STRUCTURE OF ELECTROMAGNETIC FIELDS - WAVES DYNAMIC ELECTRON (mass - charge).

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A charged particle (mass - charge) is surrounded with an electromagnetic field making it complete. This applies to any body having mass and an electric charge (mass - charge). Generally, when there are charges moving in time or moving on a contour with a current in space surrounding them, there is a variable electromagnetic field. If these processes are periodic, the variable electromagnetic field will be a wave. [1] [2] [3]. All this applies to the full concerns and to such enormous concentrated mass, possessing electric charges (mass - charge), with the periodic law of movement, as planets, stars, galaxies. Much to our regret, lengths of electromagnetic waves (frequency) of such heavenly bodies are not reflected yet on a scale in directories and textbooks. Now practical frequencies are lower than 1 Hertz by 5-6 orders of magnitude and more ($10^{-5} - 10^{-6}$the hertz and is lower). These have been considered as constant electric current or in the general category of "static", but that basically is not true. Proceeding from this, space "vacuum" of the universe in which there is the hugest quantity of the concentrated mass – charges, it is expedient and correct to consider the space filled with a powerful electromagnetic field. This field is a dynamic wave (dynamics (changes) of the universe, as concentrated mass - charges moving on the periodic law) with its electric and magnetic components being orthogonal. All this demands we consider *any* physical processes as occurring in an external electromagnetic field. Consideration of a pulse of the charged particle (mass - charge) in external cross (orthogonal) homogeneous electric and magnetic fields occurs on cycloids to trajectories. [4] Cycloids can be ordinary, short, or lengthened. Frequently a cycloid can be considered as movement of a point on a rim of a wheel sliding without sliding with a speed of V_0. Here it is necessary to specify that in the universe there is no motionless point, and uniform, rectilinear movement in the pure state *does not exist.* For accentuation of this important point it is enough to draw with a compass a circle on a paper. What thus has taken place? The paper together with a compass, the Earth, Solar system, the Galaxy, the universe goes not in regular intervals and not rectilinearly under periodic laws. In really occurring process in the universe the pencil never will return to the same point, whence began movement, yet on a paper it has taken place. Thus, the circle drawn on a paper is only *a display* of really occurring movement on an arch (a site of a certain resulting cycloid). So, we have real movement on a certain cycloid, and on a paper we receive *display* as a circle. For example, in science instead of real cycloids, trajectories of movement of planets are considered as deformed circles - ellipses *(display);* that is not correct. This only applies to the "direct" line drawn by a pencil on a ruler on a paper. Much to our regret, modern physics created many theoretical bases using the uniform concept; rectilinear movement also receives the result constructed on *display* of dynamics of processes, instead of on *real* not uniform, not rectilinear movement. In the given work the trajectory of periodic movement of an electron will be considered on a cycloid as any movement of a point (mass - charge) in the universe appears as total elementary cycloids trajectories with different parameters. By consideration *of elementary* structure of an electromagnetic wave electron (mass - charge) we shall take advantage of an ordinary cycloid which is shown in the figure below. This cycloid from [3 [4] have the following parameters:

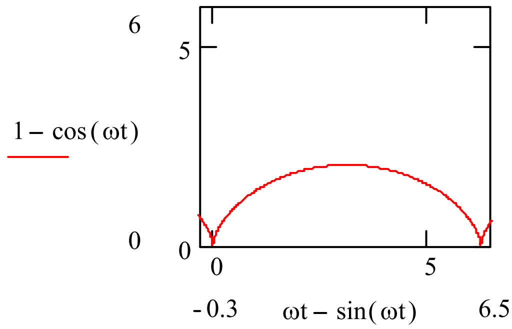
$$V_0 \cdot t - R\sin\omega t = a(\omega t - \sin\omega t) \qquad y = R - R\cos\omega t = a(1 - \cos\omega t)$$

$$V_0 = \frac{E}{B}\ ; \qquad a = \frac{mE}{qB^2}\ ; \qquad \omega = \frac{qB}{m}\ ; \qquad R = \frac{m \cdot V_0}{qB}\ ;$$

Moving on a cycloid an electron (mass - charge) is an element of an electric current around which there is an electromagnetic field. We shall note also, that an electromagnetic wave - field, moving on a cycloid, electron (mass - charge), is and counteraction reaction to revolting influence to it on the part of an external electromagnetic field. For definition of structure of this electromagnetic fields - waves of electron (mass - charge) we shall add Maxwell equations in the differential form, the material equations. The received full system of the equations of an electromagnetic field from [2] looks like:

$$\nabla\times \mathbf{H} = \gamma\mathbf{E} + \frac{\partial}{\partial t}\mathbf{D} + \delta_{nep}\ , \qquad \nabla\times \mathbf{E} = -\frac{\partial}{\partial t}\mathbf{B}\ , \qquad \nabla\mathbf{D} = \rho\ , \qquad \nabla\mathbf{B} = 0\ ,$$

$$\mathbf{B} = \mu\mu_0\,\mathbf{H}\ , \qquad \mathbf{D} = \varepsilon\varepsilon_0\,\mathbf{E}\ .$$



Orbit - cycloid of electron (mass - charge) in
Homogeneous orthogonal electric and
Magnetic fields. For simplification have taken $a = 1$.

Let's take advantage of this full system of the equations of an electromagnetic field. In the Cartesian system of coordinates the first two equations will be written down as six equations, according to three projections to axes of coordinates. Using expressions for vectors **D** and **B**, we receive these equations as:

$$\frac{\partial H_z}{\partial y} - \frac{\partial H_y}{\partial z} = \gamma \cdot E_x + \varepsilon\varepsilon_0 \frac{\partial E_x}{\partial t} + \delta_{nep\ x} \qquad (1)$$

$$\frac{\partial H_x}{\partial z} - \frac{\partial H_z}{\partial x} = \gamma \cdot E_y + \varepsilon\varepsilon_0 \frac{\partial E_y}{\partial t} + \delta_{nep\ y} \qquad (2)$$

$$\frac{\partial H_y}{\partial x} - \frac{\partial H_x}{\partial y} = \gamma \cdot E_z + \varepsilon\varepsilon_0 \frac{\partial E_z}{\partial t} + \delta_{nep\ z} \qquad (3)$$

$$\frac{\partial E_z}{\partial y} - \frac{\partial E_y}{\partial z} = -\mu\mu_0 \cdot \frac{\partial H_x}{\partial t} \qquad (4)$$

$$\frac{\partial E_x}{\partial z} - \frac{\partial E_z}{\partial x} = -\mu\mu_0 \cdot \frac{\partial H_y}{\partial t} \qquad (5)$$

$$\frac{\partial E_y}{\partial x} - \frac{\partial E_x}{\partial y} = -\mu\mu_0 \cdot \frac{\partial H_z}{\partial t} \qquad (6)$$

Let's note that movement of an electron (mass - charge) is an element of an electric current, on a cycloid in plane Oxy and submits *to sine wave* laws. Proceeding from this, it is possible to take advantage of a symbolical method (a method of complex amplitudes) to record the intensity of electric and magnetic fields. The electric field varies in plane Oxy together with movement of the electron (mass - charge). On axis Oz movement is absent; that corresponds $\dot{E}_z = 0$. Change of electromagnetic waves in plane Oxy are interconnected to parameters (sizes) of the cycloid. On axis Oz of such limiting interrelation is not present; therefore change of waves here is equal to ∞.

For an Electron on a trajectory - cycloid it is possible to present as elementary segment - section (plane Oxy) to a homogeneous long line (axis Oz) as it is represented similarly to a case of movement of waves of a current (I) and voltage (U) along a line. Feature consists only in that; all functions are carried out unique considered an electron. An electron is an element of a current and a voltage in an elementary segment - section (cycloid) and not of an existing long line simultaneously. For the best understanding of this representation it is necessary to make a specification. The maximum of a current (I) and voltage (U) along a line is reached during that moment when electron is in a point of the base of a cycloid or at its top. These extreme points also are segment - section of "wires" of not existing homogeneous long line. As the current and a voltage are created by electric charges (in our case to one electron as mass - charge) it has allowed movement of electron on a trajectory - cycloid to present as the electromagnetic wave process occurring in a long homogeneous line. We believe that a change of intensity of fields along axis Oz is expressed by exhibitor function of a kind exp (-g'z), that corresponds to presence of one direct running wave through segment - section. Size γ' is meaningful factor of distribution.

Under such circumstances complex expressions of instant values of intensity components look like electric and magnetic fields:

$$\dot{E}_x = \dot{E}_{mx}\exp(i\cdot\omega t)\exp\left(-\gamma' z\right), \qquad \dot{H}_x = \dot{H}_{mx}\exp(i\cdot\omega t)\exp\left(-\gamma' z\right),$$

$$\dot{E}_y = \dot{E}_{my}\exp(i\cdot\omega t)\exp\left(-\gamma' z\right), \qquad \dot{H}_y = \dot{H}_{my}\exp(i\cdot\omega t)\exp\left(-\gamma' z\right),$$

$$\dot{E}_z = 0, \qquad \dot{H}_z = \dot{H}_{mz}\exp(i\cdot\omega t)\exp\left(-\gamma' z\right),$$

where complex amplitudes $\dot{E}_{mx}, \dot{E}_{my}, \dot{H}_{mx}, \dot{H}_{my}, \dot{H}_{mz}$ are functions of x and y.

Let's substitute these expressions of instant values in the equations (1), (2), (3), (4), (5), (6) and also we shall take into account that conductivity of surrounding space $\gamma = 0$ and $\delta = 0$, as other charges are absent. Besides on a condition $\dot{E}_z = 0$, and after reduction on the common multiplier $\exp(i\cdot\omega t)\exp\left(-\gamma' z\right)$ we receive:

$$\frac{\partial}{\partial y}\dot{H}_{mz} + \gamma'\dot{H}_{my} = i\cdot\omega\varepsilon\varepsilon_0\dot{E}_{mx} \qquad (1')$$

$$-\gamma'\dot{H}_{mx} - \frac{\partial}{\partial x}\dot{H}_{mz} = i\cdot\omega\varepsilon\varepsilon_0\dot{E}_{my} \qquad (2')$$

$$\frac{\partial}{\partial x}\dot{H}_{my} - \frac{\partial}{\partial y}\dot{H}_{mx} = 0 \qquad (3')$$

$$\gamma'\dot{E}_{my} = -i\cdot\omega\mu\mu_0\dot{H}_{mx} \qquad (4')$$

$$-\gamma'\dot{E}_{mx} = -i\cdot\omega\mu\mu_0\dot{H}_{my} \qquad (5')$$

$$\frac{\partial}{\partial x}\dot{E}_{my} - \frac{\partial}{\partial y}\dot{H}_{mx} = -i\cdot\omega\mu\mu_0\dot{H}_{mz} \qquad (6')$$

Further we shall substitute $\dot{E}_{my}$ from $(4')$ to $(2')$ and $\dot{E}_{mx}$ from $(5')$ to $(1')$ we receive:

$$\dot{H}_{mx} = -\frac{\gamma'}{\omega^2\mu\mu_0\varepsilon\varepsilon_0 + \left(\gamma'\right)^2}\cdot\frac{\partial}{\partial x}\dot{H}_{mz} \qquad (1'''')$$

$$\dot{H}_{my} = -\frac{\gamma'}{\omega^2\mu\mu_0\varepsilon\varepsilon_0 + \left(\gamma'\right)^2}\cdot\frac{\partial}{\partial y}\dot{H}_{mz} \qquad (2'''')$$

The equation $(3')$ is obeyed automatically, if in it to substitute expressions $(1'''')$, $(2'''')$. There is an equation $(6')$. Substituting in it $\dot{E}_{mx}$ and $\dot{E}_{my}$ from $(5')$ and $(4')$ and then instead of $\dot{H}_{mx}$ and $\dot{H}_{my}$ their expression $(1'''')$, $(2'''')$, we obtain equation for $\dot{H}_{mz}$:

$$\frac{\partial^2}{\partial x^2}\dot{H}_{mz} + \frac{\partial^2}{\partial y^2}\dot{H}_{mz} + \left[\omega^2\cdot\mu\mu_0\varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]\dot{H}_{mz} = 0 \qquad (**)$$

Let's search $\dot{H}_{mz}$ in the form $\dot{H}_{mz}$ = XY, where X - function only x and Y - function only y. Then last equation (**) becomes:

$$\mathrm{Y}\cdot\frac{\partial^2\mathrm{X}}{\partial x^2} + \mathrm{X}\cdot\frac{\partial^2\mathrm{Y}}{\partial y^2} + \left[\omega^2\mu\mu_0\varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]\mathrm{XY} = 0$$

We divide on XY and is discovered:

$$\frac{1}{X}\cdot\frac{\partial^2 X}{\partial x^2}+\frac{1}{Y}\cdot\frac{\partial^2 Y}{\partial y^2}+\left[\omega^2\mu\mu_0\varepsilon\varepsilon_0+\left(\gamma'\right)^2\right] = 0$$

or

$$\frac{1}{X}\cdot\frac{\partial^2 X}{\partial x^2}+\left[\omega^2\mu\mu_0\varepsilon\varepsilon_0+\left(\gamma'\right)^2\right] = -\frac{1}{Y}\cdot\frac{\partial^2 Y}{\partial y^2}$$

The left-hand part of last equation is a function only X, and right - only Y. Hence, the equation is obeyed for anyone X and Y only in the event that both left-hand and right its parts are equal to some stationary value η^2. Thus the equation breaks up to two:

$$\frac{\partial^2 X}{\partial x^2}+\xi^2 X = 0, \qquad \frac{\partial^2 Y}{\partial y^2}+\eta^2 Y = 0, \quad \text{где } \xi^2 = \left[\omega^2\mu\mu_0\varepsilon\varepsilon_0+\left(\gamma'\right)^2\right]-\eta^2$$

After an integration of these two last equations is obtained:

X = Acos(ξx + ϕ) , Y = Bcos(ηy + ψ) and $\dot{H}_{mz} = \dot{H}_0$ cos(ξx + ϕ)cos(ηy + ψ), where $\dot{H}_0$ = AB.

The stationary values ξ, η, ϕ, ψ are determined from boundary conditions in a plane Oxy, where E_m = 0. It means that components of vector E of an electromagnetic field in the given place is directed on a normal to a plane Oxy. Such made line of boundary conditions in a plane Oxy is located apart λ = vT from an electron, driving on a cycloid, where v - speed of light, T - the time of phase of motion, λ - corresponds to length of an electromagnetic wave. The orthogonal fracture of a line of an electrical field on this distance at acceleration of an electron (mass - charge) from a stationary point and returning (negative acceleration) it in this point surveyed in [5]. Available of such area there is a physical sense. The transition from positive to a negative half-wave and back should necessarily transit through zero value. Hence, on the made area λ (wavelength) everywhere E_m = 0. It also is boundary conditions for component of vector fields E in a plane Oxy. Using this requirement we have:

$\dot{E}_{my}$ = 0 at x = $-\lambda_x$ and at x = $+\lambda_x$; (-) - at the left, and (+) - to the right of an electron in figure on an axis Ox.

$\dot{E}_{mx}$ = 0 at y = $-\lambda_y$ and at y = $+\lambda_y$; (-) - below, and (+) - above from an electron in figure on an axis Oy.

From equations $(4')$, $(5')$ and $(1'''')$, $(2'''')$ thus is obtained:

$\frac{\partial}{\partial x}\dot{H}_{mz}$ = 0 at x = $-\lambda_x$ and at x = $+\lambda_x$, $\frac{\partial}{\partial y}\dot{H}_{mz}$ = 0 at y = $-\lambda_y$ and at y = $+\lambda_y$.

It gives: ϕ = 0, $\xi = \frac{m\pi}{\lambda_x}$, ψ = 0, $\eta = \frac{n\pi}{\lambda_y}$, where m and n - integers. λ_x,λ_y also correspond to values of intervals from - λ up to + λ accordingly. Now finally we have:

$$\dot{H}_{mz} = \dot{H}_0 \cos\left(\frac{m\pi x}{\lambda_x}\right)\cos\left(\frac{n\pi y}{\lambda_y}\right) .$$

Substituting this expression in equations $\left(1''''\right)$, $\left(2''''\right)$ and using equations $\left(4'\right)$ and $\left(5'\right)$, we discover complex expressions of instantaneous values of component strengths of electrical and magnetic fields:

$$\dot{H}_x = \frac{\gamma' m\pi}{\lambda_x\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \sin\left(\frac{m\pi x}{\lambda_x}\right)\cos\left(\frac{n\pi y}{\lambda_y}\right)\exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{H}_y = \frac{\gamma' n\pi}{\lambda_y\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \cos\left(\frac{m\pi x}{\lambda_x}\right)\sin\left(\frac{n\pi y}{\lambda_y}\right)\exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{H}_z = \dot{H}_0 \cos\left(\frac{m\pi x}{\lambda_x}\right)\cos\left(\frac{n\pi y}{\lambda_y}\right)\exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{E}_x = \frac{i\cdot\omega\mu\mu_0 n\pi}{\lambda_y\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \cos\left(\frac{m\pi x}{\lambda_x}\right)\sin\left(\frac{n\pi y}{\lambda_y}\right)\exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{E}_y = -\frac{i\cdot\omega\mu\mu_0 m\pi}{\lambda_x\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \sin\left(\frac{m\pi x}{\lambda_x}\right)\cos\left(\frac{n\pi y}{\lambda_y}\right)\exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{E}_z = 0 .$$

Besides an equation (**) after substitution in it of expression $\dot{H}_{mz}$ and its flexons gives:

$$\left[-\left(\frac{m\pi}{\lambda_x}\right)^2 - \left(\frac{n\pi}{\lambda_y}\right)^2 + \left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]\right]\dot{H}_{mz} = 0 ,$$

whence

$$\left(\frac{m\pi}{\lambda_x}\right)^2 + \left(\frac{n\pi}{\lambda_y}\right)^2 = \left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right] .$$

The found solution displays, that in space λ_x, λ_y there can be a set of waves, and each wave corresponds to a pair of integers m and n. In it there is also physical sense. The electron (mass - charge) can be not homogeneous, as our Earth (oceans and continents) and trajectory of motion can be general phase of motion should be equal by as much as composite, but phase of motion on a considered cycloid. More obviously, the variation by numbers m and n will call the same difference, as sounding of the same note "la" on different musical instruments. The task simultaneously m and n equal to zero (0) results in equality to zero of all component electrical field *E*. As a matter of fact it will mean a terrain clearance stop of an electron (mass - charge), that basically it is impossible, as Universe together with a considered electron (mass - charge) inside her, is in constant motion. Thus elementary case receives, if one of these numbers is equal 0, and second 1. If m = 1 and n = 0, it corresponds to the elementary case of motion of an absolute homogeneous electron (mass - charge) on an ideal cycloid. It from what we have begun consideration of structure of its wave, as oppositioning response on an external disturbing electromagnetic field. According to last ratio, provided that we have:

$$\sqrt{\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2} = \frac{\pi}{\lambda_x},$$

and the equations for component strengths of a field gain a view:

$$\dot{H}_x = \frac{\gamma' \lambda_x}{\pi} \dot{H}_0 \sin\left(\frac{\pi x}{\lambda_x}\right) \exp\left(i\cdot\omega t - \gamma' z\right) \quad ;$$

$$\dot{H}_y = 0 \ ;$$

$$\dot{H}_z = \dot{H}_0 \cos\left(\frac{\pi x}{\lambda_x}\right) \exp\left(i\cdot\omega t - \gamma' z\right) \quad ;$$

$$\dot{E}_x = 0 \ ;$$

$$\dot{E}_y = -\frac{i\cdot\omega\mu\mu_0 \lambda_x}{\pi} \dot{H}_0 \sin\left(\frac{\pi x}{\lambda_x}\right) \exp\left(i\cdot\omega t - \gamma' z\right) \quad ;$$

$$\dot{E}_z = 0 \ .$$

As is visible even in the elementary wave representation there are at once 2 orthogonal magnetic vectors. It indicates that the flux density is value especially *complex*. Let's remind also, that the stationary value γ' has the same sense, as a *propagation factor* in the theory of homogeneous long lines. Generally , it is possible to present as $\gamma' = \alpha + i\beta$, where α characterizes damping a wave along an axis Oz and can be called as a *decay coefficient*, and β characterizes change of a phase along an axis Oz and can be called as a *factor of a phase*.

From a ratio $\left(\frac{m\pi}{\lambda_x}\right)^2 + \left(\frac{n\pi}{\lambda_y}\right)^2 = \left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]$ we obtain for area λ_x, λ_y:

$$\left(\gamma'\right)^2 = \left(\frac{m\pi}{\lambda_x}\right)^2 + \left(\frac{n\pi}{\lambda_y}\right)^2 - \omega^2 \mu\mu_0 \varepsilon\varepsilon_0 \qquad (***)$$

At $\left(\frac{m\pi}{\lambda_x}\right)^2 + \left(\frac{n\pi}{\lambda_y}\right)^2 > \omega^2 \mu\mu_0 \varepsilon\varepsilon_0$ we obtain $\left(\gamma'\right)^2 < 0$ and γ' - material number, i.e. $\gamma' = \alpha$ and $\beta = 0$. This case corresponds to a damped wave.

At $\left(\frac{m\pi}{\lambda_x}\right)^2 + \left(\frac{n\pi}{\lambda_y}\right)^2 < \omega^2 \mu\mu_0 \varepsilon\varepsilon_0$ we obtain $\left(\gamma'\right)^2 < 0$ and γ' - imaginary number, i.e. $\gamma' = i\beta$ and $\alpha = 0$. In this case we obtain a wave spreading along an axis Oz without damping.

Further we come to an interesting inference, that in area λ_x,λ_y, created by an electron (mass - charge) there corresponds also critical frequency, defined of a requirement $\gamma' = 0$ by expression:

$$\omega_0 = \frac{\pi}{\sqrt{\mu\mu_0\ \varepsilon\varepsilon_0}} \cdot \sqrt{\left(\frac{m}{\lambda_x}\right)^2 + \left(\frac{n}{\lambda_y}\right)^2} \ .$$

On frequencies is lower than ω_0 the waves are fading . As we consider waves of an electron (mass - charge) as an oppositioning response on an external disturbing electromagnetic field, and it at us on definition does not vary, for obtaining frequencies below ω_0, electron (mass - charge) should increase the cycloid (phase of motion), i.e. change mass and charge. In considered requirements such transformation is not represented possible, as well as generation of these frequencies. The generally considered cycloid can be a device of more composite periodic motion. The example can be served with periodic motion of the Earth, as mass - charge in a structure of a Solar system on a Galaxy and Universe. At frequencies higher than ω_0 the waves are continuous. It means a capability of generation by an electron (mass - charge) of such waves at constant phase of a cycloid. it is not correct to consider an electron (mass - charge) as an ideal homogeneous orb (geometrical place of points), especially if the weight - charge reaches the sizes of planets and more . Ideal distribution of weight and charge in a volume is not reached. The Earth, as a mass - charge confirms it. The physical properties of ocean water and continental land are various. Concentrated a weight - charge is more often similar to a set of dynamic electric dipoles. Concerning to an electron, it consider even as a hemisphere [6].

Distance on which is spread an electromagnetic wave during one phase of the change, as is known term as a wavelength $\lambda = vT$, where:

$$v = \frac{1}{\sqrt{\mu\mu_0\ \varepsilon\varepsilon_0}} \quad , \quad T = \frac{2\,\pi}{\omega} \ .$$

Hence, to a critical frequency ω_0 there corresponds a critical wavelength λ_0 in space:

$$\lambda_0 = \frac{2\,\pi}{\omega_0 \cdot \sqrt{\mu\mu_0\ \varepsilon\varepsilon_0}} = \frac{2}{\sqrt{\left(\frac{m}{\lambda_x}\right)^2 + \left(\frac{n}{\lambda_y}\right)^2}} \ .$$

The values ω_0 and λ_0 interdependent to numbers m and n, wave, determining character. In our case $\lambda_x > \lambda_y$, therefore smallest critical frequency receives at m = 1 and n = 0. It appears equal: $\omega_0 = \dfrac{1}{\sqrt{\mu\mu_0\,\varepsilon\varepsilon_0}}\cdot\dfrac{\pi}{\lambda_x}$ and, hence, greatest critical wavelength matters $\lambda_0 = 2\lambda_x$.

As at $\omega>\omega_0$ have $\gamma' = i\beta$ and exp $(i\omega t - \gamma' z)$ = exp $(i\omega t - \beta z)$, for obtaining expressions for real instantaneous values H_x, H_y, H_z, E_x, E_y, also it is necessary in expressions for their complexes to exchange a factor exp $(i\omega t - \gamma' z)$ on sin $(\omega t - \beta z)$. The value $\dfrac{\omega}{\beta} = v'$ is *a phase velocity* of a wave.

The wavelength Λ on an axis Oz receives from a ratio $\beta\Lambda = 2\pi$. Substituting in the ratio (***) through $(-\beta^2)$ and $\omega^2\,\mu\mu_0\,\varepsilon\varepsilon_0$ through $\left(\dfrac{2\,\pi}{\lambda}\right)^2$ is discovered:

$\beta^2 = \left(\dfrac{2\,\pi}{\lambda}\right)^2 - \left(\dfrac{m\pi}{\lambda_x}\right)^2 - \left(\dfrac{n\pi}{\lambda_y}\right)^2$. Then we have $\dfrac{2}{\Lambda} = \sqrt{\left(\dfrac{2}{\lambda}\right)^2 - \left(\dfrac{m}{\lambda_x}\right)^2 - \left(\dfrac{n}{\lambda_y}\right)^2}$ or

$$\frac{1}{\Lambda} = \sqrt{\frac{1}{\lambda^2} - \frac{1}{(\lambda_0)^2}}\ .$$

From here it is visible, that the wavelength Λ on an axis Oz is more, than wavelength λ in a plane Oxy at the same frequency. This difference the is more, than more λ comes nearer to a critical wavelength λ_0, and at $\lambda = \lambda_0$ is obtained $\Lambda = \infty$.

Phase velocity can be submitted as:

$$v' = \frac{\omega}{\beta} = \frac{\omega}{2\,\pi}\cdot\Lambda = \frac{1}{\sqrt{\mu\mu_0\,\varepsilon\varepsilon_0}}\cdot\frac{\Lambda}{\lambda} = v\cdot\frac{\Lambda}{\lambda}\ .$$

Hence, the phase velocity v' of electromagnetic waves on an axis Oz is more than a velocity of motion of electromagnetic waves in a plane Oxy. It, certainly, does not mean, that the electromagnetic field changes with a velocity greater, than v, as there is a velocity v', from which in a steadied mode the phase distribution along an axis Oz changes. In physical sense it means, that at any violation of an existing charge distribution on weight the factors m and n vary which change phase distribution along an axis Oz with a velocity v'. Differently with this velocity the factors m and n change which determine frequency filling of a wave of a weight - charge, i.e. spectrum, which can be submitted also by trigonometric Fourier series at which number of terms correspond to factors m and n.

In above explored a case along an axis Oz has distinct from zero component only strength of a magnetic field. In this connection calls interest that $\nabla\mathbf{B} = 0$ always (absence of magnetic charges, and the lines of a magnetic field are made) and the flux density is value *complex*. Magnetic component along an axis Oz of a critical wave of an electron (mass - charge) is made in perpetuity. On this magnetic wave the electron, considered in a particular place, can be inspected (mass - charge) *instantaneous* everywhere in the Universe. It makes with it one whole *indefinitely made space*, where any changes of phase distribution of its wave implement *instantaneous* in the Universe.

The considered properties components $\dot{H}_z$ electron (mass - charge) to the full correspond to this a component and our Earth (mass - charge). It is tempting to influence the information on a component $\dot{H}_z$ at the Earth. The same *instant* passage of the information on the universe! Certainly, the standard techniques used in a standard radio communication here are not applicable. The received complex expressions of instant values of components intensity magnetic and electric fields $\dot{H}_x$, $\dot{H}_y$, $\dot{H}_z$, $\dot{E}_x$, $\dot{E}_y$, $\dot{E}_z$ of electron (mass - charge) are completely applicable for electrons in an environment of atom. From above-stated also follows, that the orbit of electron (mass - charge) in atom is epicycloid, instead of the deformed circle - ellipse. These complex expressions already in a ready kind are original *wave periodic function* of an electronic environment of atom of hydrogen H_1. The area λ_x, λ_y determines the external sizes of atom of hydrogen H_1. *Wave periodic function* for electrons in atom can appear more convenient, than transformations of equation Shredinger from which receive *probability* of a finding of electron at present time, in the given place of an orbit.

It is necessary to note special interrelation of the considered processes with works on sphere dynamic [7 [8]. In them the sounding body, and is more concrete, it's any separate material point (conformity with electron, possessing in the mass, generates whole sound number frequencies, by analogy to factors m and n. As we see, a mechanical and electric wave picture dynamic a mass - charge submit to the same laws in the nature. They are in indissoluble connection and in any case make a single whole (mass - charge).

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