

**PHYSICS ZMV.  
THE BASICS OF NEW PHYSICS**

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**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 that gave to the mass their kinetic energy. “Physics ZMV” is based on the idea of existence of the gravitational field independent of mass and the mass, created by the gravitational field, independent of the gravitational field. The masses are not attracted to each other. The potential energies of the gravitational field distorted by masses compresses the masses to their common center of mass. The compression of masses by gravitational field (distorted by masses) is named “Universal compression of masses”. Mass grows quantitatively due to gravitons, which gave to mass their kinetic energy (therefore have remained in the mass) and is heated by this energy. These phenomena are named „Growth of mass” and “Heating of mass” in the gravitational field. The motion of mass under the action of the inertia energy of the gravitational field is named "Motion of mass by inertia energy of the gravitational field". In gravitational field mass cannot move by inertia at a higher speed than the maximum speed, which corresponds to the given mass. Mass is not a function of its speed. The inertia energy of the gravitational field depends on the speed of mass. Mass, which has received rectilinear and rotational movement (axis of rotation is perpendicular to the vector rectilinear velocity), changes the volume of its parts, in synchronism with the rotational speed. This phenomenon is named “Flux and reflux of mass”. The gravitational field is propagation medium of the electromagnetic field. The speed at which the mass is moving under the action of a force in the space without gravitational field is directly proportional to the force and inversely proportional to the mass:  $F = zmV$ , where  $z$  – is a coefficient of proportionality. That’s why this Physics is named “Physics ZMV”.

## 1. Introduction

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

**The Beginning of the Beginning is the gravitational field. It is formed from 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 gave to mass their kinetic energy of motion.

The gravitational field penetrates the entire space and all masses. It propagates from the center of the Universe to its periphery. Together with it, in the same direction, all the masses of the Universe are moving (at a different speed, depending of the proportion of their mass). The Universe extends due to the extension of the gravitational field.

It is possible to scientifically explain many physical phenomena that classical physics cannot explain them or explain them naive, if **at the basis of physics put the existence of the gravitational field independent of mass and the mass created by the gravitational field, 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 relation is there between the potential and thermal energy in any point inside the mass?
4. What is the propagation medium of the electromagnetic field?
5. Why is the mass accelerating when a constant force acts upon it?
6. Why is the mass moving by inertia?
7. What is the maximum speed at which the given mass can move by inertia?
8. Why do fluxes and refluxes take place on the Earth?

Physics ZMV can give an explanation to all these questions. Why ZMV? Because in space, where there is no gravitational field, the speed of mass is directly proportional to the force and inversely proportional to the mass:

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

In any point inside the mass, the sum of the potential energy of the gravitational field (distorted by the mass) and of thermal energy of the mass (received from the gravitational field

at the mass penetration), is a **constant** value for the given mass in the respective region of the gravitational field. This constant is referred to as "**Constant of mass**" in the gravitational field.

**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 masses by the gravitational field (distorted by masses) is named "**Universal compression of masses**".

**Universal Compression of Masses by 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 at the mass penetration) **heats** the mass. This phenomenon is named "**Heating of Mass**" by the gravitational field.

**Heating of Mass by Gravitational Field** (during its penetration through the mass) is the second fundamental law of Physics ZMV.

That part of gravitons, which gave up their energy to the mass and contributed to the creation of the potential energy of the gravitational field and the thermal energy of mass, remain in the mass and **increase** the amount of the mass. This phenomenon is named „**Growth of Mass**” by gravitational field.

**Growth of Mass by Gravitational Field** (during its penetration through the mass) is the third fundamental law of Physics ZMV.

At a certain quantity of mass, the thermal energy of the mass is so high, that the frequency of the maximum of radiation of thermal energy emitted by the mass coincides with the frequencies of the electromagnetic field perceived by the human eye. Such masses are named **stars**.

Due to the gravitational field, the mass, which initially received a kinetic quantity of energy, is continuously moved by the "inertia 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). Motion of the mass under the action of the inertia energy of the gravitational field is referred to as "**Motion of mass by inertia energy**".

**Motion of Mass by Inertia Energy of Gravitational Field** (distorted by the mass and by initial kinetic energy of the mass) is the fourth fundamental law of Physics ZMV.

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

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

At a speed of mass is less than, maximum inertia speed for the given mass, the inertia energy of the gravitational field  $E_i$  for the given mass is directly proportional to the square speed of mass:

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

$$\mathbf{F} = m\mathbf{a}, (\mathbf{V} \leq \mathbf{V}_{max}).$$

The given mass is moving with acceleration directly proportional to the force and inversely proportional to the mass.

At a speed of the mass higher, than maximum inertia speed for the given mass, the inertia energy of the gravitational field  $E_i$  has a constant value for the given mass:

$$E_i = m\mathbf{V}_{max}^2/2 = E = \text{const},$$

$$\mathbf{F} = zm\mathbf{V}_{ex}, (\mathbf{V} \geq \mathbf{V}_{max}),$$

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

The given mass is moving with excessive speed directly proportional to the force and inversely proportional to the mass, without acceleration.

Mass that has received rectilinear and rotation motion (axis of rotation is perpendicular to the velocity vector) changes the volume of parts of the mass synchronously with the rotation speed. This phenomenon is referred to as "**Flux and Reflux of Mass**".

**Flux and Reflux of Mass** is the fifth fundamental law of Physics ZMV.

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

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

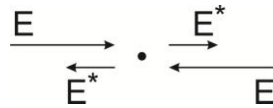
Suppose there is a point in the gravitational field with energy  $E$ . We note:

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

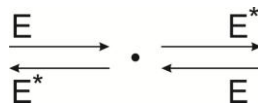
$E^*$  – is the energy of the gravitational field, which emerges from this point.

$E_p$  – 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 which enters in this point and which emerges from this point, from opposite directions:  $E_p = E - E^*$ .



Definition 2: In a given point, the gravitational field is named homogeneous, if the gravitational field energy which enters this point is equal to the gravitational field energy which emerges from this point, from 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 gravitational field with energy  $E$ . We note:

$E$  – is the energy of the gravitational field (which enters the mass).

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

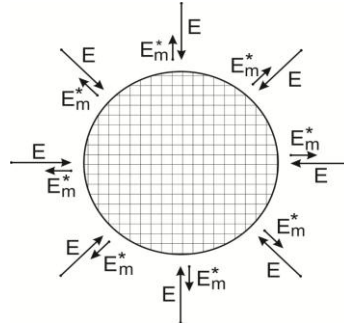
$E_p$  – is potential energy of the gravitational field at distance  $r$  from the center of mass.

The gravitational field is the gravitons in chaotic motion. Therefore, the expressions “the energy of the gravitational field  $E$ , which enters the mass” and “the energy of the gravitational field  $E_m^*$ , which emerges from the mass” are identical with the expressions: “the gravitons with kinetic energy  $E$ , which enters the mass” and “the gravitons with kinetic energy  $E_m^*$ , which emerges from the mass”.

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

Around the mass is created a deformed (non-homogeneous) gravitational field with energy equal to the difference between the gravitational field energy  $E$ , which enters the mass and energy  $E_m^*$ , which emerges from the mass in opposite directions, at the distance  $r_m$  from the center of the mass and is directed towards the center of mass:

$$E - E_m^*.$$



The energy, equal to the difference between the gravitational field energy  $E$ , which enters the mass and energy  $E_m^*$ , which emerges 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 center of the mass (at the mass surface) and is directed towards the center of the mass.

The potential energy  $E_p$  of the gravitational field (distorted by the mass), at the distance  $r_m$  from the center of the mass (at the mass surface), is directly proportional to the difference between the energy  $E$  of the gravitational field which enters the mass and energy  $E_m^*$ , which emerges from the mass, from opposite directions and is directed towards the center of the mass:

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

**The masses are not attracted to each other.** Potential energies of the gravitational field (distorted by masses) compress the masses.

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

Universal Compression of Masses is the result of action of potential energies of the gravitational field, which appear as a result of deformation of the gravitational field by masses.

**Universal Compression of Masses is the First Fundamental Law of Physics ZMV.**

#### 4. Potential Energy of the Gravitational Field, Distorted by Mass and Thermal Energy of Mass, Received from the Gravitational Field at the Mass Penetration

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 the mass).

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

The energy, equal to the difference between the gravitational field energy  $E$  which enters the mass and energy  $E_m^*$ , which emerges from the mass, in the opposite direction, at the distance  $r_m$  from the center of the mass (that is, at the mass surface), is named the fall of the gravitational field energy in the given mass:

$$E - E_m^*.$$

The fall of the gravitational field energy in mass ( $E - E_m^*$ ), is converted into potential energy  $E_p$  of the gravitational field (distorted by mass) and into thermal energy  $E_t$  of the mass (received from the gravitational field at mass penetration):

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

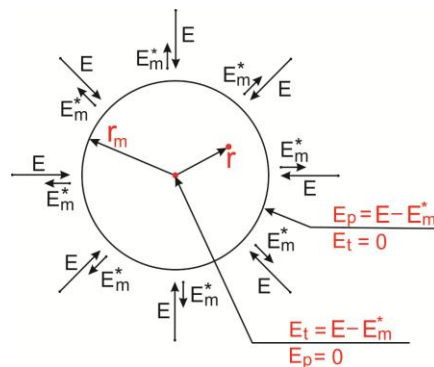
The gravitational field energy  $E$  in the given region of the gravitational field is a constant value.

The gravitational field energy  $E_m^*$  which emerges from the given mass is a constant value.

In the given region of the gravitational field, for the given mass, the fall of the gravitational field energy is a constant value:

$$E - E_m^* = \text{const},$$

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



In any point inside the mass, the sum of the potential energy  $E_p$  of the gravitational field (distorted by the mass) and of thermal energy  $E_t$  of the mass (received from the gravitational field

at mass penetration), is a **constant** value for the given mass in the given region of the gravitational field.

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

This constant is referred to as "**Constant of Mass**" in the gravitational field.

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

$$\begin{aligned} E_t &= E - E_m^*, \\ E_p &= 0, \quad (r = 0). \end{aligned}$$

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

$$\begin{aligned} E_p &= E - E_m^*, \\ E_t &= 0, \quad (r = r_m). \end{aligned}$$

The potential energy of the gravitational field (distorted by mass) at the mass surface ( $r = r_m$ ) is equal to the thermal energy (received from the gravitational field at the mass penetration) in the center of mass ( $r = 0$ ).

If we decrease the mass, the gravitational field energy  $E_m^*$  which emerges from the mass is increasing and tends to the gravitational field energy  $E$  at the entrance in the mass and the fall of gravitational field energy (at mass penetration) tends to zero:

$$\begin{aligned} m &\rightarrow 0, \\ E_m^* &\rightarrow E, \\ E_p + E_t &= E - E_m^* \rightarrow 0. \end{aligned}$$

If we increase the mass, the gravitational field energy  $E_m^*$  which emerges from the mass is decreasing and tends to zero, and the fall of the gravitational field energy increases and tends to the gravitational field energy  $E$ :

$$\begin{aligned} m &\rightarrow m_c, \\ E_m^* &\rightarrow 0, \\ E_p + E_t &= E - E_m^* \rightarrow E, \end{aligned}$$

Where  $m_c$  – is the critical mass (the mass for which  $E_m^* = 0$ ).



Mass is a transformer of energy. A part from the gravitational field energy ( $E - E_m^*$ ) in the mass is converted into potential energy  $E_p$  of the gravitational field (distorted by mass) and into thermal energy  $E_t$  of the mass (received from the gravitational field at mass penetration).

The thermal energy  $E_t$  of the mass (received from the gravitational field at the mass penetration) is emitted in the gravitational field, which is the medium of propagation of electromagnetic field.

The thermal energy of mass and the frequency of the maximum of radiation of thermal energy are directly proportional to the mass. The bigger the mass the bigger the thermal energy of the mass (received from the gravitational field) and the frequency of the maximum of radiation of thermal energy are higher.

At a certain amount of mass, the frequency of the maximum of radiation of thermal energy emitted by the mass coincides with the frequencies of electromagnetic field perceived by human eye. Such masses are named **stars**.

If we continuously increase the mass, at a certain amount of mass, the gravitational field energy which emerges from the mass is equal to zero:

$$E_m^* = 0.$$

The fall of the gravitational field energy in the mass ( $E - E_m^*$ ) is equal to the gravitational field energy at the entrance in the mass ( $E$ ):

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

In other words, the gravitational field cannot penetrate such a mass. The entire energy of the gravitational field, which enters the mass, remains in the mass.

The minimum mass that the gravitational field cannot emerge from it is referred to as “**Critical Mass**”.

$$m = m_c$$

$$E_m^* = 0,$$

$$E_p + E_t = E - E_m^* = E.$$

For the critical mass, the sum of the potential energy  $E_p$  of the gravitational field (distorted by mass) and of the thermal energy  $E_t$  of the mass (received from the gravitational field in its penetration into this mass) reaches the maximum possible value, equal to the gravitational field energy  $E$  in the given region of the gravitational field.

## 5. Heating and Growth of Mass by Gravitational Field.

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

$E_m^*$  – is the gravitational field energy which emerges from the mass, at distance  $r_m$  from the center of the mass (at the mass surface).

$E_p$  – is potential energy of the gravitational field (distorted by the mass), at the distance  $r$  from the center of mass.

$E_t$  – is thermal energy of the mass (received from the gravitational field at the mass penetration), at the distance  $r$  from the center of mass.

$E - E_m^*$  – is the fall of the gravitational field energy in the given mass.

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

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

At penetration of the gravitational field through the mass, a part of its energy ( $E - E_m^*$ ) remain in the mass and is transformed into the potential energy  $E_p$  of the gravitational field and into the thermal energy of the mass  $E_t$ .

The potential energies of the gravitational field (distorted masses) compress the masses. The compression of masses by the gravitational field (distorted by the masses) is referred to as „**Universal Compression of Masses**” by gravitational field.

The heating of the mass (by the gravitational field) depends on its quantity. The bigger the mass the bigger the thermal energy  $E_t$  of the mass, received from the gravitational field at the mass penetration. This phenomenon is referred to as “**Heating of Mass**” by gravitational field.

**Heating of Mass by Gravitational Field is the Second Fundamental Law of Physics ZMV.**

That part of the gravitational field energy ( $E - E_m^*$ ), that is, that part of gravitons, which gave their energy to the mass, remains in the mass, enlarging its quantity. The mass in the gravitational field is growing in size. This phenomenon is referred to as “**Growth of Mass**” by Gravitational Field.

**Growth of Mass by Gravitational Field is the Third Fundamental Law of Physics ZMV.**

The mass is a conglomerate of gravitons in the state of rest, that is, those gravitons which gave to the mass their kinetic energy of motion.

## 6. Hollow Body in Gravitational Field

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

$E$  – is the gravitational field energy (at the entrance in the mass of hollow body).

$E_m^*$  – is the gravitational field energy which emerges from the mass of hollow body, at the distance  $r_m$  from the center of the mass (at the exterior surface of the hollow body).

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

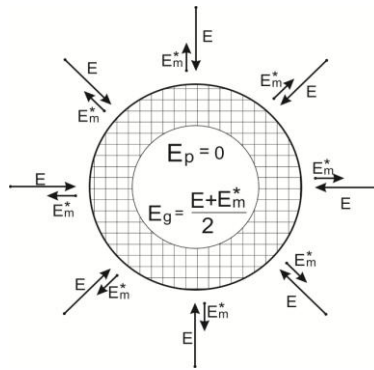
$E_p$  – is potential energy of the gravitational field, distorted by the mass, at distance  $r$  from the center of the mass of hollow body.

$E_t$  – is thermal energy of the mass received from the gravitational field, at the mass penetration, at distance  $r$  from the center of the mass of hollow body.

$r_m$  – is radius of the exterior surface.

$r_i$  – is radius of the interior surface.

When gravitational field penetrates the hollow body, the gravitational field energy falls only between the exterior and the interior surface of hollow body (there where mass exists).



On the outside of the hollow body, at a distance  $r_m$  from the center of mass (on the exterior surface of hollow body), the potential energy of the gravitational field (distorted by the mass of hollow body) is equal to the energy fall of the gravitational field in the mass of hollow body:

$$E_p = E - E_m^*,$$

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

Inside the hollow body ( $r < r_i$ ) the gravitational field is homogeneous (undistorted by the mass of hollow body). Inside the hollow body the potential energy (which is directly

proportional to the difference between the gravitational field energies from the opposite directions) is equal to 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 of the hollow body and the energy  $E_m^*$ , which emerges from the mass of hollow body:

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

## 7. Potential Energy of Gravitational Field Distorted by 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 center of mass, is directly proportional to the mass included inside the sphere with radius  $r$  and inversely proportional to the radius  $r$ .

$$E_p \sim m_r/r, (0 < r \leq r_m), \quad (1)$$

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

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

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

$$m_r \sim d_r r^3$$

Where  $d_r$  – is the mass density included inside the sphere of radius  $r$ .

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

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

The proportionality (1) and (2) are identical:

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

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

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

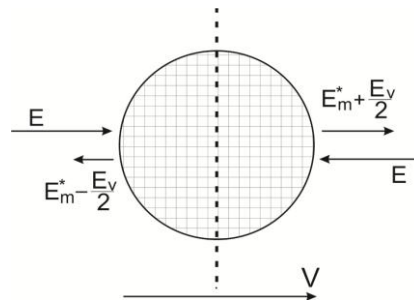
## 8. Inertia Energy of Gravitational Field

Suppose there is a mass  $m$  radius  $r_m$  in the gravitational field with energy  $E$ , which got initial kinetic energy  $E_v$ :

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

When the mass gets initial kinetic energy and it starts to move with initial velocity, the gravitational field is deformed additionally (in the direction of motion) by the initial kinetic energy of mass.

If imaginary we divide the mass with a plan perpendicular on the vector of velocity and which passes through the mass center, then the mass is divided relatively this plan into two parts: the **front side** of the moving mass and the **back side** of the moving mass.



The gravitational field energy, which enters through the back side and which emerges 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, which enter through the front side and which emerges 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:

$$E_m^* - E_v/2.$$

We note:  $E$  – is the gravitational field energy (at the entrance to mass).

$E_m^*$  – is the gravitational field energy which emerges from the mass (at  $r_m$  distance from the mass center), when the mass is not moving.

$E_v$  – is the initial kinetic energy which the mass received from source of energy.

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

We calculate the potential energy of the gravitational field (distorted by the mass and by initial kinetic energy of the mass) in the front side of the mass  $E_{pf}$  and in the back side of the mass  $E_{ps}$  at the distance  $r_m$  from the mass center (at the mass surface).

The thermal energy of the mass (received from the gravitational field at mass penetration) at the distance  $r_m$  from the mass center (at the mass surface) is zero, no matter whether the mass moves or not:

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

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 by 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):

$$E_{pf} = E - E_m^* - E_v/2,$$

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

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 by 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):

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

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

The potential energy of the gravitational field (distorted by the mass and by initial kinetic energy of mass) in the back side of the mass (in motion), at the distance  $r_m$  from the mass center, is bigger than the potential energy of the gravitational field (distorted by the mass and by initial

kinetic energy of mass) in the front side of mass (in motion), at the distance  $r_m$  from the mass center:

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

The mass that received initially a quantity of 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 by initial kinetic energy of the mass), at the distance  $r_m$  from the mass center (at the mass surface), in the back side and in the front side of the mass in motion.

The energy, equal to the difference between the potential energy of the gravitational field (distorted by the mass and by initial kinetic energy of the mass), at the distance  $r_m$  from the mass center (at the mass surface), in the back side and in the front side of the mass (in motion) is transformed into kinetic energy of the mass (received from the gravitational field).

The energy, which the gravitational field communicates to the mass, after it received an initial kinetic quantity of energy  $E_v$ , is referred to as **inertia energy**  $E_i$  of the gravitational field (distorted by the mass and by 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 inertia energy of the gravitational field  $E_i$  is equal to the difference between the potential energy of the gravitational field (distorted by the mass and by initial kinetic energy of the mass) in the back side of the mass  $E_{ps}$  and in the front side of the mass  $E_{pf}$ , at the distance  $r_m$  from the mass center (at the mass surface):

$$E_i = E_{ps} - E_{pf}$$

The inertia energy  $E_i$  with which the gravitational field moves the mass after it received initial kinetic energy  $E_v$ , is equal to this initial kinetic energy:

$$E_i = E_v$$

The mass, that received initial kinetic energy  $E_v$ , is moved continuously by the gravitational field (distorted by the mass and by initial kinetic energy of mass), with the inertia energy  $E_i$ , equal (in value and direction) to the initial kinetic energy  $E_v$ .

The motion of the mass under the action of inertia energy of the gravitational field (distorted by the mass and by initial kinetic energy of mass) is named "**Motion of Mass by Inertia Energy of Gravitational Field**".

**Motion of Mass by Inertia Energy of Gravitational Field** (distorted by the mass and by initial kinetic energy of mass) is the fourth fundamental law of Physics ZMV.

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

Suppose that there is a mass  $m$  radius  $r_m$  in the gravitational field with energy  $E$ , which received initial rectilinear and of rotational quantity of kinetic energy.

The mass will continue the rectilinear and rotational motion due to the inertia energy of the gravitational field.

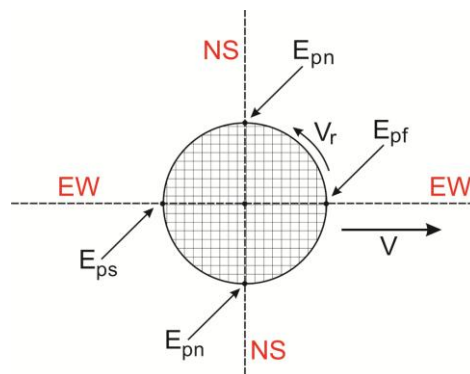
The potential energy of the gravitational field (distorted by the mass and by the initial kinetic energy of the mass) in the back side  $E_{ps}$  of the mass, is bigger than the potential energy of the gravitational field (distorted by the mass and by the initial kinetic energy of the mass) in the front side  $E_{pf}$  of the mass:

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

We shall analyze the case, when the axis of the rotation motion of the mass is perpendicular to the velocity vector of the rectilinear motion.

Imaginary we divide the mass into  $n$  parts and we named one of the divided parts from the mass „mass particle”. Also imaginary, we divide the mass with a perpendicular plan to the axis of rotation motion at an arbitrary distance of the mass center.

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



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



The potential energy on the line NS is the same, as in the case, if the mass is not moving and we named it „normal potential energy" of the gravitational field  $E_{pn}$  for the given mass.

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

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

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

Then, the „mass particle" passes through the "normal potential energy" of the gravitational field  $E_{pn}$ , when it again crosses the NS line, in the opposite part of the mass.

Then, the „mass particle" again reaches the line EW in the front side of the mass in motion, where the potential energy of the gravitational field  $E_{pf}$  is minimal. Here completes one rotation.

In this way, at a complete rotation, each „mass particle" passes through the above enumerated zones, 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 and again to the minimum potential energy of the gravitational field  $E_{pf}$  in the front side of the mass in motion.

Each „mass particle" (from the center to the surface), being in different zones of the gravitational field with different potential energy, 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 that has received a rectilinear and rotation motion (the axis of rotation is perpendicular to the vector of rectilinear speed) changes the volume of the mass parts, synchronously to the rotation speed. This phenomenon is called "**Flux and Reflux of Mass**".

**Flux and Reflux of Mass is the fifth fundamental law of Physics ZMV.**

Potential energy of the gravitational field (distorted by the mass) has a maximum value on the mass surface. Because of this, the gradient of the volume variation of the „mass particle" on

the surface of the mass, is bigger, then the gradient of the volume variation of the „mass particle” inside the mass, when passing from one zone into another.

The closer the "mass particle" is to the rotation axis, the smaller the gradient of change of volume of the "mass particle" is, when passing from one zone to another.

## 10. Classification of Masses in Gravitational Field

Masses in the gravitational field of energy  $E$ , depending on their size, can be classified as follows: "**medium mass**", "**small masses**" and "**big masses**".

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

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

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

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

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

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

## 11. Maximum Speed of Mass Motion by Inertia Energy of Gravitational Field

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

Potential energy of gravitational field (distorted by the mass and by initial kinetic energy of the mass) in the back side of mass (in motion), at the distance  $r_m$  from the center of mass (at the mass surface) is equal to:

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

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

Potential energy of gravitational field (distorted by the mass and by initial kinetic energy of the mass) in the front side of mass (in motion), at the distance  $r_m$  from the center of mass (at the mass surface) is equal to:

$$E_{pf} = E - E_m^* - E_v/2,$$

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

If we increase the initial speed  $V_0$ , potential energy of gravitational field in the back side of mass, at distance  $r_m$  from the center of mass (at the mass surface) increases and tends to the energy of gravitational field  $E$ :

$$E_{ps} \rightarrow E,$$

$$E_v/2 \rightarrow E_m^*.$$

Potential energy of gravitational field in the front side of the mass at distance  $r_m$  from the center of mass (at the mass surface) decreases and tends to zero:

$$E_{pf} \rightarrow 0,$$

$$E_v/2 \rightarrow E - E_m^*.$$

At a certain speed, potential energy of gravitational field (distorted by the mass and by the initial kinetic energy of mass) in the back or in the front side of the mass, at distance  $r_m$  from the center of mass (at the mass surface), reaches one of the extreme values:

$E$  – in the back side of the mass in motion (at the mass surface),

$0$  – in the front side of the mass in motion (at the mass surface).

The speed for which potential energy of gravitational field (distorted by mass and by initial kinetic energy of the mass) in the back side of mass (in motion) or in the front side of mass (in motion), at the distance  $r_m$  from the center of mass (at the mass surface), reaches one of the extreme values  $E$  or  $0$  is named “**Maximum Speed of Mass Motion by Inertia Energy of Gravitation Field**”, of the given mass, ( $V_{max}$ ).

By inertia, mass cannot move faster than the maximum speed, which corresponds to the given mass.

1. We calculate the maximum speed of mass motion by inertia energy of gravitational field,  $V_{max}$ , for the "**medium mass**":

$$m = m_j,$$

$$E_m^* = E/2.$$

If we increase the initial kinetic energy, we reach such a speed, for the given mass  $m = m_j$ , named maximum speed of the mass motion by inertia,  $\mathbf{V}_{max}$ , for which the potential energy of the gravitational field in the back side of the mass (in motion), at distance  $r_m$  from the center of mass (at the mass surface) is equal to the energy of gravitational field  $E$  (the maximum possible value), and the potential energy of the gravitational field in the front side of the mass (in motion), at distance  $r_m$  from the center of mass (at the mass surface) is equal to zero (minimum possible value).

When the speed of the "**medium mass**" reaches the maximum value,  $\mathbf{V}_{max}$ , the potential energy of the gravitational field in the back side and in the front side of the mass (in motion), at the distance  $r_m$  from the mass center (at the mass surface), reaches the extreme values simultaneously:

$$E_{ps} = E, E_{pf} = 0,$$

$$m = m_j,$$

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

$$E_i = E_{ps} - E_{pf} = E_v = m_j \mathbf{V}_{max}^2 / 2 = E = \text{const},$$

$$\mathbf{V}_{max} = (2E/m_j)^{1/2} = \text{const},$$

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

$$\mathbf{V}_{max} = 2(E_m^*/m_j)^{1/2} = \text{const},$$

$$E_{pf} = E - E_m^* - E_v/2 = 0, m_j \mathbf{V}_{max}^2 / 4 = E - E_m^*,$$

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

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

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

$$m < m_j,$$

$$E_m^* > E/2.$$

If we increase the initial kinetic energy, we reach such a speed, that the potential energy of gravitational field in the front side of the mass (in motion), at the distance  $r_m$  from the mass center (at the surface of mass), reaches the value zero, before the potential energy of gravitational field in the back side of the mass (in motion), at distance  $r_m$  from the mass center (at the surface of mass), reaches the energy  $E$  of the gravitational field.

The speed, for which the potential energy of gravitational field in the front side of the mass (from the "small masses" category,  $m < m_j$ ), at the distance  $r_m$  from the mass center (at the mass surface), reaches the minimal possible value (zero), is named **“Maximum Speed of Mass Motion by Inertia Energy of Gravitation Field”**, for the given mass, ( $V_{max}$ ).

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

$$E - E_m^* = mV_{max}^2/4,$$

$$V_{max} = 2[(E - E_m^*)/m]^{1/2}.$$

If we decrease the mass (from the "small masses" category,  $m < m_j$ ), the energy of gravitational field, which emerges from the mass,  $E_m^*$ , increases and tends to the energy of gravitational field  $E$ , which enters in the mass:

$$m \rightarrow 0,$$

$$E_m^* \rightarrow E,$$

$$(E - E_m^*) \rightarrow 0,$$

$$(E - E_m^*)/m \rightarrow \text{const},$$

$$V_{max} = 2[(E - E_m^*)/m]^{1/2} \rightarrow c.$$

If the mass is decreasing and tends to 0, then the maximum speed of the mass motion by inertia,  $V_{max}$ , which can move the given mass by inertia energy of gravitational field (from the "small masses" category) is increasing and tends to a constant value, which is named  $c$ .

3. We calculate the maximum speed of mass motion by inertia energy of gravitational field,  $V_{max}$ , for the **"big masses"**:

$$m > m_j,$$

$$E_m^* < E/2.$$

If we increase the initial kinetic energy, we get such a speed, that the potential energy of gravitational field in the back side of the mass, at the distance  $r_m$  from the center of mass (at the mass surface), reaches the maximum possible value (the energy of gravitational field  $E$ ), before the potential energy of the gravitational field in the front side of the mass, at the distance  $r_m$  from the center of mass (at the mass surface), reaches the value zero.

The speed, for which the potential energy of gravitational field in the back side of the mass (from the "big masses" category), at distance  $r_m$  from the center of mass (at the mass surface),

reaches maximum value (the energy  $E$  of gravitational field), is named “**Maximum Speed of Mass Motion by Inertia Energy of Gravitation Field**” for the given mass, ( $\mathbf{V}_{max}$ ).

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

$$E_m^* = E_v/2 = m\mathbf{V}_{max}^2/4,$$

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

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

$$m \rightarrow m_c,$$

$$E_m^* \rightarrow 0,$$

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

When the mass reaches the critical mass, the energy of the gravitational field which emerges from the critical mass is zero:  $E_m^* = 0$ .

The maximum speed of the mass motion by inertia energy of gravitational field, for the masses equal or bigger than critical mass is equal to zero:

$$E_m^* = 0,$$

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

## 12. Acceleration

We will analyze two cases: 1) the mass  $m$  is located in a space without gravitational field.

2) the mass  $m$  is located in a space with gravitational field.

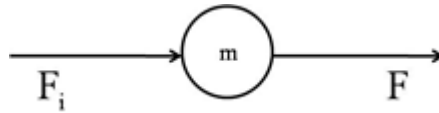
If the force  $\mathbf{F}$ , acts upon the mass  $m$ , which is located in a space without gravitational field, then the mass is moving at a speed directly proportional to the force and inversely proportional to the mass:

$$\mathbf{F} = zm\mathbf{V},$$

where  $z$  – is a coefficient of proportionality.

Suppose the mass  $m$  is located in a space with gravitational field and a force  $\mathbf{F}$  acts upon it. From the moment the force  $\mathbf{F}$  appears (which created the initial velocity  $\mathbf{V}_0$ ), there also appears

the force of inertia  $\mathbf{F}_i$  of the gravitational field (distorted by the mass and by the initial kinetic energy of the mass), which moves the mass, at the speed  $\mathbf{V}_0$ .



Let us imagine that the gravitational field can be considered to be a source of external energy that acts upon the mass  $m$  with a force  $\mathbf{F}_i$ , and the mass is situated in a space without gravitational field, upon which the forces  $\mathbf{F}_i$  and  $\mathbf{F}$  act on it:

$$\mathbf{F}_i = zm\mathbf{V}_0,$$

$$\mathbf{F}_m = \mathbf{F} + \mathbf{F}_i,$$

$\mathbf{F}_m$  – is the sum of all forces which act upon the mass  $m$ .

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

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

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

If we assume that in the space with gravitational field  $z = t^{-1}$  then we can write:

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

In the space with gravitational field the force creates acceleration.

In the space with a gravitational field, the acceleration, at which the mass moves, is directly proportional to the force and inversely proportional to the mass. (Newton's second law of motion).

### 13. Excessive Speed

Suppose there is a mass  $m$  in the space with gravitational field with the energy  $E$ , which is moving by inertia energy of gravitation field at a maximum speed, ( $\mathbf{V}_{max}$ ), for the given mass:

1) For „small masses”,  $m < m_j$ ,

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

2) For „medium mass”, ( $m = m_j$ ),

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

3) For „big masses”, ( $m > m_j$ ),

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

If a force ( $\mathbf{F}$ ) acts upon the mass, which is moving at a maximum speed of the mass motion by inertia for the given mass ( $\mathbf{V}_{max}$ ) in the direction of motion, then the mass will move at a higher speed than the maximum speed of the mass motion by inertia 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 by inertia for the given mass ( $\mathbf{V}_{max}$ ), is named “**Excessive speed**”:

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

The excessive speed ( $\mathbf{V}_{ex}$ ) of the mass, which the mass is moving under the action of a force  $\mathbf{F}$  in the gravitational field, is directly proportional to the force  $\mathbf{F}$  and inversely proportional to the mass  $m$ :

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

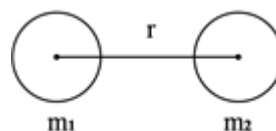
If the force  $\mathbf{F}$  that created the motion with excessive speed becomes equal to zero ( $\mathbf{F} = 0$ ), then the excessive speed is also equal to zero ( $\mathbf{V}_{ex} = 0$ ), and the speed of motion  $\mathbf{V}$  is equal to the maximum speed of the given mass ( $\mathbf{V} = \mathbf{V}_{max}$ ) and the mass continues the motion by inertia energy of gravitational field, with the maximum speed ( $\mathbf{V}_{max}$ ) for its mass.

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

#### 14. Force with which Gravitational Field compresses the Mass

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

The gravitational field distorted by the mass  $m_1$  creates around the mass  $m_1$  a potential energy directly proportional to the mass  $m_1$  and pointed toward its center of the mass.





The gravitational field distorted by the mass  $m_2$  creates around the mass  $m_2$  a potential energy directly proportional to the mass  $m_2$  and pointed toward its center of mass.

The potential energy created 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 created 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 distance  $r$  from the center of the mass  $m_2$ :

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

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

The mass  $m_2$  is in a gravitational field distorted by the mass  $m_1$  with a potential energy in the center of the mass  $m_2$  equal to  $E_{pm1}$  and pointed 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 one to another with a force directly proportional to the multiplication of potential energies created by the gravitational field distorted by the mass  $m_1$  and  $m_2$  at the distance  $r$  between their centers of mass:

$$\mathbf{F} \sim E_{pm1}E_{pm2},$$

$$\mathbf{F} \sim m_1m_2/r^2.$$

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

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

At any point within the mass, at distance  $r$  from the center of mass, the sum of the potential energy  $E_p$  of the gravitational field (distorted by the mass) and of the thermal energy of the mass

$E_t$  (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:

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

1. The masses are compressed by the potential energies of gravitational field (distorted by the masses) to their common center of mass. This phenomenon is named **Universal Compression of Masses by Gravitational Field** (distorted by the masses)
2. A part of the energy of the gravitational field, (that is, that part of gravitons, which gave their energy to the mass), is converted into thermal energy of the mass. This phenomenon is named **Heating of Mass by Gravitational Field** (during its penetration through the mass).
3. The gravitons, which gave up their energy to the mass and contributed to increasing of thermal energy of mass and potential energy of gravitational field, remain in the mass, thus increasing the amount of mass. The mass in the gravitational field is growing in size. This phenomenon is named **Growth of Mass by Gravitational Field** (during its penetration through the mass). Therefore mass is a conglomerate of gravitons in the state of rest, that is, those gravitons that gave up to the mass their kinetic energy of motion and remained in mass.
4. Gravitational field moves the mass with inertia energy, equal to the initial kinetic energy of the mass. This phenomenon is named **Motion of Mass by Inertia Energy of Gravitational Field** (distorted by the mass and by initial kinetic energy of the mass).
5. The mass, which has received a rectilinear and rotation motion (the axis of rotation is perpendicular to the vector of rectilinear speed), changes the volume of parts of the mass, synchronously to the speed of rotation. This phenomenon is named "**Flux and Reflux of Mass**".

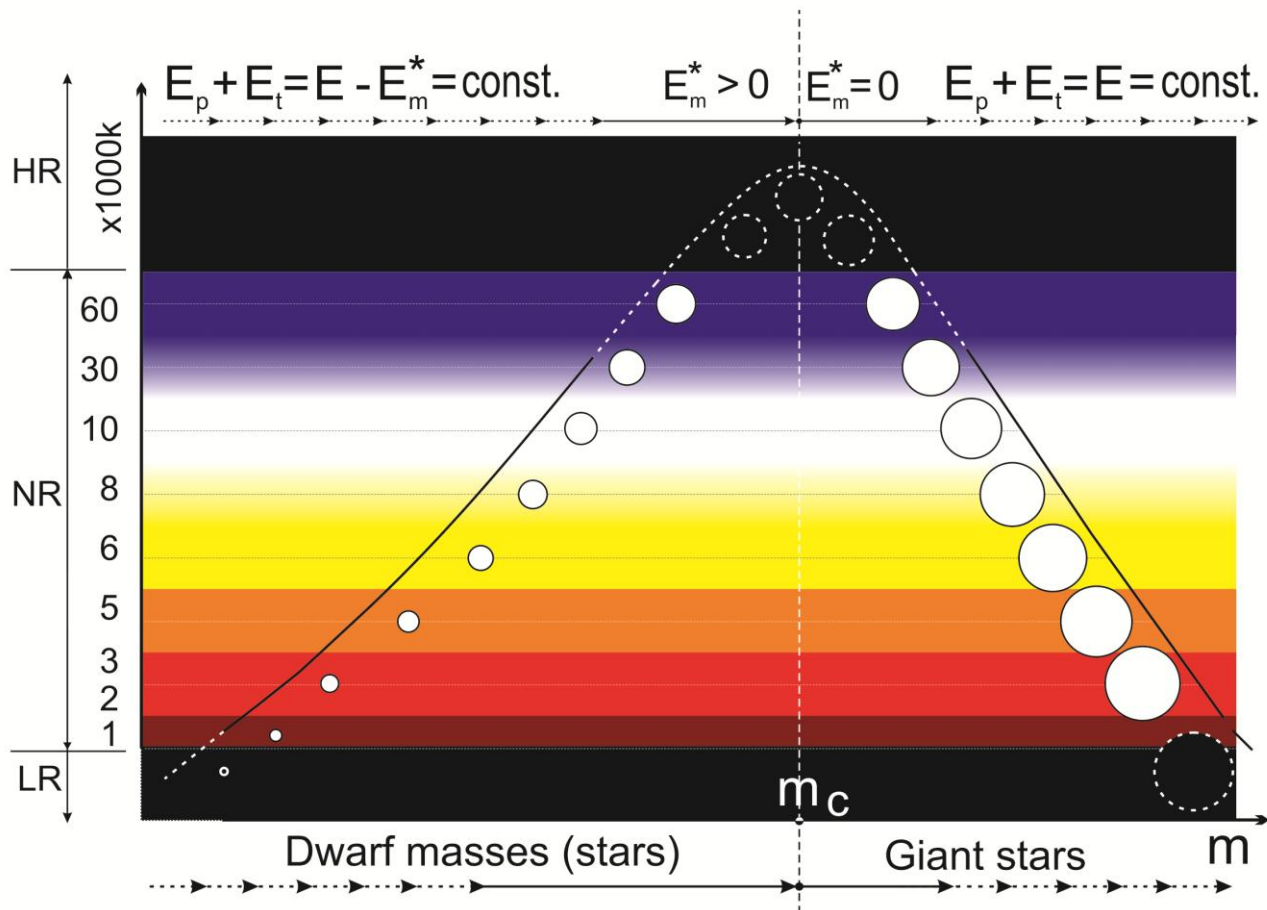
The bigger the mass, the bigger the sum of the potential energy ( $E_p$ ) of the gravitational field distorted by the mass and of the thermal energy ( $E_t$ ) of the mass, received from the gravitational field at mass penetration and the higher the frequency of the maximum of radiation of thermal energy emitted by the mass.

The thermal energy of the mass propagates in the gravitational field, which is the medium of propagation of the electromagnetic field.

At a certain quantity of mass, the frequency of the maximum of radiation of thermal energy emitted by the mass coincides with the frequencies of the spectrum of the electromagnetic field, perceived by the human eye.

The mass, which radiates thermal energy with the frequency of maximum of radiation of thermal energy in the region of frequencies of the electromagnetic field perceived by the human eye, is named **star**.

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



Thermal energy of mass (received from the gravitational field at the mass penetration), increases while increasing the mass of the star. The frequency of the maximum of radiation of thermal energy emitted by the mass is moving 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**”).

Further increase in mass leads to a further increase of thermal energy of mass (received from the gravitational field during it passes through the mass) and the frequency of maximum of radiation of thermal energy emitted by the mass, shifts to the **ultraviolet** region of spectrum. These masses are not visible to the naked eye.

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 (distorted by the mass) and of the thermal energy of the mass  $E_t$  (received from the gravitational field at the mass penetration) reaches the maximum possible value, the energy  $E$  of gravitational field in the given region of the gravitational field:

$$m \geq m_c, E_m^* = 0,$$

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

The potential energy of the gravitational field (distorted by the mass) at the mass surface, for masses equal or bigger than the critical mass ( $m \geq m_c$ ), reaches the maximum possible value, equal to the energy  $E$  of the gravitational field in the given region of the gravitational field.

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

$$E_p = E, (r = r_m).$$

At the increase of mass of star, the volume and the area of surface of the mass increase too. If the volume of the mass increases  $n$  times the area of the mass surface increases only  $n^{2/3}$  times. This means, that the gradient of increasing of volume of the mass is bigger than the gradient of increasing of surface area of the mass.

The energy of the gravitational field which enters the mass through its surface is distributed in the whole volume of mass and is transformed into thermal energy of mass. The thermal energy (that each unit volume of mass received from the gravitational field), decreases with increasing the mass, because the gradient of increasing the volume of mass is greater than the gradient of increasing the surface area of mass.

When the mass increases, the thermal energy emitted by a unit volume of mass decreases (in the case where the mass is greater than critical mass:  $m \geq m_c$ ). The frequency of the maximum of radiation of thermal energy emitted by the mass is decreasing. At a certain quantity of mass (greater than the critical mass), the frequency of the maximum of radiation of thermal energy emitted by the mass, again enters in the region of frequencies perceived by the human eye, but in this case, from the high part of frequencies, that is, from ultraviolet region of the spectrum. This star is named "**Blue Giant**".

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

With further increase in mass, the frequency of the maximum of radiation of thermal energy emitted by the mass shifts from the **red** region of the spectrum, in 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, greater than the critical mass, emitting in the gravitational field the thermal energy with the frequency of maximum of radiation of thermal energy in the frequency range lower than the frequency of the electromagnetic field sensitive to the human eye, is called the "**Black Hole of Mass**".

## **16. Black Hole of Gravitational Field. Darkness**

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

Among the masses that are situated in a space without gravitational field there does not exist thermal interaction, because there does not exist the medium of propagation of the electromagnetic field, because there does not exist gravitational field.

In the space without gravitational field there does not exist mechanical interaction between the masses, because there does not exist the potential energy of the gravitational field, because there does not exist gravitational field.

In the space without gravitational field there does not exist inertia energy of the gravitational field, this means, there does not exist acceleration, because there does not exist gravitational field.

In the space without gravitational field it is possible to move, but without inertia and without acceleration. How long does 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 gravitational field is named "**Black Hole of Gravitational Field**" or "**Darkness**".

## **17. The New Categories in “Physics ZMV” and a New Interpretation of Some Existing Categories in the Classical Physics. Hypotheses**

1. **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.
2. **Mass** – is a conglomerate of gravitons, which are in the state of rest.
3. **Energy** – is the gravitons in orientated motion.
4. **Gravitational Field** – is the space with the gravitons in chaotic motion, in which is conceived and increased the mass.
5. **Universe** – is an infinite number of conglomerates of gravitons in the state of rest (that is an infinite number of masses), which is moving at different speed (depending on their masses), in the space with gravitons in chaotic motion (that is in a gravitational field).
6. **Visible Stars (the stars of NR type)** – they are the masses that radiate thermal energy with the frequency of the maximum of radiation of thermal energy in the visible region of the spectrum (NR means normal radiation).
7. **Invisible Stars of HR type** – they are the masses that radiate thermal energy with the frequency of the maximum of radiation of thermal energy in the region of frequencies higher than the visible frequencies of the spectrum. (HR means high radiation).
8. **Invisible Stars of LR type or Black Hole of Mass** – they are the masses, bigger than the critical mass, which radiate thermal energy with the frequency of the maximum of radiation of thermal energy in the region of frequencies lower than the visible frequencies of the spectrum. (LR means low radiation).
9. **Black Hole of Gravitational Field or Darkness, Abyss** – is a space without gravitational field.

### **Hypothesis 1**

#### **About the Existence of Anti-gravitons, Anti-gravitational Field and Anti-energy**

From the reality of existence of anti-mass, it follows the existence of the indivisible particles of anti-mass from which anti-mass is created. We name it anti-gravitons. From the reality of the existence of anti-mass, created from anti-gravitons in state of rest, there results the reality of the

existence of anti-gravitons in the state of chaotic motion (where anti-mass is conceived and growth), that is, the existence of the anti-gravitational field. The anti-gravitons in the orientated motion are named anti-energy.

10. **Anti-Graviton** – is an elementary quantum of anti-energy, when it is in the state of motion and an indivisible particle of the anti-mass, when it is in the state of rest.

11. **Anti-Mass** – is a conglomerate of anti-gravitons, which are in the state of rest.

12. **Anti-Energy** – is anti-gravitons in orientated motion.

13. **Anti-Gravitational Field** – is the space with the anti-gravitons in chaotic motion, in which the anti-mass is conceived and growth.

14. **Annihilation of Mass and Anti-Mass** – is the mass and the anti-mass disintegration in their initial components: the gravitons in orientated motion (that is the energy) and the anti-gravitons in orientated motion (that is the anti-energy).

15. **Anti-Universe** – is an infinite number of conglomerates of anti-gravitons in the state of rest (that is, an infinite amount of anti-masses), which are moving at different speeds (depending on the size of anti-masses), in the space of anti-gravitons in the chaotic motion (that is, in anti-gravitational field).

## **Hypothesis 2**

### **About the Existence of Annihilation of Energy and of Anti-energy**

The emitted energy during the mass and anti-mass annihilation is the orientated motion of gravitons and the orientated motion of anti-gravitons.

In nature, there must be a reverse process of mass and anti-mass annihilation, that is, should be the annihilation of energy and anti-energy, as a result of which the mass and the anti-mass appears. The annihilation of energy and anti-energy, means, that the energy (that is, the gravitons in the orientated motion), interacts with the anti-energy (that is, anti-gravitons in the orientated motion), is transformed into the mass (that is, the gravitons in the state of rest) and the anti-mass (that is, the anti-gravitons in the state of rest).

16. **Annihilation of Energy and Anti-Energy** – is the cease orientated motion of the gravitons and anti-gravitons, as a result of which, there appears the mass (that is the gravitons in the state of rest) and anti-mass (that is the anti-gravitons in the state of rest).

17. **Mass – is Energy in the State of Rest.** The mass is a conglomerate of gravitons in the state of rest. In certain conditions, for example, at the annihilation of mass and anti-mass, the mass transforms into energy, that is, into orientated motion of gravitons.

18. **Anti-Mass – is Anti-Energy in the State of Rest.** The anti-mass is a conglomerate of anti-gravitons in the state of rest. In certain conditions, for example, at the annihilation of mass and anti-mass, the anti-mass transforms into anti-energy, that is, into orientated motion of anti-gravitons.

19. **Energy – is the Mass in Orientated Motion.** The energy - is the gravitons in orientated motion. In certain conditions, gravitons in orientated motion lose their energy and converts back into mass (the hypothesis of the energy and anti-energy annihilation).

20. **Anti-Energy - is the Anti-Mass in Orientated Motion.** The anti-energy - is the anti-gravitons in orientated motion. In certain conditions, the anti-gravitons in orientated motion lose their anti-energy and converts back into anti-mass (the hypothesis of the energy and anti-energy annihilation).

### **Hypothesis 3**

#### **About the Existence of Deportation of Mass and Anti-mass**

From the reality of the mass and anti-mass annihilation, follows the reality of existence of energy and anti-energy annihilation.

In certain conditions, mass and anti-mass (that is, gravitons and anti-gravitons in the state of rest) transforms into energy and anti-energy (that is, into orientated motion of gravitons and orientated motion of anti-gravitons).

In certain conditions, energy and anti-energy (that is, the orientated motion of gravitons and anti-gravitons) transforms into mass and anti-mass (that is, in gravitons and anti-gravitons in the state of rest).

The transformation of the mass and anti-mass in energy and anti-energy in one place of the space and the further conversion of the energy and anti-energy in the mass and anti-mass in another place of the space is referred to as “deportation of mass and anti-mass” in the space.

21. **Deportation of Mass and Anti-Mass in the Space** - is the annihilation of the mass and anti-mass in energy and anti-energy in one place of the space and the further annihilation of the energy and anti-energy in the mass and anti-mass in another place of the space.



## 18. Conclusions

1. The Beginning of the Beginning is the gravitational field. It is formed by gravitons in a chaotic movement.
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, which gave the mass their kinetic energy of motion.
4. Gravitational field exists independently of mass. The mass, created by gravitational field, exists independently of the gravitational field.
5. Gravitational field is the medium of propagation of electromagnetic fields.
6. Gravitational field is homogeneous in the space, where there are no masses (i.e. the masses are at very great distance in comparison with their size). The potential energy of the homogeneous gravitational field is equal to zero.
7. The amount of thermal energy of mass, received from the gravitational field at the mass penetration ( $E - E_m^*$ ), is directly proportional to the mass. At a certain amount of mass, the frequency of maximum of radiation of thermal energy emitted by the mass coincides with frequencies of electromagnetic field perceived by human eye. Such masses are named **stars**.
8. Mass, greater critical mass, emitting in the gravitational field the thermal energy with the frequency of the maximum of radiation of thermal energy in the region of frequencies lower than the frequencies of the electromagnetic field perceived by human eye, is named "**Black Hole of Mass**".
9. Potential energy of the gravitational field inside the mass, at the distance  $r$  from the center of mass, is directly proportional to the mass  $m_r$  included inside the sphere of radius  $r$  and inversely proportional to the radius  $r$ . The mass, which is not included inside the sphere of radius  $r$ , does not distort the gravitational field inside sphere of radius  $r$ .
10. Inside the hollow body the gravitational field is homogeneous (undistorted by the mass of hollow body). The potential energy of the gravitational field inside the hollow body is equal to zero.

11. The energy of the gravitational field inside the hollow body is equal to the arithmetic average between the energy of gravitational field, which enters and which emerges from the hollow body.
12. At any point inside the mass, the sum of the potential energy  $E_p$  of the gravitational field (distorted by the mass) and of 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. This constant is referred to as „**Constant of Mass**“ in the gravitational field:  $E - E_m^* = E_p + E_t = \text{const}$ . Potential energy of the gravitational field  $E_p$  **compresses** the mass towards its center. Thermal energy of the mass  $E_t$  (received from the gravitational field at the mass penetration) **heats** the mass.
13. The constant value of the sum between the potential and thermal energy at any point within the mass is named the "**Law of Constant Sum**".
14. **The masses are not attracted to each other.** The potential energies of the gravitational field (distorted by masses) compress the masses. The compression of the masses by the gravitational field (distorted by masses) is named "**Universal Compression of Masses**".  
  
**Universal Compression of Masses by Gravitational Field** (distorted by masses) is the first fundamental law of Physics ZMV.
15. The thermal energy of the mass (received from the gravitational field at the mass penetration) **heats** the mass. This phenomenon is named "**Heating of Mass**" by gravitational field.  
  
**Heating of Mass by Gravitational Field** (during its penetration through the mass) is the second fundamental law of Physics ZMV.
16. That part of gravitons, which gave up their energy to the mass ( $E - E_m^*$ ) and contributed to the creation of the **potential** energy  $E_p$  of the gravitational field and the **thermal** energy of mass  $E_t$ , remains in the mass and **increases** the amount of the mass. This phenomenon is named „**Growth of Mass**“ by the gravitational field.  
  
**Growth of Mass by Gravitational Field** (during its penetration through the mass) is the third fundamental law of Physics ZMV.
17. The mass, which received initial kinetic energy  $E_v$ , further is moving by gravitational field (distorted by the mass and by the initial kinetic energy of the mass), with energy of inertia  $E_i$ , equal (in value and direction) with the initial kinetic energy  $E_v$ . This phenomenon is named "**Motion of Mass by Inertia**".

**Motion of Mass by Inertia Energy of Gravitational Field** (distorted by the mass and by initial kinetic energy of mass) is the fourth fundamental law of Physics ZMV.

The mass cannot move by **inertia** faster, than the maximum speed, which corresponds to the given mass.

18. The mass that has received a rectilinear and rotation motion (the axis of rotation is perpendicular to the vector of rectilinear speed) changes the volume of the parts of mass, synchronously to the rotation motion. This phenomenon is named "**Flux and Reflux of Mass**".

**Flux and Reflux of Mass** (which appears due to the inertia energy of gravitational field) is the fifth fundamental law of Physics ZMV.

19. The mass is not a function of its speed. The inertia energy of the gravitational field depends on the speed of mass.
20. If the speed of the mass is less than the maximum inertia speed for the given mass, then inertia energy of gravitational field for the given mass is directly proportional to the square speed of mass. The mass moves with acceleration directly proportional to the force and inversely proportional to the mass.  $\mathbf{F} = m\mathbf{a}$ , ( $\mathbf{V} \leq \mathbf{V}_{max}$ ).
21. If the speed of the mass is higher, than maximum inertia speed for the given mass, then inertia energy of gravitational field  $E_i$  is a constant value for the given mass. The mass moves with excessive speed  $\mathbf{V}_{ex}$  directly proportional to the force and inversely proportional to the mass, without acceleration.  $\mathbf{F} = z m \mathbf{V}_{ex}$ , ( $\mathbf{V} \geq \mathbf{V}_{max}$ ).
22. If the force  $\mathbf{F}$  that created the motion with excessive speed becomes equal to zero ( $\mathbf{F} = 0$ ), then the excessive speed is also equal to zero ( $\mathbf{V}_{ex} = 0$ ), and the speed of motion  $\mathbf{V}$  is equal to the maximum speed for the given mass ( $\mathbf{V} = \mathbf{V}_{max}$ ) and the mass continues the motion with the maximum speed for its mass, due to the inertia energy of the gravitational field.
23. In the space without gravitational field the mass moves at a speed directly proportional to the force and inversely proportional to the mass:  $\mathbf{F} = z m \mathbf{V}$ . The space without gravitational field is named "**Black hole of gravitational field**" or "**Darkness**".

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