The optics of masses

Michail Telegin
Independent analyst

E-mail: mtelegin@comail.ru; m_telegin@chat.ru

Abstract

The theory of gravitation and variable curvature of space is in the noninertial systems of reference (without postulates). The identical laws of operation of electrodynamics and massodynamics forces allow creating the uniform field theory. The constructions, implying from the obtained theory, are reduced is quantum of fields and neutrino, their transmutations. Some practical corollaries are examining.

Used notations

c_0 – the maximum velocity of electromagnetic waves, i.e. velocity far from gravitating masses without accounting of the universe influence. c_ρ - local velocity of electromagnetic waves ($c = f(\rho)$);
γ – the gravitational constant;
M – mass of gravitating body (Sun);
m – mass of a particle;
ν – frequency of a photon;
λ – wavelength;
n – the factor of refraction ($n = f(\rho)$);
α – the Fizeau's dragging factor;
v – velocity;
t – time;
T – period;
ρ – the distance from the center of gravitation up to the given point;
Δ – difference of magnitudes;
P – gravitational potential;
K – kinetic energy;
W – potential energy;
F – force;
h – the Planck's constant;
u – curvature of a line;
ε_0 – permittivity of a vacuum;
μ – permeability of space;
i – angle of incidence;
p – impulse;
E – electric field intensity;
D – electrical displacement;
H – magnetic field strength;
B – induction of magnetic field;
S – gravitational field intensity;
T – gravitational displacement;
G – massodynamic field strength;
L – induction of massodynamic field.

1. Introduction

By the virtue of square-law of the universal gravitation in the visible universe there are no present inertial systems except for, most likely, universe in whole. The space of the universe is filled by such spherical (or approximately) symmetrical plants with the high-power gravitation, as stars, their complicated conglomerates as accumulations, galaxies etc. These systems have own primary frames of reference, difiniendums by their dominant mass, which can be accepted for laboratory. The law of universal gravitation will not concede existence of inertial systems. They are possible in the case of flat ground on three whales only (or turtles, at will).

Therefore driving, both Earth, and all solar system concerning stars, are easily determined with the help of the Doppler's effect. The Michelson's interferometer, being the closed system, cannot be used for the definition of any frame system. As the dragging factor of vacuum, according to experiences of Fizeau, is equal to zero absolutely, and to air - practically. More in detail see **appendix A**.

The energy of photons and quantum passage cannot be considered defined because of an incorrectness of proofs and mathematical calculations, owing to which the conservation law of impulse is broken. **Appendix B**.

Generally to modern physics is inherent enough of paradoxes. One from them is the paradox of Lorenz (reduction of an electron's length at driving of a rather laboratory frame). There is an explicit violation of conservation law of moment (spin), as at the modification of the form varies accordingly and moment of inertia. But the spin's magnitude does not vary with velocity, from what system it do not observe [3]. Therefore for a long time has ripened necessity to analyze properties of noninertial systems. It is easiest to make it on the example of the Sun, as nearest and most investigated star. But for the beginning it would be necessary to pay attention to the paradoxical situation existing in modern physics, which can be reduced to one formula:

$$\frac{\Delta\nu}{\nu}=\frac{\Delta\lambda}{\lambda}=\frac{\Delta c}{c}=-\frac{\Delta P}{c^2}. \qquad (1.1)$$

But the velocity of light is unequivocally determined as $c=\lambda\nu$! What three magnitudes can we consider as the constant from? It is possible, certainly, even temporarily by fixing one from them, to change remaining. But such emotional approach is closer to mysticism, than to logic.

It is impossible to consider a similar statement of the question is correct (in the nature such trigger is impossible). Therefore it is obviously necessary the solution of this problem, for what enough to find the explanatory variable.

All issues in this work will be decided for vacuum.

2. The invariance of photon

According to experimental datas, velocity of light in a hollow does not depend on frequency; (there is no frequent dispersion). But depends on the gravitational potential (on the surface of the Sun it is approximately on 600 m/s less those on the Earth orbit. In connection with a diminution of the transfer rate of electromagnetic signal, the spectral resonance frequency of radiation and absorption of photons by resonators - substance of the surface stratum should proportionally decrease. The wavelength at deleting from a star is increased, that is clear and on the geometric reasons from the formula of light velocity.

But what happens with the energy of photon at the gravitational potential modification in the star - photon system? On the one hand the energy of photon is proportional to its frequency. With another – the energy is proportional to the mass multiplied on the quadrate of velocity. If to assume, that at overcoming of the gravitational potential the photon loses an energy and reddens according to the formula (1.1), its frequency, so also product of the mass on quadrate of the velocity, should decrease proportionally to cube of the velocity. Because the velocity of photon in accordance with moving away from the Sun is increased, and its energy ($\nu \cdot h$) is proportional as well to quadrate of the velocity. Fortunately paradoxes are inherent only in thinking, but not to nature.

Let's assume that the velocities of electromagnetic and gravitational signals are equal, or almost are equal. The photon is gone with the greatest possible velocity, the velocity of wave of the medium. The instantaneous interchanging by the mass or energy with the Sun is impossible that the transmission of the energy, as some perturbation, cannot surpass the velocity of wave. This perturbation should be transmitted only with the velocity of wave. It is necessary to suppose that the mass continuously turns energy of the field in the point of photon location. And it implies that by means of photons the mass of the Sun gradually passes in the energy of its gravitational field. That is mean the body's mass losses because on radiation, its gravitational field is increased, and on the contrary. Thus, we come “ad absurdum”, - to the denial of the universal law of gravitation and the law of conservation of mass.

The proof by contradiction shows, that interchanging by the energy and mass of any substance driven with light velocity with any field is impossible. In other words, body or particle becomes " a black hole ". For example a photon, not having field contacts, should interact with bodies only at direct contact. Therefore at the modification of space properties under the operation of the gravitational energy, which is condensed, becoming inhomogeneous and anisotropy, the velocity of electromagnetic signal, remaining the constant concerning him, should vary together with space.

If the photon frequency, so also its energy at the modification of its position concerning to center of gravitation is constant, the red displacement of the spectrum is stipulated only by modification of resonators frequencies because of the modification light velocity. In this connection it is interesting to define the difference of resonators frequencies, by counting up the difference of their energies.

3. Experiences of Pound and Rebka

The differences of power performances of emitters on the Earth and on the Sun can be traced, using the supposition of equivalence mass and energy: $W = mc^2$. Let's appropriate to the Sun an index "$_s$", by letting orbit of the Earth without those. Then the ratio of the energy difference to the energy of a terrestrial resonator for the same spectral line, in view of the equivalence of mass – energy, will look like the following:

$$\frac{\Delta W}{W} = \frac{W - W_s}{W} = \frac{mc^2 - mc_s^2}{mc^2} = \left[1 - \frac{c_s^2}{c^2}\right]. \qquad (3.1)$$

The potential energy of the Sun is spent for the radiation of photon, therefore input energy $\Delta W = mc^2$ is equated of the mutual energy of the system the sun-photon, equal $\gamma Mm/\rho$, and the mass of photon is reduced:

$$c_s^2 = \frac{\gamma Mm}{\rho_s m} = \frac{\gamma M}{\rho_s}. \qquad (3.2)$$

Is received: $\frac{\Delta W}{W} = \left(1 - \frac{\gamma M}{\rho_s c^2}\right)$.

On that to the principle (3.2), unit in the obtained formula can be replaced on $\gamma M/(\rho c^2)$:

$$\frac{\Delta W}{W} = \left[\frac{\gamma M}{\rho c^2} - \frac{\gamma M}{\rho_s c^2}\right] = \frac{\gamma M}{c^2} \cdot \left[\frac{1}{\rho} - \frac{1}{\rho_s}\right] = \frac{-\Delta P}{c^2}. \qquad (3.3)$$

As the frequencies of resonators are proportional to their energies, the relation of energies in the expression (3.1) can be replaced with the relation of frequencies, and expression in brackets in the formula (3.3), multiplied on γM, and on the difference of gravitation potentials ΔP. In an outcome of these operations the expression for frequencies difference of resonators will be received:

$$\frac{\Delta\nu}{\nu} = -\frac{\Delta P}{c^2}. \quad (3.4)$$

For the resonator on the Sun or Earth obtaining a photon from infinity, the sign for the potential energy varies on opposite. That in exactitude is equal to the formula applied by Pound and Rebka in their Harvard experience, but for the photon frequency.

From the comparison of formulas and previous reasoning it becomes clear, that in this experience not magnification of photon frequency was measured at the falling on the Earth, and diminution of the resonator frequency in the gravitational field of the Earth. Thus all stated above confirms the law of mass conservation, and also the independence of photon energy at the lack of direct contact with substance.

4. Time

For the further reasoning it is necessary to update concept of such strange magnitude as time present that or other aspect practically in all physical formulas. What it by itself represents? In effect the seconds, minute and hours show, on what angle concerning direction on the Sun the Earth was turned, while some process proceeded. That is the duration of two processes is compared. And for a basis completely any is taken, but psychologically quite justified and practically rather convenient the turn angle of planet. Most interesting, that the Earth makes about 365 such revolutions for one turnover round the Sun. And this fact does not depend on the choice of the frame of reference.

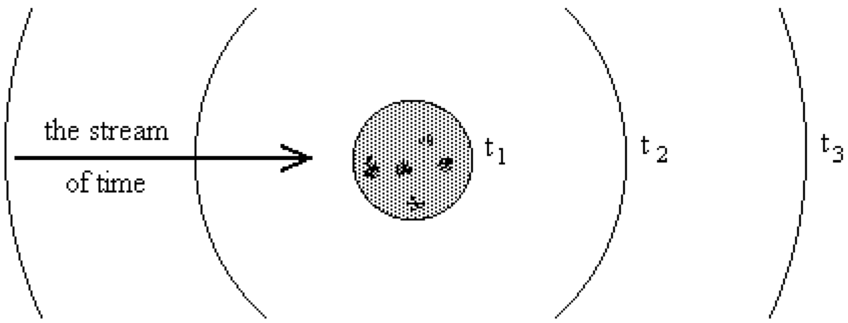


Fig.1

If to apply the Lorenz's transformation to the Sun and its neighborhoods, that, in connection with the diminution of light velocity because of the gravitational potential magnification with an approximation to the heavenly body, for the difference past from some instant it is possible to write [2,3]:

$$t_n = t\left(1 - \sqrt{1 - \frac{c_n^2}{c^2}}\right).$$

That is if $c_1 < c_2 < c_3$, then $t_1 < t_2 < t_3$ and the time flows on direction to the Sun, which appears more young than its neighborhoods (see fig.1). But the corollary cannot proceed to the reason! On the contrary, if the defining source of gravity is, the gravitational potential is dictated by them, and anyone modification is transmitted from the center to rim with the velocity of signal. Thus the time, with the help of which we fix causal and effect connections, is the method of comparison of various processes. This artificial measurement is used for the comparison of processes in the universe and physical magnitude cannot be. As the choice an origin is completely arbitrary, as the temporal zero cannot be defined.

Therefore at the amplification of gravitation field the deceleration of processes because of the diminution of transfer rate an energy (signal), but not of time happens. The time, as nonexistent magnitude, with the help of which is watched the sequence of processes, cannot to vary.

5. The correlation of impulse and energy

The important condition about the origin and annihilation of impulses by pair, − the conservation law of impulse, is possible to deduce immediately from the second and third Newton's laws. The outcome of a substitution of the second law expression in third one and reductions in this expression of time, as for interacting bodies it is uniformly, will look so: $d(m_i v_i) = -d(m_j v_j)$. The inversely proportional dependence of velocities and masses of bodies allows with the help of proportionality constant to reduce expression in the frame of reference in the center of equal masses, that is to aspect $mv = -mv$, shown lower:

$$\frac{m_i}{m_j} = \frac{m_i}{km_i} = \frac{-v_j}{kv_j}, \text{ or } \quad m_i v_j = -m_i v_j \,. \tag{5.1}$$

By multiplying both parts of the equation on the differential of velocity, we shall receive $mvdv = -mvdv$. As the bodies in this system or gather the velocity from 0 up to v, or lose it, it is possible obtained expression to integrate over velocity:

$$\frac{mv^2}{2} = -\frac{mv^2}{2} + C. \text{ or } \quad mv^2 = C. \tag{5.2}$$

Obviously C, as the double kinetic energy, can be only potential energy W of the given system. The sign of it, which before at birth of impulses, is negative, as if the energy is spent, and it is positive at their annihilation. This implies both mandatory equality of impulses, and they're opposite directness, as the corollary of the opposite directness of their velocities. It is possible to reach the same conclusion, by deducing the equation of the photon energy from the condition of its origin or absorption.

6. The optical bench

As an example we shall consider an optical bench with the emitter of photons at the left and receiver on the right, adjusted on identical frequency and hardly fixed. In other words atoms of substance of radiant will be in the excited state because of deriving the energy from an outside radiant, the receiver - in fixed.

A difference of power levels is equal ΔW. The atom of the receiver passes in the excited state accompanying with the energy magnification on ΔW, at deriving of photon radiated by exited atom of radiant during passage in the basic fixed condition. On figure 2 above the radiant and receiver the power levels of atoms are conditionally shown.

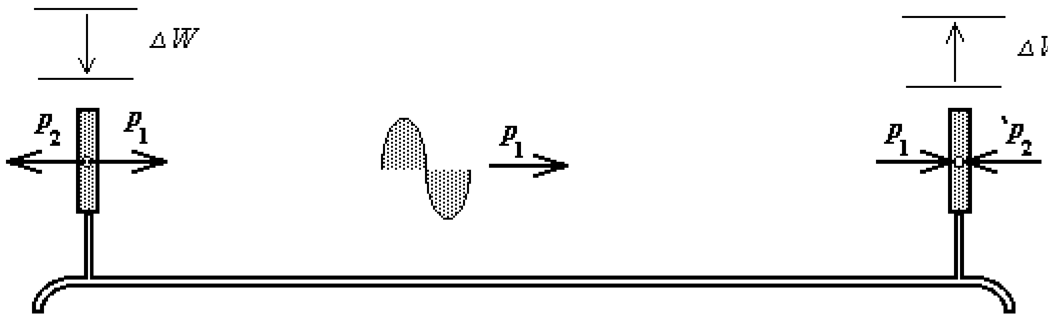


Fig.2

On the formation of photon the energy of quantum passage ΔW is expended which will be transformed to two equals and opposite directed impulses $\mathbf{p}_1$ and $\mathbf{p}_2$ on the conservation law of impulse. As it is visible from figure, the energy will be divided between two impulses into two equal parts equal $\Delta W/2$. That is at difference of energies $\Delta W = h\nu$, the kinetic energy obtained by photon $K = h\nu/2$.

Whether the receiver can, by receiving the half of the necessary energy, to be excited up to the same level? The practice shows that the resonators swallow on the same frequencies, as radiate [3]. A missing half of the required energy whence undertakes, you see the impulses can be generated or to be swallowed only by pair?

By collision with the fixed atom of the receiver, the photon by the impulse $\mathbf{p}_1$ will call at the resonance reciprocal impulse of the receiver $`\mathbf{p}_2$ equal to it on magnitude and opposite on direction. Which, in turn, can appear only in a pair with impulse of pressure on the receiver $`\mathbf{p}_1$ (= $\mathbf{p}_1$), on figure not shown. That is to transmit to body any impulse, it is necessary to take away of him equal impulse of opposite direction for doubling the energy necessary for the excitation of resonator. Just due to this also there is such appearance as light pressure, - response of the receiver on the light pulse.

Therefore it is possible to state that factor of the refraction at absorption or emission is equal to infinity, and the Fizeau's factor of dragging is equal 1. Energy brought by a photon, will add with an energy, equal to it obtained from the response of the receiver, more correct occupied at it, and will excite atom on the energy ΔW. The impulse $\mathbf{p}_2$ obtained by a radiant, by annihilating with impulse $`\mathbf{p}_1$ in the bench will leave the system in the rest.

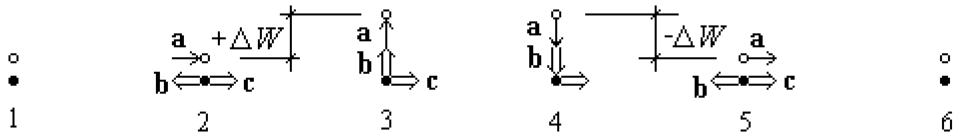


Fig.3

Said it is possible to illustrate on an example of linear spreading of light through homogeneous and isotropic medium. Including vacuum. Let's imagine a series of resonators, by means of which passing impulse (Fig.3) is ensured.

By collision with resonator in the 2nd position, the photon by its impulse **a** will call at the resonator reciprocal equal and opposite directed impulse **b** born only in the pair with the impulse **c**. Thus the resonator 3 will increase the energy on the sum of integrals of impulses ΔW, by receiving thus the not compensated impulse **c**. At passage from the position 4 to the position 5, the resonator will radiate the energy ΔW, which will be divided into equal parts between impulses **a** and **b**. The impulse **b** will compensate impulse **c** and resonator remains on the place. The velocity of light will depend on the duration of these processes in the given medium. By the way just the linearity of distribution of light ray in the isotropic and homogeneous medium well illustrates the energy conservation law.

The circumscribed above contact interaction, which is taking into account the impossibility of field interaction of photon with a substance on light velocity, leads to interesting conclusion. The laser radiation is induced not by flying photon, but by impulse of the emitter response.

7. The gravitational bench

Let's assume now, that the role of an optical bench is played a pair of two bodies, connected only by gravitation force. If the bodies shine, there will be also light pressure that will be repulsive force. As is known the vectors of strength of electrical and magnetic fields in the electromagnetic wave are cross of its velocity [2,3]. But the impulse of the transversal particle is the vector only due to the vectorial of its velocity. If to present a prospective graviton with the transversal directness of gravitational strength, it also should render pressure just due to the vectorial impulse. Just the appearance of light pressure denies it and forces to doubt of existence of such particles, as transversal graviton – the quantum of attraction, but to not refuse longitudinal gravitational waves, as waves of potential. The same as is and in the electrostatics.

A graviton, (would be more correct a masson), as it is clearly simulated on an example of the optical bench, should call repulsive force:

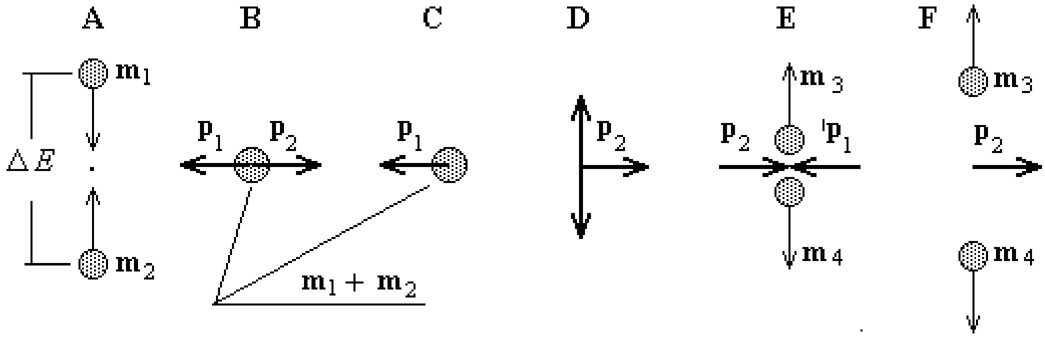


Fig.4

As models of gravitational "bench" are visible from represented on figure 4, at coming together m_1 and m_2 (A) in the center of their masses the gravitational energy should be selected, which some part is bisected between two impulses $\mathbf{p}_1$ and $\mathbf{p}_2$ (B) on the conservation law of impulse. Thus the center of masses will receive negative impulse $\mathbf{p}_1$ (C), and the graviton will carry away positive impulse $\mathbf{p}_2$ (D). The impulse $\mathbf{p}_2$ will transfer a kinetic energy to the center of masses m_3 and m_4 (E), calling negative reciprocal impulse '$\mathbf{p}_1$, carrying the energy equal to the energy of the impulse $\mathbf{p}_2$. The transforming energy repels bodies of m_3 and m_4 system, and systems of centers of masses should be repelled from each other, utilizing impulses $\mathbf{p}_1$ and $\mathbf{p}_2$.

As under Planck's law energy of resonators can vary only portions multiple $h\nu$, that, taking into account the conservation law of impulse, on which the formation only pairs of equal and opposite directed impulses is possible, the energy of resonator should be divided into two equal parts. One of which is impulse of response; another one is carried away by quantum. That most happens at the absorption of energy. Thus, the transversal graviton should call the repulsion, instead of attraction. Therefore the gravitation, that is just the attraction, cannot be represented by any particles. Probably there is field representation as a modification of virtual impulse of attraction only.

But a carrier of impulses in similar processes can be neutral particles – quantum of mass waves, carrying energy with the velocity close to light. From known particles for this process the neutrino approaches. By flashes of supernew stars, its velocity is more the light one, as the neutrino register before an optical flash. Thus the ratio of the neutrino velocity to velocity of light is possible to solve under the formula $k = 1 + \Delta t \cdot c/s$, where c – velocity of light, s – the distance up to the radiant, Δt – the difference in time of arrival of signals.

If the neutrino have the wave nature to register those can only from them, which were born in conditions close to terrestrial. That is a resonator adjusted on defined frequency. A corollary it should be deficit the solar neutrino because of different frequencies of resonators owing to difference of gravitational potentials.

8. The energy of photon

Let's calculate the kinetic energy of photon by the classical mode. Under the second law of Newton we have: $d(mc) = Fdt$. It is possible to present an increment of the energy dK equal to work accomplished by the force F on the path $dx = cdt$, that is $A = Fdx$, as $\Delta K = Fcdt$. By replacing Fdt on $d(mc)$, we shall receive $\Delta K = cd(mc)$:

$$\Delta K = cd\,(mc) = c(cdm + mdc) = 0 + mcdc = Pdc. \quad (8.1)$$

The first term is explicitly equal to zero, as the mass of photon, so also frequency, do not depend on time. So $mcdc = Pdc = \Delta K$. Let's produce integration at the modification by a photon at the birth of velocity from 0 up to c, which it gathers with velocity c (in the laboratory frame):

$$K = \int_0^c mcdc = \frac{mc^2}{2}. \qquad (8.2)$$

To integrate wholly impulse to receive $E=mc^2$ mathematically incorrectly because it comprises the integrable variable. With the help of previous reasoning it is possible to solve the longitudinal size of a photon – l, by accepting for characteristic time of its formation the phase $T = 1/\nu$, owing to what the acceleration will be defined as $a = c/T$:

$$\ell = \frac{K}{F} = \frac{K}{ma} = \frac{mc^2}{2}\cdot\frac{1}{ma} = \frac{c^2}{2}\cdot\frac{T}{c} = \frac{cT}{2} = \frac{\lambda}{2}. \qquad (8.3)$$

Thus, the minimum longitudinal size of quantum is equal to the half of its wavelength. This conclusion can be for the definition of elementary particles sizes on the lower threshold Compton's effect on them of photons. As was shown in experience with optical bench, the energy selected by a resonator, is divided on two equal parts and is carried away by equal and opposite directed impulses. Whence at radiation:

$$-\Delta W = -2K = -\frac{mc^2}{2} - \frac{mc^2}{2} = -\Delta mc^2. \qquad (8.4)$$

At an absorption, naturally, the sign varies on opposite. Here mass is meant as that difference in masses, which took part in a response. But it concerns only to those processes, in which are not born or the particles having a mass do not disappear. To those processes, in which there is not so-called mass excess [3].

If, for example, gamma quantum of sufficient energy will meet atom of substance, it will transmit him the impulse. Thus it will take away at him, as shown in figure 3 in chapter 6, equal and opposite directed impulse. The sum of energies of two impulses will go on formation an electron - positron pair. And the half of energy will be spent for formation of the mass of particles, half - on the masse excess ensuring their stability.

9. The deduction of integrated energy

It is possible to deduce the energy of photon driven along the radius of spherically symmetric sun - photon system, from the energy conservation law. As the photon carries away a part of energy, the summarized energy will be equal to potential minus kinetic one. Thus on any distance r from the center of the Sun:

$$\frac{m\,c^2}{2} + \frac{\gamma M\,m}{\rho} = Const. \qquad (9.1)$$

In any cut this equality should be observed. At the magnification of distance from the Sun to infinitum, the constant will become merely equal only kinetic energy of photon, and the mass, as well as frequency, magnitude will be the constant.

This very important conclusion, - the invariance of photon frequency, speaks that the frequency of emanating or swallowing resonator depends only on the gravitational potential. That the gravitation operates on a photon through its velocity. Therefore, in the experience of Pound and Rebka not the modification of photon's frequency was measured, but the difference of resonator's frequencies was measured at various gravitational potentials.

Therefore, by designating through c_0 the possible maximum velocity of light, and through c - velocity of light on the distance r from the gravitation center, so:

$$\frac{mc^2}{2} + \frac{\gamma Mm}{\rho} = \frac{mc_0^2}{2} = \frac{h\nu_0}{2}. \qquad (9.2)$$

By reducing the mass of photon, we shall receive an ordinary integral of energy for the body - photon system:

$$\frac{c^2}{2} + \frac{\gamma M}{\rho} = \frac{c_0^2}{2}. \tag{9.3}$$

From here follows, that the double gravitational potential on the distance *r* from the gravitation center is equal to difference of quadrates of maximum and local velocities of light:

$$\frac{2\gamma M}{\rho} = c_0^2 - c^2 . \tag{9.4}$$

Proceeding from the formula (9.3), maximum velocity of light without the registration of influence of Galaxy and remaining part of the universe:

$$c_0 = \sqrt{c^2 + \frac{2\gamma M}{AU}} . \tag{9.5}$$

Accepting on [4] with c= 299792458 m/sec, the mass of the Sun M= $1.9891 \cdot 10^{33}$ kg, astronomical unit AU = $1.4959891 \cdot 10^{11}$ m and radius of the Sun R = $6.95991 \cdot 10^{8}$ m, we shall receive the maximum velocity of electromagnetic waves far from gravitating bodies $c_0 \cong$ 299792461 m/sec. Knowing the maximum velocity, it is easy to calculate local one on any distance from the center of gravitation:

$$c = \sqrt{c_0^2 - \frac{2\gamma M}{\rho}} . \tag{9.6}$$

The given formula at simplification will be transformed in wide known [6], for what it is enough to use equality of full energies of the system on various distances from the center of gravitation:

$$c_1^2 - \frac{2\gamma M}{\rho_1} = c_2^2 - \frac{2\gamma M}{\rho_2} . \tag{9.7}$$

By rearranging formula (9.7) and by decomposing difference of quadrates of velocities on multiplicands, it is possible to write:

$$(c_1 - c_2) \cdot (c_1 + c_2) = 2\gamma M \cdot \left(\frac{1}{\rho_2} - \frac{1}{\rho_1} \right). \tag{9.8}$$

By designating a difference of velocities through $\Delta c = c_1 - c_2$ and by assuming, that because of a small difference of velocities $c_1 + c_2 = 2c$, is separable both parts of the formula on $2c$ and on c:

$$\frac{\Delta c}{c} \cong \frac{2\gamma M}{2c^2} \cdot \left(\frac{1}{\rho_2} - \frac{1}{\rho_1} \right) \text{ or to divide the right party on } 2\text{, we have } \frac{\Delta c}{c} \cong \frac{-\Delta P}{c^2}, \tag{9.9}$$

Where ΔP is designated the difference of potentials. The Einstein's formula thus was received.

10. The ratio of frequencies

As the mass of photon, so also its frequency, are constant in time both space due to the law of conservation of mass and energy, as was shown above, the frequency of resonator can depend only on the gravitational potential. In other words - at moving off a photon from the Sun does not happen neither loss its energy, nor modification its frequency. The magnification of concentration of the gravitational energy is simples reduce as it was to condensation of space, to magnification of its amount on unit of volume. It, in turn, reduces to the diminution of geometric light velocity. Physically it is possible to consider the velocity of light concerning spaces as the constant and equal maximum. Therefore, and the denseness (curvature) of space, and velocity of light are tensors.

As under the Planck's law the energy of resonator can vary only with portions multiple $h\nu$, taking into account the conservation law of impulse, on which the formation only pairs of equal and opposite directed impulses is possible, the energy of photons should vary multiply $h\nu/2$. One from impulses is impulse of the response and remains with emanating by a body; another one is carried away by quantum.

By replacing the mass-speed definition of energy on frequent, in view of doubling the resonator energy in the formula (9.2), it is possible to write the equation of the energy for a resonator:

$$h\nu + \frac{\gamma Mm}{\rho} = h\nu_0 \,, \qquad (10.1)$$

and to make the equation for different potentials: $h\nu_1 + \frac{\gamma Mm}{\rho_1} = h\nu_2 + \frac{\gamma Mm}{\rho_2}$,

whence a difference of frequencies:

$$\Delta\nu = \nu_1 - \nu_2 = \frac{\gamma Mm}{h}\left(\frac{1}{\rho_2} - \frac{1}{\rho_1}\right) = \frac{\gamma M\nu_0}{c_0^2}\left(\frac{1}{\rho_2} - \frac{1}{\rho_1}\right) = -\frac{\Delta P\nu_0}{c_0^2}. \qquad (10.2)$$

Relation $mc^2 = h\nu$, implying from the Planck's law and formula (9.2) [2,3] here is used. The expression in brackets multiplied on ΔM and being difference of gravitational potentials, is designated as ΔP. An outcome of division of expression (10.2) on ν_0 is the ratio of the frequencies difference to basic frequency (on infinity):

$$\frac{\Delta\nu}{\nu_0} = -\frac{\Delta P}{c_0^2}. \qquad (10.3)$$

In an outcome is obtained the formula similar deduced right at the beginning and indicating that actually Pound and Rebka have measured the difference of resonator frequencies.

The energy of photon by the mass m on the distance r from the gravitational center is received at use that relations $mc_0^2 = h\nu_0$, that was used above, without the registration of doubling energy in the (9.2) and formula (9.6):

$$\frac{h\nu_\rho}{2} = \frac{mc_0^2}{2} - \frac{\gamma Mm}{\rho}\,; \qquad \nu_\rho = \frac{2m}{h}\left(\frac{c_0^2}{2} - \frac{\gamma M}{\rho}\right) = \frac{h\nu_0}{hc_0^2}\left(c_0^2 - \frac{2\gamma M}{\rho}\right),$$

Where, by replacing the mass on $h\nu_0/c_0^2$, and by taking into consideration, that the quadrate of the local velocity of light is equal under the formula (9.6) $c^2 = c_0^2 - 2\gamma M/\rho$, it is possible to write:

$$\nu_\rho = \frac{\nu_0}{c_0^2}\left(c_0^2 - \frac{2\gamma M}{\rho}\right) = \frac{\nu_0 \cdot c_\rho^2}{c_0^2}. \qquad (10.4)$$

By dividing the equation (10.4) on c_ρ^2 and by multiplying both parts on h, we shall receive the proportionality of resonator frequencies to quadrates of local velocity of light and, as a corollary, invariance of the mass (energy) of photon:

$$m = \frac{h\nu_0}{c_0^2} = \frac{h\nu_\rho}{c_\rho^2}, \qquad (10.5)$$

$$\frac{\nu_\rho}{\nu_0} = \frac{c_\rho^2}{c_0^2} = \frac{1}{n_0^2} = \frac{1}{\varepsilon_0\mu_\rho}. \qquad (10.6)$$

The refractive index considered here as absolute (of rather fixed stars), is equal to the radical square of the product of an absolute permittivity and local permeability $n_0 = \sqrt{\varepsilon_0\mu_\rho}$. As the permittivity does not vary on the velocity of electromagnetic waves only local permeability of space influences. The gravitation fulfills function of a slowing down system, changing the impedance of space. Therefore in winter, at the greatest distance from the Sun, all processes on the Earth happen hardly faster, than at summer.

11. Derivatives with respect to radius

For convenience of consequent operations with various magnitudes depending on the potential of gravitational field, it is best beforehand to take derivatives of these magnitudes with respect to radius. Let's differentiate with respect to radius an index of refraction, substituting in further under the formula (9.6) complicated expressions on equivalent *c*:

$$\frac{dn}{d\rho}=\frac{d}{d\rho}\left(\frac{c_0}{c}\right)=\frac{d}{d\rho}\left(\frac{c_0\sqrt{\rho}}{\sqrt{c_0^2\rho-2\gamma M}}\right),$$

$$\frac{dn}{d\rho}=c_0\cdot\frac{\frac{c}{2}-\frac{c_0^2}{2c}}{c_0^2\rho-2\gamma M}=c_0\cdot\left(\frac{1}{2c\rho}-\frac{c_0^2}{2c^3\rho}\right)=\frac{c_0}{2c\rho}\left(1-\frac{c_0^2}{c^2}\right)=\frac{n}{2\rho}\left(1-n^2\right). \tag{11.1}$$

At the same time similarly we shall output the derivative of light velocity with respect to radius, using (9.6):

$$\frac{dc}{d\rho}=\frac{d}{d\rho}\left(\sqrt{c_0^2-\frac{2\gamma M}{\rho}}\right)=\frac{1}{2c\rho}\left(c_0{}^2-c^2\right)=\frac{c_0 n}{2\rho}\left(1-\frac{1}{n^2}\right)=\frac{\gamma M}{c\rho^2}. \tag{11.2}$$

At the definition of photon passing time on the radius between points with different potentials it is taken into account, that the velocity – the derivative of distance with respect to time, and formula (9.6) will be transformed so:

$$\frac{d\rho}{dt}=\sqrt{c_0^2-\frac{2\gamma M}{\rho}},\quad \text{whence: } \frac{dt}{d\rho}=\frac{\sqrt{\rho}}{\sqrt{c_0^2\rho-2\gamma M}}. \tag{11.3}$$

12. The time of light passing on a radius of system

Let's transform the formula (11.3), by dividing variables:

$$dt=\frac{\sqrt{\rho}}{\sqrt{c_0^2\rho-2\gamma M}}d\rho. \tag{12.1}$$

For obtaining summarized time of the photon transition on the radius of system against the gradient of potential, the expression (12.1) is integrated in the necessary limits. For the solution of this equation we shall take advantage of the tabulated integral [1]:

$$\int\sqrt{\frac{Y}{X}}d\rho=\frac{1}{a}\cdot\sqrt{XY}-\frac{\Delta}{2a}\int\frac{d\rho}{\sqrt{XY}}.\qquad \text{where}: X=a\rho+b=c_0^2\rho-2\gamma M\ ;Y=f\rho+g=\rho$$

$$f=1,\quad g=0,\quad a=c_0^2,\quad b=-2GM,\qquad \Delta=bf-ag=-2\gamma M-0\cdot c_0^2=-2\gamma M$$

For $af=c_0{}^2\cdot 1>0$, the second integral is: $\int\frac{dx}{\sqrt{XY}}=\frac{ln\left(\sqrt{aY}+\sqrt{fX}\right)}{\sqrt{2af}}$.

It is necessary to substitute values and limits of integration at the definition of time on a radius from ρ_1 up to ρ_2 ($\rho_2>\rho_1$):

$$t=\int_{\rho_1}^{\rho_2}\frac{\sqrt{\rho}}{\sqrt{c_0^2\rho-2\gamma M}}d\rho, \tag{12.2}$$

$$t=\left(\frac{\sqrt{c_0^2\rho^2-2\gamma M\rho}}{c_0^2}+\frac{\gamma M}{c_0^3\sqrt{2}}\ln\left(\sqrt{c_0^2\rho}+\sqrt{c_0^2\rho-2\gamma M}\right)\right)\Bigg|_{\rho_1}^{\rho_2}. \tag{12.3}$$

If to rearrange in this integral limits of integration, it is necessary to take into consideration the diminution of electromagnetic waves velocity at the magnification of gravitational potential, putting the sign before time on a sense. That is the absolute value of time is meaningful only, as it does not have direction.

13. Test of assumed formula

Now, it is possible to conduct theoretical check of the offered formula (9.2). The acceleration of light (the derivative of velocity of light with respect to time) $a = dc/dt$ is possible to factorize:

$$a = \frac{dc}{dt} = \frac{dc}{d\rho} \cdot \frac{d\rho}{dt} = \frac{\left(c_0^2 - c^2\right)}{2\rho c} \cdot c = \frac{\left(c_0^2 - c^2\right)}{2\rho}, \quad (13.1)$$

Where $d\rho/dt = c$, and $dc/d\rho$ is substituted under the formula (11.2). Substituting in the given equation the velocity of light c with the help of formula (9.6), and acceleration on $a = F/m$, we obtain:

$$a = \frac{c_0^2}{2\rho} - \frac{c_0^2}{2\rho} + \frac{2\gamma M}{2\rho^2} = \frac{\gamma M}{\rho^2} = \frac{F}{m}. \quad (13.2)$$

The sign of acceleration shows, that it is directed from the Sun. Thus offered formula passes check by the second Newton's law.

14. Passing a ray of light near by the Sun

In connection with the diminution of light velocity with an approaching to the surface of Sun, it is possible to state that the magnification of the refraction factor due to power obturating of space happens. For not swallowing mediums with then continuous modification of the index of refraction the curvature of ray [2,3]:

$U = \sin i \cdot Dn / n = dj/ds.$ (14.1)

Where i – the angle formed by the falling ray with the normal to the spherical surface with the constants factor of refraction. The curvature of the curve is equal to the derivative from the turn angle on the length of arc, whence it is possible to find out the differential of the turn angle of ray $dj = uds$. By integrating which on all paths of ray, we shall receive the turn angle of the ray at passing by the Sun.

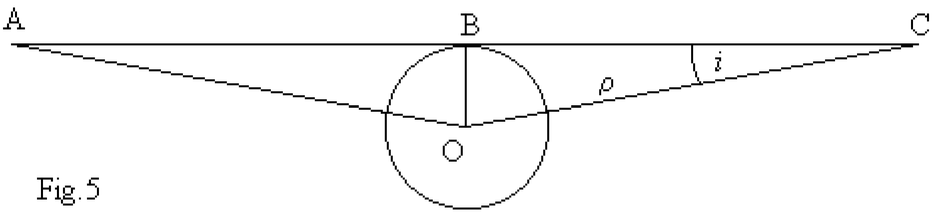


Fig.5

Under the calculated scheme shown on figure 5 it is visible, that the angle of falling on the surface of equal potential i - angle with at the top of triangle BCO. The side OC – ρ = OB/sin i, is the perpendicular to the surface of equal potential. The angle OBC is less direct one on the half of the summarized turn angle of ray of light. The side BC is equal $s = \rho \cdot \cos i$. Under the definition, the absolute index of refraction is equal to the ratio of the maximum velocity to the local one:

$$n = \frac{c_0}{c} = \frac{c_0}{\sqrt{c_0^2 - \frac{2\gamma M}{\rho}}} = \frac{\sqrt{\rho}}{\sqrt{\rho - \frac{2\gamma M}{c_0^2}}}. \quad (14.2)$$

Let's take the derivative with respect to an index of refraction, that was made above (11.1), and divide it on n, taking into consideration the spherical symmetry of the system $\nabla n = -dn/d\rho$:

$$\frac{\nabla n}{n} = -\frac{n(1-n^2)}{2\rho} \cdot \frac{1}{n} = -\frac{\left(1-n^2\right)}{2\rho}. \quad (14.3)$$

As it is one from multiplicands in terms of curvature, finally for the finding of the half of turn angle we shall receive the following expression:

$$u = \frac{-\sin i}{2\rho} \cdot \left(1 - n^2\right). \tag{14.4}$$

The side BC on figure 5 can interpret the curve of the path of ray of light. In this connection, the formula of the curvature of trajectory of light ray can be presented [3] so:

$$dj = -\frac{\sin i}{2\rho} \cdot \left(1 - n^2\right) ds. \tag{14.5}$$

Taking into account, that this expression represents, according to the scheme on figure, only half of the turn angle, it is necessary to double it. Finally:

$$dj = -\frac{\sin i}{\rho} \cdot \left(1 - n^2\right) ds. \tag{14.6}$$

Length of the path $s = \rho \cdot \cos i$. Let's shall differentiate s on the angle of falling i, by expressing ρ through the radius of the Sun R and sine of the angle of falling i:

$$\frac{ds}{di} = \frac{d(\rho \cdot \cos i)}{di} = \frac{d}{di}\left(\frac{R \cdot \cos i}{\sin i}\right) = R\frac{d(\cot i)}{di}. \tag{14.7}$$

Whence: $ds = -\dfrac{Rdi}{\sin^2 i}$. (14.8)

In turn distance $r = R/\sin i$, where R – radius of the Sun and $\sin i$ – sine of the angle of incidence, therefore formula (14.6), taking into account signs, it is possible to write as:

$$dj = \frac{\sin^2(i)}{R} \cdot \left(1 - n^2\right) \cdot \frac{Rdi}{\sin^2(i)} = \left(1 - n^2\right) di. \tag{14.9}$$

Uncovering quadrate of the refraction factor n_2 through the ratio of light velocities (10.6) and substituting c under the formula (9.6), and r is similar previous as the function of $\sin i$, we shall receive:

$$dj = \left(1 - \frac{1}{1 - B \cdot \sin i}\right) di, \text{ where } B = \frac{2\gamma M}{R c_0^2}. \tag{14.10}$$

Finally – the turn angle of light ray at the surface of the Sun at the modification of angle i from π up to 0 is equal to the integral:

$$j = \int_{\pi}^{0} \left(1 - \frac{1}{1 - B \cdot \sin i}\right) di. \tag{14.11}$$

Thus: $j = i\Big|_{\pi}^{0} - \dfrac{2}{\sqrt{1 - B^2}} \operatorname{Arc\,cot}\left(\dfrac{\tan(i/2) + B}{\sqrt{1 - B^2}}\right)\Bigg|_{\pi}^{0}$. (14.12)

In the given expression B is equal B from the formula (14.10). The outcome of the evaluation under this formula is equal 1".75 that corresponds observed. The conclusion about the optical reason the curvature of trajectory of light ray in the gravitational field of the Sun from here follows. Dependence of the trajectory of photons is defined by the dominant mass.

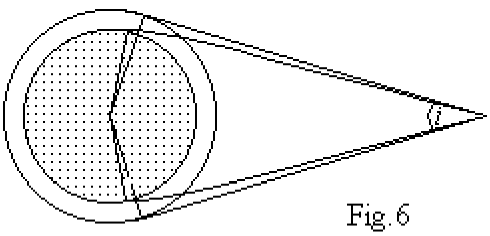


Fig. 6

The gravitational interaction is eliminated because of impossibility of power interaction on the limiting transfer rate of a signal – on the velocity of light. Besides the gravitational turn would increase the energy of quantum, transmitting them the solar impulse. On the dependence from their mass, would be decomposed a ray in a spectrum, is increasing frequency proportional to the mass because of impossibility to increase the velocity of light. In this connection the angular size of the Sun should be less observed, as the extreme rays are bent, as shown in figure 6. Using the same notations, as is higher, with the help of Mathcad we shall define the value of the angular size of Sun.

$R := 694721605 \quad M := 1.9891\cdot 10^{30} \quad \gamma := 6.67\cdot 10^{-11} \quad c := 299792461 \quad i := 4.652\cdot 10^{-3}$

$$\varphi := \int_{\frac{\pi}{2}}^{i} \left[1 - \frac{1}{1 - \frac{2\cdot\gamma\cdot M}{\left(R\cdot c^2\right)}\cdot\sin(\tau)} \right] d\tau$$

R - the radius of Sun,
M - the mass of Sun,
γ - the gravitation constant,
c - the maximal light velocity,
ψ - the doubled angle between the tangent to the Sun and a ray,
i - the half of the angular Sun size on distance AU.

$\psi := 2\cdot\varphi\cdot 3600 \qquad \psi = 1.753\cdot deg$

Thus, the average angular diameter of Sun on an average distance from the Earth on [1] be have to be on the 1".75 less observed: 1919".26 –1".75 = 1917".51.

15. The precession of Mercury orbit

The concept of physical space condensed at the magnification ratio of the gravitational energy concentration allows using physical coordinates. In these coordinates the velocity of light is fixed and is equal maximum, the extent of space distortion is characterized by the factor of refraction. Using the given approach, it is possible to try to calculate the velocity of gravitational signal on the precession of Mercury orbit. If to designate through a the semimajor axis of orbit, through e – the eccentricity, focal orbit parameter will be $p=a(1-e^2)$. An equation of the curve in polar coordinates:

$$\rho(\varphi) = \frac{p}{1+e\cdot\cos\varphi} = \frac{a(1-e^2)}{1+e\cdot\cos\varphi}. \qquad (15.1)$$

Radius of the curvature $\rho(\varphi) = ds/d\varphi$, therefore the differential of arc $ds=\rho(\varphi)d\varphi$. Whence the geometric perimeter of the ellipse s_g is equal to the double integral of arc at the modification φ from 0 up to π:

$$s_g = 2\cdot\int_0^{\pi} \rho(\varphi)d\varphi = 2\cdot\int_0^{\pi} \frac{a\cdot(1-e^2)}{1+e\cdot\cos\varphi}d\varphi. \qquad (15.2)$$

In the physical space the radius $\rho(t,\varphi) = t(\varphi)\cdot c_0 + R$, here $t(\varphi)$ pays off under the formula (12.3) with the substitution $\rho = \rho(\varphi)$, whence physical perimeter s_p:

$$s_p = 2\cdot\int_0^{\pi} \left(t(\varphi)\cdot c_0 + R\right)d\varphi. \qquad (15.3)$$

The difference of physical and geometric perimeters divided on the average radius of orbit will give sine of the angle precession of orbit. That is the difference of perimeters represents the difference actually passed paths in the physical space and path in the space visible, Euclidean. That short speaking is the reason of precession.

$$\Delta\varphi = \frac{s_p - s_g}{a}. \qquad (15.4)$$

Substituting in these formulas astronomical datas from [1]: AU=1,495989·10^{11} m, G= 6,67259·$10^{-11}$$m^3$/(kg·$sec^2$), e=0,2056, maximum velocity of light c_0=299792461 m/sec, M= 1,9891·10^{30} kg, radius of the Sun R=695467630 m, a=0,387·AU, we shall receive $\Delta\varphi$= 0,0000004978. The precession for 100 years in angular seconds will be calculated at recalculation of the angular measure in degree, multiplied on the amount of revolutions for hundred years. Whence the precession angle φ_{100}=42".6. Here the value of angle obtained on the computer is rounded off because of the inaccuracy of input datas. The secular precession of Earth orbit on those formulas will give the angle in 4".86.

Other methods of calculation give after a point little bit other numbers. For example, at count on difference of squares of orbits, it is possible to receive the ratio of gravitation velocity to velocity of light k=1,0002 ($\Delta\varphi$=42".57). However this value is too great and gives too small distance up to supernew stars. If, certainly, neutrino is the mass (gravitational) quantum (see chapter 2). Therefore this problem requires further research.

The final transfer rate of the gravitational signal (perturbation) should have an effect on the operation of planets on the Sun – the perturbation from a planet goes on the spiral because of rotation of planets round the center of masses of rather fixed stars). Thus, the line of the operation of planet gravity on the Sun is the spiral. In physical coordinates with the constant velocity of signal it is the spiral of Archimedes. As the perturbation comes under some angle to the surface of the Sun, the force can be decomposed on normal and tangential component. Tangential component untwists the Sun, increases frequency of its rotation. The greatest force operates on equator, increasing latitude nonuniformity of rotation.

That most happens and to the Jove and its satellites. By this we are obliged only to final transfer rate of the signal (energy). Therefore it is possible to explain the diminution of period of radiant type *PSR* 193+16 mutual twisting of two stars because of the final transfer rate of energy and the diminution of geometric distance thereof.

16. The ratio of mass to its radius

Maximum velocity of light c_0 allows expressing the local velocity of light with through the difference of maximum and some running away velocity v. It is the velocity, which gives effect of the red (gravitational) displacement. That is $c_0 = c + v$. In such treatment there is clearly the scale inside which the magnitude of geometric velocity of light - from 0 for the black hole, up to c_0 for the vanishingly small mass can vary. In particular for the Sun, as the running away velocity $v \cong 633$ m/sec is visible from evaluations. By increasing v up to c_0, we shall equate geometric velocity of light to zero, so, we shall receive after the transformation of formula (9.4) the gravitational radius of body:

$$\rho = \frac{2\gamma M}{c_0^2 - (c_0 - v)^2}, \tag{16.1}$$

At $c = c_0 - v$, tending to zero:

$$\rho = \frac{2\gamma M}{c_0^2}. \tag{16.2}$$

In an assumption formula (16.1) we shall take out for brackets of denominator c_0^2, and we shall express the ratio of quadrates of velocities through absolute factor of refraction n_0:

$$\rho = \frac{2\gamma M}{c_0^2\left(1 - \frac{(c_0 - v)^2}{c_0^2}\right)} . \tag{16.3}$$

As $n_0 = \frac{c_0}{c} = \frac{c_0}{c_0 - v}$, and the Fizeau's factor of dragging $\alpha = \left(1 - \frac{1}{n_0^2}\right)$, the formula for the radius of body, on which surface local velocity of light is equal with c, will be those:

$$\rho = \frac{2\gamma M}{c_0^2 \alpha}. \tag{16.4}$$

Where $c_0^2\alpha = c_0^2\left(1 - \frac{1}{n_0^2}\right) = c_0^2\left(1 - \frac{(c_0 - v)^2}{c_0^2}\right) = 2cv - v^2$. (16.5)

The obtained formula shows, that changing any image the index of refraction on the surface of body (or the Fizeau's factor of dragging), we thus shall change its radius as much time as the energy of system body – quantum. It allows proceeding to the research of gravitational potential immediately on the body surface.

As the factor of dragging can influence on the radius of body only, at its modification the potential energy of a body will vary also. Let's designate the factor, gravitational or electrical through k, and the mass or the charge through q. But αc_0^2 in inverse proportion ρ (16.3). Then the appropriate potential on the surface of body will be expressed by the following formula:

$$P = \pm \frac{kq\alpha c_0^2}{\rho} . \qquad (16.6)$$

By finishing the Fizeau's factor up to unit, – we shall convert a body into the black hole, by stipulating its direct contact to substance only, without possibility of using any fields. If the velocity of light in the exactitude is equal to the velocity of gravitational signal only. And if the iniquitous fluctuations will allow to do it.

It is possible, certainly to go on the Lorenz's path of transformations and to reduce the radius at magnification of velocity, multiplying it on $\sqrt{\alpha}$ and to increase the mass, dividing it on the same factor. But at gravitational or high-speed compression the amount of substance is not increased – because of the diminution of light velocity the geometric distance decreases, physical remains constant. Thus the magnification of the energy can be explained by figure 7:

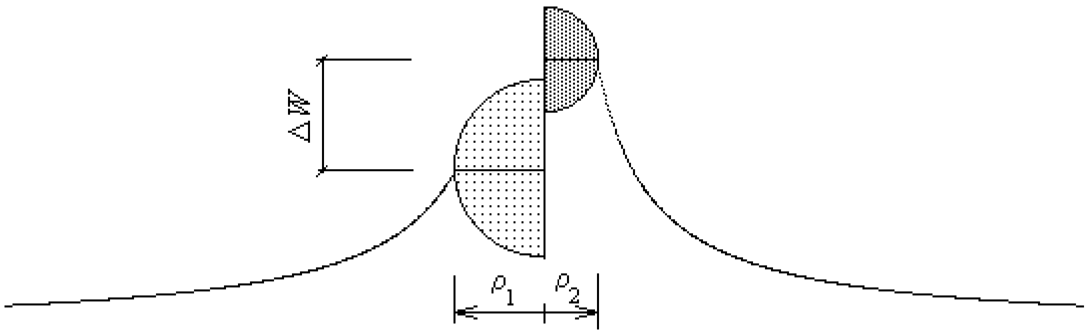


Fig.7

Why the energy instead of mass varies? Because, for example, at acceleration of elementary particles are not remarked magnifications of the charge or amount of particles, so also the mass, that is the amount of substance, does not vary. Therefore any modifications is concern only to radius.

As the potential is received proportional α (fig.8a), its modification, at rushing of local velocity of light to zero it is possible to explain by the graph of dependence the factor from difference of maximum velocity of light and running away velocity on the surface of body.

On figure 8b the dependence of radius of body from factor α under the formula (16.3) is shown. As the quadrate of local velocity of light can be presented as $1/(\varepsilon_0\mu_c)$, with the help of formulas (9.6) can be solved the local permeability of vacuum μ_c.

$$\mu_c = \frac{\rho}{\varepsilon_0 (c_0^2 \rho - 2\gamma m)} . \qquad (16.7)$$

The local impedance Z_c (16.8), as it is visible from figure 8c, at the rushing of velocity of light on the surface of body to zero (or at rushing of the running away velocity to velocity of light), tends to infinity.

$$Z_c = \sqrt{\frac{\mu_c}{\varepsilon_0}} = \sqrt{\frac{\rho}{\varepsilon_0^2 (c_0^2 \rho - 2\gamma m)}} . \qquad (16.8)$$

But the local velocity can be aimed to zero not only at gravitational compression, but also at the boosting of particle up to velocity of light. If the particle is rather small to present by point, for example elementary, it is possible to put equality of the running away velocity on forward and back its surfaces at the translational driving. Differently, – the velocity of light on its surface will represent the difference of velocity of light and velocity of flight of a particle in the laboratory frame just because of boundedness of the light velocity. That will call the modification of refraction factor on its surface, and consequently also of dragging factor.

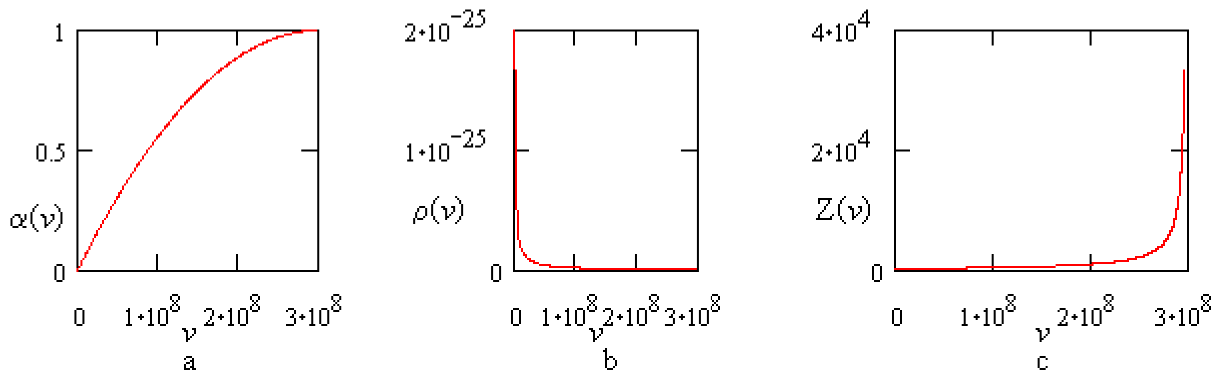


Fig.8

The similar approach allows to proceed immediately from the gravitation and its effects, called by her, to driving in the laboratory frame of reference.

17. The moving mass

In the previous chapter the mass, fixed rather laboratory frame was considered. By making a slit which is taking place it the center (fig.9), it is possible in two-dimensional representation, proceeding only from the law of gravitation, to see increase of the energy at the reduction of radius.

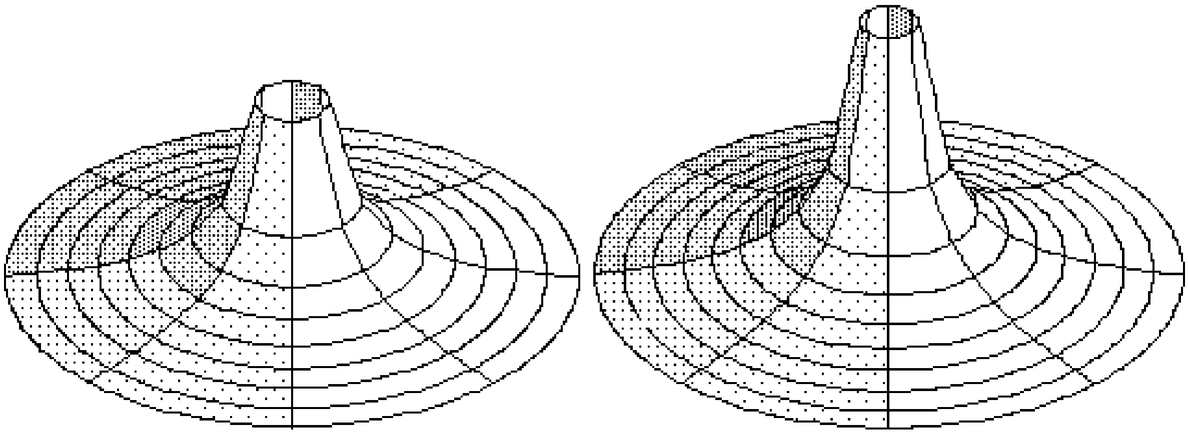


Fig.9

By laboratory frame we shall select what will stipulate aberrational effects considered further. The spreading of gravitational field will become asymmetrical because of the final velocity of spreading of the gravitational signal (fig.10). In direction of driving the equipotential lines will be condensed, in opposite direction – they will be rarefied. Owing to the diminution its radius the energy of particle will increase.

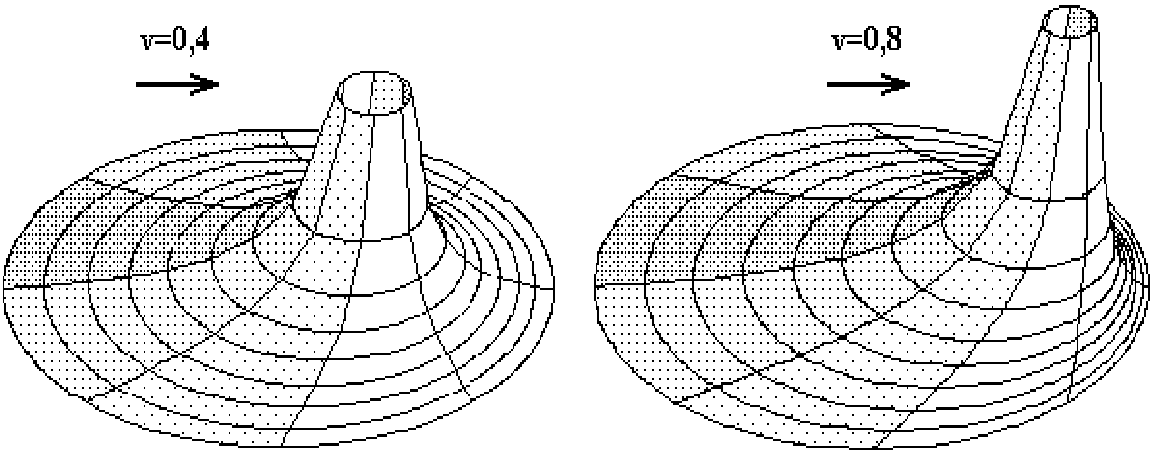


Fig.10

Whereas $c_0 - c \cong 3$ m/s, i.e. practically the velocity of light on the distance in astronomical unit from the Sun is almost equal maximum, the maximum velocity in further reasoning can be replaced local, terrestrial.

If to take rather a small quasispherical particle, for example - elementary one, so that the velocities of light on forward and back sides coincide, it is possible to estimate the diminution of light velocity on the surface of body up to $c_v = c - v$. Therefore it is possible to take advantage of the formula deduced for the static (16.3). The diminution of light velocity will call magnification of high-speed factor of refraction n_v and, as a corollary, the magnification of high-speed factor of dragging $\alpha_v = \alpha$ (16.5) will be:

$n_v = \dfrac{c}{c-v}$, $\alpha_v = 1 - \dfrac{(c-v)^2}{c^2}$, with an appropriate diminution of average radius of body. Therefore formula for the potential on the surface of particle will look the same as also static formula (16.6), illustrated with figure 8.

$$P = \frac{\gamma m c^2 \alpha}{\rho_0} = \frac{\gamma m}{\rho_0}\left(2cv - v^2\right). \tag{17.1}$$

Here pertinently to remind, that ρ_0 is the radius of particle at the velocity tending to zero. The zero velocity, as will be shown further, has not sense. As neither mass, nor gravitational constant at the modification of velocity does vary, the high-speed modifications concern only to the radius. Therefore for the radius at the velocity v it is possible to note the following relation:

$$\rho_v = \frac{\rho_0}{c^2 \alpha} = \frac{\rho_0}{2cv - v^2}\ . \tag{17.2}$$

The formula (16.3) was deduced from the condition of the photon radiation by body. It needs to double mass of photon, which energy is used on the formation of photon and impulse of response. It is possible to remove the condition of radiation, by reducing the mass required it in twice:

$$\rho_0 = \frac{\gamma m}{c^2 \alpha}\ . \tag{17.3}$$

Let's transform the obtained formula, by multiplying both parts on m, c^2 and by dividing on the radius of particle at the velocity tending to zero ρ_0:

$$\frac{\gamma m^2}{\rho_0 \alpha_v} = mc^2\ . \tag{17.4}$$

As it is visible from this formula, the own gravitational energy of initial volume is fixed and is equal mc^2. Factor α_v concerns only to the radius of particle. Just this property allows on sufficient distant from the particle or body ($r >> \rho$) to consider as their mass points and to put the center of the forces operation in the center of masses (or charges).

What under conditions the mass will begin to radiate? It is possible to see by opening α_v in the formula (16.3) and by making appropriate transformations, that the full energy of initial volume of particle (volume almost of fixed particle), with the condition of radiation, is proportional to velocity:

$$\frac{\gamma m^2}{\rho} + \frac{mv^2}{2} = mcv\ . \tag{17.5}$$

Till reaching by the particle of light velocity this energy will stands mc^2. By exceeding local velocity of light, the particle will begin to get rid of excess Δmc^2 as the Cherenkov's radiation. Whether the length of particle is reduced at the magnification of velocity on the Lorenz's transformation of? Is not present, certainly. Because at a modification of the form the moment of inertia of particle would vary also, and the moment of particle, or the spin, completely depends on its moment of inertia. The spin of particles, as is known [2,3], does not depend on their velocity on the conservation law of moment. The Lorenz's transformations, as will be shown below, concern wholly to the phenomenon of aberration.

18. The interaction of bodies (particles)

Basing only on the final velocity of signal spreading, it is possible to explain the Ampere's law and the origin of magnetic field, but also origin of neutral mass currents. Let's imagine two particles, for the beginning with the identical charge or mass, flying with the identical velocity in parallel each other in the laboratory frame (fig.11).

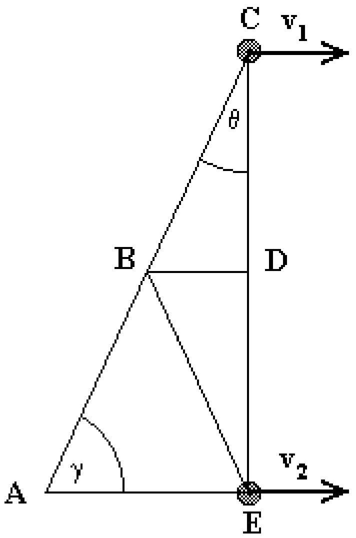


Fig.11

As the velocity of interaction between them cannot be instantaneous, also line of the least operation connecting these particles cannot be the direct line CDE. The line connecting the points C and E, because of the high-speed drift is some curve. But at small velocities a polygonal line CBE can replace it. At acceleration of particles from 0 up to v rather laboratory frames, the mutual energy of these particles tends to save the value. That is the particles tend to save the initial distance CBE =ABC = ct. For this purpose the particles should be pulled together on the distance $\delta^2 = ct^2 - vt^2$, perpendicular direction to their velocity. Therefore it is possible to decompose the line of operation of the mutual energy, the line of operation of forces ABC = ct on component – parallel to direction of driving AE = vt and perpendicular CDE = ut. And $u^2 = c^2 - v^2$. Here the distances are represented as a product of the signal passing time on its velocity.

The energy of one particle in the field another, with the condition of interchanging with energy, it is possible to designate as Q/r. Where Q – the product of appropriate factor on charges or masses, and r – the distance between them is equal 2BC = ct at the zero velocity and 2CD = ut at driving of a rather laboratory frame.

In this case for rest and driven particles it is possible to note the following equations for energies:

$W_0 = \frac{Q}{r_0} = \frac{Q}{ct}$ At $v = 0$ and $W_v = \frac{Q}{r_v} = \frac{Q}{ut} = \frac{Q}{t\sqrt{c^2 - v^2}}$ at $v > 0$.

For observable difference of energies ΔW it is possible to write:

$$\Delta W = 2(W_v - W_o) = \frac{2Q}{t\sqrt{c^2 - v^2}} - \frac{2Q}{ct} = \frac{2Q}{ct}\left(\frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} - 1\right) = \frac{2Q}{r_0}\left(\frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} - 1\right). \qquad (18.1)$$

Why the difference is doubled? The double power interchanging is necessary for the modification of mutual disposition, as it follows from chapters 6 and 7. It is impossible to contract or to stretch the spring for one extremity. If to put on a spring the weight of 1 kg, on other extremity, under the third Newton's law, the force of support response of the same magnitude, but opposite direction will operate. Therefore for coming together of particles, instead of their turn, it is necessary to affix on a pair of particles two equal and opposite directed forces. As will require the doubling of energy.

If to continue transformation of the formula, it is possible to reach the very interesting conclusion, as at a small velocity v expressions under the radical can be decomposed in the series: $\sqrt{1 - \frac{v^2}{c^2}} = 1 - \frac{v^2}{2c^2} - \frac{v^4}{8c^4}...$ It is possible to neglect by the third term of the formula, in view of it smallness. Thus the expression for difference of energies will gain the following view:

$$\Delta W = \frac{2Q\left(1 - 1 + \dfrac{v^2}{2c^2}\right)}{r_0\sqrt{1-\dfrac{v^2}{c^2}}} = \frac{2Qv^2}{2r_0c^2\sqrt{1-\dfrac{v^2}{c^2}}} = \frac{\varepsilon_0\mu_c 2Qv^2}{2r_0\sqrt{1-\dfrac{v^2}{c^2}}} \cong \frac{\varepsilon_0\mu_c Qv^2}{r_0} \ . \qquad (18.2)$$

At the velocity $v<<c$, factor of obtained transformation of the Lorenz can be accepted equal to unit. Therefore for the force it is possible to write:

$$F = \frac{dW}{dr} = -\frac{\varepsilon_0\mu_c Qv^2}{r^2} \ . \qquad (18.3)$$

Here expression $1/c^2$ is replaced with the permittivity and permeability product, equivalent to it. And as will be shown in further, the permeability depends on the velocity of light, therefore to it the index "$_c$" is appropriated. The obtained expression can be decomposed on the product of the potential and double kinetic energies:

For mass forces – $$F = -\frac{\varepsilon_0\mu_c \gamma m_1}{r^2}\cdot\frac{2m_2v_1v_2}{2} = -\frac{\varepsilon_0\mu_c\gamma m_1 m_2 v_1 v_2}{r^2}, \qquad (18.4)$$

For electrical forces – $$F = -\frac{1}{4\pi\varepsilon_0}\cdot\frac{\varepsilon_0\mu_c q_1v_1\cdot q_2v_2}{r^2} = -\frac{\mu_c q_1v_1\cdot q_2v_2}{4\pi\cdot r^2} \ . \qquad (18.5)$$

Permittivity in the formula (18.5) is reduced and for dynamics remains only permeability. The forces of interaction, as it is clear from figure 11, will be perpendicular velocities of particles.

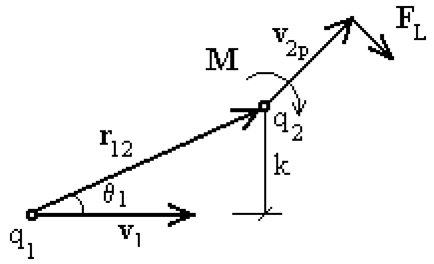


Fig.12

In that case, when the velocities v_1 and v_2 of charges (18.5) are not equal and are noncoplanar, always it is possible to find a plane, coplanar to one from vectors of velocity and taking place through the second particle. On figure 12 vector of the 1st particle velocity is located in the plane which is taking place and through the 2nd particle. And in the plane of the operation of the 1st particle the projection of the second particle velocity $v_{2p} = v_2 \sin\vartheta_2$ is located, where ϑ_2 – the angle between the velocity of particle and normal to the surface hits only. As it is visible from figure, on this projection torque from the particle 1, which arm $k = r_{12}\sin\vartheta_1$, appropriate to the Lorenz's force $\mathbf{F}_L$ operates at of the same name charges. From here follows, that the moment is perpendicular this planes and $\mathbf{M}_{12} = \mathbf{r}_{12}\times q_1\mathbf{v}_1$ is equal. The formula (18.5) in a general view will look so:

$$F_{12} = -\frac{\mu_c}{4\pi}\cdot\frac{q_2v_2\cdot\sin\vartheta_2\cdot q_1v_1\cdot\sin\vartheta_1}{r^2} \ . \qquad (18.6)$$

By translating in the vectorial form and by rearranging, we shall receive the law of Ampere:

$$\mathbf{F}_{12} = -\frac{\mu_c}{4\pi}\cdot\frac{q_2\mathbf{v}_2\times\mathbf{M}_{12}}{r^3} = -\frac{\mu_c}{4\pi}\cdot\frac{q_2\mathbf{v}_2\times[\mathbf{r}_{12}\times q_1\mathbf{v}_1]}{r^3} = \frac{\mu_c}{4\pi}\cdot\frac{q_2\mathbf{v}_2\times[q_1\mathbf{v}_1\times\mathbf{r}_{12}]}{r^3}. \qquad (18.7)$$

Then the force of operation of the first particle on the second particle will be expressed through the magnetic field strength created by 1st particle. As [2] $\mathbf{H}_1 = \frac{1}{4\pi}\cdot\frac{q_1\mathbf{v}_1\times\mathbf{r}_{12}}{r_{12}^3}$, and that it is most possible to tell about an operation of the second particle on the first, it is possible to write the formula (18.7), with regard $\mathbf{H}=\mu_c\mathbf{B}$ and the constant of proportionality in the SI, as follows:

$$\mathbf{F}_{12} = \frac{\mu_c}{4\pi}\cdot\frac{q_2\mathbf{v}_2\times[q_1\mathbf{v}_1\times\mathbf{r}_{12}]}{r^3} = \mu_c\cdot q_2\mathbf{v}_2\times\mathbf{H}_1 = \frac{m_2}{m_2}q_2\mathbf{v}_2\times\mathbf{B}_1 = m_2\frac{d\mathbf{v}_2}{dt}. \qquad (18.8)$$

As it is visible from the obtained formula, the acceleration of particle is proportional to the ratio of its charge to mass. But this is instantaneous value of acceleration. As the particles is moving, it is changing the mutual disposition and velocities, the forces as vary in time:

$$\frac{d\mathbf{F}_{12}}{dt} = \frac{d}{dt}(q_2\mathbf{v}_2\times\mathbf{B}_1) = q_2\frac{d\mathbf{v}_2}{dt}\times\mathbf{B}_1 + q_2\mathbf{v}_2\times\frac{d\mathbf{B}_1}{dt}. \qquad (18.9)$$

From the above-stated reasoning implies that the obtained logically the Ampere's law is obliged to the existence to rushing of system to save the energy and the boundedness of transfer rate of energy. That is the Ampere's law is the Coulomb's law in the dynamics. From here follows also, that the magnetic field, as such, does not exist, so does not exist also magnetic monopole. That is div**B**=0. Under the theorem of Gauss [2,3] div**D** =σ, where σ - the volumetric denseness of charge. Therefore traditional magnetic field is a field by the auxiliary, certain far-fetched intermediary between interacting currents. In those times, when it has opened, electrical origin yet was not known it. And:

$$\mathbf{B}_1 = -\mathbf{M}_{12} \cdot \frac{\mu}{4\pi r^3} \ . \qquad (18.10)$$

By analogy to the impulse of force *mv*, it is possible to name the product *qv* as impulse of electrical force. Therefore, the electromagnetic forces have only dynamic origin; and permeability, being just by the dynamic characteristic, determines by the velocity of light. At the presence of several there are enough of large masses, permeability is the tensor and is determined by superposition of appropriate fields.

19. The Maxwell's set of equations

This set of equations implies immediately from the Ampere's law and the Gauss's theorem. The application for the formula (18.8) third Newton's law allows determining forces of interaction of two particles as equal and opposite directed:

$$\mathbf{F}_{12} = -\mathbf{F}_{21} = q_2 \mathbf{v}_2 \times \mathbf{B}_1 = -q_1 \mathbf{v}_1 \times \mathbf{B}_2 , \qquad (19.1)$$

whence:

$$\frac{m_2 d\mathbf{v}_2}{dt} = q_2 \mathbf{v}_2 \times \mathbf{B}_1 = -\frac{m_1 d\mathbf{v}_1}{dt} = -q_1 \mathbf{v}_1 \times \mathbf{B}_2 \ . \qquad (19.2)$$

If to assume the parallel driving of particles with identical ratios of charge to mass and equal vectors of velocities, after reduction of identical terms of fields, induced by them $\mathbf{B}_2 = -\mathbf{B}_1$ will stay only. As the vectorial sum of fields is equal to zero, but the particles cooperate with each other, it means formation of some dynamic field at moving of particle. From the definition of electric field strength and expression (19.2) follows, that for the same particle strength of dynamic field created by this particle:

$$\mathbf{E} = \frac{\mathbf{F}}{q} = \frac{m}{q} \cdot \frac{d\mathbf{v}}{dt} = \frac{m}{q} \cdot \frac{q}{m} \mathbf{v} \times \mathbf{B} = \mathbf{v} \times \mathbf{B} \, . \qquad (19.3)$$

Therefore the operation of field, created by this particle, on itself should obey to the following expression:

$$\mathbf{E} = -\mathbf{v} \times \mathbf{B} \, . \qquad (19.4)$$

By taking the volumetric derivative from both parts of equality (19.4), we shall receive one from the equations of the Maxwell, the law of electrical inertia:

$$\mathrm{rot}\, \mathbf{E} = -\,\mathrm{rot}[\mathbf{v} \times \mathbf{B}] = -\frac{d\mathbf{B}}{dt} \ . \qquad (19.5)$$

The equation (19.5) shows the temporal modification of field in space (volume) in the laboratory frame at driving of particle. To illustrate this formula it is possible by figure 13.

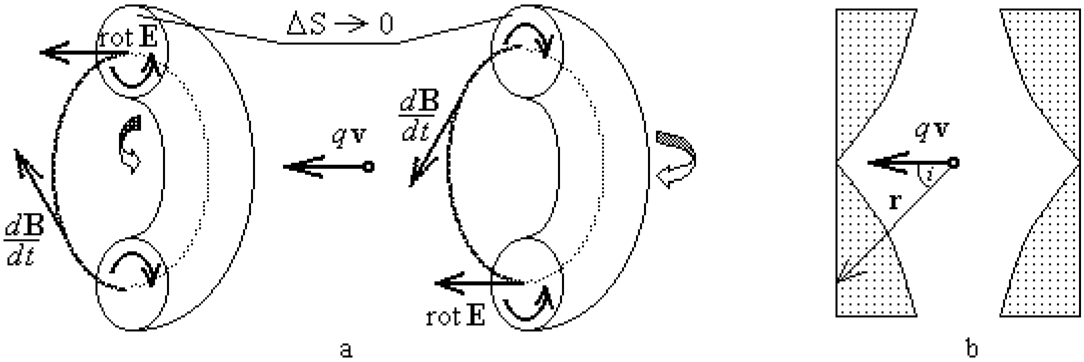


Fig. 13

As it is visible from figure, at the rectilinear driving of particle round it the toroidal fields of the vector **E** circulation (at rushing of the area element ΔS to zero) are created. On figure 13a for simplification two fields, forward and back, are shown only. And ahead and behind a particle the same name vectors have identical magnitude and opposite directedness. If in front and behind to allocate planes, perpendicular driving and were on the identical distance from the particle, the field in these planes will be presented by the function of angle i (fig.13b). As the field is proportional to sin i, and r is proportional to cos i, the field is proportional to $\sin i \cdot \cos^2 i$. The diagrams of the vector rot **E** constructed in these planes, are shown on figure 13b. From the formulas (18.10) and (19.5) implies:

$$\operatorname{rot}\mathbf{E} = \frac{\mu}{4\pi r^3} \cdot \frac{d\mathbf{M}_e}{dt} \ . \qquad (19.6)$$

Therefore, equal in effect reciprocal moment of electric pulses of space, operating on a particle, will be directed opposite to field of vector rot **E** shown on figure. Therefore any modification of the velocity of particle, on magnitude or direction, if there are no indirect forces, will call due to moment, emerging of regenerating forces. And it will ensure rectilinear and uniform driving, that is the first Newton's law for charged bodies or particles. Or the relative rest. The absolute rest, as follows from described above, is impossible. Let's transform the equation (19.4), by taking out the permeability from **B** and by multiplying both parts on the permittivity and, vectorial, on the velocity.

$$\varepsilon_0 \mathbf{E} \times \mathbf{v} = -\varepsilon_0 \mu_c \mathbf{v} \times \mathbf{H} \times \mathbf{v} \, . \qquad (19.7)$$

Let's remark, that $\varepsilon_0\mu_c = 1/c^2$, and the vector **H** is perpendicular to the vector **v** (in classical physics). But at driving (explicitly about effects of aberration in chapter 23) the vector **H** because of the boundedness of light velocity deviates back on the angle ϑ, which sine is equal to the ratio of the particle velocity to the velocity of light, that is v/c. Thus, the angle between vectors is $\vartheta + \pi/2$, and sine of this angle is equal $\cos\vartheta$. If $v \ll c$, $\cos\vartheta = v/c \cong 1$. After appropriate permutation and reduction we shall receive:

$$\mathbf{v} \times \mathbf{D} = \frac{\mathbf{v} \times \mathbf{H} \times \mathbf{v}}{c^2} = \mathbf{H}\frac{v^2}{c^2} = \mathbf{H} \, . \qquad (19.8)$$

Finally, after taking from both parts of equality the volumetric derivative [1], we shall receive the equation for circulation of the magnetic field strength without the regard of the conductivity current. That is without a regard of the charge, transferable most driven particle.

$$\operatorname{rot}\mathbf{H} = \operatorname{rot}[\mathbf{v} \times \mathbf{D}] = \frac{d\mathbf{D}}{dt} \ . \qquad (19.9)$$

From figure (13.a) the formation of fields by the driven charge is clear. But (19.9) these charges do not participate in the equation. Therefore it is necessary to supplement the equation (19.9) by expression for the current of conductivity. By designating through k_0 number of particles in unit of volume, for the current density we shall receive expression $\mathbf{j} = k_0 q_d \mathbf{v}_d$, where $\mathbf{v}_d$ is the drift velocity of the summarized charge of volume, and q_d - its charge. Neglecting individual masses of particles, that is the cause of inertia, and considering that forces have only electrical nature, we shall come to some one Maxwell's equation:

$$\text{rot}\,\mathbf{H} = \mathbf{j} + \frac{d\mathbf{D}}{dt}\ . \tag{19.10}$$

Thus in this regard the velocity of electromagnetic waves servings by the power intermediary is final, has allowed applying the Coulomb's law in dynamics. In an outcome the set of Maxwell's equations is obtained. To this it is necessary to add still full the Lorenz's force of $\mathbf{F} = q\mathbf{E} + q[\mathbf{v}\times\mathbf{B}]$ because of not taken into account before an exterior electrical field and masses of particles.

$$\left.\begin{aligned} &\text{rot}\,\mathbf{E} = -\frac{d\mathbf{B}}{dt}, \qquad \text{div}\mathbf{D} = \sigma, \\ &\text{rot}\mathbf{H} = \mathbf{j} + \frac{d\mathbf{D}}{dt}, \qquad \text{div}\,\mathbf{B} = 0. \end{aligned}\right\} \tag{19.11}$$

It is necessary to notice, that the perpendicularity to the particle's speed of flight transversal component of displacement currents, as it is visible from the formula (19.9), will be possible only at $v \ll c$. Thus the particle will be enclosed by the sinusoidal wave of transversal displacement currents. Otherwise they will be turned around back on the angle arc v/c because of the finiteness of velocity of light, where v/c - the sine of turn angle.

20. The Maxwell's set of equations for gravitation

Taking into account the developed mathematical means for the electromagnetic field, it is possible to enter just the same for the gravitational or mass field. By conducting similar transformations with the formula for mass (18.4), we shall receive the same outcome at application of the right-handed system of vectors. By designating the strength of gravitational field $\mathbf{S}=\mathbf{F}/m$, we shall enter the strength of massodynamics field $\mathbf{G}$, as analog magnetic, and the mass induction $\mathbf{L}$, analog electromagnetic one. For the full correspondence mass factor $\xi = 1/4\pi\gamma$ is entered by the similar electrical constant – permittivity of vacuum. Then the gravitational displacement is $\mathbf{T}=\mathbf{S}/4\pi\gamma$. Here it is possible also to define the mass induction as $\mathbf{L}= 4\pi\varepsilon_0\mu_c\gamma\mathbf{G} = 4\pi\gamma\mathbf{G}/c^2$. The table of correspondences located below helps to understand essence of appearances.

As the massodynamic field – it conditionally, as the magnetic field, its divergence is div$\mathbf{L}$= 0. The gravitational (mass) induction (displacement) will be defined from the condition $\mathbf{T}=\xi\mathbf{S}$. From the conservation law of the mass amount follows div$\mathbf{T}=\sigma$, where σ – the volumetric denseness of mass. The strength of massodynamics field is proportional and opposite directed to the moment of the first particle concerning second one, $\mathbf{G}_1 = [m_1\mathbf{v}_1\times\mathbf{r}_{12}]/4\pi r^3$.

Electromagnetic appearances		Gravitational appearances
$\mathbf{E} = \dfrac{\mathbf{F}}{q}$	Strength	$\mathbf{S} = \dfrac{\mathbf{F}}{m}$
$\mathbf{D} = \varepsilon_0\mathbf{E}$	Displacement (induction)	$\mathbf{T} = \dfrac{1}{4\pi\gamma}\mathbf{S} = \xi\mathbf{S}$
$\mathbf{H} = \dfrac{1}{4\pi}\cdot\dfrac{q\mathbf{v}\times\mathbf{r}}{r^3} = \dfrac{-\mathbf{M}_e}{4\pi\, r^3}$	Strength of fictitious field	$\mathbf{G} = \dfrac{m\mathbf{v}\times\mathbf{r}}{4\pi r^3} = \dfrac{-\mathbf{M}_m}{4\pi r^3}$
$\mathbf{B} = \mu_c\mathbf{H} = \dfrac{\mathbf{H}}{c^2\varepsilon_0}$	Fictitious induction	$\mathbf{L} = \dfrac{4\pi\gamma}{c^2}\mathbf{G} = \dfrac{\mathbf{G}}{c^2\xi}$

Applying the same reasons were used at the conclusion of the formula (18.6) and the same figure 11, it is possible at once to write the formula for masses appropriate to the formula (18.7) for electromagnetic appearances. Then is similar to the formula (18.8), the appropriate mass equation can be presented as:

$$\mathbf{F}_{12} = \varepsilon_0 \mu_c 4\pi\gamma \cdot \frac{m_2 \mathbf{v}_2 \times [m_1 \mathbf{v}_1 \times \mathbf{r}]}{4\pi r^3} = \frac{1}{c^2 \xi} \cdot m_2 \mathbf{v}_2 \times \mathbf{G}_1 = m_2 \mathbf{v}_2 \times \mathbf{L}_1 = m_2 \frac{d\mathbf{v}_2}{dt}. \qquad (20.1)$$

From the formula (20.1) follows, that the acceleration of the second particle in the outcome of action by the first one, is similar (19.2):

$$\frac{d\mathbf{v}_2}{dt} = \mathbf{v}_2 \times \mathbf{L}_1 . \qquad (20.2)$$

Similarly to conclusion of the formula (19.1), we shall output similar for mass forces. Proceeding from the third law of Newton:

$$\mathbf{F}_{12} = m_2 \mathbf{v}_2 \times \mathbf{L}_1 = -\mathbf{F}_{21} = -m_1 \mathbf{v}_1 \times \mathbf{L}_2 , \qquad (20.3)$$

whence:

$$\mathbf{S}_{12} = \mathbf{v}_2 \times \mathbf{L}_1 = -\mathbf{S}_{21} = -\mathbf{v}_1 \times \mathbf{L}_2 . \qquad (20.4)$$

Applying logic constructions used at the conclusion of the formula (19.3), that is accepting equality of masses and speeds, and consequently also equality of their fields ($\mathbf{L}_2 = -\mathbf{L}_1$), we shall output the same formula for the strength of the mass (gravitational) field of particle:

$$\mathbf{S} = \frac{\mathbf{F}}{m} = \frac{m}{m} \cdot \frac{d\mathbf{v}}{dt} = \mathbf{v} \times \mathbf{L} . \qquad (20.5)$$

Under the third law of Newton, the operation of the field, created by the particle, on a particle obeys similar (19.4) to equation:

$$\mathbf{S} = -\mathbf{v} \times \mathbf{L} . \qquad (20.6)$$

By differentiating the equation (20.6) on the volume, we shall receive expression for the first Newton's law – the law of inertia. It is completely similar (19.5).

$$\mathrm{rot}\,\mathbf{S} = -\mathrm{rot}[\mathbf{v} \times \mathbf{L}] = -\frac{d\mathbf{L}}{dt}. \qquad (20.7)$$

It is possible to illustrate this equation, as well as equation (19.5) on figure 13. It is necessary only to replace electrical magnitudes similar mass (gravitation). By the way it is necessary to mark, that because of the symmetry of space the response on driving of particle, because of its inertness, both its spin and magnetic moment should lie on the speed line of particle. Thus the particle will move rectilinearly and uniformly in a lack of indirect forces and the invariance of magnetic constant. So the first Newton's law mathematically for not charged bodies looks.

If the inertia of particle depends from inertness of space, which, in turn, reacts to driving of the mass, it can mean not only equivalence of gravitational and inert masses. But also it is the impossibility of the microscopic rest of rather any frame.

For deriving the fourth equation of system, it is necessary to do with the formula (20.6) transformations similar of themes that are done with the formula (19.4). Thus the speed of gravitational perturbations, as it was shown at reviewing of the secular precession of Mercury's orbit, is equated to velocity of light.

$$\xi \mathbf{S} \times \mathbf{v} = -\frac{\xi}{c^2 \xi} \mathbf{v} \times \mathbf{G} \times \mathbf{v} = -\mathbf{v} \times \xi \mathbf{S} . \qquad (20.8)$$

Here, as well as at the conclusion of the similar formula of the electromagnetic that fact is used the vector of the speed is perpendicular to the vector of displacement, therefore sine of the angle between them, equal to the ratio v/c =1 (19.8).

$$\mathbf{G} = \mathbf{v} \times \mathbf{T} . \qquad (20.9)$$

The volumetric derivative from both parts of equality (20.8):

$$\mathrm{rot}\,\mathbf{G} = \mathrm{rot}[\mathbf{v} \times \mathbf{T}] = \frac{d\mathbf{T}}{dt} \ . \qquad (20.10)$$

The same as and in similar (19.9) electromagnetic formula, in this formula driving masses creating this field is not taken into account. Therefore final view the equation will gain after addition of the masses current. Let's enter the vector of mass denseness current $\mathbf{k} = k_0 m_d \mathbf{v}_d$, where k_0 – amount of particles in unit of volume, and m_d – summarized mass drifting with the speed $\mathbf{v}_d$. As the masses in the denominator, as well as in the electrodynamics, influence only on cyclical component speed, is summable expression on considered volume:

$$\operatorname{rot}\mathbf{G} = \mathbf{k} + \frac{d\mathbf{T}}{dt}. \tag{20.11}$$

For the regard of individual interaction of particles with the exterior gravitational field and with the dynamic field created motion particles (in the laboratory frame), it is necessary to enter the full gravitational "Lorenz's force".

$$\mathbf{F} = m\mathbf{S} + m[\mathbf{v}\times\mathbf{L}] \ . \tag{20.12}$$

The second term of the right member of the formula (20.12) is the field expression of the centrifugal force. Finally Maxwell's set of equations for the gravitation has the view completely similar to the same equations of the electrodynamics.

$$\left.\begin{aligned} &\operatorname{rot}\mathbf{S} = -\frac{d\mathbf{L}}{dt}, \qquad \operatorname{div}\mathbf{T} = \sigma, \\ &\operatorname{rot}\mathbf{G} = \mathbf{k} + \frac{d\mathbf{T}}{dt}, \quad \operatorname{div}\mathbf{L} = 0. \end{aligned}\right\} \tag{20.13}$$

All described above allows to state, that the gravitational or mass interaction of particles owes, as well as electromagnetics one obey to the Maxwell's laws. And it means existence both neutral displacement currents, and mass waves as neutral particles, which are not having any rest masses. That is the quantum of mass field completely similar to electromagnetic quantum everything, except for a charge.

Therefore is similar to the vector of flux density of energy in the electrodynamics $[\mathbf{E}\times\mathbf{c}\times\mathbf{E}]/c = \mathbf{c}E^2/c$, we shall enter the same one and into the gravitation. Then the vector of instantaneous flux density of the gravitational energy $\mathbf{\Gamma}$ will be expressed by the following formula:

$$\mathbf{\Gamma} = \frac{[\mathbf{S}\times\mathbf{G}]}{c} = \frac{[\mathbf{S}\times\mathbf{c}\times\mathbf{S}]}{c} = \frac{\mathbf{c}S^2}{c} = \mathbf{g}_0 S^2 \ . \tag{20.14}$$

Here single vector of the speed is designated as $\mathbf{g}_0$. Average for period the vector of flux density of energy is equal $\mathbf{\Gamma}/2$.

21. Qualitative pictures of radiation

Using formulas (19.5) and (20.7), we shall construct some schemes of radiation at the accelerated driving of charges or masses of the rather laboratory frame.

On the figure (14.a) the dipole antenna or half-wave vibrator (Hertz's) [3] is shown. The distributed current here is replaced by one positive charge clearer to present formation of displacement currents curls at its driving. The direction of driving is shown by arrow, and the cut passes on the axes of vibrator. From the (19.5) just such follow bitoroidal fields stipulated by increase of the magnetic induction ahead of particle and decrease behind.

The toroidal electromagnetic radiation consists of pair of double curls, gyrating in opposite directions. Thus, for simplification of figure, the curls, compensatory charges formed at deceleration of charges are not shown. The form of photon is considered in the following chapter. At the range of particles of various energies there are curls of appropriate energies, so also of frequencies. On figure 14 curls are represented conditionally flat.

The one-wave vibrator on figure (14.b) radiates by two-petal [3]. But if to replace approach-correcting positive charges by masses, curls of the strength of electrical field are substituted with curls of strength of gravitational field. Thus the directness of radiation remain precisely same because the same principles are used.

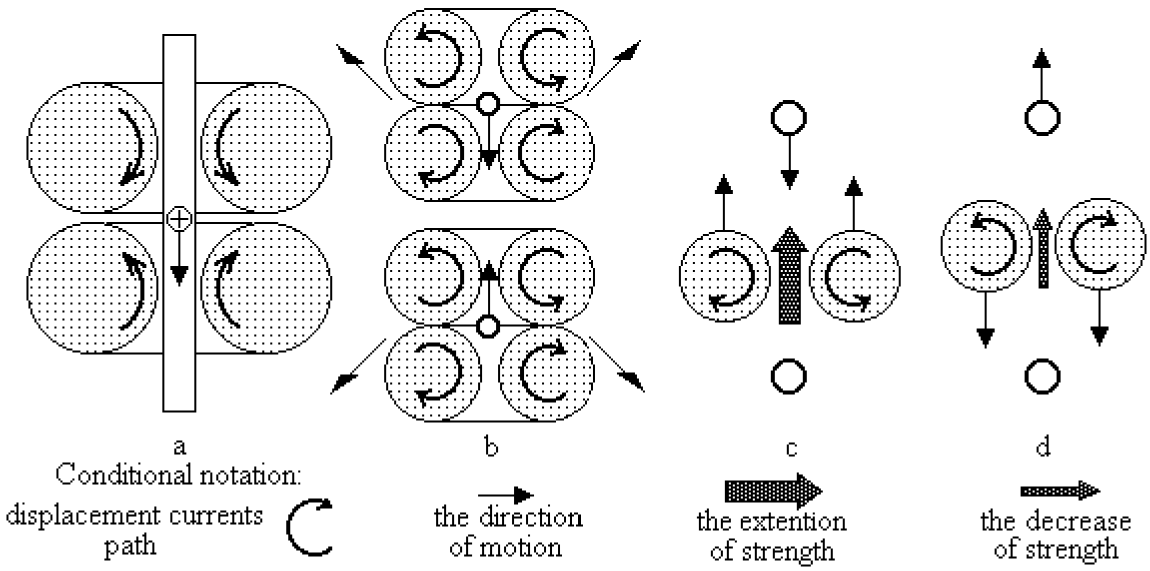


Fig.14

On figure (14.c) the fixed kernel, above the electron dropping on it, is below represented. The spins for simplification of the picture start antiparallel and directed perpendicularly to the plane of figure. The magnification of field strength will call in a space displacement current (19.9), generating the magnetic field. The variable of magnetic field, in turn, will generate (19.5) curls, which displacement currents will be directed against increase of the strength. At the falling on the lower layer the system will radiate a light quantum, the vector of which electrical strength is polarized perpendicularly planes of rotation of curls. The plane of polarization is setting by polarization of gyrating of currents.

Under the same conditions (20.7 and 20.10) and falling of electron on the kernel, that is at K-capture, the same scheme will show the radiation of neutrino under the formula e- + AZ - > AZ-1 + n [3]. The polarization corresponds to polarization of mass currents of particles; arrows show the direction of driving.

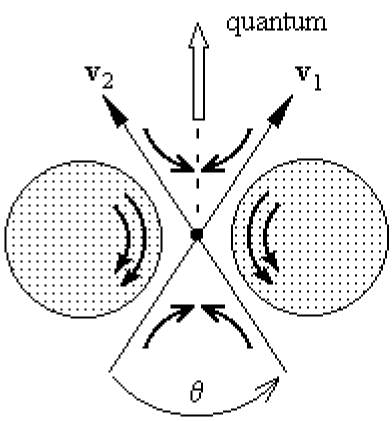


Fig. 15

By figure (14.d) is illustrated or the deriving of photon by atom and the passage of electron to the more high level, or the beta - disintegration of neutron (in the bottom of figure) on a proton, electron (above) and antineutrino (in the middle). Thus of the explanation same, as to figure (14.c), only direction of displacement currents will be opposite. From explained follows that the neutrino is located in the short-wave extremity of gravitational radiation spectrum and corresponds to the gamma quantum of electromagnetic radiation.

On figure 15 the mechanism of radiation of quantum is shown at a particle turn on the angle ϑ. At the turn of the speed vector from $\mathbf{v}_1$ to $\mathbf{v}_2$ the curls at the left ahead and on the right behind amplify with each other, and on the right ahead and at the left behind - are loosened.

22. Forms of electrons and quantums

A construction of electrons is the theme of separate work. Therefore I concern it briefly, only to explain the transformation of spin at transformation of particles. As the spin of quantum is equal to one [2,3], each half of quantum consisting from two opposite of twisted curls, has the spin $^1/_2$. Spins of these curls as the magnetic moment are directed to different sides. Its halves are formed of dispacement currents of opposite polarity from the condition of photon's neutrality.

On figure (16.a) quantum of electromagnetic waves under the angle 45° to the direction of driving is represented. It represents four vortexes, driven in one plane, of dispacement currents conditionally shown flat. The curls can be fastened by the magnetic field, which is taking place through their centers. As two directions of speed are possible, two sorts of photons with one direction of curling of vortexes and two with another are possible. The algebraic sum of spins is equal to one. Length of quantum corresponds to the (8.3).

At the half of quantum from negative dispacement currents on figure 16.a the magnetic moments are opposite to spins. The half from positive dispacement currents has magnetic moment conterminous to the direction of spin.

If such quantum with the sufficient energy will hit in the field of atom, it can turn to electron and positron. For the formation of particle two curls planes should be oriented under the angle 120°, as on figure 16.c. As both halves of quantum have own torque, at the inflection they should precess round their axes which is taking place through the centers rotations of curls. The vectorial sum of spins, as shown in figure 16.d, is equal $^1/_4$. That will happen and with magnetic moment of curls.

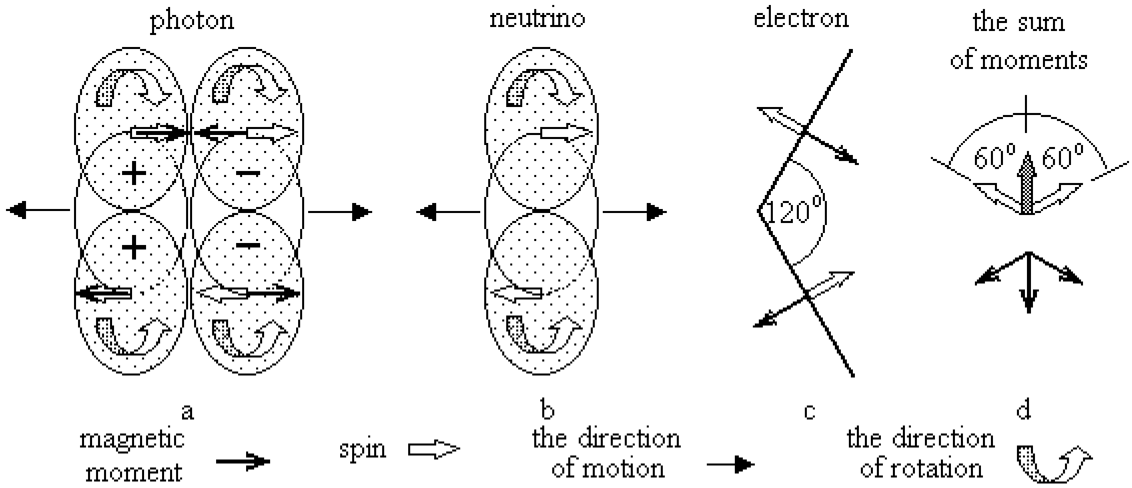


Fig.16

On the formation of particles the atom owes, according to the conservation law of impulse, to expend the same energy, what is incorporated in a particle. Therefore spin at the twisting will be increased twice and will be $^1/_2$. That can be told and about the magnetic moment. A projection of the given construction on a plane, perpendicular the rotation axes of particle, is an ellipse. The gyrating round its axes the charged ellipse will increase the magnetic moment twice.

The charge will be supplied with negative or positive displacement currents. And the charge is not transmitted by means of photon, as the currents make of circular driving, similarly to particles of water in a marine wave. Thus the currents of different charges of forward and back curls compensate each other. It is possible to name quantums having the opposite directions of rotation of forward curls, as photons and antiphotons.

Because of the neutrality of currents the magnetic moment at the free neutrino is absent. The summarized spin by analogy to a photon should be equal to one. But, as the neutrino is radiated only at acceleration or deceleration of any elementary particle, it consists only of two curls of neutral currents with the summarized spin $^1/_2$ (fig.16b). Therefore with him will happen in the field of the kernel too most, as with the gamma quantum (fig.16.c, d).

There is the difference the spin gamma quantum will be divided between two particles. The "gamma" quantum of the massodynamic field with the spin equal $^1/_2$, will turn to the neutrino with spin $^1/_2$. The similar transformation also is explained by the inflection and curling by the reciprocal impulse of the kernel. As the neutrino consists only by a pair of neutral curls, there can be only two aspects of these particles (waves).

Whether the massodynamic (gravitational) waves will be derivated and are swallowed completely similarly the electromagnetic, obeying the same laws, these waves should be observed at collision or explosive dispersion of masses. Being the long wavelength relatives to neutrino, they should have the same spin, $^1/_2$. At periodic (quasiperiodic) mutual driving of masses there should be waves with the spin equal to one. They should be completely similar to the electromagnetic waves.

23. High-speed effects of aberration

At the conclusion of formulas for the forces originating at driving of particles, in the (18.2) the conversion coefficient was omitted. As in the case of small speed of driving it practically is equal to one. When the speed of particle becomes the noticeable part from the velocity of light, this factor to ignore already is impossible.

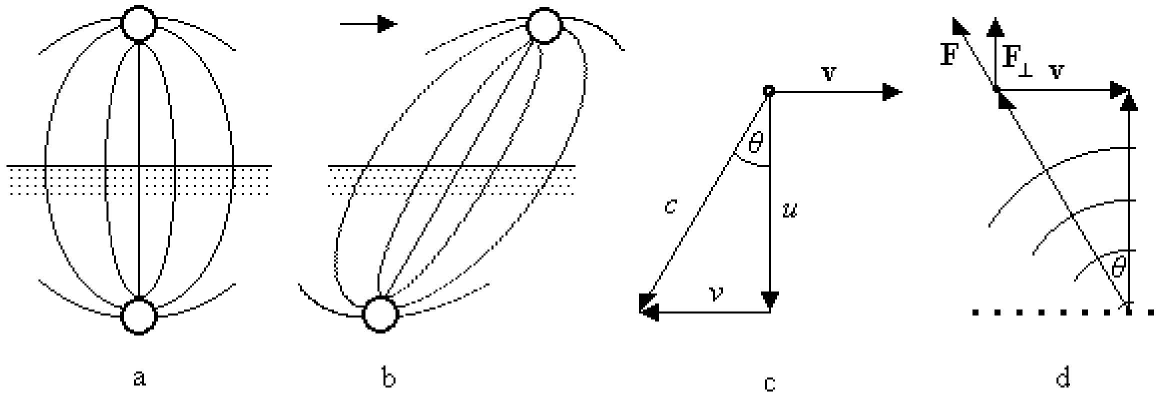


Fig. 17

For clearing up of the interaction of charge with a plane the method of mirror images [3,5] is used. On figure 17a the interaction with a plane of the fixed charge is shown. The line of the least operation, on which it is carried out, in this case is perpendicular to the surface. As the speed of any field interaction cannot exceed velocity of light in the given medium, at driving along a plane the line of operation will receive declination depending on the speed of charge concerning the plane (fig. 17b). The angle of deviation depends on the perpendicular to the plane from the ratio of the driving speed to the light velocity, that is $\sin\vartheta = v/c$.

Thereof arises effect completely similar to the star-shaped aberration. In this case field created by the plane and perpendicular direction of driving will act with particle under an angle. The plane can be divided on indefinitely thin bands, perpendicular the direction of particle driving (fig.17d). At the fluctuation of the field strength or its modification from bands with the velocity = c will be spreaded cylindrical waves.

But because of the particle's driving, as it is visible on figure, they will register by particle under the angle $^1/_2\pi - \vartheta$ to direction of driving. That would happen at filling sky increasing and great many of stars. Therefore transversal force $\mathbf{F}_\perp$ deviates the particle, on the similarity of the triangle of forces to the triangle of distances, will be equal to the initial force $\mathbf{F}$ multiplied on $\cos\vartheta$. Here it is supposed that the particle is charged also, as well as plane. The force, necessary for the modification of the particle driving direction, is equal:

$$\mathbf{F} = \frac{\mathbf{F}_\perp}{\cos\theta} = \frac{\mathbf{F}_\perp}{\sqrt{1-\sin^2\theta}} = \frac{\mathbf{F}_\perp}{\sqrt{1-\frac{v^2}{c^2}}} \; . \qquad (23.1)$$

The distance ct, on which the power interaction of particle to the plane shown on the figure 17c happens will concern to the geometric distance ut as $1/\cos\vartheta$. Therefore and the energy necessary for the turn of particle, will vary with the speed, similarly to the force:

$$W = \frac{W_{\perp}}{\sqrt{1 - \frac{v^2}{c^2}}}. \quad (23.2)$$

Considered here the interaction with one plate could be interpreted as interaction with the condenser that second electrode is deleted on infinity. On figure 17d the longitudinal force obtained at expansion of the force **F** is not shown. As at the equal distance of particle from plates of the condenser the transversal force is doubled and longitudinal destroy each other. If the particle is closer to one from plates, that on the dependence from the plate charge, the longitudinal part of force will be either accelerating, or braking.

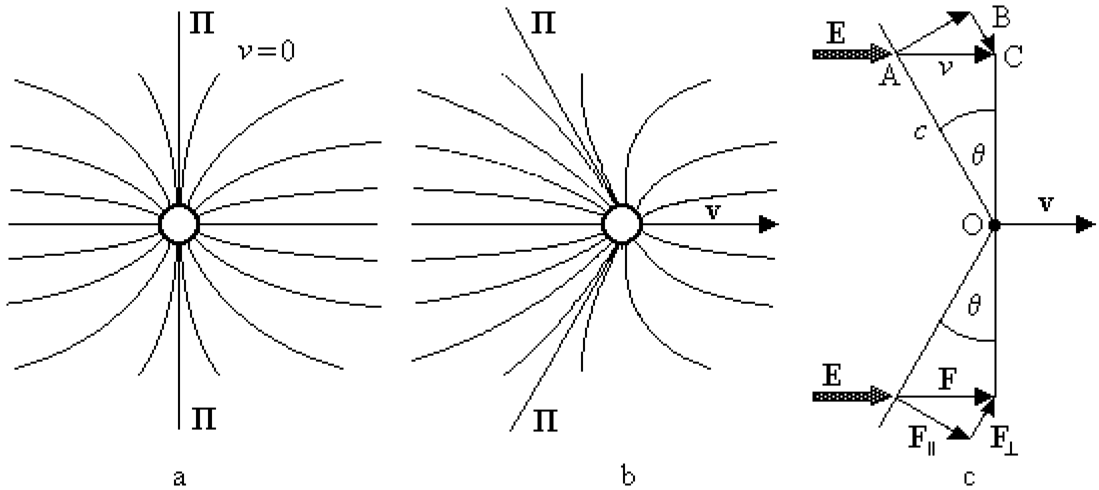


Fig.18

At opposite charges the particle will be accelerated the same as and not charged, driven along the gravitating plane. From here follows, that the acceleration obtained at the gravitational turn of a small celestial body round large one, depends on the speed of the small rather laboratory (primary) frame. The more speed last one, then the majority of the force of attraction of the large body is used on acceleration, instead on the modification of the direction of speed vector. And, if the force obeys to perpendicular driving, formula (23.1), the accelerating force will depend on the sine of angle ϑ.

$$\mathbf{F}_{\parallel} = \mathbf{F}\sin\theta = \frac{\mathbf{F}v}{c}. \quad (23.3)$$

The interaction with the magnetic field is similarly to interaction with the condenser. Thus, any transversal interaction of fixed plants with a driven particle (body), will depend on the aberrational effect. Due to the effect of aberration the choice of primary frame is possible. Thus does not happen of any modifications neither mass, nor time.

As it is strange, but at application of the force accelerating a particle, also there is the aberration effect. Let's consider an example on figure 18. A particle was under the operation of the accelerating electrical field here is shown. The field on figure is directed from left to right. In the position 18a the particle is even motionless also cut **П-П,** which perpendicular accelerating field, represents the plane, and the force lines are not deformed yet by speed. After the particle will begin to gather the speed, the force lines will begin to change the form because of restriction for the transfer rate of signal. The plane **П-П** will turn to a cone, an angle of which disclosure is determined by the particle speed (fig.18b). As at the outside of particle the transfer rate of signal is determined only in local velocity of light, all lines will receive the high-speed drift. Thus forming of cone will deviate from the vertical on the angle ϑ, which sine is equal to the ratio v/c.

But for the particle this line is perpendicular to its speed of driving, as the high-speed drift it receives only outside of particle. Therefore the forces created by the electrical field with the strength **E** will operate under an angle to the particle, as they operate under an angle to forming. From figure 18c it is visible, that the triangle ABC is similar to the triangle ACO on the mutual perpendicularity of sides. The force **F**, operating on the particle, will be decomposed on component forces $\mathbf{F}_{\parallel}$ and $\mathbf{F}_{\perp}$. Component force $\mathbf{F}_{\parallel}$, parallel to the speed of particle and equal $F\cdot\cos\vartheta$, boosts it. Component $\mathbf{F}_{\perp}$, is equal $F\cdot\sin\vartheta$ – contracts the particle. Taking into account that $\sin\vartheta = v/c$, for these component it is possible to write:

$$\mathbf{F}_{\parallel} = \mathbf{F}\sqrt{1-\frac{v^2}{c^2}} \; . \tag{23.4}$$

$$\mathbf{F}_{\perp} = \mathbf{F}\frac{v}{c}. \tag{23.5}$$

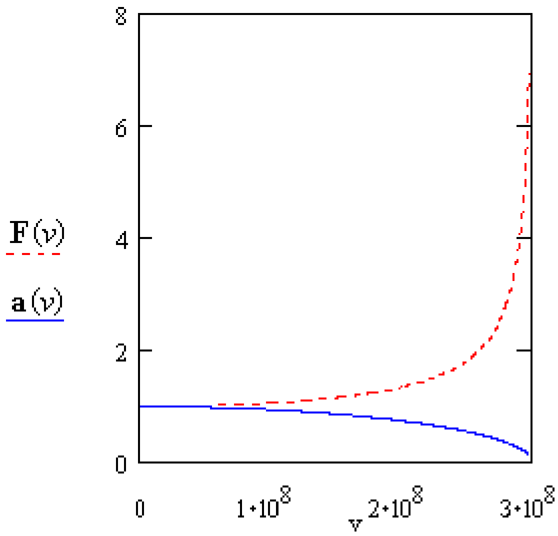


Fig. 19

Thereof the acceleration of a particle $\mathbf{a}(v)$ by the operation of constant force at the approximation to velocity of light will be aimed to zero, as it is shown on figure 19. There the force $\mathbf{F}(v)$, tending to infinity for maintaining constant acceleration under the equation (23.4) is shown. Energy required for the boost of particle, the same as and for the turn will submit to the equation (23.2).

The longitudinal effect of aberration demonstrates not only impossibility to accelerate particles (body) up to velocity of light by action of exterior forces. It also shows the force contracting a particle, potential energy increasing at the approximation to velocity of light (rather laboratory frame).

24. The pinch-effect

At the conclusion of the Ampere's law were considered interactions of two moving particles. On figure 11 they are represented by the joint broken line. It is interesting to clarify what by a line of the operation they are connected actually with?

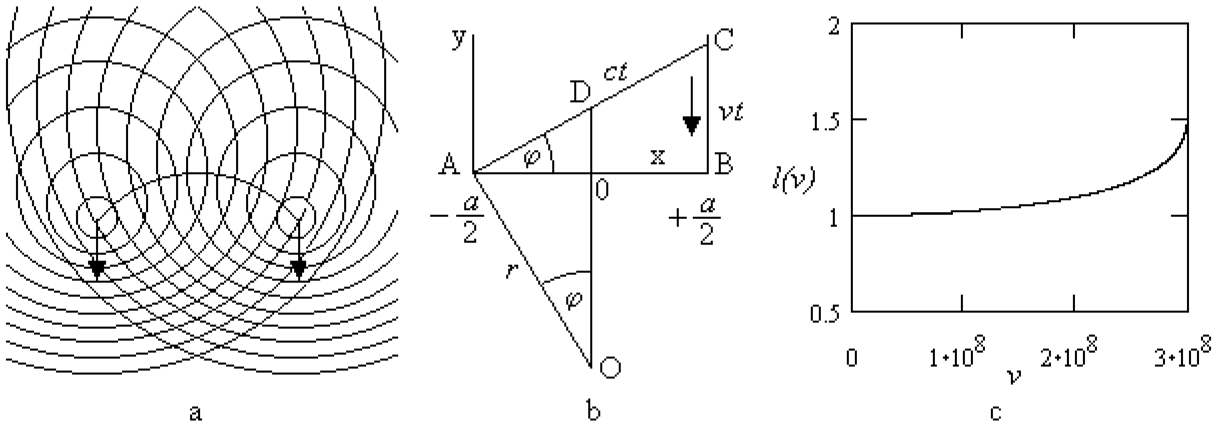


Fig.20

On figure 20b one particle is shown in the point A, and another in the point B is from to first one on the distance a. The disposition of axes x-y is visible from figure, where x=0 will be in the middle distances and, and at = 0 – on axes x. Because of high-speed drift the line of operation will leave from particle under angle φ, which sine, as is clear from figure, is equal to the ratio v/c, and the cosine is equal a/ct.

The signal gone out the point C, in time t will touch particle A. In accordance with moving off from the particle A the angle φ of the normal declination to the surface of adjoining signal spheres of particles decreases, turning in a zero above the point x=0. Let's present spheres on the plane of particles driving by circles. The centers of circles, difiniendums by particles A and B, because of particles moving, displace along the positive axis y, simultaneously increasing their radius.

By taking advantage the symmetry of particles position of rather x=0, it is possible to construct the resulting curve of adjoining circles. Above the point x=0 circles are equal and are mapped by the same formula being at the same time and the formula resulting curve for tangents to circles (fig. 20b):

$$x^2+\left(y+\frac{a}{2}\tan\varphi\right)^2=r^2 \qquad (24.1)$$

As the normals are perpendicular to tangents, factor at the operating value y, namely $\tan\varphi$ it is necessary to replace on cot φ. Therefore curve of normal will look so:

$$x^2+\left(y+\frac{a}{2}\cot\varphi\right)^2=r^2\,. \qquad (24.2)$$

Now this formula is possible to rearranged and to extracted with the square root, by receiving the equation of the arc of circle:

$$y=\sqrt{r^2-x^2}-\frac{a}{2}\cot\varphi\,. \qquad (24.3)$$

From figure 20b it is visible, that the angle OAD is direct, as the angle of tangent to curve with its normal. From the similarity of triangles ADO and ACB follows, that $r=a/(2\sin\varphi)$. Both it is possible to express sine, and cosine through v and c, and to transform the equation (24.3).

$$\sin\varphi=\frac{v}{c},\ \cos\varphi=\sqrt{1-\sin^2\varphi}=\sqrt{1-\frac{v^2}{c^2}},\ r=\frac{a}{2\sin\varphi}=\frac{ac}{2v}, \qquad (24.4)$$

$$y=\sqrt{\left(\frac{ac}{2v}\right)^2-x^2}-\frac{ac}{2v}\sqrt{1-\frac{v^2}{c^2}}\,. \qquad (24.5)$$

Approximately length of the arc of circle $l(v)$ [1] expresses through the segment h= 0D:

$$h=r-r\cos\varphi,\ \text{whence}\ \ l(v)=\sqrt{a^2+\frac{16}{3}h^2}=\sqrt{a^2+\frac{16r^2}{3}(1-\cos\varphi)^2}\,. \qquad (24.6)$$

The dependence of length is shown to this curve from the speed of moving in the laboratory frame on figure 20c. Let us take particle is moving in parallel with the identical speed, but one from them lags behind another on the distance CD, then the arc of circle will turn to the segment of ellipse:

$$y=\sqrt{\left(\frac{ac}{2v}\right)^2-x^2}-\frac{ac}{2v}\sqrt{1-\frac{v^2}{c^2}}+\tan\varphi\left(x+\frac{a}{2}\right). \qquad (24.7)$$

According to the magnification of distance the energy, required for the share boost of particles is increased also. As the system tends to save the energy, as the acceleration of particle approaching will appear. The transversal forces necessary for it are taken from the longitudinal accelerating force. For the analysis of forces, operating on the falling positively charged particles with an identical mass it is possible to use obtained earlier formula (18.9). With the help of equations (18.8) and (19.5) this formula is reduced in:

$$\frac{d\mathbf{v}_2}{dt}=\frac{q_2}{m_2}\cdot\left[\frac{q_2\mathbf{v}_2}{m_2}\times\mathbf{B}_1\right]\times\mathbf{B}_1-\frac{q_2}{m_2}\mathbf{v}_2\times\operatorname{rot}\mathbf{E}_1\,,$$

$$\mathbf{a}_2=-\left(\frac{q_2}{m_2}\right)^2\mathbf{v}_2-\frac{q_2}{m_2}\mathbf{v}_2\times\operatorname{rot}\mathbf{E}_1\,. \qquad (24.8)$$

The acceleration $\mathbf{a}_2$ of the particle 2, as follows from (24.8), is decomposed on two components: parallel to driving − first term on the right, and perpendicular, − second term on the right. The similar forces operate and on the first particle.

Acceleration, operating on the particle 2 in the laboratory system of reference, is shown on figure 21. As because of the Ampere's law particles cannot move strictly in parallel, and should approach, the vector $d\mathbf{B}_1/dt$ is directed to the same side, as vector $\mathbf{B}_1$. The vector rot $\mathbf{E}_1$ is equal and is directed opposite to the vector $d\mathbf{B}_1/dt$, on figure is not shown. As the outcome of these forces operation also is received that force line, that was deduced in the beginning of this chapter and is represented on figure 20.

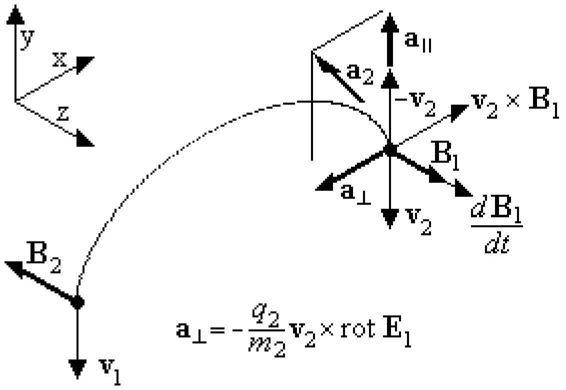


Fig. 21

The modification of the mutual energy of particles in any moving bundle is possible pairwise sum assuming that they are moving with the identical speed. But not pressing in details it is possible at once to make conclusion, that the pinch-effect also can be referred to high-speed effects of aberration concerning as and neutral particles.

25. Speed, energy, impulse

The modification of energy with the speed is easiest for considering on the example of electron. In 22 chapter the structure of quantum was considered. Thus the half of the gamma quantum energy at the formation of electron is expended on the spin changing, as the vector. The energy of this quantum is in the equal mass units $mc^2/2$. In terms of mass of electron – $2m_ec^2$ (at formation of the pair on atom). Together with the reciprocal energy of atom the common energy of the pair formation is equal $4m_ec^2$.

The energy m_ec^2 is expended on the modification of the curls spins direction, and, therefore, on the precession them round the new axes, as shown in figure 16c. Signifies this energy passes in the kinetic energy of the particle rotation, on $^1/_2\, m_ec^2$ to the each half of construction. The summarized moment s of obtained construction does not vary. Thus, because of the construction rotation, the magnetic moment is increased twice.

As where $m_ec^2 = \frac{J\omega^2}{2} = \frac{h\omega}{4\pi} = \frac{h\nu}{2}$ the moment of inertia $J = \frac{s}{\omega} = \frac{h}{2\pi\omega}$, and $\nu = \frac{c}{\lambda}$, for the wavelength of electron the following formula will be fair:

$$\lambda_e = \frac{h}{2m_ec}. \tag{25.1}$$

The formula for the frequency of rotation ω_e and radius of electron r_e from here follow. The radius of electron is deduced from the condition of equality of the peripheral rotation speed of electron to the light velocity that will be shown further.

$$\omega_e = 2\pi\nu = 2\pi\frac{c}{\lambda_e} = \frac{4\pi m_ec^2}{h}. \tag{25.2}$$

$$r_e = \frac{c}{\omega_e} = \frac{ch}{4\pi m_ec^2} = \frac{h}{4\pi m_ec}. \tag{25.3}$$

Precisely same formulas will be received if to assume that the elementary whirl represents a hoop (coil with a current) with uniformly distributed mass, gyrating with velocity of light. Using datas from [2,3] and by limiting six numbers after point, we shall receive for electron the following parameters:

The wavelength $\lambda_e = 1.213107\cdot10^{-12}$ m.

Frequency of rotation $\omega_e = 1.55275\cdot10^{21}$ sec^{-1}.

Radius (semimajor axis of an ellipse) $r_e = 1.930719\cdot10^{-13}$ m.

The obtained wavelength of an electron twice is less the Compton's wavelength and is equal to the wavelength of parent quantum. At magnification of the particle speed of rather laboratory frame its radius, by (17.2) and it similar, falls on the following dependence:

$$r_v = \frac{r_0}{c^2 \alpha} = \frac{r_0}{2cv - v^2} . \qquad (25.4)$$

Where r_v – radius at the speed v, and r_0 – radius in the quiescence. On the conservation law of moment for the rotated particle $mv_t r = mv_{t0} r_0$. For such particle the product of tangential rotation rate on its radius is the constant magnitude. Therefore at the diminution of particle radius from r_0 up to r_v the kinetic energy of rotation will be defined from the following formula (17.2):

$$m_e v_t^2 = m_e v_{t0}^2 \left(\frac{r_0}{r_v} \right)^2 = m_e v_{t0}^2 \left(2cv - v^2 \right)^2 . \qquad (25.5)$$

Where v_t and v_{t0} – the resulting and initial tangential rotation rate. . From the last equation becomes clear, as, due to the conservation law of moment, energy informed to a particle is reserved. From here follows, that the work expended on the reduction of radius or it creation, is determined by the relation:

$$-\Delta A = m_e v_{t0}^2 \left[\left(2cv - v^2 \right)^2 - 1 \right] = -m_e c^2 . \qquad (25\ .6)$$

Equating in this expression the translational speed v of particle to zero, we shall receive tangential rotation rate of the particle $v_{t0} = c$. Now it is possible to receive the equation of the full energy of particle, sums all aspects of the energy:

$$W + \Delta K + K = m_e c^2 + \Delta A + \frac{m_e v^2}{2} . \qquad (25.7)$$

In the formula (25.7) ΔA will be entered with plus, as this work is added to the mass energy of particle. But at $v \to 0$, peripheral velocity $v_{t0} = c$, therefore additional kinetic energy ΔK will depend wholly on frequency of the precession of whirls or on the frequency of rotation of particle. At the diminution of radius of a particle the frequency of its rotation is increased, transforming the required energy in some effective centrifugal energy of repulsion. At the same time, because of the diminution of radius at the magnification of velocity of moving at rather primary system of reference, velocity of light in the moving system is dropping. Therefore formula (25.3) can be copied so:

$$\frac{c}{\omega_e (2cv - v^2)} = \frac{h}{4\pi m_e c (2cv - v^2)} . \qquad (25.8)$$

Whence follows, that at the diminution of velocity the frequency of rotation of particle drops also, therefore frequency of rotation is increased. The increased frequency increases the time of life of particle and the length of its run.

$$\frac{mc^2}{(2cv - v^2)} = \frac{h\omega}{4\pi (2cv - v^2)} . \qquad (25.9)$$

Taking into consideration (25.9), we transform the formula (25.6):

$$\Delta K = \frac{m_e c^2 \left(2cv - v^2 \right)^2}{\left(2cv - v^2 \right)} = m_e c^2 \left(2cv - v^2 \right). \qquad (25.10)$$

From the equation (25.10) it is visible, that the rotated particle reserves energiy in αc^2 times more non-rotating the same mass at the identical speed of moving, if was not the diminution of velocity of light in a system. The final aspect the equation (25.7) signs after disclosure ΔK with the help of formula (25.10):

$$W + \Delta K + K = m_e c^2 + m_e c^2 \left(2cv - v^2 \right) + \frac{m_e v^2}{2} . \qquad (25.11)$$

As the elementary particles are accelerated by boosters in the laboratory frame, the effects of aberration (23.2) putting the speed limit, of boosted from the outside particles participate in this process. Therefore on ΔK the operation of the Lorenz's transformation will be spreaded and the equation (25.9) will look differently:

$$W + \Delta K + K = mc^2 + mc^2 \frac{(2cv - v^2)}{\sqrt{1 - \frac{v^2}{c^2}}} + \frac{mv^2}{2} . \tag{25.12}$$

In this formula the mass is not marked because it concerns to any elementary particle. Really, – the moment of any particle is constant at any speed of its moving of the rather laboratory frame. From here that is correctly for an electron, is correctly and for any other particle with the spin.

For an electron from this chapter one interesting circumstance – for birth an electron and positron pair follows is spent on $2m_ec^2$ for a particle. And at the annihilation, as follows from [3] for parapositronium (s=0), two gamma quantums with common energy $2m_ec^2$ are radiated. Any way was lost $2m_ec^2$. Is it true? Therefore, to not break the conservation law of energy, it is necessary to include in the process two neutral particles realizing the lost energy. Such particles can be only neutrino and antineutrino.

Then the reaction should pass under the following scheme:

$$e^+ + e^- \to \gamma + \tilde{\gamma} + \nu + \tilde{\nu} . \tag{25.11}$$

Where in the left part are represented an electron and positron, and in the right one - neutrino and antineutrino and two gamma quantums with opposite directions of rotation displacement currents.

26. Conclusion

In the introduction was mentioned about noninertial systems based on forces, inversely proportional to quadrate of distance. A dependence of the light velocity from distance up to the center of gravitation spherically symmetric system further was shown. This dependence determines on the heterogeneity and anisotropy of space near to large masses. That, in turn, shows a localization of the inertial frame of reference. The inertial frame of reference is fair only at small gradients of the gravitation potential. Therefore transfer their properties on extreme situations are unreasonable.

Noninertial frame of reference allows to select the frame of reference, basing on the summarized dominant mass. That mass, which dictates properties to space. Therefore primary system of a reference is the system, on which the researched mass does not render noticeable influence. For example, the fixed stars put overwhelming contribution in properties of space, despite of the Sun proximity. This operation is reflected in the appearance of the star-shaped aberration. Only a part of the Galaxy located to its center from the Sun diminishes the maximum velocity of light almost in 20 times. The influence of our star on the distance of ten astronomical units becomes insignificant. At magnification of considered volume, because of diminution of the space curvature at deleting from dot masses, the geometry of space again tends to Euclidian.

The introduction of the concept of physical space allows to not resort to use of nonexistent physical magnitude and inventing of a superfluous measurement. Is present in view of time and operations above it. The same concept allows to not postulate, and to measure the velocity of gravitational interaction, that is proved experimentally. The gravitational turn appears optical. The optical essence of appearances was reflected and in the title of the given work..

The analogy between gravitational and high-speed loss of light velocity enables to pass to the similar mode of modification of their energies relatively to noninertial frame of reference. The forces, operating on particles or bodies and their responses, depend on their speed with respect to primary frame of reference and are subordinate to instrument effects of aberration. Therefore also speed of particles is limited only to possibility of exterior action. The kynetic energy too has the physical sense only relatively concrete frame of reference. From here the dependence of radioactive disintegration, for example π-mesons from driving relative to primary frame of reference follows also.

The relation of indeterminacy of Heisenberg is the instrumental function and the mental modeling of microcosmos objects does not prohibit. To imagine visible the Maxwell's set of equations, both for the electrodynamics, and for the massodynamics, it is possible to simulate elementary particles and properties of space. Not resorting thus to magic blossoming and smelling enchanted entities. The solution of the ripened engineering problems in many respects depends on minimization eclectic models, from the diminution of numbers "chimerodynamicses".

The identical principles of an operation of electrodynamics and massodynamics forces, suggesting on possibility of using of electromagnetic devices principles and gears at creation similar massodynamics. For example, the singularity of the double winding demonstrates a possibility of creation the flywheel, which disks will not be teared by centrifugal forces and etc. The flattening of the rotated planet's spheroid demonstrates effect of forces, operating on a solenoid.

The resolving value for physics and its applications has, on my opinion, the strict regard of the conservation law of impulse. The most spreaded assumption about insignificance of the response impulse reduces in magnification of the energy of quantum twice. One such assumption can cause a shower of errors.

The given work does not claim for creation of the completed general field theory, as all areas of physics are not enveloped. However I hope, that essence and consistency of the theory are clear and further development is explained rather precisely for it.

Appendix A. Experiences of Michelson and Morley

The Fizeau's experiences [3,6] have shown that light is dragging by driving medium in the dependence on its index of refraction. By other words – on dependence from the ratio of the light velocity in vacuum to the light velocity in the given medium. Thus velocity of light u [2,3]:

$$u = \frac{c}{n} \pm v\alpha = \frac{c}{n} \pm v\left(1 - \frac{1}{n^2}\right)$$

Whether is it possible with the help of closed system, not contacting with the driving medium, to define the relative driving? Especially in vacuum, where the factor of refraction n is equal to one? As the above-stated formula shows, it is not present. Well and in the fixed air, as in the fixed medium, especially. Therefore it is impossible to consider, that the experiences of Michelson and Morley [3,6] proved any absence of the absolute or primary frame of reference. The Michelson's interferometer, in difference from the Fizeau's interferometer, is the closed system, in which there is no contact to a moving medium.

That followed from the Fizeau's experiences, as its the interferometer differs only by referred inverse ray for inclusion in experience the moving medium. Whether is possible after that to state, that in any frame of reference the velocity of light is identical and is equal with?

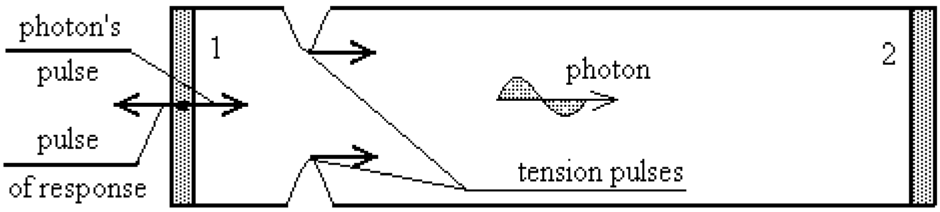
Nevertheless, the interferometer can be broke by putting one of arms vertically. Then in the vertical arm the varying gravitational potential will change also velocity of light, so also the time of passing of distance. At the suitable process engineering, for example application of the Fabry's resonator or line of optical delay, it is possible to increase the sensitivity of interferometer not only for the recurring of experience of Pound and Rebka [3] in the spectral band of visible light. But also for observation of Earth moving concerning stars.

Appendix B. The double-dealing box

In 1906 the paper of Einstein about principle of preservation of the barycentre moving and inertia of energy [5,6] was published. In it was described the mental experiment permitting, on his opinion, to receive the dependence $E = mc^2$ for a photon.

The closed box was considered, on which extremities the devices 1 and 2, permitting are located to send and to accept light pulses. According to the electromagnetic theory the light pulse should carry away mechanical impulse $p=mc$. Therefore box, on an intention of the author, should test the response of impulse p. During passing by impulse of the path from the 1st apparatus to the 2nd, in which it is broke, returning the impulse, the box like owes will be shifted on the distance l.

Saw in that violation of the conservation law, Einstein self-denyingly rushes to rescue it, neglecting on time by the photon's mass, so also by the second Newton's law. But there is no sense to consider consequent sophisms; there is enough of first one.



We shall look narrowly at appearances, happening it closer. Let's consider that the light pulse does not beat out the bottom of box that is the box is unit. To shift from the place this unit, it is necessary to impulse of expansion to reach an opposite extremity of box with the 2nd apparatus.

On the scheme the impulse of expansion, which is taking place on the walls of box, is marked with curvings. But, as we know on experience, similar impulse, as well as the impulse of compression, will travel up to the opposite extremity with the speed of sound. Even if it could be transmitted with the velocity of light, it would not reach other extremity faster than light pulse. Thus, the notorious box, as well as the conservation law have remained on its place. As well as formula required for formalization of the photoeffect.

Mathematical sophisms of Einstein at all do not passing at any gate - we from childhood remember the formula of the path of uniformly accelerated driving $s = at^2/2 + vt + s_0$. On the condition the box was rested, signifies both the second and third terms of the right member of the equation are equal to zero; first, at the neglect by a mass equal F/a, does not exist at all. In mentioned to the paper is applied at calculation $s = vt$, equal to zero on the predicate. Uttermost nonsense!

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