Principle of a golden section: physical aspect

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People follow a nature, the nature follows natural
To the laws, natural laws follow a conservation law,
the conservation law follows own essence.

Lao-tzi

1. *A golden section in a nature and engineering*

In mathematics a golden section (harmonious division, division of a segment in the extreme and mean ratio) is a division of segment *AB* into two parts in such a manner that its big part *AC* is mean proportional between all segment and its smaller part *CB* [1]. Proportion *AB:AC= AC:CB* can be written down differently: *AB:AC= AC:(AB-AC)*. Then the solution of this equation will be ratio *AC/AB=0.5* (√5-1) =0.618., designated as constant *Φ* it sometimes name number Фидия). Number *Φ* may be approximately expressed by fractions 2/3=0.6666, 3/5=0.6, 5/8=0.625, 8/13=0.615, 13/21=0/619…, where 2, 3, 5, 8, 13, 21,… - numbers the Fibonacci.

On fig. 1 the known reception of the harmonic division of segment *Ob* is figured: from point *O* perpendicular *Oa=0.5Ob* is raised, and from a point *a* radius *Oa* drown an arc *y1*, traversing direct *ab* in a point *c*. The segment *cb=Ob· Φ* will be a unknown quantity, and the arc *y4* radius *cb* in a point *d* itscrosses with an arc *y3* radius *Ob* forms a chord *y8*, equal *db* and being the side of the entered decagon which ratio to a circumradius is equal *Φ*.

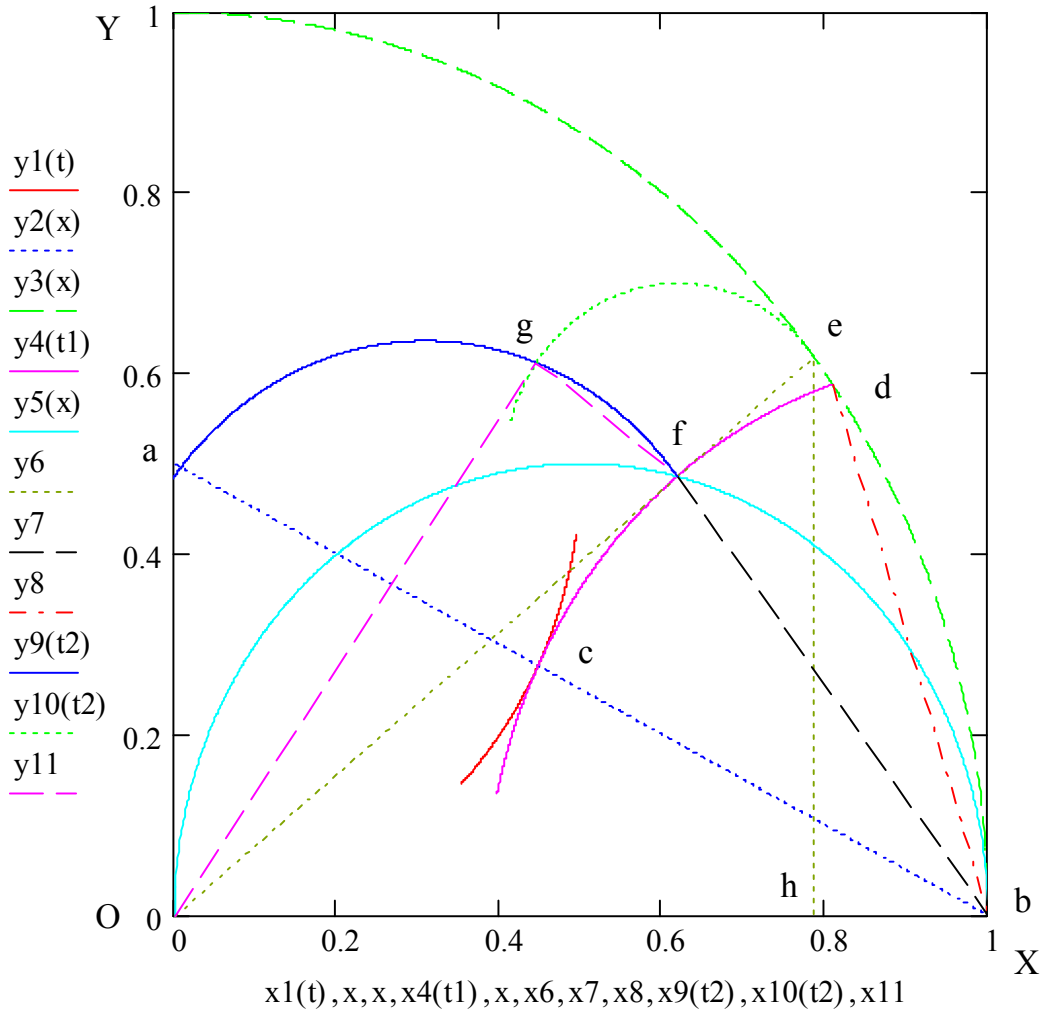

Fig. 1 Scheme of harmonious division of a segment

Let's execute additional constructions: the straight line *y6* will be tangent (to)Arches *y4* in a point *f*, forming with radius *y7*, equal *fb*, a right angle; from a point *e* its crossings with an arch *y3* the perpendicular *eh* is drop; through a point *f* it is to draw the half-round *y5*, basing for diameter *Ob*. As triangles *Ofb* and *Oeh* are equal, we shall receive the following equality: $cb=fb=db=eh=Ob\cdot\Phi$.

Division of a segment can be prolonged in both sides. To find segments of a golden proportion of a uprising and descending series, use a pentagram. On fig. 2 the exact entered pentagon which diagonals form a five-pointed star is figured. Then, for example, the basis *b1b2* a triangle *bb1b2* divides its side *bb2* in

proportion Φ.

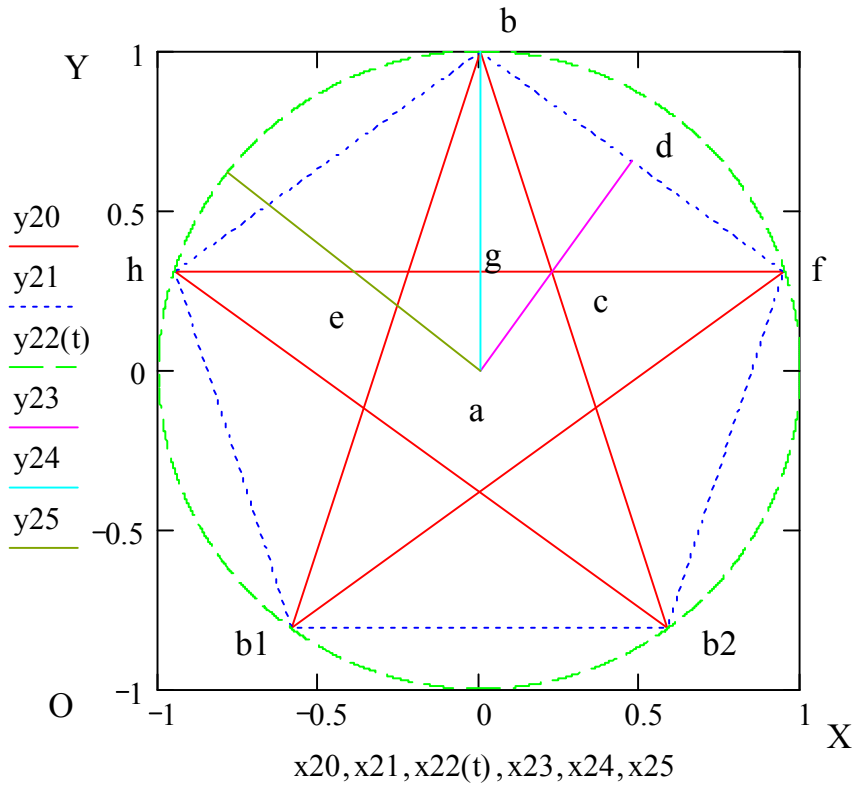

Fig. 2 Pentagram

The principle of a golden section is known from an extreme antiquity [2], it was applied by architects and sculptors to what testify found at excavation, and also tools figured on ancient lists, for example, the Egyptian and antique scaling compasses. Undoubtedly, it testifies to borrowing shapes from world around, following to natural samples. For example, spiroid a web and shells, combs of seeds in a basket of a sunflower and a sand buckle of pine cones, molecules of a DNA and leaves on branches of trees. Golden section it is exhibited in proportions of a human body, in space systems and genic structures. On fig. 3 parametric representation of a shell of a snail is given. Affirms [3], that stationary value Φ is discovered in all structures of the organization of an alive and lifeless nature, and

relate it to statistical equilibrium of system.

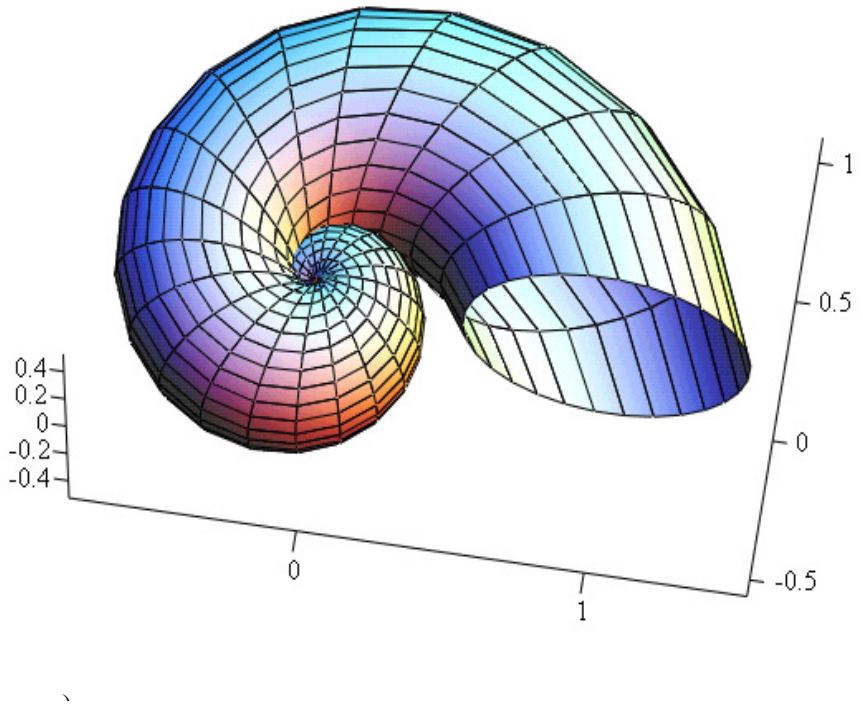

Fig. 3 Parametric representation of shell Nautilus

2. *A golden section in the world of elementary particles*

Here we shall put forward the assumption, that the harmonious proportionality observably in numerous objects of wildlife, has an original cause the appropriate structure of elementary particles. Above on fig. 1 the plane in geometrical sense was examined. Meaning, that microobjects have own length of a wave which size is opposite their energy, it is possible to replace dimension of the sizes determining coordinate system. Let now dimension on axes will be energy.

Let's take as an example reaction $\pi \rightarrow \mu + \nu$ decay of a pion π (pi-

meson) with energy $E_\pi = 139.56995$ MeV on a muon μ (mu-lepton) with energy $E_\mu = 105.658389$ MeV and neutrino ν with energy $E_\nu = 0.5 \cdot E_\pi^{-1}\left(E_\pi^{2} - E_\mu^{2}\right) = 29.792$ MeV [4], having accepted concept Larmor-Lorentz-Poincare [5]. Our hypothesis [6] about what it is more in detail stated in section 3, is, that energy of a particle is made in the fields peculiar to electromagnetic and strong interactions. Let $Oe = E_\pi$, and eh and Oh there are strong and electromagnetic components of a vector with the module E_π, its projections to axes of coordinates OY and OX. If to designate through φ a corner eOh from triangle Oeh we shall receive, that $sin(\varphi) = \Phi$, and, as $\Phi + \Phi^{2} = 1$, $cos(\varphi) = \sqrt{\Phi}$.

Quantity of a segment $Of = E_\pi \cdot \sqrt{\Phi} = 109.723$ MeV, that is close to value of the experimental quantity of energy of a particle $\pi\mu$, generatored right after separating of a neutrino and which take for a muon possessing a momentum, equal $E_\nu : E_{\pi\mu} = E_\pi - E_\nu = 0.5 \cdot E_\pi^{-1}\left(E_\pi^{2} + E_\mu^{2}\right) = 109.778$

$E_{\pi\mu} = E_\pi - E_\nu = 0.5 \cdot E_\pi^{-1}\left(E_\pi^{2} + E_\mu^{2}\right) = 109.778$ MeV. Segment ef then take for energy of a neutrino, and settlement energy of a muon will be equal $Og = \sqrt{Of^{2} - \left(E_\pi - Of\right)^{2}} = E_\pi \cdot \sqrt{2\sqrt{\Phi} - 1} = 105.586$ MeV, corresponding to the experimental quantity with a relative accuracy $7 \cdot 10^{-4}$. Really, the point g is blanket for a circle $y10$ with radius $fe = fg$ and half-rounds $y9$ with a diameter Of, fg there is an energy diffused by a particle $\pi\mu$ during inhibiting action, and

Og (direct *y11*) then there is a required energy of a muon.

On fig. 1 the ways of transformations of particles following are looked through: a way *efgO* decay of a pion on neutrino and muon; way *Ofe* of transformation of a particle $\pi\mu$ in a pion through absorption of relativistic kinetic energy *fe*; way *Ofb* of transformation of a particle $\pi\mu$ in a pion due to getting of a momentum $fb = E_\pi \cdot \Phi$.

Conclusion. Energy $E_\pi \cdot \Phi$ is a golden section of energy of a pion; it is equal to length of the side of the correct ten-square entered in a circle of radius E_π; it is equal to a momentum necessary for transition of a particle $\pi\mu$ with energy $E_\pi \cdot \sqrt{\Phi}$ on a level with energy E_π; it is equal electromagnetic a component of a particle $\pi\mu$; it is strong a component of energy of the pion having a phase $\varphi = acos\left(\sqrt{\Phi}\right) = acos\left(\sqrt{2 \cdot sin\left(0.1 \cdot \pi\right)}\right)$. Provided that the mass of muon is equal $E_\mu = E_\pi \cdot \sqrt{2\sqrt{\Phi} - 1} = 105.586\ MeV$.

On fig. 4 the scheme of decay of a pion and the logarithmic spiral appropriate to it is represented. In comparison with fig. 1 auxiliary lines here are removed, mutually perpendicular straight linees *bf* and *Oe* are continued, and also added broken *(y21)* and logarithmic *(y22)* spirals. The equation of a broken spiral looks like:

$$x21_i := \Phi - \Phi^{0.5(i+1)}\left(cos\left(0.5\pi \cdot i\right) \cdot \sqrt{\Phi} + sin\left(0.5\pi \cdot i\right)\right),$$

$$y21_i := \Phi^{1.5} + \Phi^{0.5(i+1)}\left(cos\left(0.5\pi \cdot i\right) - sin\left(0.5\pi \cdot i\right) \cdot \sqrt{\Phi}\right)$$

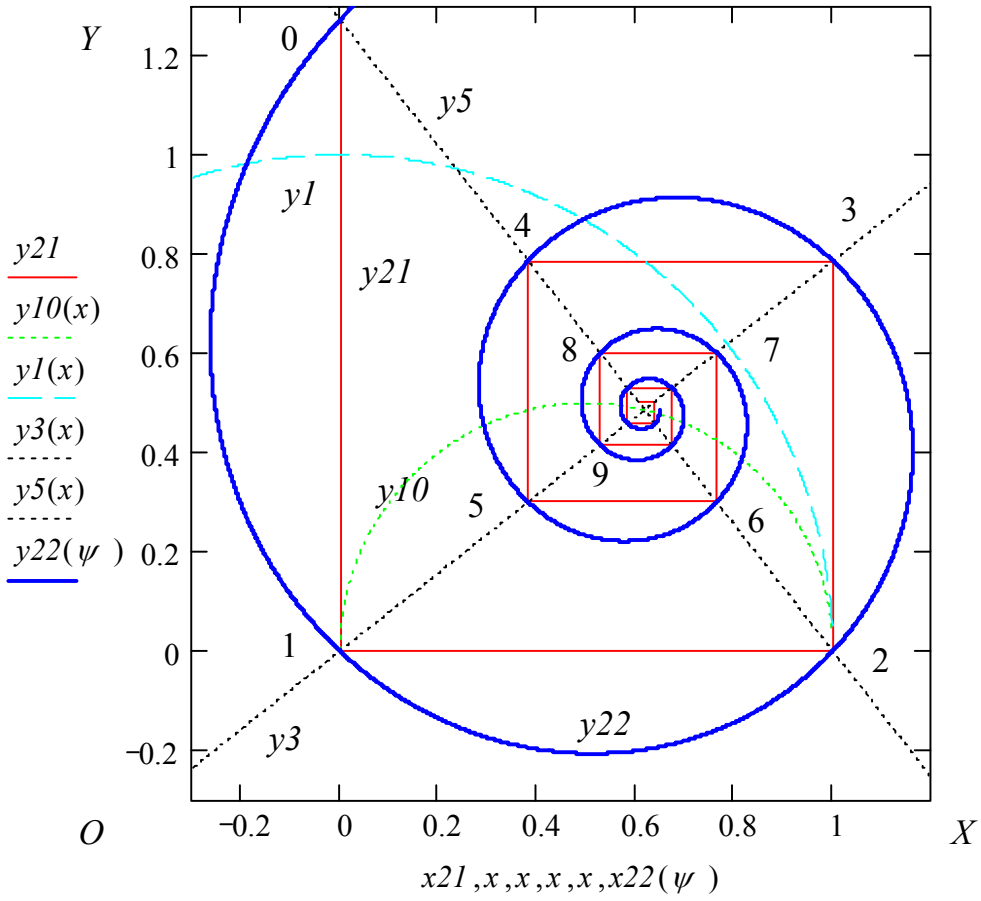

Fig. 4 Scheme of decay of a pion .

Apparently, as parameter of the given system the corner 0.5π serves, the integer i varies from 0 up to 16, and as gauge half-integer degrees of number Φ serve. It is easy to notice, that the logarithmic spiral passes through all points of crisis which are central for reaction of decay of a pion, its transformations in muon. The equation of a logarithmic spiral in our case and in polar coordinates looks like:

$$r(\psi) := \Phi^{\frac{\psi - \varphi_6 - 0.5\pi}{\pi}}.$$

Here ψ - the current value of a corner, and φ - its initial value. As the rectangular system of the coordinates is used, the given spiral is set parametrically, and parameter also is chosen corner ψ. Accordingly the system of the equations looks like:

$$x22(\psi) := r(\psi)\cdot cos(\psi) + \Phi \quad ,$$

$$y22(\psi) := r(\psi)\cdot sin(\psi) + \Phi^{1.5} \quad .$$

The solution takes place only at the following coordinates of the centre of a spiral: $x=\Phi$, $y= \Phi^{1.5}$, that is at earlier certain initial phase of a pion φ . Precisely construction of a shell on fig. 3 where the system of the equations with scale factor Φ is used also is executed:

$$R(\phi) := 1\cdot\Phi^{\frac{\phi}{1.5}}, \quad r(\phi) := 0.5\cdot\Phi^{\frac{\phi}{4}},$$

$$x_{i,j} := \left(R(\phi_i) + r(\phi_i)\cdot cos(\psi_j)\right)\cdot cos(\phi_i),$$

$$y_{i,j} := \left(R(\phi_i) + r(\phi_i)\cdot cos(\psi_j)\right)\cdot sin(\phi_i),$$

$$z_{i,j} := r(\phi_i)\cdot sin(\psi_j) \quad .$$

3. *The vector model of an electron*

According to concept Larmor-Lorentz-Poincare, it is necessary to admit existence of other forces, besides electromagnetic to counterbalance maxwell's a pressure between components electron subparticles. Accelerated deformable electron it is subject to constant negative external pressure which work is proportional to change of its volume. The electromagnetic mass of electron is increased with speed, and, means, has extremely electrodynamic origin. Similar action show movement and on all other electrons mass , determined by its other fields. So the understood inert mass is factor of dependence of acceleration from force and over it there is no real or material mass which should be excluded, and gravitational energy can be offered.

The model submitted below electron assumes coexistence in it of the fields peculiar to electromagnetic and strong interactions. Thus, here affirms, that equality of counteraction to action can be distributed for limits of area of the mechanics, and

interaction forces always are dissimilar.

Annihilation pairs a electron-positron or proton-antiproton in a pair of photons it is convertible, that is represents not transformation, and reform of particles by rearrangement of subparticles. Therefore the wave properties of particles determined by a kind of interaction of subparticles, are kept. First of all it concerns to equivalence energies E_0 and lengths of waves λ_0 not excited electron and a photon, equally categorized to massless to field objects. Both they have momentum P of field $P = E/c$, speed of light c subparticles (forward or rotary), and charges determining field.

When electron goes rectilinearly with speed v, orbital speed of subparticles will be equal u, whereas full speed of their movement (in this case on a screw line) is always equal c, and the projection of a trajectory to a plane, perpendicular to a direction of movement, will look like a circle.

Having multiplied all members of the equation $c^2 = u^2 + v^2$ on P^2/c^2, we shall receive $P^2 = P_u^2 + P_v^2$, where $P_u = P\,u/c$ and $P_v = P\,v/c$ - mutually orthogonal projections of full momentum $P = E/c$, and E - energy electron at speed v. From a condition of conservation of an orbital momentum we shall find its size P_{u0} in a case $v = 0$: $u = c$, $E = E_0$, $P = E_0 / c = P_0$, $P_{u0} = P_0 = P_u$. Hence, generally we shall receive known relativistic expression for energy of electron: $P = (P_0^2 + P^2 v^2 / c^2)^{1/2} = P_0/\beta$, $E = Pc = E_0/\beta = [E_0^2 + (P v)^2]^{1/2} = (E_0^2 + E_i^2)^{1/2}$, where $\beta = (1 - v^2 / c^2)^{1/2}$, $P v = E_i = E_0 v/\beta c$ - impulse energy.

Let's distribute concept of orthogonality energies E_0 and E_i on immobility electron. Then we shall receive for absolute sizes: $E_0^2 = E_{0e}^2 + E_{0h}^2$ where $E_{0e} = E_0\alpha$ there is an energy electromagnetic fields. From here module E_{0h} to energy of a strong field and argument φ electron will be equal:

$$E_{0h} = E_0 (1 - \alpha^2)^{1/2},$$

φ = arc tg $E_{0h}/E_{0e} = (\alpha^{-2} - 1)^{1/2} \approx$ arc tg 137.

On fig. 5 in plane YOX energies the vector *ab* has module E_0, projections *ad* = E_{0c} and *ae* = E_{0h}. When approach electron and a proton in the closed system, radiation is absent also energy of particles does not change. At approachement under action colomb attractions the sum energies electromagnetic fields decreases, that is accompanied by a gain of energy of a strong field equal on size. At constant length of a vector *ab* it means its turn in position *af*. Reduction of share E_{0e} at growth E_{0h} conducts to reduction of size colomb attractions and to growth

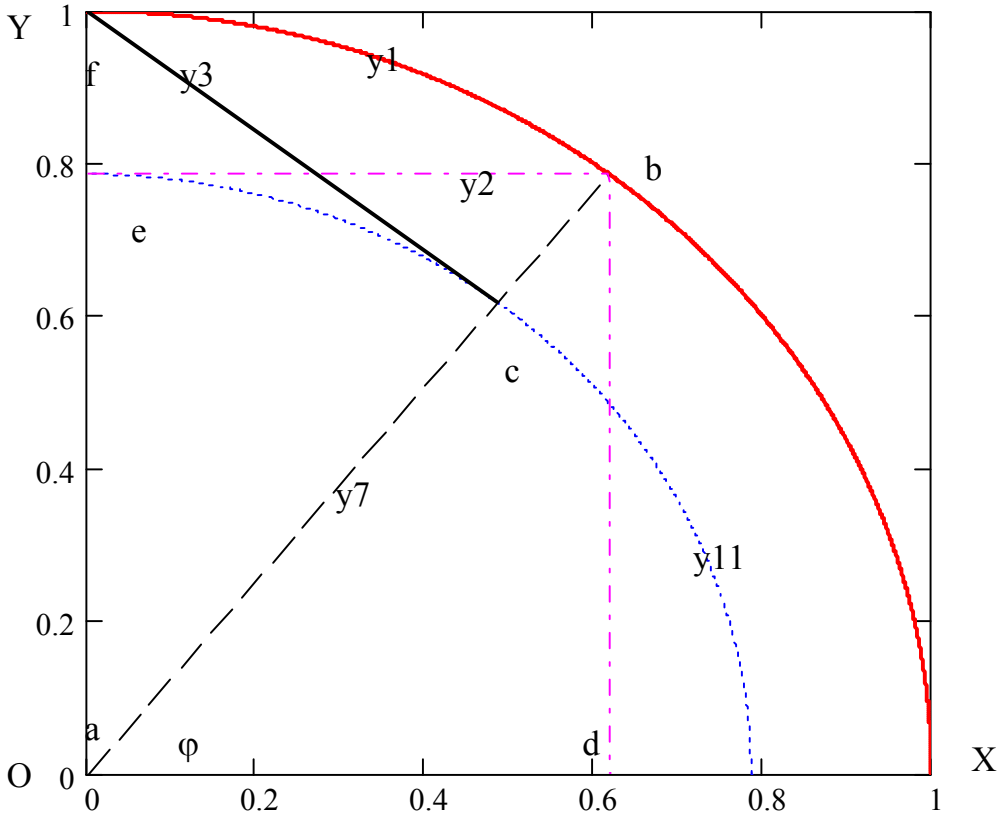

Fig. 5 Vector model electron

repellent force, that is the collision accompanying with bremsstrahlung takes place. Energy radiated a photon is equal $fe = E_0\alpha^2/2$ = 13,6 *эВ*. When process is made at

presence of external influences (for example in plasma), vector *Of* may make fluctuations around of position of balance and then formation electromagnetic waves train is possible. Thus, at ultralow temperatures in single atom of hydrogen electron electroneitral also has energy $ae = E_0 (1-\alpha^2/2)$, and process of ionization of atom is accompanied by addition of impulse energy on lines *eb* or *cf*.

4. *The Conclusion* It is found, that decay's of some elementary particles (a pion, kaon, lambda , sigma, xi, omega) energetically correspond to a principle of a golden section. Thus, from all variety of forms of existence of the elementary power structures the nature selects the steadiest which time of existence is enough for their registration by devices. Such perfection of a ratio of parts and the whole elementary particles matters is projected on those objects of the world environmental us which admit as us samples, be they natural creations or creations of hands and mind of people. The most majestic and known of them, named miracles of world, concern to correspond constructions: to pyramids, temples, beacons, dams.

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