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Einstein's Theory of Gravity: Alternative Experiment and Theory

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Abstract. The post- Newtonian theory of gravitation, both in linear and nonlinear approximations is constructed only on the bases of the Maxwell's equations in electrodynamics. Below some corollaries from this theory are considered.
Keywords: Grayitogiroskope field, Perihelion advance.

1. INTRODUCTION.

The general as a special [1] Einstein theory of relativity is a building on two cornerstones: the general principle of relativity and the principle of equivalence. Both these principles are not correctly interpreted by Einstein [2] and others.

As a result it must be confessed that in spite of a 3/4-century existence of this theory it has not found technical applications and has not changed our technologies. This put on us guard.

In this connection it is useful to call into memory that the period of kinematical theory of gravitation of Ptolemaeus-Kopernikus -Kepler was replaced by the dynamical theory of gravitation of Newton. Then began again a period of kinematical theory of gravitation by Einstein as the theory of space and time. We should recognize that we lost sight of something, not having a dynamical post-Newtonian theory of gravitation as a technical theory.

In order to reflect the dynamical process of motion of the material body, Newton had introduced the conceptions of an applied force and of a force of inertia.

The forces of inertia have the same universal character as the gravitational forces of attraction. As to the forces of attraction, Newton established that their sources are from the material bodies. As to the forces of inertia, he did not establish from what sources they emerge, and only gave the definition, that the forces of inertia are the inborn forces of matter. Only Mach made the suggestion that the forces of inertia are due to forces of gravitational attraction inborn by material bodies. Developing this idea, Einstein formulated the principle of the identical equivalence of the forces of inertia and the forces of gravitational attraction and constructed on this basis his theory of gravity [3]. But already from the theory of Newton it follows that the forces of inertia are equivalent to the forces of gravitational attraction with correct sign (principle of D'Alambert). Unfortunately, Einstein did not mention this and did not understand that the force of inertia of a separate body must have a sign opposite to the gravitational force of attraction of this body. If so, then the second (post-Newtonian) stationary field of gravitation of a body must be a field of repulsion but not of attraction. The question occurred whether to take into account this fact in the theory of Einstein or not. In order to answer this query, we need to have a post- Newtonian theory of gravitation, which must be constructed independently from the theory of gravitation of Einstein.

Many attempts were made to construct a post- Newtonian theory of gravitation- [4], [5], before and after Einstein. Unfortunately, these attempts ended without success. It is difficult to believe that the post-Newtonian theory of gravitation can not be constructed only on the basis of the physical facts and analogies, i.e. not as a result of simplifications of Einstein's equations. Below, we construct such a theory and consider some general corollaries from it.

POST-NEWTONIAN GRAVITATIONAL FIELD – LINEAR APPROXIMATION.

The scientific works of H. Lorentz, H. Poincare, A. Einstein and others had finally led to the understanding that the system of equations of Maxwell, which describe the electromagnetic field on the basis of experimental results obtained by M. Faraday, is the corollary of a kinematical effect, the limitation of the speed of spreading of physical interactions. In particular, not only the change of the space and time intervals, but also the squeeze of the field of a moving charge in the direction of its motion is also a kinematic-type effect, which is not connected in a natural way to the field's source, no matter whether it is an electrical or a gravitational source. From here we can make the conclusion, that for any interactions similar to the Coulombian, we can construct a theory in form analogous to Maxwell's electrodynamics.

Only four types of fields can be constructed in form of a system of Maxwell equations. They are as follows.

The field I, created by a moving medium, the volume density of an electrical charge ρ_e which is positive

$$\operatorname{rot}\overline{E} = -\frac{\partial \overline{B}}{\partial t}; \qquad \operatorname{div}\overline{E} = \frac{1}{\varepsilon_0}\rho_e; \tag{1}$$

$$\operatorname{rot}\overline{B} = \mu_0(\rho_e v + \varepsilon_0 \frac{\partial \overline{E}}{\partial t}): \qquad \operatorname{div}\overline{B} = 0. \tag{2}$$

The field II, which we obtain from the field I by substituting $-\overline{E}$ in the place of $\overline{E}$ and $-\overline{B}$ in the place of $\overline{B}$. The same result is obtained by substituting in the equations of field I $-\rho_e$ in the place of ρ_e. This gives us the opportunity to introduce the conception of a negative electrical charge and its field II.

The field III can be constructed from field I by substituting $-\overline{E}$ in the place of $\overline{E}$ and $-\overline{B}$ in the place of $\overline{B}$, or re-designate $\overline{E}$ on $\overline{H}$ and $\overline{B}$ on $\overline{G}$. Thus we obtain the following system of equations, which describes this field:

$$\operatorname{rot}\overline{H} = \frac{\partial \overline{G}}{\partial t}; \qquad \operatorname{div}\overline{H} = -\frac{1}{\gamma_0}\rho_m; \tag{3}$$

$$\operatorname{rot}\overline{G} = g_0(\rho_m \overline{v} - \gamma_0 \frac{\partial \overline{H}}{\partial t}): \qquad \operatorname{div}\overline{G} = 0, \tag{4}$$

where c is the velocity of the light and $\gamma_0 g_0 = \varepsilon_0 \mu_0 = 1/c^2$.

The field IY can be obtained from field I by substituting $\overline{H}$ in the place of $\overline{E}$ and $-\overline{G}$ in the place of $\overline{B}$.

The fields III and IY have the same symmetry with respect to a density of a charge, as the fields I and II, i. e. the field IY is obtained from the field III by substituting $-\rho_m$ in the place ρ_m. But such a symmetry does not exist between the fields I and II on the one hand and the fields III and IY on the another hand. All what we know from the experiments about the interactions of electrical charges is described by fields I and II. Hence we can suggest that the fields III and IY describe interactions not of electrical nature.

From the analogy between the Coulomb's law of electrostatics and the law of universal attraction of Newton on gravitostatics, we have ground to make the suggestion, that the fields III and IY can correspond to the gravitational interactions. As we know, the existence of the gravitational charge has only one sign. Thus this charge must correspond field III, for which

$$\operatorname{div}\overline{H} = -\frac{1}{\gamma_0}\rho_m, \tag{5}$$

in accordance with the universal law of gravitation of Newton. In this case H is the strength of the gravitational field, ρ_m is the mass- density, and the gravitational constant $\gamma_0 = 1/4\pi k$ (k is the gravitational constant of Newton).

The physical meaning of the vector $\overline{G}$ is defined from the consideration of interaction of the gravitational vortices- it is twice the angular velocity of the precession of the test gyroscope within the given field. The vector $\overline{G}$ appropriately is called vector of gyroscopic induction, g the gyroscopic constant, and the HG field the gravitogyroscopic field as an analogy of electromagnetic field.

POST- NEWTONIAN GRAVITATIONAL FIELD – NONLINEAR APPROXIMATION.

From the equations (3), (4) we find the energy density of the gravitogyroscopic field

$$w_0 = \frac{1}{2}(\gamma_0 H^2 + \frac{1}{g_0}G^2) \tag{6}$$

the density of energy flow

$$\overline{S} = \frac{1}{g_0}\overline{H}\times\overline{G}. \tag{7}$$

and the momentum density of the field

$$\overline{p}_f = \frac{\overline{S}}{c^2} = \gamma_0\overline{H}\times\overline{G}. \tag{8}$$

In accordance with the idea of Einstein, the field of gravitation has also sources of gravitation due to the field. Considering the equations (3) and (4) we must take into account equally the density of a mass ρ_m and of the momentum of matter $\rho_m\overline{v}$ also the energy density w_0 and of the momentum density of the field $\overline{p}_f$. Thus

$$\operatorname{div}\overline{H} = -\frac{1}{\gamma_0}(\rho_m + \rho_f), \tag{9}$$

$$\operatorname{rot}\overline{G} = g_0[(\rho_m\overline{v} + \overline{p}_f) - \gamma_0\frac{\partial H}{\partial t}] \quad , \tag{10}$$

where

$$\rho_f = \frac{w_0}{c^2}. \tag{11}$$

The system of the equations of the gravitogyroscopic field is, in nonlinear approximation, taking into account the values of w_0, $\overline{p}_f$ and (11)

$$\operatorname{rot}\overline{H} = \frac{\partial \overline{G}}{\partial t}; \qquad \operatorname{div}\overline{H} = -\frac{1}{\gamma_0}\rho_m - \frac{1}{2}\left(\frac{1}{c^2}H^2 + G^2\right); \tag{12}$$

$$\operatorname{rot}\overline{G} = g_0\left(\rho_m\overline{v} - \gamma_0\frac{\partial \overline{H}}{\partial t}\right) + \frac{1}{c^2}\overline{H}\times\overline{G}: \qquad \operatorname{div}\overline{G} = 0 \tag{13}$$

Considering only terms up to order v^2/c^2, we obtain

$$\operatorname{rot}\overline{H} = \frac{\partial \overline{G}}{\partial t}; \qquad \operatorname{div}\overline{H} = -\left(\frac{1}{\gamma_0}\rho_m + \frac{1}{2c^2}H^2\right); \tag{14}$$

$$\operatorname{rot}\overline{G} = g_0\left(\rho_m\overline{v} - \gamma_0\frac{\partial \overline{H}}{\partial t}\right); \qquad \operatorname{div}\overline{G} = 0. \tag{15}$$

For $\rho_m = 0$ (14, (15) reduces to a system of equations describing gravitogyroscopic waves, which (in contrast to electromagnetic waves) are nonlinear.

PERIHELION ADVANCE OF PLANETS [6].

The gravitational field of a central body, which rotates with constant angular velocity, is stationary. In this case according to (14), the vector of the field strength $\overline{H}$ is determined by the system of equations

$$\operatorname{rot}\overline{H} = 0; \qquad \operatorname{div}\overline{H} = -\left(\frac{1}{\gamma_0}\rho_m + \frac{1}{2c^2}H^2\right) \tag{16}$$

Hence, the field $\overline{H}$ is a potential field, $\overline{H} = -\operatorname{grad} f$.
Let us define the potential function f in form

$$f = f_0 + \frac{1}{c^2}f_1 + \frac{1}{c^4}f_2 + \cdots \tag{17}$$

If we consider only the first two members in this series, then

$$f = -\frac{kM}{r}\left(1 - \frac{r_0}{2r}\right) \tag{18}$$

$$\overline{H} = -\frac{kM}{r^2}\left(1 - \frac{r_0}{r}\right)\overline{r}^0 \tag{19}$$

where

$$r_0 = kM/2c^2 \tag{20}$$

and M is the mass of the central body, $\bar{r}$ is the radius-vector of the field point, $\bar{r} = r \cdot \bar{r}^0$.

The vector of the gyroscopic induction $\bar{G}$ according to (15) is to be determined from the system of equations

$$\operatorname{rot} \bar{G} = g_0 g \rho_m \bar{v}; \qquad \operatorname{div} \bar{G} = 0, \tag{21}$$

where g is the gyroscopic permeability (the analogy of the magnetic permeability). From these equations we find a vector $\bar{G}$ (as from the electromagnetic equations one finds the vector $\bar{B}$)

$$\bar{G} = r_0 g \cdot \frac{K_z}{M} \cdot \frac{3\bar{r}^0 \times (\bar{k} \cdot \bar{r}^0) - \bar{k}^0}{r^3} \tag{22}$$

where K_z is the angular momentum of the central body with respect to its axis of rotation, $\bar{k}^0$ is the unity vector along this axis.

Later we confine ourselves only to the case, when the plane of orbit of a moving particle is perpendicular to the axis of rotation of the central body, i.e. $\bar{r} \perp \bar{k}^0$. Then

$$\bar{G} = -r_0 g \cdot \frac{K_z}{M} \cdot \bar{k}^0 \tag{23}$$

If we take into account the equality of the inertial and gravitational masses, then the equation of motion of a particle in the field under consideration is

$$\frac{d}{dt}[1-(u/c)^2]^{-1/2}\bar{u} = \bar{H} + \bar{u} \times \bar{G} \tag{24}$$

where $\bar{u}$ is the velocity of the particle.

Using (19), (23) and projecting (24) on the radial and transverse directions, we obtain

$$\frac{d^2 r}{dt^2} - r(1+\frac{r_0}{r})(\frac{d\psi}{dt})^2 = -\frac{kM}{r^2}(1-\frac{r_0}{r}) - \frac{r_0 g}{r^2} \cdot \frac{K_z}{M}\frac{d\psi}{dt}, \tag{25}$$

$$r^2 (1 + \frac{2 r_0}{r}) \cdot \frac{d\psi}{dt} + \frac{r_0 g}{r} \cdot \frac{K_z}{M} = h = \text{const} \tag{26}$$

The last of these equations states the law of conservation of the angular momentum of the system. From this law it follows that the angular momentum of the central body is diminished by simultaneous gyration of an angular momentum of the moving particle.

Defining an angular momentum constant h,

$$h = (1+\frac{r_0}{R})(kMR)^{\frac{1}{2}} + \frac{3}{2} \cdot \frac{r_0 g}{R} \cdot \frac{K_z}{M} \tag{27}$$

R is the average radius of the orbit, we obtain the follow expression of a perihelion advance of the planets (in radians per second) of the solar system

$$\theta = \frac{\pi kM}{2c^2 a(1-e^2)T} + \frac{2\pi g K_z}{c^2 a^{3/2}(1-e^2)^{3/2}T}(k/M)^{1/2} \quad (28)$$

where a is the semi-major axis of the orbit, e is its eccentricity, T is the rotation period.

If we take into account only the relativistic linear momentum of a particle, then the perihelion advance equals

$$\theta_1 = \frac{\pi kM}{c^2 a(1-e^2)T}. \quad (29)$$

Considering only the selfacting of the gravitation field gives

$$\theta_2 = \frac{-\pi kM}{2c^2 a(1-e^2)T} \quad (30)$$

Finally taking into account only the rotation of the central body we obtain

$$\theta_3 = \frac{2\pi g K_z}{c^2 a^{3/2}(1-e^2)^{3/2}T}(k/M)^{1/2} \quad (31)$$

and the summation of all these results give the above value of θ.

As in the general theory of relativity of Einstein the perihelion advance of the planet is caused only by the central-symmetric stationary field of the Sun, but a contribution caused by its rotation is neglected, i.e. it is opposite in sign and very small in value. So in this theory, the contribution of the rotation consists of 11/12 of the resulting advance and has the same sign.

In the approximation $\theta \cong \theta_3$, the ratio of the advances of two planets i and k equals

$$\frac{\theta_i}{\theta_k} = \left(\frac{T_k}{T_i}\right)^2. \quad (32)$$

If we find the value gK_z from the condition that the perihelion advance of Mercury equals 42", then for the other planets the values of their advances are in accordance with the observations.

Notice, that in the general theory of relativity we have

$$\frac{\theta_i}{\theta_k} = \left(\frac{T_k}{T_i}\right)^{5/3} \quad (33)$$

From the point of view of this theory, we can understand such facts as the mutual orientation of the axis and the direction of rotation of the planets and Sun, the redistribution of the angular momentum between the planets and Sun on the process of evolution of the solar system, and other matters.

CONCLUSION

Many attempts were made to establish post -Newtonian theory of gravitation in form of Maxwell's equations of electrodynamics. In this article, such an attempt is made not only in linear but also in nonlinear approximation. It is found that the equations of the gravitational field have the same form as the equations of Einstein in the post-Newtonian approximation. But there is the difference in principle between these two theories: they coincide with the accuracy "on the contrary". For example, if the body rotates with respect to an axis, we find the components of the gravitational field, generated by this body, as follows

$$\overline{H} = -\frac{kM}{r^2}(1 \pm \frac{r_0}{r})\bar{r}^0 \tag{34}$$

$$\overline{G} = \pm r_0 g \cdot \frac{K_z}{M} \cdot \overline{k}^0 \tag{23}$$

the upper "+" sign refers to the geometrical theory of Einstein (Kerr field in post- Newtonian approximation), the lower "-" to our field theory of gravity.

Examining of the right sign by an alternative experiment will give us the opportunity to reject one of these two theories. If the upper sign holds then we receive once more confirmation of Einstein theory, i.e. have to abandon the field theory of gravitation in Maxwellian form. If the experiment confirms the lower sign "-", then:

a) we prove that the additional advance of the perihelion of the planets is due to rotation of the Sun-its vortex component;

b) it is necessary to perform the experimental study of the vortex component of the gravitational field, in particular to research the possibility of change of this component in a medium (as a magnetic field is changed in a ferromagnetic medium) [6].

c) we prove that the gravitational field generated by a body can be quantized in the regions of attractions or repulsion's [7].

Publishing this article, we wish to attract the attention of physicist -experimentators to the alternative experiment.

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