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HOW TO DECLARE THE FUNCTION OF A UNIVERSE

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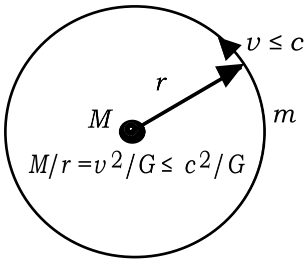
In the year 1666 Isaac Newton discovered the law of gravitation, in 1900 Max Planck found that light is quantized electromagnetic radiation, in 1905 Albert Einstein published the equation $E = m\,c^2$, in 1913 Niels Bohr found out, that the light quants have a spin and in 1929 Edwin Hubble published the most important evidences that the Universe is expanding with accelerating velocity. The function of a universe is explicit declared in this article with help of a natural constant c^2/G and the important inventions mentioned above.

The limit value of the mass potential is a natural constant



A figure for explanation the limit value c^2/G.

When a very thin mass ring is rotating around a central star at distant r we find a state of equilibrium of forces $GMm/r^2 = m\,v^2/r$, where G is the gravitational constant, M the mass of a central star, m the apparent mass of a very thin mass ring , depend to its peripheral speed v and r the radius of the orbit of the rotating mass ring. With help of this state of equilibrium we can find $M/r = v^2/G \leq c^2/G \approx 1{,}3468 \cdot 10^{+27}$ kg/m. It is valid also in the form $\mathrm{d}m/\mathrm{d}r \leq c^2/G$, where $c \approx 299\,792\,456{,}2$ m/s and $G \approx 6{,}6732 \cdot 10^{-11} \mathrm{m^3/(kg \cdot s^2)}$.

The quantity $c^2/G \approx 1{,}3468 \cdot 10^{+27}$ kg/m is a natural constant, it is the limit value of the mass potential M/r . It is very important because it is independent of time and also therefore that we can use it in format $M/r \leq c^2/G$ and in format $\mathrm{d}m/\mathrm{d}r \leq c^2/G$. It means from astronomical calculations to calculations of the quantum electrodynamics or the QED calculations.

The apparent mass of a moving particle and the limit value of the force

The famous equation of Einstein is $E = m\,c^2$. From it follows $m = E/c^2$, where m is the apparent mass of the energy E . The square of the speed of light comes from an equation of James Clerk Maxwell, $c^2 = 1/(\varepsilon_0\,\mu_0)$, in which $\varepsilon_0 \approx 8{,}854187924 \cdot 10^{-12}$ As/(Vm) is the permittivity of a vacuum and $\mu_0 \approx 1{,}256643706 \cdot 10^{-06}$ Vs/(Am) the permeability of a vacuum . Both are important and well known natural constants.

It is possible to present the Einstein´s equation also in the following forms $m = E\,\varepsilon_0\,\mu_0$ and $\mathrm{d}m = \mathrm{d}E\,\varepsilon_0\,\mu_0$. From this follows $\mathrm{d}m/\mathrm{d}r = \varepsilon_0\,\mu_0 \mathrm{d}E/\mathrm{d}r \leq c^2/G$ and from this $\mathrm{d}E/\mathrm{d}r \leq c^2/(\varepsilon_0\,\mu_0 G) = c^4/G$. The quantity $\mathrm{d}E/\mathrm{d}r = c^4/G$ describes the limit value of the force $F_{\mathrm{lim}} \leq c^4/G \approx 1{,}210 \cdot 10^{+44}$ N, which is allowed by the nature. It is a natural constant, because it depends only on two natural constants, the biggest speed of light c and the gravitational constant G.

The acceleration of the gravity and the acceleration ability of a photon
We can find the acceleration of a gravitational field from equation $a_g = MG/r^2$. It is easy to believe that the acceleration a_g increases to infinity if the radius r approach limitless to zero. Probably this belief is the reason that the existence of the "black holes" is widely accepted, but this belief is totally wrong. If we substitute in the equation $a_g = MG/r^2$, $M = r\,v^2/G$, we find the limit value for the acceleration of the gravity field from equation $a_{glim} = v^2/r \leq c^2/r$, where the quantity c^2/r describes the electromagnetic acceleration ability of a photon, which always vins the gravitational acceleration MG/r^2, if the acceleration ability of a photon $f\,c$ is more than enough to win MG/r^2 , therefore in this case holds $c^2/r \leq c^2/\lambda = f\,c \geq MG/r^2$, where λ is the wavelength of a photon.

Planck´s constant is a product of its electric part and its magnetic part
Einstein published his famous formula in 1905, but earlier, in 1900 Max Planck declared that light is formed of photons. The energy of a photon comes from the equation $E = h\,f$, where $h \approx 6{,}626196 * 10^{-34}$ AsVs is the Planck´s constant and f the frequency of the photon as above. The unit of frequency is Hz or Hertz. Its dimension is 1/s. Also the spinning frequency n is measured by Hz. The dimension AsVs of the Planck´s constant means that a photon has two parts. The dimension As is for the electric flux Ψ , and Vs for the magnetic flux Φ .

If a photon is moving in a vacuum, we find the following equations for the apparent mass for this photon, $m = h\,f\,\varepsilon_0\,\mu_0 = \Psi\Phi\,f\,\varepsilon_0\,\mu_0$, which means that the photon will explode if its frequency f becomes too big.

The spin of a photon
Niels Bohr found out in 1913 , that the light quants or the photons have a spin $L_f = h/(2\pi)$, or an ability to rotate. Therefore we can write $L_f = h/(2\pi) = \omega J_f$, where J_f is the moment of inertia of a photon and $\omega = 2\pi n = 2\pi f$ the electric angular speed of the fluxes of a photon. With the help of a photon´s spin we can find the energy coupled to a photon´s spin from the following equations

$$E_{fs} = \tfrac{1}{2}\omega^2 J_f = \pi\,n\,L_f = \tfrac{1}{2}h n = \tfrac{1}{2}\Psi\Phi n = \tfrac{1}{2}\Psi\Phi f$$

We can see from these equations that the photon´s spin captures exactly one half of a photon´s total energy. The photon´s spin is an important natural constant. It is combined of electricity and magnetism. It is also independent, of the speed of light, which increases its importance.

If a photon is in a polarized electromagnetic state it does not spin. In this case we can use the following vector format to describe the Planck´s constant $\boldsymbol{h} = \boldsymbol{\Psi} \times \boldsymbol{\Phi}$. This format means that the described photon "attempts" to transport its energy toward the spectator. At this polarized electromagnetic state the photon has an important ability to start to spin around its propagation axis in either direction. But this spinning movement cancels the both fluxes of the photon and it goes into a spinning state, in which it is a neutral mass particle.

A photon propagates always at light speed
The total apparent mass of a photon travels at speed of light $v = \pm 1/(\varepsilon\,\mu)^{1/2}$, where ε is the permittivity of the medium in which the photon is traveling and

μ is the permeability of this medium. The energy coupled to a photon´s speed comes from the following equations

$$E_{fv} = \frac{1}{2} hn = \frac{1}{2} hf = \frac{1}{2} mv^2 \leq \frac{1}{2} mc^2 = E_{fc}$$

The speed of light is a medium depending property, therefore the photons are always moving at the speed of light to all directions. A vacuum is that kind of medium in which the photons are moving to all directions at the greatest speed. But the speed of a photon is not independent compared to Planck´s constant because the speed of light always depends of the property of the medium in which a photon is moving. Albert Einstein gave a too large importance to the greatest speed of light , c , and forgot the status of Planck´s constant and the status of the photon´s spin, $h/(2\pi)$.
Einstein himself told that he never found out what are the photons. Even to day the ”unknown photon” causes difficulties for physics and cosmology.

The limit value of the mass loss
At the points in which the mass potential has its limit value $\mathrm{d}m/\mathrm{d}r = c^2/G$ holds. From this we get $\mathrm{d}m = \mathrm{d}r\, c^2/G$, dividing its both sides by $\mathrm{d}t$ we find the following line of equations $\mathrm{d}m/\mathrm{d}t = (\mathrm{d}r/\mathrm{d}t)c^2/G = v_r\, c^2/G \leq c^3/G \approx 4{,}0376 \cdot 10^{+35}$ kg/s, where $\mathrm{d}r/\mathrm{d}t = v_r$ is the speed of a very little mass particle in direction which is orthogonal to its peripheral speed v . For example, if the radius of a rotating star begins to decrease and the mass derivative $\mathrm{d}m/\mathrm{d}t$ reaches its limit value c^3/G the star must explode. It sends at beginning gamma waves which goes at first against a very strong gravitational field, therefore the gamma waves weaken in the following order: at next into the Röntgen waves, to ultra violet waves, to visible light, from these to infra red waves and at last into very long radio waves.

The unit of Hubble´s constant is Hz
The dimension of Hubble´s constant is 1/time or 1/s therefore we can use Hz for describing the value of Hubble´s constant H. For this reason it is possible to understand that the following equations describes the limit value of the mass loss of a universe $(\mathrm{d}m/\mathrm{d}t)_{\mathrm{lim}} = MH = c^3/G \approx \pm 4{,}0376 \cdot 10^{+35}$ kg/s.

This mass loss is created when all the stars and all other radiation sources together transforms the matter into the energy of electromagnetic radiation. It is very cold on the ”outer border” of the universe, therefore the frequency of Hubble`s radiation constant $f = H$ is so small that its ”acceleration ability” Hc and the gravitational acceleration are in an equilibrium. Therefore the equation $Hc = GM/r^2$ holds, where r is the apparent radius of the universe. But the mass of the universe M is so big that the equation $MH = c^3/G$ holds too.

The inverse $1/H$ can be a very long time. For our universe it is circa $13{,}5 \cdot 10^{+9}$ years. It is not ”the age of our universe”, but explicit: the inverse of an important constant that describes a state of an equilibrium of a universe . The result $MH = c^3/G$ means that it is possible that ”our universe” is not the single one, but only a possible one, among in a large number of the universes.

A graviton may be generated by colliding of two photons
The gravitational field can force the very weak ”up going photons”, to reflect ”down” from the universe´s very cold ”outer surface”. Therefore it is possible that there exists collisions between ”up going” and ”down coming” photons.

A graviton may be created, if at those collisions the momentum-values, $m_f c$, of colliding photons nullify each other, but the spin-values $h/(2\pi)$ strengthen each other. This is possible, if all the following equations hold: $E_g = 2E_f = 2hn_f = hn_g = mc^2$, $n_g=2n_f$ and $L_g = h/\pi = \Psi\Phi/\pi = 2L_f$ and $E_g = n_g h = 2n_f\Psi\Phi = mc^2$, where the subscript f refers to the colliding photons and the subscript g to the created graviton. After the birth of a graviton the following equations must hold too: $\boldsymbol{\Psi}_g=\boldsymbol{\Psi}_{f1}+\boldsymbol{\Psi}_{f2}$ and $\boldsymbol{\Phi}_g = \boldsymbol{\Phi}_{f1}+\boldsymbol{\Phi}_{f2}$. From this follows that the numerical values stays at the constant value: $\Psi_g\Phi_g = \Psi_{f1}\Phi_{f1} = \Psi_{f2}\Phi_{f2} = h$. This is possible, because all those fluxes of the colliding photons are vector quantities.

The weakest graviton can obviously start to rotate at the spinning frequency $n_g = 2n_f$ and at the speed light c around the universe, therefore we can use the same very thin mass ring , as above, for describing the new created graviton. It is also obviously that a graviton may be created at several places inside the universe by collisions between the photons. Ref. [2].

The radius r of the weakest graviton cannot grow because the gravitational field blocks it. But this radius can decrease. In this case the graviton must take energy from the gravitational field and its energy starts to increase. But the spin of a graviton is a natural constant. Therefore we find the equation $L_g = E_g/(n_g\pi)$, which means that if the graviton´s energy, E_g increases, its spinning frequency n_g must increase too, and at same time the graviton´s size must decrease. Therefore at finally the graviton must explode into two photons or different mass particles, for example into hydrogen atoms, the fuel of the stars.

The limit value of the power

If we multiply the limit value of the mass loss c^3/G by c^2 we get the limit value of power $P_{lim} = c^5/G \approx 3{,}6288*10^{+52}$ W $= h\,(f_{lim})^2$, where f_{lim} is the limit value of the photon´s frequency f. $P_{lim} = c^5/G$ is the biggest power by which the universe can transform mass to electromagnetic radiation energy. P_{lim} and f_{lim} are natural constant and the results of cooperation of light and gravity.

Obviously there can exist a state of an automatic equilibrium in a universe if the power flow of the ”up going” photons and the power flow of the ”sinking” gravitons are in balance. If the flow of the ”sinking” gravitons is too small, the temperature of the universe starts to drop down, but in this case the flow of the ”sinking” gravitons starts soon to increase. This means that the fuel flow for the starts to increase too. From this follows that the temperature of the universe begins automatically to increase toward a state of the equilibrium. The force, needed to expand the universe is the same as above $F_{lim} = c^4/G$.

The limit values of the photon´s frequency and its wavelength

The limit value of the photon´s frequency is $f_{lim} = [c^5/(Gh)]^{0,5} \approx 7{,}400*10^{+42}$ Hz. The corresponding wavelength is $\lambda_{lim} \approx 4{,}051*10^{-35}$ m $= 4{,}051*10^{-23}$ pm. The energy of the corresponding photon is $E_{lim} \approx 1362$ kWh. The human eye is most sensitive for the photons at the wavelength 555 nm = 555000 pm. Therefore the wavelength $\lambda_{lim} \approx 4*10^{-23}$ pm is probably so short that it is impossible to create with any equipment built by men.

For example the spinning frequency of a graviton, needed to create by splitting two protons and two electrons, or the building blocks for two hydrogen atoms, is circca $4{,}54*10^{+23}$ Hz only. This splitting graviton or the ”conjugated graviton” may be created by collision of two photons, which are spinning at least by $2{,}27*10^{+23}$ Hz . This is very small compared to the $f_{\text{lim}} = 7{,}400*10^{+42}$ Hz or the frequency of the most powerful photon and the most powerful graviton.

Hopefully, this comparison of the frequencies shows to all the readers, that the gravitons can by splitting create all the small parts of the atoms, which can exist on the planet Earth. The Universe has for this very much time and power.

References

[1] www.osmohassi.net
[2] Hassi, O. : Mikä on gravitoni , (What is a graviton), Sähkö & Tele(2008)1, pp. 63...66.