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WHAT ARE ELECTROMAGNETIC WAVES AND WHAT IS THEIR PHYSICAL MEANING?*R.Eshchanov, professor, Chirchik State University, Chirchik***"Ever since mathematicians pounced on my theory of relativity, I don't understand it anymore."****Albert Einstein**

Annotatsiya. Bugungi kunda kvant matematikasi har qanday muammoni fizik va kimyoviy ma'nosiz hal qiladi. Elektromagnit to'lqinlar past chastotalarda uzunlamasına to'lqinlar sifatida tasvirlangan, chastotasi esa spiral to'lqin sifatida. Elektron, ehtimoliy elektromagnit to'lqinlar sifatida, koordinatalarda tasodifiy va ehtimoliy pozitsiyalar noaniqliklarga olib keladi. Bizning yashash joyimiz elektromagnit to'lqinlar dengizi bo'lib, ular ochiq, sun'iy ravishda o'zgartirilgan va tabiiy elektromagnit to'lqinlardir. ma'lum, ammo tabiiy to'lqinlar ma'lum emas. Yangi dualizm turli sharoitlarda ularning energiya va to'lqin harakatlarini tushuntiradi. Yadro, termoyadro va Katta Handron Kollayder tajribalarida zarrachalar hisoblangan qisqa umrga ega ochiq to'lqinlar qayd etiladi. Bundan tashqari, EMW ning klassik zaryadi nisbiy (+) ortiqcha, (-) minus va jismoniy ma'noga ega emas. Kvant fizikasida EMW elementar "zarralar" va to'liq aniq bo'lmagan to'lqinlarni ko'rib chiqadi, bundan tashqari, nuklonlarda u leptonlar - fraktsiyali elektromagnit to'lqinlar sifatida qaraladi. Nazariy jihatdan, Katta portlashdan keyin tabiiy to'lqinlarning paydo bo'lishi ko'rsatilgan. Ochiq to'lqinlar va yopiq EMWPlarning matematik tenglamasi tuzilgan.

Kalit so'zlar: elektr, magnit to'lqinlar, nisbiy, plyus, o'tkazgich, o'tkazmalar, tok, leptonlar-kasr, magnit maydonlar, kvark tuzilishi, proton, Shredinger, yopiq, uzluksiz, statsionar, kvant nazariyasi, elektron, neytron, dimer, juft, gamma, neytron bog'i, o'rta, to'lqin, vodorod, proton, yorug'lik, yadro, termoyadro, spiral chiziq, sinusoidlar, torus, atrofiga.

Аннотация. Сегодня квантовая математика решает любую задачу без физического и химического смысла. Электромагнитные волны изображаются на более низких частотах как продольные волны, с увеличением частоты как винтовая волна. Электрон, как вероятные электромагнитные волны, случайные и вероятные положения в координатах приводят к неопределенностям. Наша среда обитания - море электромагнитных волн, которые являются открытыми, искусственно преобразованными и естественными электромагнитными волнами. известны, но не известны никакие естественные волны. Новый дуализм объясняет их энергетическое и волновое поведение в разных условиях. В ядерных, термоядерных и Большом хандронном коллайдере экспериментах регистрируются короткие по времени жизни открытые волны, которые считаются частицами. Кроме того, классический заряд ЭМВ является относительным (+) плюс, (-) минус и не имеет физического смысла. В квантовой физике ЭМВ рассматривает элементарные «частицы» и волны, которые не совсем ясны, кроме того, в нуклонах он рассматривается как лептоны - дробные электромагнитные волны. Теоретически показано образование естественных волн после Большого взрыва. Составлено математическое уравнение открытых волн и закрытых ЭМВП.

Ключевые слова: электрический, магнитные волны, относительный, плюс, проводник, переносы, ток, лептонно-дробный, магнитные поля, кварковая структура, протон, Шредингер, замкнутый, непрерывный, стационарный, квантовая теория, электрон, нейтрон, димер, пара, гамма, нейтронная связь, орта, полинейронные связи, протон, водород, свет, волны, ядерный, термоядерный, винтовая линия, синусоиды, тор, вокруг.

Abstract. Today, quantum mathematics solves any problem without physical and chemical meaning. Electromagnetic waves are depicted at lower frequencies as longitudinal waves, with increasing frequency as a helical wave. Electron, as probable electromagnetic waves, random and

probable positions in coordinates lead to uncertainties. Our habitat is a sea of electromagnetic waves, which are open, artificially transformed, and natural electromagnetic waves. known, but no natural waves are known. The new dualism explains their energy and wave behavior under different conditions. In nuclear, thermonuclear and Large Handron Collider experiments, short-lifetime open waves are recorded, which are considered to be particles. In addition, the classic charge of EMW is relative (+) plus, (-) minus and has no physical meaning. In quantum physics, EMW considers elementary "particles" and waves, which are not completely clear, in addition, in nucleons it is considered as leptons-fractional electromagnetic waves. Theoretically, the formation of natural waves after the Big Bang is shown. A mathematical equation of open waves and closed EMWPs has been compiled.

Keywords: electric, magnetic waves, relative, plus, conductor, transfers, current, leptons-fractional, magnetic fields, quark structure, proton, Schrödinger, closed, continuous, stationary, quantum theory, electron, neutron, dimer, pair, gamma, neutron bond, orta, polyneuron bonds, proton, hydrogen, light, waves, nuclear, thermonuclear, helical line, sinusoids, torus, around.

Introduction. Today's quantum physics and quantum chemistry are covertly based on quantum mathematics, and it solves any problems without physical or chemical sense, but this is not the fault of mathematicians, it is the fault of physicists and chemists when formulating problems.

Today, electromagnetic waves (EMW) are depicted at low frequencies as longitudinal waves, and with increased frequencies, EMW turns into helical waves. But despite the above notions of electrons as probable and random EMW, as well as particles, lead to uncertainties in the probability of being in coordinates.

Our habitat is a sea of electromagnetic waves that we do not notice. In technology, there are the following types of waves: electric and radio waves, microwaves, X-ray EMWP.

There are natural waves formed after the big bang of a black hole (BH). The black hole consists of approximately 25% of a single "AsI" particle and 75% of highly compressed natural electromagnetic wave packets (EMWP).

The constant mass component of the universe is the particle of god "AsI", stable under all circumstances, does not demonstrate dualism and the rest of the subatomic, atomic "particles" its derivatives as "particles", and "AsI" is the memory of the universe, each time the universe is formed along the same path [1].

Classical electromagnetic waves have both wave and corpuscular properties. A new view of dualism explains their energy and wave behavior under different conditions. EMW has an estimated mass, it is converted into different types of energy as a dualism and obeys the law of conservation of energy (Figure 1).

Energy transition in Electromagnetic Waves

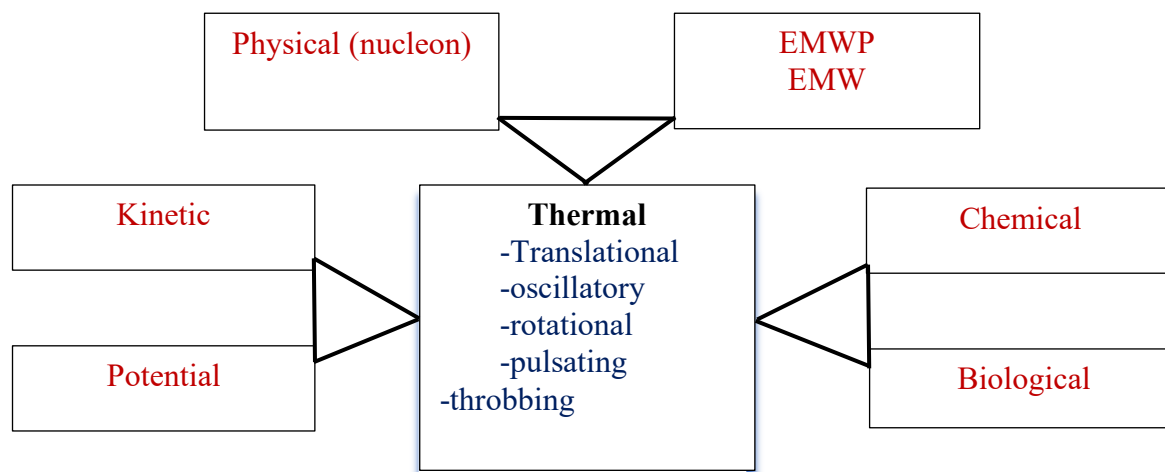


Figure 1. The Path of Transition of Energy Dualism in the World

There is a single "*As!*" particle in the world, which is the mass basis of the neutron, proton, and black hole.

In nature, EMWPs exist as a form of energy. They are interrelated variables: electric and magnetic fields that propagate through space. Electric and magnetic waves cannot exist separately, since their fields synchronously create each other, when we say EMW, they cannot be described by a single function.

Table 1.

Types of EMW in nature and experiments

№	Emergence of a wave	Types of waves	Form of existence and time of life	Compression properties	
1	Natural EMWP	Gamma Positron Electron Light	Closed and infinite lifetime	Neutron, proton-orbital EMWP medium compression	In a black hole, high EMWP compression is free
				Electron orbital of EMWP in a weak compression atom	
				Light EMWP is not compressive	
2	Generated waves	-X -micro -radio -electric	Open & Lifetime $\tau = \frac{L}{c}$ Short-lifetime	Not compressed, converted into energy	
3	Destroyed waves during annihilation	Waves, the so-called "particle"	Open, ultra-short, survivable, picked up by scintillators and wave analyzers. 10 ⁻¹⁰ -10 ⁻²² seconds fractional waves	Not compressed, converted into energy	

A new view of EMW in the 21st century is presented as alternating helical electric and plane sinusoidal magnetic fields. Until now, EMW is considered as a classical, flat, perpendicular, sinusoidal wave, this representation does not fully reflect the physical meaning of the electric and magnetic oscillations of the wave.

In addition, according to classical concepts, the EMW charge is relative (+) plus and (-) minus and has no physical meaning, since the charge is a wave function of the rotation of electric waves, and the wave function of the magnetic field determines the magnetic moment.

As can be seen from the table, EMW can be closed and open with different lifetimes, of which natural waves are infinitely survivable in a stationary state, as well as open short and ultra-short time survivable (Table 1).

For example, let's consider the formation of the most common EMW as an electric current. When generating an electric current (as EMW), a permanent magnet moves around the conductor of the generator coil and forms a superposition secondary helical electric field around the conductor, which synchronously forms a magnetic field within the helical electric field in the conductor with a diametrically planar sinusoidal function. Thus, a difference in the electromagnetic field (EMF) is formed in the conductor, which is considered as an electric current, as an open EMW. Until now, the dualism of electric current is asserted as a particle and EMW, if it is so that there should be a grinder and charger inside the generator, as well as an accelerator, there are none there, in the generator the primary field of the permanent magnet forms a secondary electric field and it is synchronously formed a secondary magnetic field in the diametrical plane of the conductor of the generator coil, this is the real open EMW. This is wave and energy dualism, not as a particle and a wave (Figure 2). The difference between EMF at the beginning and end of the conductor carries the current.

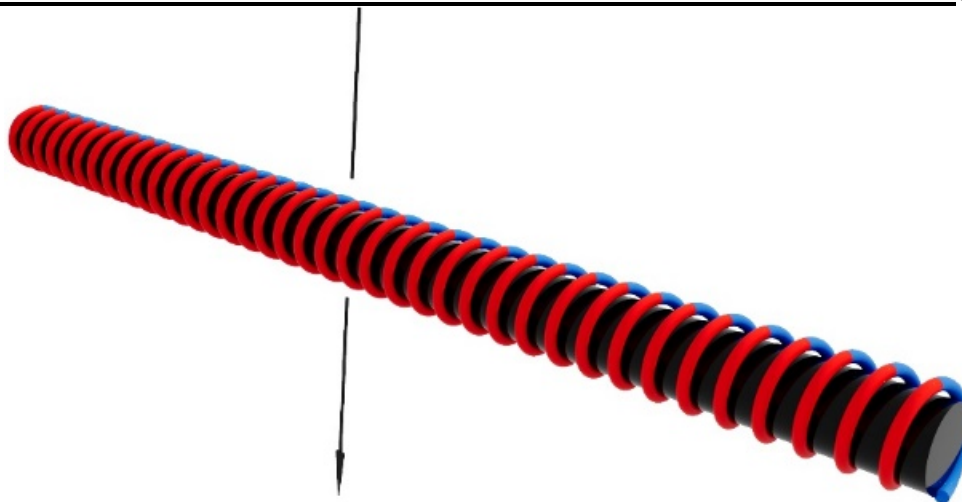


Figure 2. The process of formation and transfer of electric current as an electric field around a conductor

In quantum physics, EMW are considered as elementary "particles" and waves, their components are not completely clear, in addition, in nucleons they are considered as leptons - fractional electromagnetic waves, $-\frac{1}{3}$; + in quarks and they are found in experiments - nuclear, thermonuclear and large hadron collider (LHC) interactions, while scintillators or wave analyzers are used for registration. Such short-lifetime discovered unstable EMFs are considered elementary particles, but this theory cannot answer many questions of atomic and subatomic structure. What is the mass component of the neutron, the proton, as well as the lepton component of the proton is greater than the neutron, while the mass of the proton is less than the neutron, this is also one of the "special cases". How fractional charges are retained in quarks, as well as when a single charge is released $\beta \frac{2}{3}$ from a nucleon, one lepton is not enough, and also how fractional charges are combined, if they are really charges, then what is their wave function. The concept of spin is considered to be the ability of the proton-positron EMWP bond formation. In the same proton there are two high quarks and one low quark. A negative quark does not compensate for a positive quark by $1/3$ of the charge. thus, the positron as EMW exhibits $4/3$ of the positive charge. If there is no whole positron, what will happen to the spin and what will manifest it? The basis for such errors is the registration of open waves in the ultra-short lifetime of the annihilation fractional gamma, positron, electron and photon in experiments, and this is far from the truth. The PMR method is known, in which the resonance of the magnetic moment of the positron orbital of the proton in the molecule with the external magnetic field and other magnetic fields of the positron orbital of protons of the interaction molecule involves the whole positron, and not fractional quark inclusions of the proton. This once again proves that a quark subatomic structure is not possible, because there is not a single full-fledged positron unit in the quark structure of the proton. Quantum physics always talks about EMW, but the wave function is never written anywhere. Another paradox in solving the Schrödinger equation: the first step is the compilation of a wave function, then using the mathematical conditions for normalizing this function, and then the location of this particle in a volume equal to unity. Thus, the wave function is replaced by the Coulomb integral, as a charge with a scalar magnitude, but as we know, the EMW charge is a multi-vector unit, which is not taken into account anywhere.

There are four real types of EMWPs in the universe: gamma, positron, electron, and light waves—closed, continuous, steady-state, toroidal, which can transform depending on conditions.

The practice of EMW is far ahead of the theory, since in computer information technology, electromagnetic information is recorded and deleted on ferromagnets as the electronic memory of EMWP in certain coordinates, which is not consistent with the quantum theory of the electron. In technology, open EMW is also used to transmit the desired information and is propagated using modulation and demodulation.

Electromagnetic Waves (EMW) in Quantum Physics

Theoretically, it is possible to imagine the formation of natural waves after the big bang. A black hole consists of about 25% of the "AsI" particle and 75% of the energy of highly compressed

natural free EMWPs. At critical masses and energy, a big bang occurs with the destructive energy of EMWP, which propels the "*Asl*" at speeds greater than the speed of light. "*Asl*" destroys everything in the universe and loses momentum with the initial decrease in the temperature of the universe. Next, the "*Asl*" particle begins an oscillatory rotational energy motion, which leads to the formation of subatomic and atomic elements of the world. In oscillatory rotational motion, "*Asl*" forms an orbital of the gamma EMWP neutron around itself (Figure 3).

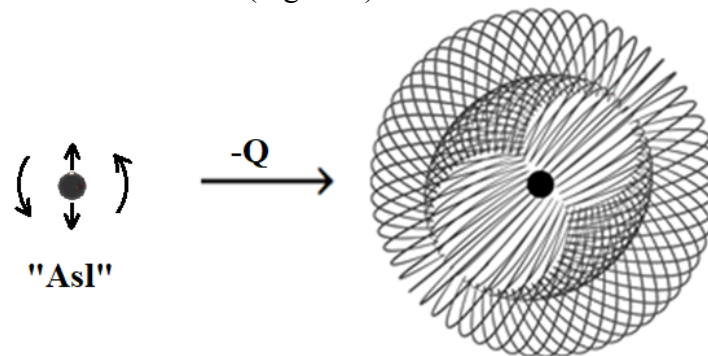


Figure 3. Neutron formation

The orbital of the neutron EMWP gamma is right-hand helical transformed EMW. The neutron is the first product of the universe in the universe, not the proton. The neutron's life is short, but despite this, the two neutrons interact, forming a pair-gamma covalent paired bond with opposite spins (Figure 4).

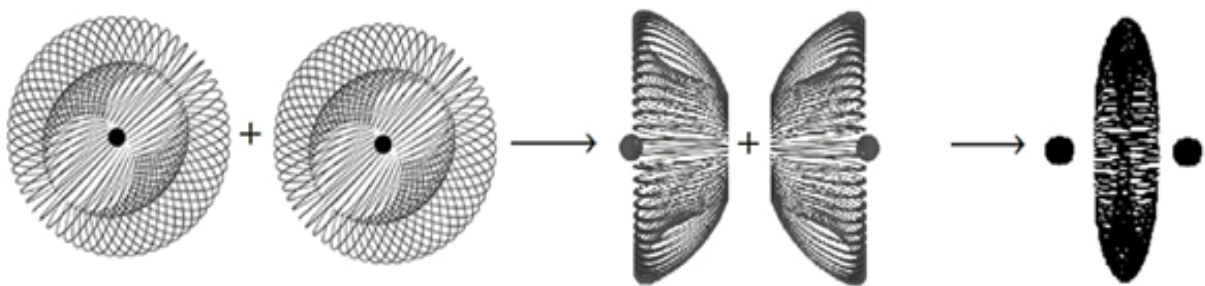


Figure 4. Formation of a gamma-neutron bond pair dimer

There is another way to form a neutron bond: valence polymer orta gamma bond in neutron stars (Figure 5).

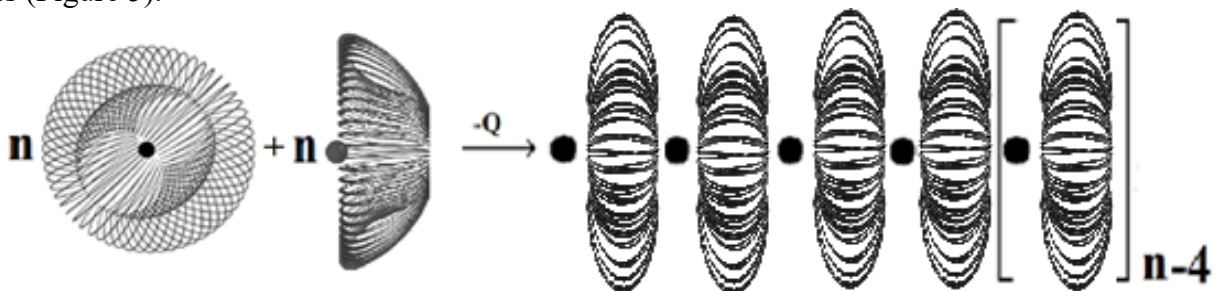


Figure 5. Formation of ortho gamma poly-neuronal communication

This physical reaction dominates from a decrease in the temperature of the universe to the eventual formation of a positron EMWP around "*Asl*" with the proton's right-hand EMWP screw (Figure 6).

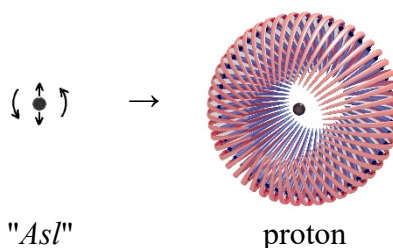


Figure 6. Formation of the proton

Now a stable proton with a positron orbital EMWP has been formed, while the temperature of the universe has still decreased, and the oscillatory rotational motion of the proton forms an EMWP of the electron orbital with a left helical motion, thereby forming a hydrogen atom (Figure 7) [2].

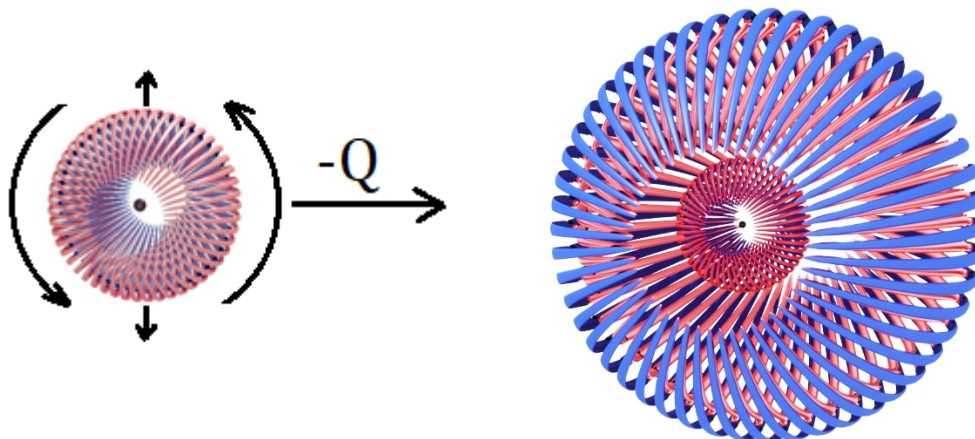


Figure 7. Formation of the hydrogen atom

Other nuclear reactions involving the neutron, proton, and electron occur with the formation of a number of elements of the periodic table.

In the universe, the spherical orbital of hydrogen in high-energy processes passes into an excited hemispherical transformed electron orbital, and it resonates to form a left-screw EMWP of light waves with different characteristics, passing into a state of rest (Figure 8) [3].

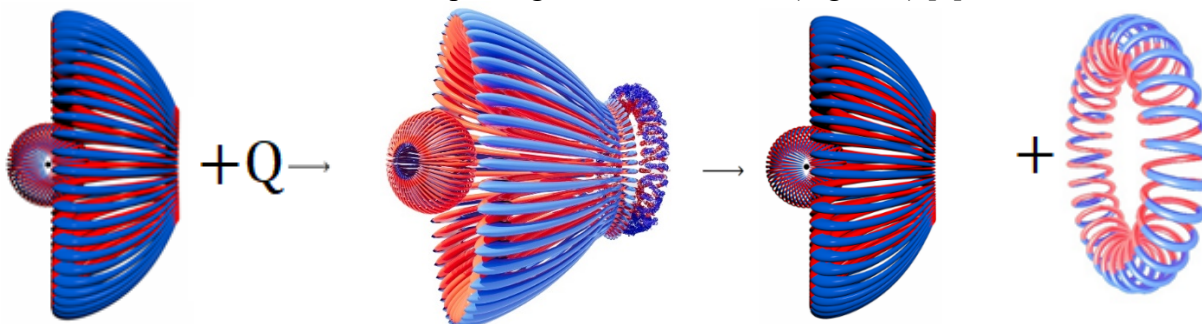


Figure 8. The Formation of Light in the Universe

Today, in technical experiments, mankind has learned to form the only natural EMWP of light waves using various tube instruments with different heat losses and energy efficiency. The rest of the natural EMWPs - gamma, positron and electron - cannot be formed even during nuclear, thermonuclear and LHC experiments, except for the destruction of the structural elements of the atom in high-energy experiments, where EMWP occurs until complete destruction by various methods as an open detection of open ultra-short-lifetime waves by scintillators and wave analyzers are considered as various elementary particles in theoretical physics. Theoretically, during these experiments, it is possible to find any supposed particles and it is possible to continue the experiments indefinitely, for which there is not enough time and a name, because there is no particle and it is fractional EMW, since the result depends on the recorder.

The riddle of the universe out of nothing is the rejection of the physical reality of the world, since the incorrect scientific interpretation - "quantum mathematics" can solve any problems without physical meanings and comes to conclusions from nothing.

There is the "*Asl*" particle in the universe, natural electromagnetic waves with different characteristics and configurations like EMWP and discovered EMW, as well as other types of thermal energy.

All the "particles" registered in terrestrial experiments, EMW with various ways of destroyed EMWP and their annihilation, like an open electromagnetic wave with different energies and a lifetime of approximately 10^{-10} - 10^{-24} seconds, and this is out of nothing. That is, quantum entanglement has no physical sense.

The new concept of an open electromagnetic wave (EMW), from low to high frequency, is depicted as a single open helical line [4], but the current interpretation consists of a combination of two curves, an open helical line that corresponds to the constituent electric wave (Figure 9.1) and sinusoidal lines that corresponds synchronously to the magnetic wave (Figure 9.2), these waves cannot exist separately (Figure 9).

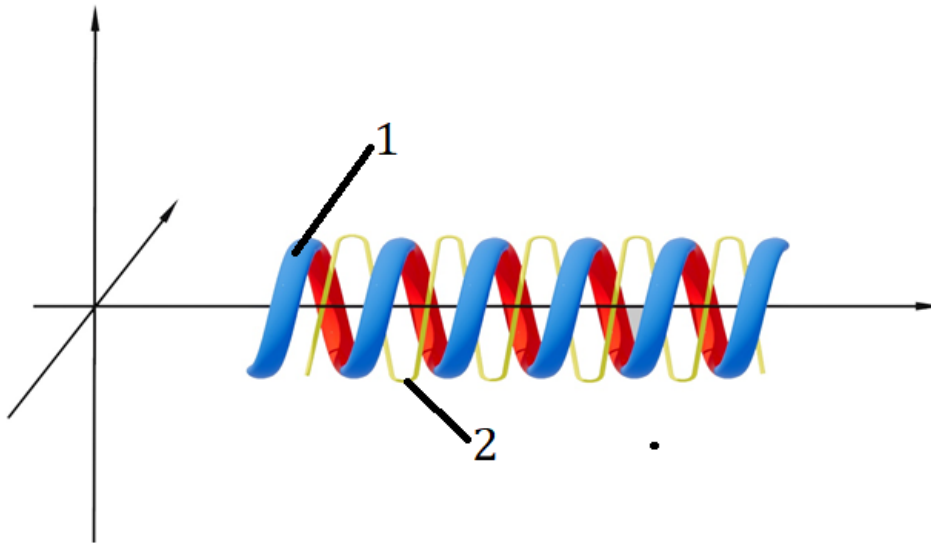


Figure 9. Open electromagnetic waves (1-electric wave; 2-magnetic wave)

Open high-frequency EMW propagate in a vacuum and in any medium at different speeds, and low-frequency waves propagate in diamagnetic and paramagnetic media as a spiral line with an alternating electric field being carried around the conductor, as well as by a synchronously existing magnetic field inside the helical wave, both in vacuum and in the conductor, in the diametrical plane of the cylindrical surface by a sinusoidal line. EMW has binary and bipolar properties, and we will make a mathematical equation for these lines.

Mathematical Representation of Open Electromagnetic Waves

Let the point M move uniformly, at velocity v , along the describing infinite cylinder with the axis Ox and radius R, and the point itself rotates around the axis Ox with angular velocity ω . Then the projection M_1 of the point M onto the plane Oyz rotates around the origin with velocity ω . If we assume that the point M at the moment of the beginning of time, i.e. at $t = 0$, has coordinates $M(0, 0, R)$, then the equation of motion of the point M_1 has $x = 0$ the form $y = R \sin \omega t$ $z = R \cos \omega t$. The projection M_2 of the point M on the axis Ox has the equation of motion $x = vt$, $y = 0$, $z = 0$. From this we conclude that the equation of motion of the point M has the form $x = vt$, $y = R \sin \omega t$ $z = R \cos \omega t$. The trajectory of the point M is called a helical line. Hence, the equation of the spiral line has the form $x = vt$, $y = R \sin \omega t$, $z = R \cos \omega t$. For the interval of time of the length $\frac{2\pi}{\omega}$ It turns out to be one turn. Depending on the sign, ω the right screw or the left screw is obtained (Figure 10).

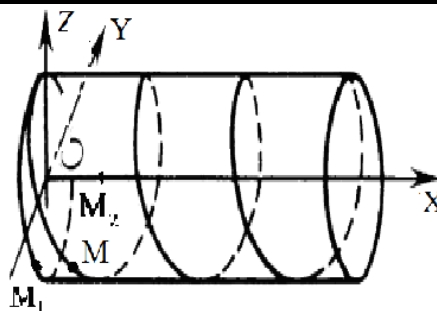


Figure10. Screw function of electric charge

It is well known that harmonic oscillations are described by a sine wave. To plot a sine wave on $z = R \sin(\omega x + \varphi_0)$ a plane, Oxz you can use the graphing calculator Mathway¹. Here R , $\frac{2\pi}{\omega}$ and φ_0 respectively, the amplitude, period and initial phase of the sinusoid. As you increase, ω the frequency of oscillations increases (Figure 11). For example, for $z = 2 \sin\left(3x + \frac{\pi}{2}\right) = 2 \cos 3x$ and $z = 2 \sin\left(3x - \frac{\pi}{2}\right) = -2 \cos 3x$ we get the following graphs:

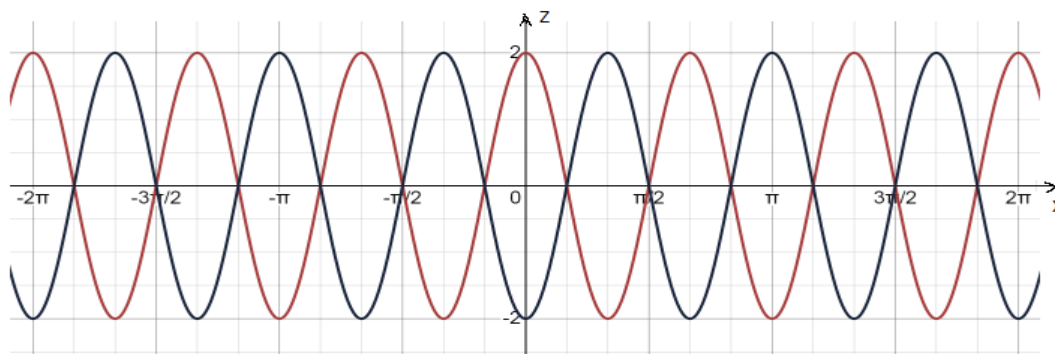


Figure 11. Sinusoidal magnetic field

If we introduce the notation $x = vt$, we get the parametric equation of the sine wave $x = vt$, $z = R \sin(\omega vt + \varphi_0)$, $-\infty < t < \infty$

Now consider the two curves together, i.e. the helical line given by the equation

$$x = vt, y = R \sin \omega t, z = R \cos \omega t, -\infty < t < \infty$$

and the sine wave given by the equation

$$x = vt, y = 0, z = R \sin(\omega vt + \varphi_0), -\infty < t < \infty.$$

To get the picture shown in Figure 9, let us assume $v = 1$ and $\varphi_0 = -\frac{\pi}{2}$. Then these equations are slightly simplified and take the form

$$x = t, y = R \sin \omega t, z = R \cos \omega t, -\infty < t < \infty \quad (1)$$

and

$$x = t, y = 0, z = -R \cos \omega t, -\infty < t < \infty. \quad (2)$$

The projections of these curves on the plane Oxz have the following equations

$$x = t, z = R \cos \omega t, -\infty < t < \infty$$

and

$$x = t, z = -R \cos \omega t, -\infty < t < \infty,$$

¹ Online mathematical graphics constructor: <https://www.mathway.com/ru/Graph>

In particular, they are mutually located as in Figure 11. This means that (1) and (2) are the desired equations of a helical line and a sinusoid, respectively.

Mathematical Representation of Closed Electromagnetic Wave Packages

There are natural waves that are closed, spiral-shaped, continuous, uniform and stable. The representation of these waves has a threaded spiral motion on the torus, corresponding to the charging properties of EMWP, and a sinusoidal motion on the inside diametrical cylindrical surface, corresponding to the magnetic properties of the packet (Figure 12).

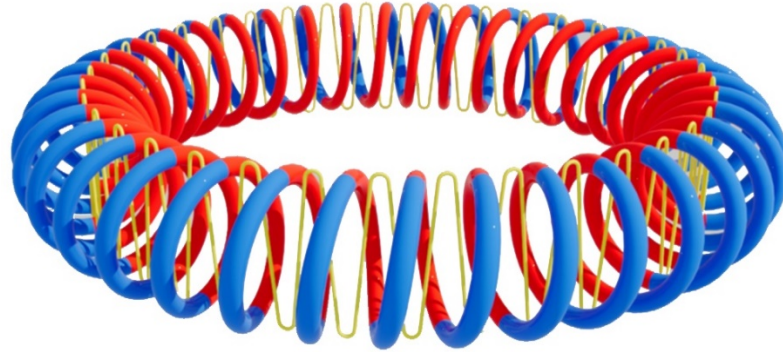


Figure 12. Electromagnetic Wave Electron Packet

Let us consider the natural EMWP of the photon and the electron as toroidal properties of EMWP. To do this, let's virtually consider separately and make an equation describing their movements for each of them.

A torus consisting of an electric wave packet (EMWP) can be mathematically described in coordinates (Figure 13), where R is the axial radius of the torus, and is the r radius of the EMWP around the "axis" of the torus.

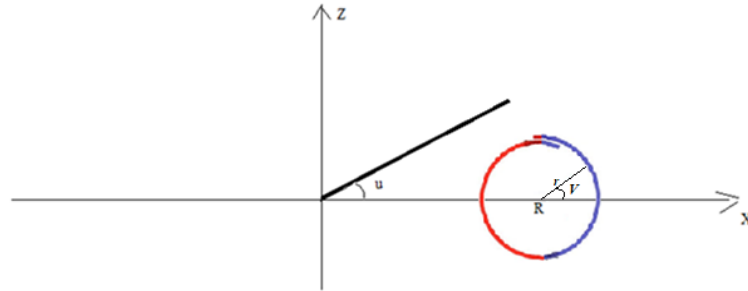


Figure 13. Formation of a torus by rotation of a circle

Let us construct the parametric equation of the torus. To do this, rotate around the axis Oz the circle given on the plane Oxz by the parametric equation $x = R + r \cos v$, $z = r \sin v$ $0 \leq v \leq 2\pi$, where $R > r$ the given numbers are.

When rotated by an angle u , counterclockwise around the axis Oz , the point of a given circle $M_0(R + r \cos v, 0, r \sin v)$ passes into a torus point $M(x, y, z)$. It is easy to see that during this rotation the third coordinate does not change, i.e. $z = r \sin v$, in addition to this, the points M_0 and M from the axis are equally distant from the axis Oz , and this distance is equal to $R_1 = R + r \cos v$. Then $x = R_1 \cos u$, $y = R_1 \sin u$, i.e. $x = (R + r \cos v) \cos u$, $y = (R + r \cos v) \sin u$. Thus, we derived the parametric equation of the torus

$$\begin{cases} x = (R + r \cos v) \cos u, \\ y = (R + r \cos v) \sin u, \quad 0 \leq u \leq 2\pi, 0 \leq v \leq 2\pi. \\ z = r \sin v, \end{cases}$$

To derive the equation of a helical line on a torus, i.e. a spiral on a torus, let us give the internal equation of a spiral on the surface of a torus $u = \omega t, v = kt$, where $0 \leq t \leq 2\pi$. Then the equation of a spiral on a torus looks like this

$$\begin{cases} x = (R + r \cos kt) \cos \omega t, \\ y = (R + r \cos kt) \sin \omega t, \quad 0 \leq t \leq \frac{2\pi}{\omega}. \\ z = r \sin kt, \end{cases} \quad (1)$$

To make the spiral on the torus more dense, you should choose a number k large enough.

To obtain a closed helix, we first require the coincidence of the points describing it at and

$$t = 0 \text{ at } t = \frac{2\pi}{\omega}:$$

$$\begin{aligned} x(0) &= R + r, \quad y(0) = 0, \quad z(0) = 0, \\ x\left(\frac{2\pi}{\omega}\right) &= R + r \cos \frac{2\pi k}{\omega}, \quad y\left(\frac{2\pi}{\omega}\right) = 0, \quad z\left(\frac{2\pi}{\omega}\right) = r \sin \frac{2\pi k}{\omega}. \end{aligned}$$

From this we get that $\frac{2\pi k}{\omega} = 2\pi n$, i.e. $k = n\omega$, $n \in \mathbb{Z} \setminus \{0\}$. Then equation (1) will take the form

$$\begin{cases} x = (R + r \cos n\omega t) \cos \omega t, \\ y = (R + r \cos n\omega t) \sin \omega t, \quad 0 \leq t \leq \frac{2\pi}{\omega}. \\ z = r \sin n\omega t, \end{cases} \quad (2)$$

Now we also require the coincidence of the tangent vectors at $t = 0$ and at $t = \frac{2\pi}{\omega}$.

Calculating derivatives

$$\begin{cases} x' = -n\omega r \sin n\omega t \cos \omega t - \omega(R + r \cos n\omega t) \sin \omega t, \\ y' = -n\omega r \sin n\omega t \sin \omega t + \omega(R + r \cos n\omega t) \cos \omega t, \\ z' = n\omega r \cos n\omega t, \end{cases}$$

We find that

$$\begin{aligned} x'(0) &= 0, \quad y'(0) = \omega(R + r), \quad z'(0) = n\omega r \\ x'\left(\frac{2\pi}{\omega}\right) &= 0, \quad y'\left(\frac{2\pi}{\omega}\right) = \omega(R + r), \quad z'\left(\frac{2\pi}{\omega}\right) = n\omega r. \end{aligned}$$

This shows the coincidence of tangent vectors. Therefore, equation (2) is the equation of a closed helical line on a torus.

Let us derive the equation of a sine wave on the surface of a cylinder with the axis Oz and radius of the cross-section R . Let $M(x, y, z)$ any point be a sinusoid, and the $M_1(x, y, 0)$ projection of this point on the plane Oxy . Since the point $M_1(x, y, 0)$ lies on a circle with the radius R and center at the origin, then $x = R \cos \omega t$, $y = R \sin \omega t$. If we take into account that $z = r \sin(bt + \varphi_0)$, then we get the equation of a sine wave

$$x = R \cos \omega t, \quad y = R \sin \omega t, \quad z = r \sin(bt + \varphi_0), \quad 0 \leq t < \infty \quad (3)$$

Here r and $\frac{2\pi}{b}$ respectively, the amplitude and period of the sinusoid, ω the angular velocity of the rotation of the vector $\overline{OM_1}$ around the axis Oz .

To obtain a closed sine wave on a cylinder, we first require the coincidence of the points describing it at $t=0$ at $t = \frac{2\pi}{\omega}$:

$$\begin{aligned} x(0) &= R, y(0) = 0, z(0) = r \sin \varphi_0, \\ x\left(\frac{2\pi}{\omega}\right) &= R, y\left(\frac{2\pi}{\omega}\right) = 0, z\left(\frac{2\pi}{\omega}\right) = r \sin\left(b \frac{2\pi}{\omega} + \varphi_0\right). \end{aligned}$$

From this we get that $b \frac{\pi}{\omega} = \pi n$ or $b \frac{\pi}{\omega} + \varphi_0 = \frac{\pi}{2} + \pi n$, $n \in Z$, i.e.

$$b = n\omega, n \in Z \setminus \{0\} \text{ or } b = \left(n + \frac{1}{2} - \frac{\varphi_0}{\pi}\right)\omega, n \in Z.$$

In the case, $b = n\omega$ the sine wave equation is converted to the equation

$$x = R \cos \omega t, y = R \sin \omega t, z = r \sin(n\omega t + \varphi_0), 0 \leq t \leq \frac{2\pi}{\omega}. \quad (4)$$

Now we also require the coincidence of the tangent vectors at $t=0$ and at $t = \frac{2\pi}{\omega}$.

Calculating the derivatives $x' = -\omega R \sin \omega t$ of, $y' = \omega R \cos \omega t$, $z' = n\omega r \cos(n\omega t + \varphi_0)$ we find that

$$\begin{aligned} x'(0) &= 0, y'(0) = \omega R, z'(0) = n\omega r \cos \varphi_0, \\ x'\left(\frac{2\pi}{\omega}\right) &= 0, y'\left(\frac{2\pi}{\omega}\right) = \omega R, z'\left(\frac{2\pi}{\omega}\right) = n\omega r \cos \varphi_0. \end{aligned}$$

This shows the coincidence of tangent vectors. Therefore, equation (4) is the equation of a closed sine wave on a cylinder. $\frac{2\pi}{n\omega}$ By assigning different values for $\omega \neq 0$ and an integer $n \neq 0$,

we can obtain the curve we need. In the case $b = \left(n + \frac{1}{2} - \frac{\varphi_0}{\pi}\right)\omega$ of, we also arrive at equation (4).

Let us assume $\omega = 1$ and $\varphi_0 = -\pi$. Then equations (2) and (4) will take the form

$$\begin{cases} x = (R + r \cos nt) \cos t, \\ y = (R + r \cos nt) \sin t, \\ z = r \sin nt, \end{cases} \quad 0 \leq t \leq 2\pi. \quad (5)$$

$$\begin{cases} x = R \cos t, \\ y = R \sin t, \\ z = -r \sin nt, \end{cases} \quad 0 \leq t \leq 2\pi. \quad (6)$$

The curves given by equations (5) and (6) are mutually arranged as in Figure 12. This means that (5) and (6) are the desired equations of a closed helical line on the torus and the sinusoids on the cylinder "consistent" with the torus, respectively. By attaching different values to the integer

$n \neq 0$, we can obtain the curves we need. Note that with increasing n the "density" increases, since the period of the sine wave $\cdot \frac{2\pi}{n}$

In order for the helical spiral of the toroid to be denser, you should choose a number k large enough. Now the problem is the mathematical transformation of EMWP into spherical, hemispherical and sectoral-spherical configurations.

As can be seen from the above, EMW is an energy state, it can have various toroidal transformed configurations, such as photon, electron, positron, and gamma EMWP. In atomic and nucleon orbitals, the direction of the EMW propeller determines the charging properties. In the toroidal state, the combination of magnetic and electrical properties determines the spin properties of EMWP. For an electron in the atomic orbital of EMWP, the outer negative side and the inner side is positive, for a positron in a nucleon orbital it is the opposite. The spin property creates a stable atomic and nucleon orbital, and EMWP itself obeys the law of electrostatics. The configuration of EMWP in the atomic, nucleon orbital determines the direction of chemical and physical bonding. In atomic, nucleon orbitals, EMWP does not intersect (except for bonding or pairing) and does not overlap without interaction when forming a chemical and physical bond.

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MAHALLIY SORBENTLARNING XROM (III) IONLARIGA NISBATAN SORBSION FAOLLIGINI INFRAQIZIL SPEKTROSKOPIYA YORDAMIDA BAHOLASH

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H.M. Ismoilova, k.f.f.d., dots. Urganch davlat universiteti, Urganch

Annotatsiya. Ushbu tadqiqotda xrom (III) ionlariga nisbatan sorbsion faolligi infraqizil (IQ) spektroskopiya usuli yordamida baholandi. Tadqiqot uchun olingan ion almashinuvchi sorbentlarning adsorbsion usullari o'rganildi hamda xrom (III) ionlari bilan o'zaro ta'siri tahlil qilingan. IQ-spektroskopiya tekshiruv jarayonida sorbent tarkibidagi funksional guruhlarining spektr tahlillaridan kimyoviy sorbsiya, koordinatsion bog'lanishlar orqali xrom (III) ionlarini bog'langanligi to'g'risida xulosa qilingan.

Kalit so'zlar: mahalliy sorbent, sorbsiya, IQ-spektroskopiya, metall ion, xrom, metall-sorbent, ion almashinish.

Аннотация. В данном исследовании сорбционная активность по отношению к ионам хрома (III) оценивалась с помощью инфракрасной (ИК) спектроскопии. Изучены методы адсорбции полученных для исследования ионообменных сорбентов и проанализировано их взаимодействие с ионами хрома (III). В ходе ИК-спектроскопического исследования на основании спектрального анализа функциональных групп в сорбенте был сделан вывод о том, что ионы хрома (III) связаны посредством химической сорбции и координационных связей.

Ключевые слова: локальный сорбент, сорбция, ИК-спектроскопия, ион металла, хром, металл-сорбент, ионный обмен.

Abstract. In this study, the sorption activity of chromium (III) ions was evaluated using infrared (IR) spectroscopy. The adsorption methods of the ion-exchange sorbents obtained for the study were studied and their interaction with chromium (III) ions was analyzed. In the process of IR spectroscopy, it was concluded from the spectral analysis of the functional groups in the sorbent that chromium (III) ions were bound through chemical sorption and coordination bonds.