Physics ZMV. The Basics of New Physics

Mihail Zastavnitchi

Abstract - *The Beginning of the Beginning is the gravitational field*. It is formed from gravitons in chaotic motion. The *graviton* is an elementary quantum of energy when it is in the state of motion and an indivisible particle of mass when it is in the state of rest. The *mass* is a conglomerate of gravitons in the state of rest, that is, the gravitons, which have given their kinetic energy to the mass. Physics ZMV is based on the idea of the existence of the gravitational field *independent* of the mass and the mass (created by the gravitational field), independent of the gravitational field. *Masses are not attracted to each other*. Potential energies of the gravitational field (distorted by the masses) compress the masses to their common center of mass. The compression of masses by the gravitational field (distorted by masses) is named "*Universal compression of masses*". The mass *grows* quantitatively due to the gravitons, which have given their kinetic energy to the mass, and remained in the mass. The mass is *heated* by this energy. These phenomena are named "*Growth of the mass*" and "*Heating of the mass*" by the gravitational field (during penetration through the mass). The motion of the mass under the action of the *inertial energy* of the gravitational field is named "*Mass motion of inertia*". Mass which has obtained rectilinear and a rotational motion (rotational axis is perpendicular to the vector of rectilinear speed) changes the volume of parts of the mass in synchronism with the rotational speed. This phenomenon is named "*Flux and reflux of the mass*". The gravitational field is the medium of propagation of the electromagnetic field.

Index Terms – Universal compression of masses, Potential energy of the gravitational field (distorted by the mass), Thermal energy of the mass (received from the gravitational field at the mass penetration), Growth of the mass by gravitational field (due to its penetration through the mass), Motion of the mass by the inertial energy of the gravitational field, Maximum speed of the mass motion by inertial energy of the gravitational field, Mass is a conglomerate of gravitons in the state of rest, Graviton is an elementary quantum of energy when it is in the state of motion and an indivisible particle of mass when it is in the state of rest.

1. Introduction

> Nature itself is very simple in its physical laws but the fact, that physicists complicate them, is not the fault of the nature.

The Beginning of the Beginning is the gravitational field. It is formed from the gravitons in chaotic motion.

Graviton is an elementary quantum of energy when it is in the state of motion and an indivisible particle of mass when it is in the state of rest.

Mass is a conglomerate of gravitons in the state of rest, that is, of gravitons, which have given the mass its kinetic energy of motion.

It is possible to explain scientifically many physical phenomena which cannot be explained or explained naively by classical physics *if at the basis of the physics put the existence of the gravitational field is independent of the mass and the mass produced by the gravitational field is independent of the gravitational field*:

1. Where does the energy of the stars come from?
2. Why are the planets nuclei hot?
3. What kind of relationship exists between potential and thermal energy in any point inside the mass?
4. What is the propagation medium of the electromagnetic field?
5. Why does the mass accelerate when a constant force acts on it?
6. Why is the mass moving of inertia?
7. What is the maximum speed at which the given mass can move of inertia?
8. Why on the Earth are the tides?
9. What is the mass? Where from appeared the mass?
10. What is the Black Hole?

In any point within the mass, the sum of the potential energy of the gravitational field (distorted by the mass) and the thermal energy of the mass (received from the gravitational field during mass penetration) is a *constant* value for the given mass in the respective region of the gravitational field.

The masses are not attracted to each other [1], [2]. The potential energies of the gravitational field (distorted by the masses) compress the masses. The compression of masses by the gravitational field (distorted by the masses) is named "*Universal compression of masses*".

Universal compression of masses by potential energies of the gravitational field (distorted by the masses) is the first fundamental law of Physics ZMV.

The thermal energy of the mass (received from the gravitational field during mass penetration) *heats* the mass. This phenomenon is named "*Heating of the mass*" (as a result of the gravitational field penetration through the mass).

Heating of the mass by the gravitational field (during penetration through the mass) is the second fundamental law of Physics ZMV.

A part of gravitons, which gave their energy to the mass and contributed to the creation of the potential energy of the gravitational field and the thermal energy of the mass, remain in the mass and *increase* the amount of the mass. This phenomenon is named "*Growth of mass*" (as a result of the gravitational field penetration through the mass).

Growth of the mass by gravitational field (due to penetration through the mass) is the third fundamental law of Physics ZMV.

For a certain quantity of mass, the thermal energy of the mass (received from the gravitational field during mass penetration) is so high that the frequency of the maximum of the thermal energy radiation emitted by the mass coincides with the frequencies of the electromagnetic field perceived by the human eye. Such mass is named a *star*.

The mass, which initially received a kinetic quantity of energy, is continuously moved by the *inertial energy* of the gravitational field (equal to the difference between the potential energy of the gravitational field in the *back* and in the *front side* of the mass in motion). The motion of the mass under the action of the *inertial energy* of the gravitational field is referred to as "*Motion of the mass by inertial energy of the gravitational field*", or abbreviated "*Mass motion of inertia*".

Motion of the mass by inertial energy of the gravitational field (distorted by the mass and initial kinetic energy of the mass) is the fourth fundamental law of Physics ZMV.

In the gravitational field the mass cannot move *of inertia* at a higher speed than the maximum speed ($\mathbf{V}_{max}$) which corresponds to the given mass.

The mass which received a rectilinear and rotation motion (the rotation axis is perpendicular to the rectilinear speed vector), changes the volume of the parts of the mass in synchronism with the rotational speed. This phenomenon is referred to as "*Flux and reflux of the mass*".

Flux and reflux of the mass, as a result of the rectilinear and rotational motion of the mass (when the rotation axis is perpendicular to the vector of rectilinear speed) is the fifth fundamental law of Physics ZMV.

The gravitational field is the medium of propagation of the electromagnetic field.

2. Potential Energy of the Gravitational Field. Homogeneous Gravitational Field

Suppose there is a point in the gravitational field with the energy E. We note:

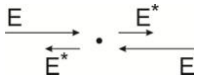
E – is the gravitational field energy which enters this point.

E^* – is the energy of the gravitational field which emerges from this point.

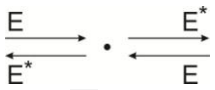
E_p – is the potential energy of the gravitational field in this point.

Definition 1: The potential energy of the gravitational field in a given point is equal to the difference between the gravitational field energy entering this point and emerging from this point in opposite directions:

$$E_p = E - E^*$$



Definition 2: In a given point, the gravitational field is named homogeneous, if the gravitational field energy entering this point is equal to the gravitational field energy emerging from this point in any direction.



For a homogeneous gravitational field: $E = E^*$

$$E_p = E - E^* = 0$$

The potential energy of the homogeneous gravitational field is zero.

3. Non-homogeneous Gravitational Field. Universal Compression of Masses

Suppose there is a mass m radius r_m in the gravitational field with energy E. We note:

E – is the energy of the gravitational field which enters in the mass.

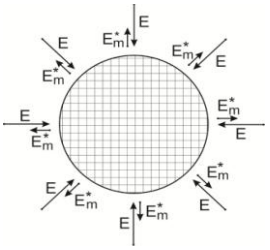
E_m^* - is the energy of the gravitational field, which emerges from the mass at the distance r_m from the center of the mass, that is, at the mass surface.

E_p – is the potential energy of the gravitational field at the distance r from the center of the mass.

The gravitational field is formed by the gravitons in chaotic motion. Therefore, the expressions "the energy of the gravitational field E entering the mass" and "the energy of the gravitational field E_m^* emerging from the mass" are identical with the expressions: "the gravitons with kinetic energy E entering the mass" and "the gravitons with kinetic energy E_m^* emerging from the mass".

When the gravitational field penetrates the mass, the gravitational field energy from the E value decreases to the E_m^* value. In this way *the mass distorts the gravitational field*.

Around the mass, a deformed (non-homogeneous) gravitational field is created with the energy equal to the difference between the gravitational field energy E (entering the mass) and energy E_m^* (emerging from the mass) in opposite directions at the distance r_m from the mass center (at the mass surface) and is directed to the center of the mass.



The energy equals to the difference between the gravitational field energy E (entering the mass) and energy E_m^* (emerging from the mass) in opposite directions is directly proportional to the potential energy E_p of the gravitational field (distorted by the mass) at the distance r_m from the mass center (at the mass surface) and is directed to the center of the mass.

$$E_p \sim E - E_m^*, (r = r_m)$$

The masses are not attracted to each other.

The potential energies of the gravitational field (distorted by the masses) compress the masses.

The compression of the masses by the potential energies of the gravitational field (distorted by the masses) is referred to as "*Universal compression of the masses*".

Universal compression of the masses by the potential energies of the gravitational field (distorted by the masses) is the first fundamental law of Physics ZMV.

4. Potential Energy of the Gravitational Field (distorted by the mass). Thermal Energy of the Mass (obtained from the gravitational field during the mass penetration)

Suppose there is a mass m radius r_m in the gravitational field with energy E. The fall of the gravitational field energy in the mass ($E - E_m^*$) is converted into the potential energy E_p of the gravitational field (distorted by the mass) and into the thermal energy E_t of the mass (obtained from the gravitational field during the mass penetration):

$$E - E_m^* = E_p + E_t, (0 < r \leq r_m)$$

The gravitational field energy E is a *constant* value in the given region of the gravitational field.

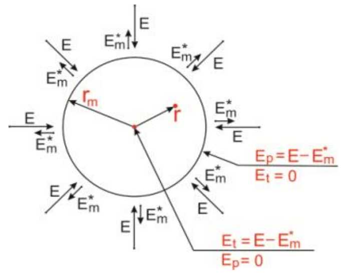
The gravitational field energy E_m^* emerging from the mass is a *constant* value for the given mass.

The fall of the gravitational field energy is a constant value for the given mass in the given region of the gravitational field:

$$E - E_m^* = const.$$

$$E_p + E_t = const., \ (0 < r \leq r_m)$$

In any point inside the mass, the sum of the potential energy E_p of the gravitational field (distorted by the mass) and the thermal energy E_t of the mass (received from the gravitational field during the mass penetration) is a constant value for the given mass in the given region of the gravitational field.



$$E_p + E_t = E - E_m^* = const. \ (0 < r \leq r_m)$$

In the center of the mass, the potential energy of the gravitational field (distorted by the mass) is *zero* and the thermal energy of the mass (which is obtained from the gravitational field during mass penetration) has a maximum value equal to the fall of the gravitational field energy in the given mass:

$$E_t = E - E_m^*$$

$$E_p = 0, \ (r = 0)$$

On the mass surface, the potential energy of the gravitational field (distorted by the mass) has a maximum value, equal to the fall of the gravitational field energy in the given mass and the thermal energy of the mass (which is received from the gravitational field during penetration through the mass) is zero:

$$E_p = E - E_m^*$$

$$E_t = 0, \ (r = r_m)$$

The potential energy of the gravitational field on the mass surface is equal to the thermal energy in the center of the mass.

If the mass is decreased, the gravitational field energy E_m* (which emerges from the mass) *increases* and tends to the gravitational field energy E (which enters in the mass) and the fall of gravitational field energy ($E - E_m^*$) tends to zero:

$$m \rightarrow 0, \ E_m^* \rightarrow E$$

$$E - E_m^* = E_p + E_t \rightarrow 0$$

If the mass is increased, the gravitational field energy E_m^* (which emerges from the mass) *decreases* and tends to zero and the fall of the gravitational field energy ($E - E_m^*$) *increases* and tends to the gravitational field energy E (which enters in the mass): $m \rightarrow m_c$, where m_c – is the *critical mass* (the mass for which $E_m^* = 0$).

$$E_m^* \rightarrow 0$$

$$E_p + E_t = E - E_m^* \rightarrow E$$

Mass is a transformer of energy. A part of the gravitational field energy ($E - E_m^*$) is converted in the mass into the potential energy E_p of the gravitational field and into the thermal energy E_t of the mass. The thermal energy E_t of the mass is radiated in the gravitational field (due to the gravitational field, which is the propagation medium of the electromagnetic field).

The thermal energy of the mass and the frequency of the maximum of the thermal energy radiation are directly proportional to the mass. The bigger the mass, the greater the thermal energy of the mass and the frequency of the maximum of the thermal energy radiation are higher.

For a certain amount of the mass the frequency of the maximum of the thermal energy radiation (emitted by the mass) lies in the region of the electromagnetic field frequencies sensitive to the human eye. This mass is named a *star*.

5. Heating and Growth of the Mass by Gravitational Field

Suppose there is a mass m radius r_m in the gravitational field with energy E.

When the gravitational field penetrates the mass, some of its energy ($E - E_m^*$) remains in the mass and is converted into the potential energy E_p of the gravitational field (distorted by the mass) and the thermal energy E_t of the mass (received from the gravitational field during the mass penetration).

The *heat* of the mass (received from the gravitational field during the mass penetration) depends on the quantity of the mass. The bigger the mass, the greater is the thermal energy E_t of the mass, received from the gravitational field during mass penetration. This phenomenon is named "*Heating of the mass*" (as a result of the gravitational field penetration through the mass).

Heating of the mass by the gravitational field (*during the mass penetration*) *is the second fundamental law of Physics ZMV*.

($E - E_m^*$) is the part of the gravitational field energy which remains in the mass, that is, a part of the gravitons, which gave its energy to the mass and remain in the mass enlarging its quantity. The mass in the gravitational field grows in size. This phenomenon is named "*Growth of the mass*" (as a result of the gravitational field penetration through the mass).

Growth of the mass by the gravitational field (*during the mass penetration*) *is the third fundamental law of Physics ZMV*.

6. Hollow Body in the Gravitational Field

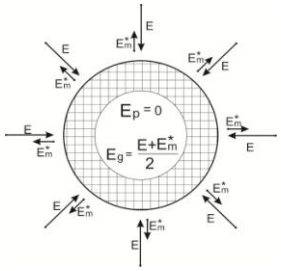
Suppose there is a hollow body with mass m in the gravitational field with energy E. We note:

E_g – is the gravitational field energy, inside the hollow body.

r_m – is the radius of the exterior surface.

r_i – is the radius of the interior surface.

When the gravitational field penetrates the hollow body, the gravitational field energy falls only between the exterior and the interior surfaces of the hollow body (where mass is present).



Inside the hollow body ($r < r_i$) the gravitational field is homogeneous (undistorted by the mass of the hollow body). Inside the hollow body, the potential energy (which is directly proportional to the difference of the gravitational field energies from the opposite directions) is zero:

$$E_p = 0, \ (r < r_i)$$

The energy of the gravitational field inside the hollow body E_g is equal to the arithmetic average between the gravitational field energy E at the entrance in the hollow body and the energy E_m^* emerging from the hollow body:

$$E_g = (E + E_m^*)/2, \ (r < r_i)$$

7. Potential Energy of the Gravitational Field within the Mass

Suppose there is a mass m radius r_m in the gravitational field with energy E.

The potential energy of the gravitational field *inside* the mass (at the distance r from the mass center) is directly proportional to the mass included in the sphere with the radius r and inversely proportional to the radius r.

$$E_p \sim m_r/r, \ (0 < r \leq r_m)$$

Where m_r – is the mass included inside the sphere with radius r.

The mass, which is not enclosed within the sphere of radius r, does not deform the gravitational field inside the sphere of radius r, $(0 < r \leq r_m)$.

The mass included inside the sphere of radius r is a function of radius r.

$m_r \sim d_r r^3$ (d_r – is the mass density included inside the sphere of radius r).

$$E_p \sim d_r r^2, \ (0 < r \leq r_m)$$

The potential energy of the gravitational field *within* the mass, at the distance r from the mass center is directly proportional to the mass density (d_r) contained in the sphere of the radius r and is directly proportional to the square of the distance r from the mass center.

The potential energy of the gravitational field (distorted by the mass m) in a certain point *outside* the mass (at the distance r from the mass center) is directly proportional to the mass m and inversely proportional to the distance r from the mass center:

$$E_p \sim m/r, \ (r_m \leq r < \infty)$$

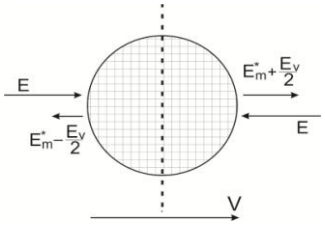
8. Inertial Energy of the Gravitational Field (distorted by the mass). Mass motion of inertia

Suppose there is a mass m radius r_m which receives an initial quantity of kinetic energy E_v in the gravitational field with energy E.

$$E_v = m\mathbf{V}_0^2/2$$

When the mass receives an initial kinetic energy and begins to move with an initial speed, the gravitational field is additionally deformed (in the direction of motion) by the initial kinetic energy of the mass.

If we divide the mass (imaginarily) with a plan perpendicular to the speed vector and passes through the mass center, the mass is divided into two parts relative to this plan: the *front side* of the moving mass and the *back side* of the moving mass.



The gravitational field energy entering through the *back side* and emerging from the *front side* of the moving mass is *increased* by an amount equal to half of the initial kinetic energy, which the mass received from the source of energy:

$$E_m^* + E_v/2$$

The gravitational field energy entering through the *front side* and emerging from the *back side* of the moving mass is *decreased* by an amount equal to half of the initial kinetic energy, which the mass received from the source of energy:

$$E_m^* - E_v/2$$

E_m^* – is the gravitational field energy emerging from the mass, at the distance r_m from the mass center (at the mass surface), when the mass does not move.

E_{ps} – is the potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the

mass) in the *back side* of the mass, at the distance r_m from the mass center (at the mass surface).

E_{pf} – is the potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) in the *front side* of the mass, at the distance r_m from the mass center (at the mass surface).

In the *front side* of the mass, at the distance r_m from the mass center, the potential energy E_{pf} of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) is equal to the *fall* of the gravitational field energy in the *front side* of the mass, at the distance r_m from the mass center (at the mass surface):

$$E_{pf} = E - E_m^* - E_v/2, \ (r = r_m)$$

In the *back side* of the mass, at the distance r_m from the mass center, the potential energy E_{ps} of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) is equal to the *fall* of the gravitational field energy in the *back side* of the mass, at the distance r_m from the mass center (at the mass surface):

$$E_{ps} = E - E_m^* + E_v/2, \ (r = r_m)$$

The potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) in the *back side* of the mass (in motion), at the distance r_m from the mass center (at the mass surface) *is greater* than the potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) in the *front side* of the mass (in motion), at the distance r_m from the mass center (at the mass surface).

$$E_{ps} > E_{pf}$$

The mass which initially has received a kinetic energy E_v is in a *perpetual* motion under the action of the energy equal to the difference between the potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) in the *back* and in the *front side* of the moving mass, at the distance r_m from the mass center (at the mass surface).

The energy equal to the difference between the potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass), in the *back side* E_{ps} and in the *front side* E_{pf} of the mass (in motion) at the distance r_m from the mass center (at the mass surface) is converted into kinetic energy of the mass and we note it E_i.

The energy which the gravitational field communicates to the mass, after it has obtained an initial kinetic energy E_v is called the *inertial energy* E_i of the gravitational field (distorted by the mass and the initial kinetic energy of the mass):

$$E_i = E_{ps} - E_{pf} = E - E_m^* + E_v/2 - E + E_m^* + E_v/2 = E_v$$

$$E_i = E_v$$

The mass which received an initial kinetic energy E_v is further moved by the gravitational field (distorted by the mass and by initial kinetic energy of the mass), with the *inertial energy* E_i equal (in magnitude and direction) to the initial kinetic energy E_v.

The motion of the mass under the action of the inertial energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) is named "*Motion of the mass by inertial energy of the gravitational field*" or abbreviated "*Mass motion of inertia*" for the given mass.

Motion of the mass by inertial energy of gravitational field (distorted by the mass and the initial kinetic energy of the mass) is the fourth fundamental law of Physics ZMV.

9. Rectilinear and Rotational Motion of the Mass. Flux and Reflux of the Mass

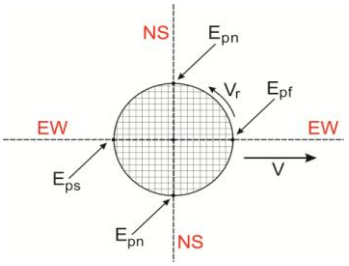
Suppose there is a mass m radius r_m in the gravitational field with the energy E, which has obtained an initial rectilinear and rotational kinetic energy. We shall analyze the case when the axis of the rotational motion of the mass is perpendicular to the vector of rectilinear speed.

The potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) in the *back side* (E_{ps}) of the mass at the distance r_m from the mass center (at the mass surface) *is greater* than the potential energy of the gravitational field (distorted by the mass and by the initial kinetic energy of the mass) in the *front side* (E_{pf}) of the mass at the distance r_m from the mass center (at the mass surface). $E_{ps} > E_{pf}$

Imaginary we divide the mass into n parts and we named one of the divided parts from the mass "*mass particle*".

Also imaginarily, we divide the mass with a perpendicular plan to the axis of rotation at any distance of the center of the mass.

EW is the name of the line, which is parallel to the vector of the rectilinear speed in this plan and which passes through the rotational axis of the mass.



NS is the name of the line, which is perpendicular to the vector of rectilinear speed in this plan and which also passes through the rotational axis of the mass.

The potential energy on the line *NS* is the same as in the case when the mass does not move and we named it "*normal*

potential energy" E_{pn} of the gravitational field for the given mass.

During the mass rotation, each "*mass particle*" in this plan passes through the *minimum* potential energy E_{pf} of the gravitational field as it crosses the line *EW* in the *front side* of the mass in motion.

Then the "*mass particle*" passes through the "*normal potential energy*" E_{pn} of the gravitational field when it crosses the line *NS*.

Then the "*mass particle*" passes through the *maximum* potential energy E_{ps} of the gravitational field as it again crosses the line *EW* in the *back side* of the mass in motion.

Then the "*mass particle*" passes through the "*normal potential energy*" E_{pn} of the gravitational field as it again crosses the line *NS*.

Then the "*mass particle*" again reaches the line *EW* in the front side of the mass in motion, with the *minimum* potential energy of the gravitational field. Here is a rotation completed.

During a complete rotation each "*mass particle*" passes through the zones listed above, which have different potential energies of the gravitational field:

From the *minimum* potential energy of the gravitational field E_{pf} in the *front* side of the mass in motion to the *maximum* potential energy of the gravitational field E_{ps} in the *back side* of the mass in motion. Each "*mass particle*" (from the center to the surface), passing through different zones of the gravitational field with different potential energies, change its density, that is, change its volume: from the *maximum* volume in the *front side* of the mass in motion (there the potential energy is minimum) to the *minimum* volume in the *back side* of the mass in motion (there the potential energy is maximum).

The mass which has obtained rectilinear and rotational motion (the axis of rotation is perpendicular to the vector of rectilinear speed) changes the volume of the mass parts in synchronism with the rotation movement. This phenomenon is named "*Flux and reflux of the mass*".

Flux and reflux of the mass, as a result of the rectilinear and rotational motion of the mass (when the rotation axis is perpendicular to the vector of rectilinear speed) is the fifth fundamental law of Physics ZMV.

The potential energy of the gravitational field (distorted by the mass) has a maximum value at the mass surface. For this reason, the gradient of the volume variation of the "*mass particle*" on the surface of the mass is greater than the gradient of the volume variation of the "*mass particle*" inside the mass (in the transition from one zone to another).

The closer the "mass particle" to the rotation axis is, the smaller is the gradient of the volume change of the "mass particle" in the transition from one zone to the next.

10. Mass classification in the gravitational field

The masses in the gravitational field of the energy E can be classified according to their size as follows: "*medium mass*", "*small masses*" and "*large masses*".

1. If the energy of the gravitational field E_m^* (which emerges from the mass) equals to half the energy of the gravitational field E (which enters the mass), then this mass is named the "*medium mass*", and we note it m_j.

$$E_m^* = E/2,\ m = m_j$$

2. For the "*small masses*" ($m < m_j$) the energy of the gravitational field E_m^* (which emerges from the mass) is greater than half the energy of the gravitational field E (which enters the mass).

$$m < m_j,\ E_m^* > E/2$$

3. For the "*large masses*" ($m > m_j$) the energy of the gravitational field E_m^* (which emerges from the mass) is less than half the energy of the gravitational field E (which enters the mass).

$$m > m_j,\ E_m^* < E/2$$

11. Maximum Speed of the Mass Motion by the inertial Energy of the Gravitational Field

Suppose there is a mass m radius r_m in the gravitational field with the energy E, which has obtained an initial kinetic energy $E_v = m\mathbf{V}_0^2/2$.

The potential energy of the gravitational field in the *back side* of the mass at the distance r_m from the mass centre (at the mass surface) *increases* and tends to the energy E of the gravitational field, as the initial speed $\mathbf{V}_0$ *increases*:

$$E_{ps} = E - E_m^* + E_v/2 \rightarrow E$$
$$E_v/2 \rightarrow E_m^*$$

The potential energy of the gravitational field in the *front side* of the mass at the distance r_m from the mass centre (at the mass surface) *decreases* and tends to *zero*, as the initial speed $\mathbf{V}_0$ *increases*:

$$E_{pf} = E - E_m^* - E_v/2 \rightarrow 0$$
$$E_v/2 \rightarrow E - E_m^*$$

At a certain speed the potential energy of the gravitational field (deformed by the mass and the initial kinetic energy of the mass) reaches one of the extreme values on the *front* or on the *back side* of the moving mass (at the distance r_m from the mass centre):

E – on the *back side* of the mass (at the mass surface),

0 – on the *front side* of the mass (at the mass surface).

The speed for which the potential energy of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) reaches one of the extreme values E on the *back side* of the mass or 0 on the *front side* of the mass at the distance r_m from the centre of the mass (i.e. at the mass surface) is named "*Maximum speed of the mass motion by inertial energy of the gravitational field*" or abbreviated "*Maximum speed of the mass motion of inertia*" for the given mass and we note $\mathbf{V}_{max}$.

Of inertia, the mass cannot move faster than the maximum speed corresponding to the given mass.

1. We calculate the maximum speed ($\mathbf{V}_{max}$) of the mass motion by inertial energy of the gravitational field for the "*medium mass*":

$$m = m_j,$$
$$E_m^* = E/2$$

We *increase* the initial kinetic energy. The potential energy of the gravitational field E_{ps} on the *back side* of the mass at the distance r_m from the mass centre (at the mass surface), reaches the energy E of the gravitational field (the maximum possible value) and the potential energy of the gravitational field E_{pf} on the *front side* of the mass at the distance r_m from the mass centre (at the mass surface), reaches the value *zero* (the minimum possible value), when the speed of the mass reaches *maximum speed of the mass motion by inertial energy of the gravitational field* or abbreviated "*Maximum speed of the mass motion of inertia*" ($\mathbf{V}_{max}$).

The potential energy of the gravitational field on the *back side* and on the *front side* of the mass in motion at the distance r_m from the mass centre (at the mass surface), reaches the extreme values *simultaneously*, when the speed of the mass motion of inertia (for the "*medium mass*") reaches the maximum value ($\mathbf{V}_{max}$).

$$m = m_j$$
$$E_m^* = E/2$$
$$E_{ps} = E,\ E_{pf} = 0$$
$$E_i = E_{ps} - E_{pf} = E_v = m_j\mathbf{V}^2_{max}/2 = E = const.$$
$$\mathbf{V}_{max} = (2E/m_j)^{1/2} = const.$$
$$E_{ps} = E - E_m^* + E_v/2 = E,\ m_j\mathbf{V}^2_{max}/4 = E_m^*$$
$$\mathbf{V}_{max} = 2(E_m^*/m_j)^{1/2} = const.$$
$$E_{pf} = E - E_m^* - E_v/2 = 0,\ m_j\mathbf{V}^2_{max}/4 = E - E_m^*$$
$$\mathbf{V}_{max} = 2[(E - E_m^*)/m_j]^{1/2} = const.$$
$$\mathbf{V}_{max} = 2[(E - E_m^*)/m_j]^{1/2} = (2E/m_j)^{1/2} = 2(E_m^*/m_j)^{1/2} = const.$$

2. We calculate the maximum speed ($\mathbf{V}_{max}$) of the mass motion by inertial energy of the gravitational field for the "*small masses*":

$$m < m_j$$
$$E_m^* > E/2$$

We *increase* the initial kinetic energy of the mass (from the category "*small masses*"). The potential energy E_{pf} of the gravitational field on the *front side* of the mass reaches the value *zero* at the distance r_m from the mass centre (i.e. at the surface of the mass), *before* the potential energy E_{ps} of the gravitational field on the *back side* of the mass at the distance r_m from the mass centre (i.e. at the surface of the mass), reaches the value E (the gravitational field energy).

The speed for which the potential energy E_{pf} of the gravitational field on the *front side* of the mass reaches the value *zero* (at the distance r_m from the mass centre, i.e. on the mass surface) is named "*Maximum speed of the mass motion by inertial energy of the gravitation field*" or abbreviated "*Maximum speed of the mass motion of inertia*" for the given mass ($\mathbf{V}_{max}$).

$$E_{pf} = E - E_m^* - E_v/2 = 0$$
$$E - E_m^* = m\mathbf{V}^2_{max}/4$$
$$\mathbf{V}_{max} = 2[(E - E_m^*)/m]^{1/2}$$

If we *decrease* the mass (from the "*small masses*" category) the gravitational field energy E_m* (which emerges from the mass) *increases* and tends to the energy E of the gravitational field, which enters the mass. The fall of the gravitational field energy in the mass ($E - E_m^*$) *decreases* and tends to zero:

$$m \to 0$$
$$E_m^* \to E$$
$$(E - E_m^*) \to 0$$
$$(E - E_m^*)/m \to const.,$$
$$\mathbf{V}_{max} = 2[(E - E_m^*)/m]^{1/2} \to c$$

As the mass *decreases* and tends to 0, the maximum speed of the mass motion of inertia ($\mathbf{V}_{max}$) *increases* and tends to a constant value, which is designated c.

3. We calculate the maximum speed ($\mathbf{V}_{max}$) of the mass motion by inertial energy of the gravitational field for the "*large masses*":

$$m > m_j$$
$$E_m^* < E/2$$

We *increase* the initial kinetic energy of the mass (from the category "*large masses*"). The potential energy E_{ps} of the gravitational field on the *back side* of the mass reaches the value E (the gravitational field energy) at the distance r_m from the mass centre (i.e. at the mass surface), *before* the potential energy E_{pf} of the gravitational field on the *front side* of the mass reaches the value *zero* at the distance r_m from the mass centre (i.e. at the mass surface).

The speed for which the potential energy E_{ps} of the gravitational field on the *back side* of the mass reaches the value E (the gravitational field energy) at the distance r_m from the centre of the mass (i.e. at the mass surface) is named "*Maximum speed of the mass motion by inertial energy of the*

gravitation field" or abbreviated "*Maximum speed of the mass motion of inertia*" for the given mass ($\mathbf{V}_{max}$).

$$E_{ps} = E - E_m^* + E_v/2 = E,$$
$$E_m^* = E_v/2 = m\mathbf{V}^2_{max}/4,$$
$$\mathbf{V}_{max} = 2(E_m^*/m)^{1/2}$$

If we *increase* the mass (from the "*large masses*" category) the gravitational field energy E_m* (which emerges from the mass) *decreases* and tends to *zero* and the maximum speed of the mass motion of inertia also tends to zero:

$m \rightarrow m_c$ where m_c – is the critical mass (the mass for which $E_m^* = 0$)

$E_m^* \rightarrow 0$

$\mathbf{V}_{max} = 2(E_m^*/m)^{1/2} \rightarrow 0$

The maximum speed of the mass motion by inertial energy of the gravitational field, for the masses equal or greater than critical mass ($m \geq m_c$) is equal to *zero*:

$$E_m^* = 0$$
$$\mathbf{V}_{max} = 2(E_m^*/m_c)^{1/2} = 0$$

The gravitational field cannot move the masses equal or greater then critical mass.

12. Acceleration

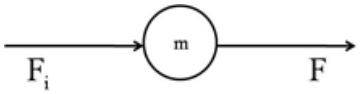
We will analyze two cases:

1) The mass m is located in a space without a gravitational field and a net force $\mathbf{F}$ acts on it. The speed of the mass as produced by a net force is directly proportional to the magnitude of the net force (in the same direction as the net force) and inversely proportional to the mass.

$\mathbf{F} = zm\mathbf{V}$, where z - is a coefficient of proportionality.

2) The mass m is located in a space with a gravitational field and a net force $\mathbf{F}$ acts on it.

In the moment that the force $\mathbf{F}$ appears (which produces the initial speed $\mathbf{V}_0$), the inertial force $\mathbf{F}_i$ (the force of the inertial energy of the gravitational field, distorted by the mass and the initial kinetic energy of the mass) also appears and will continue to move the mass, also with the speed $\mathbf{V}_0$ (the motion of inertia, if the force $\mathbf{F}$ disappears).



Suppose, the gravitational field can be considered as a source of the external energy acting on the mass m with a force $\mathbf{F}_i$ and the mass lying in a space without a gravitational field on which the forces $\mathbf{F}_i$ and $\mathbf{F}$ act:

$$\mathbf{F}_i = zm\mathbf{V}_0$$
$$\mathbf{F}_m = \mathbf{F} + \mathbf{F}_i$$

$\mathbf{F}_m$ – is the sum of all forces acting on the mass m.

As a result of the action of the external force $\mathbf{F}$ and the inertial force $\mathbf{F}_i$ the mass reaches the speed $\mathbf{V}_t$.

$$\mathbf{F}_m = \mathbf{F} + zm\mathbf{V}_0 = zm\mathbf{V}_t$$
$$\mathbf{F} = zm(\mathbf{V}_t - \mathbf{V}_0)$$

Assuming that in a space with gravitational field $z = t^{-1}$, then we can write:

$\mathbf{F} = m\mathbf{a}$, where $\mathbf{a}$ - is acceleration.

In a space with the gravitational field a force produces acceleration due to the inertial energy of the gravitational field.

In a space with the gravitational field, the acceleration of a mass as produced by a net force is directly proportional to the magnitude of the net force (in the same direction as the net force), and inversely proportional to the mass, due to the inertial energy of the gravitational field. (This is Newton's second law of motion in Physics ZMV).

13. Excessive Speed

Suppose there is a mass m in a space with a gravitational field of the energy E, which moves *of inertia* with a maximum speed ($\mathbf{V}_{max}$) for the given mass (due to the inertial energy of the gravitational field):

1) For "*small masses*", $m < m_j$,

$$\mathbf{V}_{max} = 2[(E - E_m^*)/m]^{1/2}.$$

2) For "*medium mass*", $(m = m_j)$,

$$\mathbf{V}_{max} = 2[(E - E_m^*)/m_j]^{1/2} = (2E/m_j)^{1/2} = 2(E_m^*/m_j)^{1/2} = const.$$

3) For "*large masses*", $(m > m_j)$,

$$\mathbf{V}_{max} = 2(E_m^*/m)^{1/2}.$$

When a force $\mathbf{F}$ in the direction of motion acts on the mass (which moves with a speed equal to the maximum speed of the mass motion of inertia for the given mass), the mass will move with a speed higher than $\mathbf{V}_{max}$ for the given mass, but without acceleration ($\mathbf{a} = 0$).

The difference between the speed of the moving mass ($\mathbf{V}$) and the maximum speed of the mass motion of inertia for the given mass ($\mathbf{V}_{max}$) is referred to as "*Excessive speed*".

$$\mathbf{V}_{ex} = \mathbf{V} - \mathbf{V}_{max}.$$

The excessive speed ($\mathbf{V}_{ex}$) which the mass moves under the action of a net force $\mathbf{F}$ is directly proportional to the magnitude of the net force $\mathbf{F}$ and inversely proportional to the mass m:

$\mathbf{F} = zm\mathbf{V}_{ex}$ (z – is a coefficient of proportionality).

If the net force $\mathbf{F}$ (which produced the motion with an excessive speed) becomes equal to zero ($\mathbf{F} = 0$), the excessive speed is equal also to zero ($\mathbf{V}_{ex} = 0$) and the speed of the mass motion ($\mathbf{V}$) is equal to the maximum speed of inertia motion for the given mass ($\mathbf{V} = \mathbf{V}_{max}$). In this case ($\mathbf{F} = 0$), the mass will continue the motion of inertia (due to inertial energy of

the gravitational field E_i) with the maximum speed *of inertia motion* ($\mathbf{V}_{max}$) for the given mass.

$$\mathbf{F} = 0,\ \mathbf{V}_{ex} = 0,\ \mathbf{V} = \mathbf{V}_{max}$$

14. Gravitational Field Forces that Compress the Masses

Suppose we have two masses m_1 and m_2 in the gravitational field with the energy E, located at a distance r between their centers of mass. Each of the masses distorts the gravitational field.

The potential energy produced by the gravitational field distorted by the mass m_1 at the distance r from the mass center is directly proportional to the mass m_1 and inversely proportional to the distance r from the center of the mass m_1:

$$E_{pm1} \sim m_1/r$$

The potential energy produced by the gravitational field distorted by the mass m_2 at the distance r from the mass center is directly proportional to mass m_2 and inversely proportional to the distance r from the center of the mass m_2:

$$E_{pm2} \sim m_2/r$$

The mass m_1 is located in a gravitational field which is distorted by the mass m_2 with a potential energy in the center of the mass m_1 equal to E_{pm2} and is directed to the center of the mass m_2.

The mass m_2 is located in a gravitational field which is distorted by the mass m_1 with a potential energy in the center of the mass m_2 equal to E_{pm1} and directed to the center of the mass m_1.

The potential energy of the gravitational field (distorted by the mass m_1 and the mass m_2) *compresses* the masses with a force which is directly proportional to the product of the potential energies E_{pm1} and E_{pm2} as produced by the gravitational field (distorted by the masses m_1 and m_2) at the distance r between their centers of mass:

$$\mathbf{F} \sim E_{pm1}E_{pm2} \sim m_1m_2/r^2$$

Two masses m_1 and m_2, which are located in the gravitational field at the distance r between their mass centers, are *compressed* by the potential energies of the gravitational field (distorted by the mass m_1 and m_2) with a force directly proportional to the product of their masses (m_1 and m_2) and inversely proportional to the square of the distance r between their mass centers.

15. Evolution of the Mass in the Gravitational Field. Black Hole of the Mass

In any point within the mass, at the distance r from the center of the mass, the sum of the potential energy E_p of the gravitational field (distorted by the mass) and the thermal energy E_t of the mass (received from the gravitational field at the mass penetration) is a constant value for the given mass in the given region of the gravitational field.

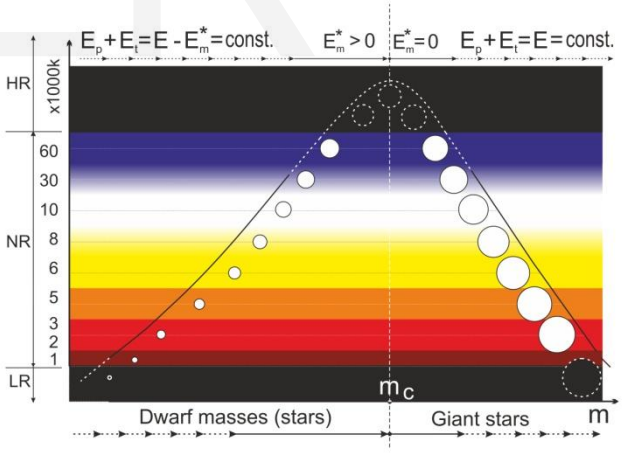
$$E_p + E_t = E - E_m^* = const,\ (0 < r \leq r_m),$$

The potential energy E_p of the gravitational field (distorted by the mass) *compresses* the mass. The thermal energy E_t of the mass (received from the gravitational field at the mass penetration) *heats* the mass.

The greater the mass, the greater the sum of the potential energy E_p of the gravitational field (distorted by the mass) and the thermal energy E_t of the mass (obtained from the gravitational field during the mass penetration). The frequency of the maximum of the thermal energy radiation emitted by the mass is also higher. The thermal energy of the mass propagates in the gravitational field, which is the propagation medium of the electromagnetic field.

At a certain quantity of the mass, the frequency of the maximum of the thermal energy radiation (emitted by the mass) coincides with the frequencies of the spectrum of the electromagnetic field perceived by the human eye. This mass is referred to as a *star*.

At the initial stage, the mass of the star radiates thermal energy with the frequency of the maximum of the thermal energy radiation in the *brown* region of the spectrum. This star is named *"Brown Dwarf"*.



A part of gravitons, which gave their energy to the mass and contributed to the creation of the potential energy E_p of the gravitational field and the thermal energy E_t of the mass, remain in the mass and *increase* the amount of the mass. The mass in the gravitational field *grows in size*.

The thermal energy of the star *increases* as the mass of the star *increases* and the frequency of the maximum of the thermal energy emitted by the star shifts to the *red* region of the spectrum. This star is named *"Red Dwarf"*.

Then in the *yellow* region of the spectrum (this star is named *"Yellow Dwarf"*), then in the *green* region of the

spectrum (this star is named "*White Dwarf*"), then in the *blue* region of the spectrum (this star is named "*Blue Dwarf*").

A further increase of the mass leads to a further increase of the thermal energy of the mass and the frequency of the maximum of the thermal energy (emitted by the mass) shifts to the *ultraviolet* range of the spectrum. These masses (*stars*) are not visible to the naked eye (ultraviolet, x-ray, neutron stars).

When the mass of the star reaches the critical mass ($m = m_c$), the sum of the potential energy E_p of the gravitational field and the thermal energy E_t of the mass reaches the maximum possible value E (the energy of the gravitational field in the given range of the gravitational field):

$$E_m^* = 0, \ (m = m_c)$$

$$E_p + E_t = E, \ (0 < r \leq r_m)$$

The volume and the area of the mass surface of the star increase as the mass of the star increases.

The area of the mass surface increases only $n^{2/3}$ times as the volume of the mass increases n times. This means that the gradient of the increases of the mass volume is greater than the gradient of the increases of the mass surface.

The energy of the gravitational field penetrates through the surface into the mass is converted by the mass into thermal energy.

For the masses greater than the critical mass, the thermal energy that each *unit volume* of the mass received from the gravitational field *decreases*, when the mass *increases*, because the gradient of the volume increases of the mass is greater than the gradient of the mass surface increases.

As the mass *increases*, the thermal energy emitted by a *unit volume* of the mass *decreases* (if the mass is greater than the critical mass: $m \geq m_c$). The frequency of the maximum of the radiation of the mass thermal energy also *decreases* with *increasing* the mass.

At a certain mass (greater than the critical mass), the frequency of the maximum of the heat energy emitted by the mass comes back into the frequency range perceived by the human eye (but in this case from the high part of the frequencies), from the violet region of the spectrum. This star is named "*Blue Giant*".

A further increasing of the mass leads to a further reduction of the thermal energy emitted by the mass per unit of its volume and the frequency of the maximum of the thermal energy radiation emitted by the mass also decreases and shifts in the *green* region of the spectrum (this star is called "*White Giant*"), then in the *yellow* region of the spectrum (this star is called "*Yellow Giant*") and then into the *red* region of the spectrum (this star is called "*Red Giant*").

The mass increases further (due to the gravitons which entered the mass, gave their energy to the mass and remained in the mass). The frequency of the maximum of the thermal energy radiation (emitted by the mass), shifts from the *red* region of the spectrum into the *infrared* region of the spectrum, getting out from the region of frequencies perceived by the human eye. This mass (star) is invisible to the human eye.

The mass, which is larger than critical mass, emitting in the gravitational field the thermal energy with the frequency of the maximum of the thermal energy radiation in the range of frequencies, which are *lower* than the frequencies of the electromagnetic field perceived by the human eye, is referred to as "*Black Hole of the Mass*".

16. Black Hole of the Gravitational Field. Darkness

Suppose we have a space without a gravitational field where there are different masses.

Among the masses, which are in a space without a gravitational field, there *is no thermal interaction*, because there is no propagation medium of the electromagnetic field, because there is no gravitational field.

In the space without a gravitational field, there *is no mechanical interaction between the masses*, because the potential energy of the gravitational field does not exist because there is no gravitational field.

In the space without a gravitational field there *is* no inertial energy of the gravitational field, this means, there *is no motion of inertia and there is no acceleration*, because there is no gravitational field.

In space without a gravitational field, it *is possible to move, but without inertia and without acceleration*. How long the force acts, so long the mass moves at a speed directly proportional to the force and inversely proportional to the mass:

$\mathbf{F} = zm\mathbf{V}$, where z – is a coefficient of proportionality.

The space without a gravitational field is referred to as "*Black Hole of the Gravitational Field*" or "*Darkness*".

17. Conclusions and a brief overview

1. ***The Beginning of the Beginning is the gravitational field***. It is formed from gravitons in a chaotic motion.

2. ***Graviton*** - is an elementary quantum of energy, when it is in a state of motion and an indivisible particle of mass when it is in a state of rest.

3. ***Mass*** - is a conglomerate of gravitons in the state of rest, that is, those gravitons that have given the mass their kinetic energy of motion.

4. The gravitational field exists independently of the mass. The mass created by the gravitational field exists independently of the gravitational field.

5. In any point inside the mass, the sum of the potential energy E_p of the gravitational field (distorted by the mass) and the thermal energy E_t of the mass (obtained from the gravitational field during the mass penetration) is a constant value for the given mass. $E_p + E_t = const.$

6. Gravitational field is the medium of propagation of the electromagnetic field.

7. Potential energy of the homogeneous gravitational field is equal to zero.

8. Potential energy of the gravitational field inside the hollow body is equal to zero.

9. ***The masses are not attracted to each other***. The potential energies of the gravitational field (distorted by the masses) compress the masses to their centre of mass.

Universal compression of the masses by the gravitational field (distorted by the masses) is the *first fundamental law of Physics ZMV*.

10. *Heating* of the mass by the gravitational field (during penetration through the mass) is the *second fundamental law of Physics ZMV*.

11. *Growth* of the mass by the gravitational field (during penetration through the mass) is the *third fundamental law of Physics ZMV*.

12. *Motion of the mass by inertial energy* of the gravitational field (distorted by the mass and the initial kinetic energy of the mass) or abbreviated "*Mass motion of inertia*" is the *fourth fundamental law of Physics ZMV*.

13. In the space with a gravitational field, a force produces acceleration due to the *inertial energy* of the gravitational field.

14. The mass cannot move *of inertia* faster than the maximum speed, corresponding to the given mass.

15. *The mass is not a function of its speed*. The inertial energy of the gravitational field depends on the speed of the mass.

16. *Flux and reflux of the mass*, as a result of the rectilinear and rotational motion of the mass (when the axis of rotation is perpendicular to the vector of the rectilinear speed) is the *fifth fundamental law of Physics ZMV*.

17. *Mass is an energy transformer*. A part of the gravitational field energy is converted in the mass into the *potential energy* of the gravitational field and into the *thermal energy* of the mass. For a certain value of mass, the thermal energy of the mass is so great that the frequency of the maximum of the mass thermal energy radiation coincides with the frequencies of the electromagnetic field perceived by the human eye. These masses are named *stars*.

18. The mass, which is greater than the critical mass, emits thermal energy at the frequency of the maximum of the mass thermal energy radiation in the range of frequencies *below* the frequencies of the electromagnetic field perceived by the human eye. These masses (stars) are named "*Black Hole of the Mass*".

19. In the space without a gravitational field, the mass moves with a speed directly proportional to the magnitude of the force and inversely proportional to the mass: $\mathbf{F} = zm\mathbf{V}$. The space without a gravitational field is referred to as "*Black Hole of the Gravitational Field*" or "*Darkness*".

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