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Gravitational Induction as Analog of Amplification of Light in Active Medium

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Abstract

Concept of gravitational induction the essence of which is in the change of gravitation force affecting test mass due to influence of gravitational field on this mass by other masses has been considered. Evaluation of coefficient of induced increase of the gravity in the titanium sample has been shown based on the measurement of weight of nonmagnetic metal rod by its vertical and horizontal orientation.

Keywords: gravitational field, weight, induction, amplification, acceleration

Term "induction" means "pointing, excitation" and in electromagnetic theory, generally, associates with appearance of electromotive force (electric field) in the conductor during change of magnetic flux through the surface limited by this conductor. Following traditional phenomenological approach while describing physical processes it is natural to assume that gravitational interaction of the bodies (masses) is connected to propagation of some disturbances – particles (gravitons etc.) within the space between interacting bodies or waves within etheric environment similar to acoustic and electromagnetic waves. Depending on approved gravitation model velocity of these waves (particles) is within wide range – from single cm/s to the values much more exceeding the velocity of light. At the same time gravitational disturbances produced by interacting masses propagate along the line of mass interaction directed towards each other. Similar to ordinary waves they involve the end space area and in principle should influence the other bodies or particles within the propagation area. Such influence may result in change of the force of gravitational interaction of the bodies analogues to optical phenomena of absorption and amplification of light within absorbing or active (inversion, excited) medium.

As shown in Dmitriev (2001), acceleration caused by external, for example, elastic forces (electromagnetic in nature), body movement is accompanied by change of the force of its gravitational interaction with massive body (the Earth). The result of this is dependence of the weight of mechanical rotor with horizontal axis on speed of its rotation as well as orientation dependence of coefficients of restitution during elastic impact of the ball on massive plate. Influence of accelerations of micro-particles on the gravity due to their chaotic thermal motion allows to confirm observed negative temperature dependence of the physical body weight (Dmitriev, Nikushchenko, & Snegov, 2003). Gravitational effect described below may be called the effect of "gravitational induction". Its essence lies in change of the gravity affecting the test body due to gravitational interaction of this body with other foreign bodies.

Let's consider the rod with mass *m* and length l_1, being placed within homogeneous gravitational field of great mass *M*, for example the Earth mass, Figure 1.

Let's consider the normal acceleration of the gravity along the rod to be constant and equal to g_0. Intensity of gravitational disturbances around point z of the rod volume, caused by interaction of the particles within upper area $(0, z)$ of the rod with great mass *M* equally increases from upper towards lower end of the rod. Due to proportionality of the induced changes *dg* to value *g* of the gravity inside the rod along the length *dz,*

$$dg = \alpha g dz \quad , \tag{1}$$

dependence *g(z)* of the acceleration of the gravity inside the rode is exponential,

$$g(z) = g_0 e^{\alpha z} \quad , \tag{2}$$

where α - coefficient of induced increase of the acceleration of the gravity.

Weight of the rod P_1 in the shape of parallelepiped with sides l_1, l_2, l_3 with vertical orientation of side l_1 is equal

$$P_1 = \rho g_0 l_2 l_3 \int_0^{l_1} e^{\alpha z} dz \approx m g_0 (1 + \frac{\alpha l_1}{2}) \quad , \tag{3}$$

where ρ - density of the rod material, $m = \rho l_1 l_2 l_3$ - rod mass.

According to 3, dimensions of the rod directly influence its weight even within homogeneous external gravitational field. In horizontal position the weight P_2 of the rod is described according to the formula 3 with substitution l_1 for l_2 (l_3).

Relative difference δ of the weights (masses) of the rod measured by its vertical and horizontal orientation equals to

$$\delta = \frac{P_1 - P_2}{m g_0} = \frac{\alpha (l_1 - l_2)}{2} \quad . \tag{4}$$

It is obvious that with $l_1 \succ l_2$ and positive strengthening coefficient α the value δ is also positive.

Dependence of the weight of non-magnetic titanium rod of BT1 model from its orientation taking into account influence on the change of some external physical factors has been studied in Dmitriev and Snegov (1998).

Average relative value δ of mass difference of the rod 150 mm in length, 30 mm diameter and mass of about 476 g measured by vertical and horizontal orientation of the rod is $1.1 \cdot 10^{-7}$ with error 10-15%. Corresponding measurement data of the absolute value of the mass difference are given at Figure 2.

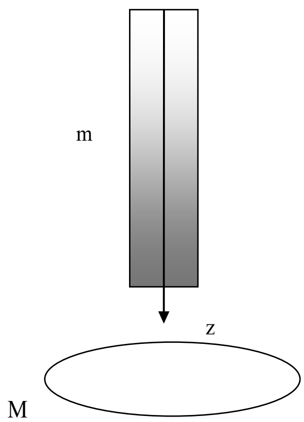

Figure 1. Explanation of the effect of gravitational induction. "Active" zone of increased value of acceleration of the gravity inside the rod is being primed. $z = 0$ corresponds to the upper end of the rod

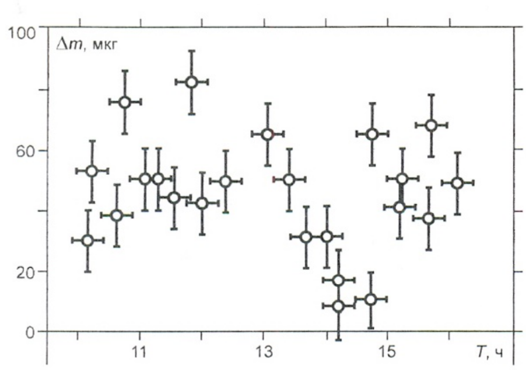

Figure 2. Mass difference Δm (mcg) of the cylindrical titanium rod measured in day-time in its vertical and horizontal orientations (Dmitriev & Snegov, 1998)

Rod weight in vertical position systematically exceeds its weight in horizontal position within measurement errors. It should be noted that decrease of the value of mass (weight) difference during hours close to astronomical noon (about 2.00 p.m. of the standard time at the longitude of Saint Petersburg).

Taking into account the influence on the measurement of the rod weight by acceleration caused by the Sun of value g_s around noon, formula 3 is as follows

$$P_1' = mg_0'(1+\frac{\alpha l_1}{2}) - mg_s(1+\frac{\beta l_1}{2}) \quad , \tag{5}$$

where g_0' - acceleration of gravity towards the Earth center taking into account tidal accelerations caused by the Sun, ($g_0' < g_0$), β - coefficient of induced change of the gravity due to the Sun influence which value may differ from α. It is obvious that $P_1' \prec P_1$, that is the cause of decrease of Δm on Fig. 2 in noon hours.

Fluctuations and decrease of value δ are explained by action of gravitational field from the Sun, Moon, and other planets on the test mass, including change of g_0 determined by tidal accelerations (Torge, 1989). Accelerations of the gravity produced by these masses are significantly lower than value g_0 and coefficient β of gravitation amplification may, in principle, exceed value α due to the Sun impact.

On the basis of the given experimental data, according to (4), the calculated value of the coefficient α of the induced gravity amplification for titanium within the Earth gravitational field is $\alpha \approx 1.8 \cdot 10^{-4} m^{-1}$. At present time there is no reason to believe that the value of α referred to is universal and applies to other materials. Also note that the length z of the rod in (2) is always limited and can not equal infinity. More detailed data on the value of the coefficient of the gravitational amplification within different materials and its possible dependence on the oscillation frequency of the masses being weighted will be gained in further research. Perspective and closest in physical substance of researched problems is experimental research with regard to the weight of oscillating specimens of the test bodies within variable gravitational field of the Earth (Dmitriev & Bulgakova, 2013; Dmitriev, 2015).

Thus, the effect of gravitational induction similar to the phenomenon of optical amplification in active medium has been proved experimentally. Thorough study of this effect conducted with the use of the test bodies of different dimensions and compositions, including by accelerated (oscillating) motion of the test bodies will provide deeper understanding of nontrivial properties of the gravity.

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