Problem of gravitational waves

A.V. Rykov[1]

The experimental detection of gravitational waves predicted by GR of A. Einstein has fundamental significance. According GR, the gravitational waves should arise at movements of massive bodies with quadrupole moment, distinct from is zero, with variable acceleration. As all kinds of acceleration are equivalent to acceleration from forces of gravitation, that, naturally, any body "radiates" gravitation or gravitational "waves". The motionless bodies are ""radiating" stationary gravitational "field" characterized in a given motionless point by gravitational "voltage" or acceleration:

$$g = G\frac{M}{R^2}.$$

"Intensity" deviates a force, which is equal to its value multiplied on gravitational "charge", i.e. on mass of a trial body: in this sense in the theory GR is "transparent", corresponds to the formula of gravitation of Newton, and there is no necessity to manipulate by a mysterious combination "space - time". The term the quadrupole moment concerns to rotating objects, for which the axial symmetry is broken: double stars, deformed black holes, temporarily broken symmetry at merge of superheavy stars and black holes, asymmetrical explosion of supernew etc. [Шакура Н.И., 1976], [Шкловский И.С., 1984], [Липунов В.М., 1986,1989,1998]. Many experimenters imagine a way of detection of gravitational waves as "deformation" of space–time, which should be revealed by deformation of firm bodies, as compact (Winer, Брагинский, device "TAMA300" - Japan), or projects of a type the British-German experiment GEO600, American LIGO, Franco-Italian experiment Vigro, in which the base of a firm body is increased up to several km, and measurement devices are laser interferometer. In all cases there are achieved extreme possible sensitivity up to 10^{-16} and 10^{-18} m. However, it remains not clear: how the devices of readout of deformations of trial bodies in conditions of a curvature of "space - time" will behave? On complexity and financial expenses the project LIGO, in which bases "strainmeters" is allocated on a space level. In 2010 is planned to start 3 satellites of the Sun with a configuration of equilateral triangle. This triangle is called "to measure" curvature "space - time" at sequences of passage of gravitational waves.

All specified experiments are designed for reception of attributes of deformation of space–time, not giving doubt to the model of GR. From our point of view, GR - only one of possible models of gravitation, which actually should have not geometrical, but other, ***physical*** "mechanism".

If to accept as environment of propagation of electromagnetic waves (EMW) across charged quasi-crystalline structure of "vacuum" (space environment), shipped in magnet-mass continuum, EMW represent cross-waves, and the gravitational waves should be longitudinal or volumetric. Thus it is necessary to remember, that the gravitational forces are electrical forces, submitting to the laws of Coulomb. The cross-waves caused by electrical variable intensity E, are accompanied by currents of displacement, following on amplitude and direction of this intensity. The currents of displacement in turn cause magnetic intensity B, which direction due to addition and mutual indemnification appears orthogonal to a direction of E and direction of propagation. In vacuum of intensity E and B are in-phase modes. Longitudinal action and the propagation of gravitation results that, the formed currents of displacement in environment of propagation, raise lines of magnetic intensity in such a manner that all of them appear to be mutually compensated. Thus, the gravitational wave appears to be without the

Anatolij Vasil'evich Rykov, Head of Seismometry & Engineering Seismology Lab
United Institute of Physics of the Earth, Moscow, Russia. E-mail: rykov@uipe-ras.scgis.ru

magnetic component. In a case EMW of a magnetic component brings in appreciable restriction to speed of propagation, giving it in open space value 2,99792458·10^8 m/s. For gravitation, most likely, absence of the magnetic components promotes growth of its speed and excess of known speed EMW. To proceed from the theory of gravitation of Newton, it is formally possible to make the following the wave equation: $\Delta\varphi + \frac{1}{c_g^2}\frac{\partial^2\varphi}{\partial t^2} = Q[s^{-2}]$. Here it is necessary to understand a function φ, that: $\bar{g} = -grad\,\varphi(\bar{r})[m\cdot s^{-2}]$. There is a vector of acceleration for force of mass, it is necessary to understand the value of Q as analogue or gravitational "charge", or as analogue of gravitational "current" of displacement. For more correct physical performance, function φ and Q should be transformed into currents of displacement or "charges" of gravitation. It is obvious, that not having received the adequate equation for a gravitational wave extending in elastic environment with unknown parameter, equivalent to its density, it is impossible it to us, not knowing speed of propagation of gravitation c_g to judge about the nature of gravitational wave. Precisely the same argument should be applied to the theory of GR.

The gravitation in GR is simulated by a curvature 4D of "space - time". The model has appeared to be successful in a number of experiences, as, for example, on a deviation EMW of beams by the Sun and detection of gravitational lenses in space. There is a lawful question: as far as this abstract model corresponds to the real nature of our world? The curvature "space - time" does not submit to logic of common sense. The judgement is quite allowable, that all searches of a curvature at passage of a gravitational wave doomed on failure owing to absence in a nature of such curvatures. In paper [Rykov A.V., 2001] the physical model of gravitation is offered, from which the physical explanation a deviation of rays of EMW by gravitation follows [Rykov A.V., 2003]. On the basis of such physically correct approach it is possible to make a conclusion: there are no special gravitational waves, quadrupole of an origin which is distinct from having tidal waves. The observation having tidal deformations or gravitational forces does not cause doubts. Therefore, the presence quadrupole of the moment at space objects, which are listed above, can be revealed in having the tidal phenomena on the Earth. The strictly symmetrically rotating object can not cause a tide on the Earth or in Solar system. In this case rotation of the Earth concerning the distant symmetric heavy object can cause observable tide. It is possible to assert that the tide phenomena on the Earth from any distant (symmetric or asymmetrical) objects will be extremely small. We shall give a similar estimation below.

Use of the law of gravitation of Newton

As an example we shall take rotation of a star with mass equal 6*M of mass of the Sun (the candidate or real object such as a black hole) around of distance "center of gravity". Let's calculate effect of change of acceleration of gravitation at a set of distances from 1 up to 200 light years. The formula for calculations will be $g_T = GM\frac{1}{[R + R_0\sin(2\pi f t)]^2}$. Here we see a gravitational constant, mass of a black hole or stars, R - distance from the Earth up to rotating object around of the center which is taking place on distance R_0. The frequency of rotation does not influence intensity of acceleration, therefore it is accepted as fixed. The result is given in a fig. 1.

The value of acceleration appears within the limits of 10^{-23} and 10^{-29} m/s^2 for distances from 1 up to 200 of light year. On a background of acceleration 9,82 m/s^2 and moon-solar tide about 10^{-6} m/s^2 the values of tide acceleration appear to be very small.

With the limits of accuracy as 10^{-8} m/s^2, it is obvious, that the observation so small on a background of the existing acceleration is unreal now. Distance of object from an axis of rotation is R_0 =3e+11m, equal approximately to distance of the Earth from the Sun, should be sufficient for formation of large quadrupole moment.

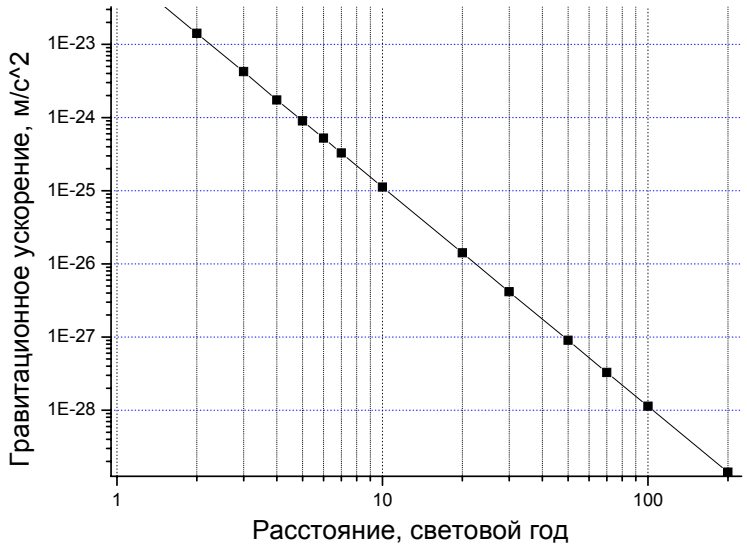

Fig.1. Dependence of acceleration g_T from distance up to a star or black hole.

On the basis of a hypothesis about a nature of gravitation as about the force arising between bodies and poorly charged environment, it is possible to calculate a force of influence of environment on micro and macro bodies of the Earth from its deformation under influence of rotation of the distant object. In the given example all conditions of a task are observed which is solved above on the basis of gravitation of Newton.

The formula for computation:

$$F = \frac{b}{R + R_o[\sin(2\pi f t)]}\sqrt{\frac{Gm}{4\pi E_\sigma S}}$$

New parameters connected to properties of space environment:

b=1.155e+19 [kg c^{-2}] - factor of elasticity; E=0.7744 [м^3 c^{-3} a^{-1}] - root square of the relation of a gravitational constant to an electrical constant of vacuum (return size of permeability); S=6.25e+43 [q м$^{-4}$] - factor of polarization of structure of vacuum.

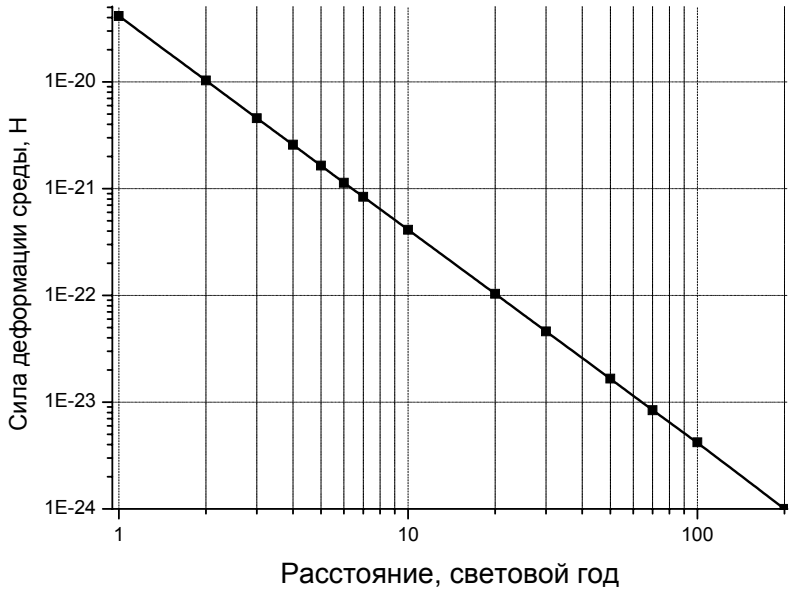

Fig. 2. Dependence of force of influence on bodies on the part of polarization structures of environment indignant of rotation of distant object.

The results of computation are shown in a fig. 2.

Thus, at asymmetric rotation of object with 6 masses of the Sun on distances from the Earth equal from 1 till 200 light years, on the Earth the force of influence on any body will appear within the limits of 10^{-24} and $4*10^{-20}$ *Newton's.*

What conclusions can be made?

1. Not knowing a true nature of gravitation, it is impossible correctly to interpret the outcome of GR like as the gravitational waves, concerning excitation, and rating of their amplitudes accessible to experimental for detection within the boundaries of Solar system. The speed of propagation of

gravitational waves is yet unknown. Therefore identification of a real source of gravitational waves will meet difficulties.

2. The theory electrical massles structure and magnet-mass continuum components of environment can appear more fruitfully then GR both at the decision of a problem of gravitational waves, and in other fundamental problems of astrophysics.

Schwarzschild Radius, black holes

Using an opportunity, we shall draw attention of the readers to a divergence of concepts of black holes on GR and on a hypothesis about a physical nature of gravitation. Schwarzschild Radius, which follows from the theory of GR, is defined under the formula $R_g = 2M_{bh}\frac{G}{c^2}$, where M_{bh} is a mass of a black hole, G – constant gravitation from the formula of Newton and c – speed of light. This radius follows from the solution of a matrix accepted in the Einstein theory. It does not follow from physical conditions existing on " horizon of events ". The physical conditions define possible extreme acceleration from force of mass, zero speed of light, generation both of substance and antisubstance after Hoyking. The hypothesis about a nature of gravitation directly results in the above listed conditions. They follow from the formulas: $\Delta r_g = \sqrt{\frac{g}{4\pi E_\sigma S}}$ - Deformation of structure of environment at acceleration from force of gravity; $g_{\max} = 6{,}3409 \cdot 10^{10}$ m/s^2 - the greatest gravitational acceleration without "destruction" of structure of environment; $\Delta r_{rb} = 1{,}020672 \cdot 10^{-17}$ m - the extreme possible deformation of environment, after which comes destruction of environment; $c_g = c_o\sqrt{1-(\frac{\alpha^{-1}}{r})^2\frac{g}{4\pi E_\sigma S}}$ - Speed of light depending on gravitational acceleration.

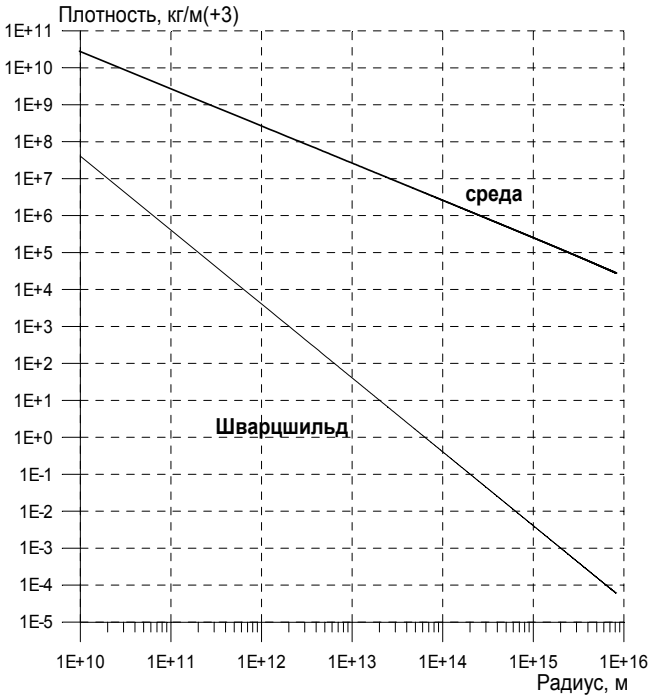

Fig.. 3. Two curves of density of black holes are given as a square root from mass. Last dependence is more tolerant, than that is stipulated by GR.

The actually given parities define physical conditions on " horizon of events " of a black hole: the speed of light is equal to zero (after Einstein – the time is slowing down), birth of pairs electron–pozitron (after Hoyking) and maximum acceleration, independent of the radius of the mass. In a fig. 3 the comparison of density of black holes according to a hypothesis about the environment as a source of gravitation and Schwarzschild radius (GR) is shown. The difference that the density in GR depends proportionally of mass of a black hole, and density on a hypothesis about environment for mass $3M_s$ we receive radius of a black hole $\boldsymbol{R}$ **= 79.5km**. On GR $\boldsymbol{R_g}$ **= 8.91km**. A difference is essential.

At achievement by object of the radius of Schwarzschild sphere, its gravitational field becomes so strong what even electromagnetic radiation can not leave this object. Schwarzschild radius of the Sun is equal **3 km** (**$\boldsymbol{R}$ = 46 km** under the theory of vacuum structure), Earth – **0,01 km** (**79 m** under the theory of structure).

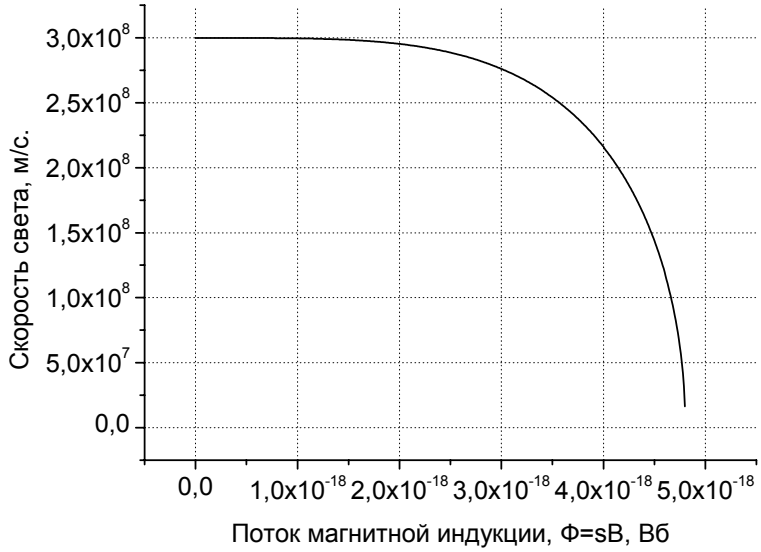

Fig. 4. Dependence of speed of light on a flow magnetic Induction.

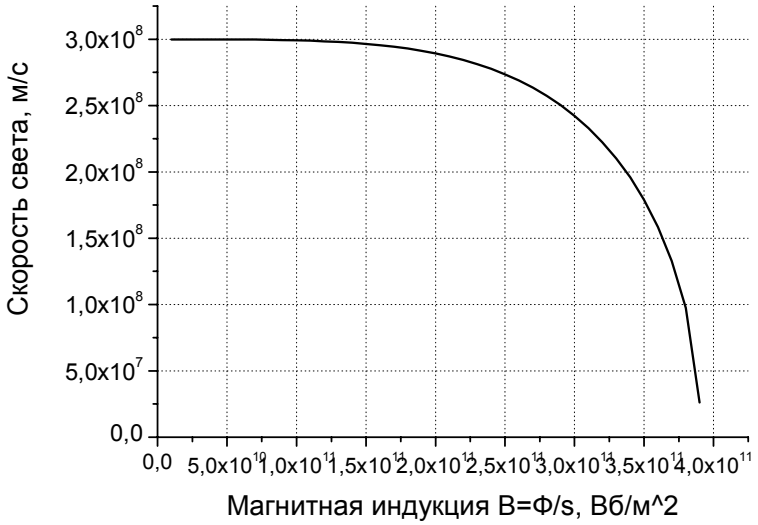

Fig. 5 Dependence of speed of light on a magnetic induction.

The speed of light depends not only on gravitation, but also from a flow of a magnetic induction. It is possible, that large stars and, especially, black holes can have flows of a magnetic induction, which are sufficient on value to change speed of light. In a fig. 4 the diagram of dependence of speed of light from a flow of a magnetic induction is given.

The dependence of speed of light on a flow of a magnetic induction Φ pays off under the formula

$$c_{\Phi} = c_0 \sqrt{1 - (\frac{\alpha^{-1}}{r_e})^2 (\frac{\eta \Phi^2}{b r_e^2})^2} \ .$$

Limiting flow of a magnetic induction before destruction of structure of environment

$$\Phi_{max} = 4{,}8032068 \cdot 10^{-18} [Вб] \ .$$

The substitution instead of Φ by value of magnetic induction

$$B = \frac{\Phi}{2\pi r_e^2} \ [Вб/м^2]$$

gives the formula:

$$c_B = c\sqrt{1 - \frac{1}{b^2}(2\pi)^4 \alpha^{-2} r_e^2 \eta^2 B^4} \ .$$

The speed of light is equal to zero at presence of magnetic "field" with a magnetic induction B=3,9Ч·10^{11} $Вб/м^2$.

The literature

Lipunov V.M. How the gravitational waves are radiated? The gravity-wave sky
The Einstein's formula works! // Sun Oct, MSK 1998.
http://xray.sai.msu.ru/~lipunov/pops/graw/graw.html
Lipunov V.M. In the world of double stars // M.: science, 1986.
Lipunov V.M. All neutron stars // M.: education, 1989.
Lipunov V.M. The Artificial universe // an Soros educational magazine, N6, 1998.
Lipunov V.M. Military secret of astrophysics // an Sores educational magazine, N5, 1998.
Shakura N. A. Neutron stars and black holes in double star systems // M.: knowledge, 1976.
Shklovsky A. With. Stars, their birth, life and death. // M.: science, 1984.
Rykov A.V. A hypothesis about a nature of gravitation // a Physical idea of Russia, M.:MSU, 2001. №1, pp.59-63.
Rykov A.V. A deviation of beams of light in space, 2003, http://www.worldspace.nm.ru/ru/articles/dev_r/dev_r.html