Golden section and elementary particles

A. P. Savrukhin

E-mail: savrukhin@yandex.ru; Site: **http://savrukhin.narod.ru/**

Abstract

According the author's opinion, the reason of micro objects stability can be explained by mutual compensating of forces with different nature. Hence, energy of elementary particles can be expressed as a vector .The vector analysis application draws a conclusion that in reactions of particles decay the energy of the part and the whole are in harmonious proportionality. Thus, the common occurrence of a golden section is a projection, consequence of the processes proceeding in a microcosm.

Harmonious proportionality of the parts and the whole or the golden section (GS) is shown in all observably natural objects and there are many researches devoted to this theme. For example, the detailed review of publications supplied with the list of the literature and the list of the basic sites, is given on a site <http://www.goldenmuseum.com/>. The analysis of the resulted data allows next confident generalization to be made. Namely, attributes of the GS are present at all objects of the descending row: spiral galaxies, harmonious solar system, proportionally combined plants and animals, cells, molecules of heredity and even atoms. Whether it is possible to prolong this row further? Whether elementary particles concern to a class of systems with attributes of the GS?

Let's notice, that each member of this row is not a simple connection of parts, but complex system, whole totality, unity. The atom of hydrogen is produced by connection of an electron with a proton. This act is accompanied by radiation of an elementary particle, a photon that has energy and a momentum, but has no mass. The reverse process of an atom and a photon pair transformation into a pair of an electron plus a proton is known as ionization. Clearly, that the electron and the proton are not contained in atom, they are formed under ionization.

It is known, that only these two basic particles have mass and can be observed in a free condition. Besides, there are about 200 unstable elementary particles. Their lifetime lasts split microsecond and then they decay to other particles, therefore they refer to systems.

The chains of decays always come to an end the basic particles. Thus photons and a neutrino, the massless particles serving as carriers of energy in addition can be born.

Then why the electron does not decay? H. A. Lorentz [1] and A. Poincaré [2] believed, that other forces should counterbalance electric forces tearing it. Its energy consists of two types of fields' energy because it is general property of stability. Namely, action to counteraction equality should be interpreted not pure mechanically, but wider: forces of counteraction should have other nature, rather than action ones. In other words: no static system of forces, fields, charges and so forth, having the relationship, concerning to one kind of interaction, can be balanced or be steady. Then it is necessary to recognize, that energy of a particle is a vector.

The conventional principle says, that it should not be supposed to multiply essence over necessary. Therefore, as components of the energy the author take such well known its types as electromagnetic (EC) and strong (SC) interaction energies. Both these components are present both at an electron, and at a proton. Due to this the stability of atom also is provided: at compression pushing asunder forces (SC) grow faster than drawing up (EC). At other particles this equilibrium has temporary character; it is unstable. We do not know structures of the atoms and the particles because experimenter tool intervention disturbs characteristics of system. Therefore one can receive the information about their properties only indirectly, studying reactions of decays

Later, the reaction of annihilation in which two electrons with opposite charges, the electron and positron, turn to a pair of photons was carried out. Thus, the acknowledgement of H. A. Lorenz's assumption about pure field character of mass has been found. Exception of concept of mass as the substance which is distinct from a field enables to consider only energy characteristics, not applied to the analysis of structure of a particle.

The term *chaos* in ancient Greece designated the undisturbed, absolutely counterbalanced, static, lifeless space. Disorder space, the universe originated from

chaos. Chaos it that is now named physical vacuum, the creator of the things and the prototype of the fields and particles. Thinkers of ancient China spoke about it so:

The chaos	The universe
The natural source is not distinguishable. First principle has no to activity.	The wet nurse of all creatures is rich forms. Daily has of incentive to activity; therefore the appearance of it is visible.

Together name them original principles: the creative beginning of a nature, moreover a source, mediate of the general creator [La-odzi].

It first principle daoists call Dao, that means the supreme absolute, the basic law, the ubiquitous beginning, the general law of movement and change of the world, a source of all phenomena from which all proceeds and to which all comes back. The only thing, eternal, invariable, but is capable to turn out in various forms and to beget all real. The unlimited substance which is incomprehensible by sense organs, outside time and space. "Nonexistence - the gate a nature. All great number of things comes to light from nonexistence. Being is not capable to become being with the help of being, it should comes to light from nonexistence. Nonexistence owns natural nonexistence. A rest, emptiness, indifference, inaction is a basis of great number of things" [Chu-undze]. Heavenly Dao is empty and shapeless. Being empty, it is inexhaustible; being a deprived form, it is unhampered. It is so great, that has no external limit and so it is small that has no limit inside itself [Gu-undze].

From stated follows, that it would be incorrect to apply the concept of a GS on vacuum. It means, that property of harmonious proportionality arises at a stage of birth of particles, and only then is transferred to all things. Therefore it is possible to expect presence of attributes of a GS in decays of particles. We shall anticipate the analysis of such reactions by some expansion of concept of a GS.

On fig. 1 the usual line segment cutting into pieces with a GS is shown. For

this purpose the rectangular triangle Δacd with cathetuses ac=1 and dc=0.5 is under construction. The arch y1 radius dc on a hypotenuse ad makes a notch in a point b, and the arch y3 radius ab=Φ makes a notch in a point h on a piece ac. Here Φ=0.5($\sqrt{5}$-1)=0.618… is named Phydeo number, the GS of radius ac=1 (the sides of the rectilinear inscribed hexagon), the side of the rectilinear inscribed ten-square. This number is a limit of the ratio of two consecutive numbers from Fibonacci row. The piece ah is named with a GS of a piece ac if harmonious proportionality takes place: ah/ac=hc/ah=Φ.

Now we shall present, that the length of a piece dc can change from zero indefinitely. It is found [3-5], that a trajectory of a point b will be a curve of the generalized GS y2=(1-x)$\sqrt{\frac{x}{2-x}}$. Hence, if dc=0.5 the hypotenuse ad shares on pieces so, that bd is equal to a cathetus dc, and ab is equal to a GS of a cathetus ac. If dc=Φ the smaller cathetus dc becomes a GS for a cathetus ac and so on. The curve y2 has remarkable feature: coordinates of a point e a maximum are connected to number Φ. Namely, ag=hc=Φ^2 and eg=$\Phi^{2.5}$. We shall construct new rectangular Δacf so that the hypotenuse af passed through a point e. Then we shall receive: fc=fe=$\sqrt{\hat{O}}$, af=1/$\sqrt{\hat{O}}$ and ae=$\Phi^{1.5}$, and fe/af=ae/fe=Φ. It means, that the cathetus fc is a GS of a hypotenuse af. Itself Δacf concerns to number "golden" as the areas of the squares constructed on its three sides, are in harmonious proportionality: ac2/af2=fc2/ac2=Φ.

One more remarkable property of a curve y2 is that for any Δabk with a right angle in a point b the length of a cathetus bk is equal to length of a piece kc: bk=kc. Hence,

$$ac=\sqrt{ab^2+bk^2}+bk. \qquad (1)$$

Most surprisingly that this equation coincides with the equation of transformation of energy of a particle at its decay on other particle and a neutrino!

To be convinced of it, it is preliminary necessary to recollect some simple physical formulas. We shall enter designations: m - particle mass of rest, p -

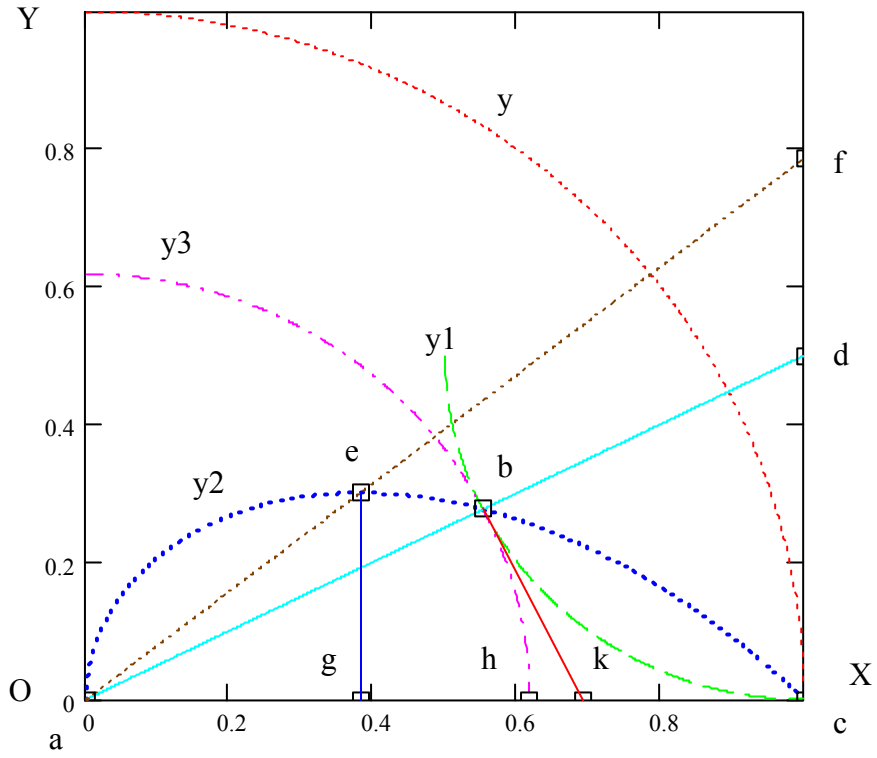

Fig. 1 Generalized golden section

a momentum, E - full energy, T - relativistic kinetic energy. We apply system of units in which the mass and a momentum are expressed in terms of energy MeV.

General energy of a particle is expressed through the sum potential and kinetic энергий or through mass and a momentum

$$E = m + T = \sqrt{m^2 + p^2}\ . \qquad (2)$$

The analysis of decays reactions we shall carry out on an example of the most widespread of pi-meson π (pion) with mass m_π=139.57 MeV, breaking up on a lepton μ (muon) with mass m_μ=105.658 MeV and a neutrino ν under the scheme $\pi \rightarrow \mu+\nu$. According to the law of preservation of a momentum, momentums p a muon and the neutrino will be equal on size and opposite on a direction. According to the law of energy conservation, energy of rest of a pion m_π will be equal to the sum энергий a muon e_μ and a neutrino e_ν:

$$m_\pi = e_\mu + e_\nu = \sqrt{m_\mu^{\ 2} + p^2} + p\ . \qquad (3)$$

Apparently, the equations (1) and (3) are identical. After normalization we shall receive the given values p_s=p/ m_π and energies of pion 1, a muon e1 and a neutrino

e2:

$1=e1+e2,\ e1=0.5(1+s^2),\ e2=0.5(1-s^2)=p_s,\ s=m_\mu/m_\pi.$

In our case $s=0.757025=\sqrt{2\sqrt{\Phi}-1}$, e1=0.786543, that is close to size $\sqrt{\Phi}$ with a relative error δ =0.0005. The foretold scheme of decay is given on fig. 2. The arch y has radius ac=1, the arch y4 has the radius 0.5, a curve y2 together with a piece ac is turned

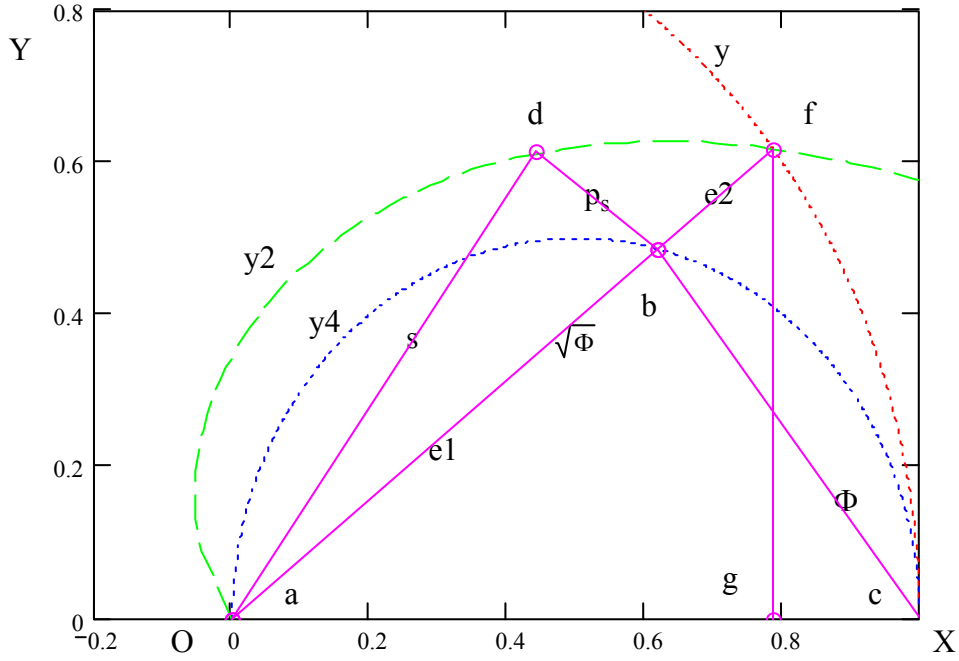

Fig. 2 Scheme of decay of a pion

on angle ∠fac and transferred on fig. 2 so that to be combined with a straight line af. From the diagram follows, that the starting position of a pion is a piece af=1 which shares a point b on $e1=\sqrt{\hat{O}}$ and $e2=1-\sqrt{\hat{O}}$. Rectangular Δabd has cathetus $db=p_s=e2$ and ad=s. Reverse transformation of a muon with energy e1 into a pion is stipulated by including of energy T=e2=bf or a momentum bc=Φ. Both equal triangles Δabc and Δafg concern to number "golden".

The analysis of 278 reactions has shown, that at the most of them there are different signs of harmonious proportionality. For example, in decay of kaon K, of "strange" meson, the horizontal projection of a piece bc is equal $tg(0.2\pi)$ (δ=0.00005), to golden section of the side of the rectilinear inscribed pentagon.

In author's opinion, the nature of the discovered phenomenon can be

explained so that energy of particles represents a vector which components, projections to axes abscises and ordinates, essence of the energy, peculiar to electromagnetic and strong interactions. In that case, from the point of view of physics, decay of a pion under the scheme of golden section provides a maximum strong component of an end-product of decay - a muon.

The literature

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