, lines 4, 4a – relations between photons' energies of different series and the

energy of photon of the Balmer series (visible line). The lines 5 and 5a contain indications on presumptive belongings of the lines of the Table 2 to the classes of radiation of the Table 1.

Table 2

	Lyman series 1	Balmer series 2	Paschen series 3	Brackett series 4	Pfund series 5	Humphreys series 6	Series 9	Series 99	Series 999
1	1/2	2/3	3/4	4/5	5/6	6/7	9/10	99/100	999/1000
2	10.472	43.563	100.98	183.19	290.36	422.56	969.66	122550	1.2535x10 ⁷
3	4.3312x10 ⁻¹⁴	1.8017x10 ⁻¹³	4.1765x10 ⁻¹³	7.5766x10 ⁻¹³	1.2009x10 ⁻¹²	1.7477x10 ⁻¹²	4.0105x10 ⁻¹²	5.0686x10 ⁻¹⁰	5.1844x10 ⁻⁸
4	0.24039	1	2.3180	4.2052	6.6653	9.700	22.259	2813.2	2.8774x10 ⁵
5	NUV EUV SX HX Y								
1a	1/3	2/4	3/5	4/6	5/7	6/8	9/11	99/101	999/1001
2a	5.2360	20.944	48.066	87.127	138.38	201.96	467.30	60978	6.2645x10 ⁵
3a	2.1656x10 ⁻¹⁴	8.6623x10 ⁻¹⁴	1.9880x10 ⁻¹³	3.6035x10 ⁻¹³	5.7233x10 ⁻¹³	8.3529x10 ⁻¹³	1.9327x10 ⁻¹²	2.5220x10 ⁻¹⁰	2.5910x10 ⁻⁸
4a	0.25	1	2.2950	4.1600	6.6071	9.6429	22.312	2911.5	2.9911x10 ⁵
5a	NUV EUV SX HX Y								

As one might see from the Table 2 photon of the line 999/1000 is five orders of magnitude more energetic than the most powerful photon of the first (red) line of the Balmer series (visible light). In roughly the same relations are photons of γ -rays or hard X-rays to those of visible light in the Table 1, which may indicate that the generation mode of such exotic for us radiations as γ -and X-rays is the same as of visible light. The substantial difference consists in that the generation of such exotic photons takes place at very high temperatures (relation m/n).

As it can be seen from calculations made with the Balmer-Rydberg formula, photons of ultraviolet radiation are relatively rare comparatively to those of visible light. It can be explained by that they are created at rather high temperatures and that due to the magnitude of their wave lengths they are rather highly distanced along the radii of their propagation. Even rarer and for the same reason, are photons of γ -and X-rays, which can be seen from the Table 3 exposed below. There in lines 1 and 1a are given indexes of the respective series (the same as in lines 1 and 1a of the Table 2), in lines 2 and 2a – frequencies in Hz, in lines 3 and 3a – wave lengths in m, and in lines 4 and 4a – relations between the wave lengths of the chosen spectral lines to those of the visible lines 2/3 and 2/4 of the Balmer series.

Table 3

	Lyman series	Balmer series	Paschen series	Brackett series	Pfund series	Humphreys series	9	99	999
1	1/2	2/3	3/4	4/5	5/6	6/7	9/10	99/100	999/1000
2	2.4674x10 ¹⁵	4.5692x10 ¹⁴	1.5992x10 ¹⁴	7.4021x10 ¹³	4.0209x10 ¹³	2.4245x10 ¹³	7.7169x10 ¹²	6.6797x10 ⁹	6.5896x10 ⁶
3	1.2150x10 ⁻⁷	6.5612x10 ⁻⁷	1.8746x10 ⁻⁶	4.0501x10 ⁻⁶	7.4559x10 ⁻⁶	1.2365x10 ⁻⁵	3.8849x10 ⁻⁵	0.04488	45.495
4	0.1852	1	2.8571	6.1728	11.364	18.846	59.210	68402	6.9339x10 ⁷
5	NUV EUV SX HX Y								
1a	1/3	2/4	3/5	4/6	5/7	6/8	9/11	99/101	999/1001
2a	2.9234x10 ¹⁵	6.1685x10 ¹⁴	2.3394x10 ¹⁴	1.1423x10 ¹⁴	6.4454x10 ¹³	3.9981x10 ¹³	1.3427x10 ¹³	1.3162x10 ¹⁰	1.3159x10 ⁷
3a	1.0255x10 ⁻⁷	4.8601x10 ⁻⁷	1.2815x10 ⁻⁶	2.6245x10 ⁻⁶	4.6513x10 ⁻⁶	7.4984x10 ⁻⁶	2.2328x10 ⁻⁵	0.02278	22.782
4a	0.1852	1	2.8571	6.1728	11.364	18.846	59.210	68402	6.9339x10 ⁷
5a	NUV EUV SX HX Y								

As I imagine, more energetic and at the same time more radially distanced is photon, so greater must be its dimensions and so greater must be the probability of its encounter, if it comes from cosmos, with particles of the earth atmosphere, which encounter would involve its misrouting, scattering, and reducing to lesser photons (Compton effect). This as well may be accompanied with the expulsion of electrons from atoms and molecules (photoelectric effect). This view is totally confirmed by the scientific data, testifying that all three types of radiation (ultraviolet, X- and γ - rays) are more or less halted by the earth atmosphere. The

most penetrative from the three is the ultraviolet, and this is well explained by lesser vastness of its photons.

As states modern science, X- and γ -rays do not much differ ones from others in the quantitative aspect; the difference exists only as to sources of their formation. So according to modern views the X-rays are emitted by electrons outside the nucleus, while gamma rays are emitted by the nucleus and produced by gamma decay. There is no low limit for energies of photons, created by nuclear reactions; therefore ultraviolet and even less energetic photons created by these processes are usually called as γ -rays. X-rays are generated in X-ray tubes, that is in vacuum tubes, in which the high electric tension accelerates to high velocities the electrons released from an incandescent cathode. High velocity electrons encounter the metallic target or anode, generating X-rays.

Here it is necessary to add that independently of radiation sources, the generative atoms either as a result of nuclear reactions, or by encountering high velocity electrons, heat themselves to very high temperatures ($\frac{m}{n} \rightarrow 1$), at which there can be created highly energetic photons, as for instance photons of lines 9/10, 99/100 and 999/1000 of the Table 2.

It becomes clear that contrary to fixed notions the so called "ultraviolet" is in no way photons of the Lyman series. The ultraviolet rather looks as a younger brother of X- and γ -radiation, characterized by somewhat lower temperature of formation.

If now to take a radio telescope, place it on a high plateau, aim it for instance at the Sun, and tune it to the frequency of 6.6797×10^9 Hz, which would concord with the data of the colon 99/100 of the Table 3, one would obtain a picture of the Sun on a radio wave length of 44,88 mm. If to aim the telescope to other astronomical objects one would in the same way obtain their pictures on the same radio wave frequency, and if to aim it in a direction where there is no found astronomical objects yet, one would obtain a background luminosity, which has received the name "cosmic microwave background radiation". According to scientific data the cosmic microwave background radiation is most intensive in a microwave sector of the radio spectrum, for which its name is.

The cosmic microwave background radiation is now an object of intensive scientific research. Its spectrum was recently examined with the spectrometer FIRAS, installed on the satellite COBE (see http://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation). The borrowed from this site spectrum of the cosmic microwave background radiation obtained by FIRAS (fig.1), is considered as the most precisely measured black body spectrum.

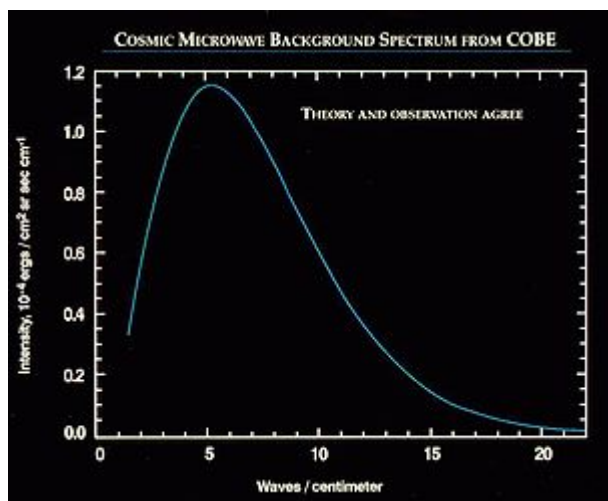


Fig.1

Fig.1 shows the distribution of radiation intensities relative to wavelengths; and as the curve shows, the peak of intensities coincides with the wavelength of approximately 51 mm, which is quite near 44.88 mm given in the colon 99/100 of the Table 3 and corresponds to wavelengths of the sector of X- or γ -rays.

The paradox consists in that although by their frequencies the waves of the cosmic background radiation can be associated with those ones characterized by very energetic photons we can register these waves only with very sensitive instruments (radio telescopes).

The above paradox can be explained together with the long ago formulated paradox of Olbers, according to which paradox if the Universe has no limits and is uniformly filled with stars, then the night sky would be uniformly enlightened. The sky is indeed enlightened, but this enlightenment is just that cosmic background radiation, the existence of which modern science associates with the mythic and speculative Big Bang.

According to my article "BIG BANG THEORY AS A RESULT OF PHOTON'S NATURE MISUNDERSTANDING" <http://wbabin.net/physics/dunaev4.pdf>, photons overcoming great distances gradually lose their energy, whereas the frequency of the electromagnetic radiation remains unharmed. Photons of visible light degrade so much that due to the red shift they cease to be visible, while photons of X- and γ -rays, which are thousands and millions times more energetic than visible light photons, come to us weakened to the energies of the cosmic background radiation.

Ending the article it would be appropriate to remark that although my theoretical computations were made here only on example of hydrogen molecule, which molecule is without doubts the principal photon generative factor in the Universe, similar computations would also relate to other atoms and molecules.

Conclusions:

- 1) Today there are two most important radiations known: photon and photonless;
- 2) The photon radiation is generated in atoms and molecules of matter, and beside visible light include infrared or thermal radiation, ultraviolet, X- and γ - rays, as well as radio radiation coming to us from astronomical objects;
- 3) The photonless radiation includes radio waves and high frequency radiation generated with oscillators and other manmade instruments;
- 4) Ultraviolet and X- and γ - rays are associated with initial lines of high numeric radiation series, the series associated with ultraviolet having lower numbers as compared with X- and γ - rays;
- 5) Photons of high numeric series have very low frequencies and are highly distanced along their propagation radii;
- 6) Radio emissions of astronomical objects are ultraviolet and X- and γ - rays, formed in atoms and molecules of their matter, those emissions as they come to us from distant and most distant objects being weakened while overcoming the respective distances;
- 7) The cosmic microwave background radiation is a remnant of the emissions from super distant and invisible stars.