R.V. Klinkerman

The hypothetical approximate model of elementary particles

In given article attempt to develop model of elementary particles (except for resonances) is done on the basis of concept that these particles, as well as electron, will consist of cooperating neutrino and antineutrino. Errors of the received models are not greater then 2 %. In article structures of particles, a background of their electric charges, bases of electromagnetic and strong interaction, essence of strangeness and replacement of system of lepton charges on system of neutrinos charges are offered.

For a basis the relativistic equations of movement of electron undertake in a spinor concept, which can be recorded as follows [1, §21]:

$$\left(i\frac{d}{dt}+is_1\frac{d}{dx}+is_2\frac{d}{dy}+is_3\frac{d}{dz}\right)x=mh,$$

$$\left(i\frac{d}{dt}-is_1\frac{d}{dx}-is_2\frac{d}{dy}-is_3\frac{d}{dz}\right)h=mx\ .$$

where h, x - two-componential spinors, s_i - Pauli's matrixes, m - mass of electron.

Conjugating terms of these equations we get:

$$i\frac{d}{dt}x^+ +i\frac{d}{dx}x^+s_1+i\frac{d}{dy}x^+s_2+i\frac{d}{dz}x^+s_3=-mh^+,$$

$$i\frac{d}{dt}h^+ -i\frac{d}{dx}h^+s_1-i\frac{d}{dy}h^+s_2-i\frac{d}{dz}h^+s_3=-mx^+.$$

The equations are recorded in the form where speed of light and Planck's constant are accepted equal 1. The equations with x, h describe movement of an electron, the equation with x^+, h^+ - of a positron.

If to put m=0 there will be equations two-componential neutrino and antineutrino [1, §30].

Further we work in the system of coordinates connected with a particle. Then for electron

$$i\frac{\partial x}{\partial t} = mh\ , \quad i\frac{\partial h}{\partial t} = mx\ ,$$

or in matrix form

$$i\frac{\partial y}{\partial t} = A \cdot y\ , \ \text{ where } A = \begin{vmatrix} 0 & m \\ m & 0 \end{vmatrix},\ y = \begin{vmatrix} x \\ h \end{vmatrix}..$$

For a positron $i\frac{dy^{+}}{dt} = A \cdot y^{+}$, где $A = \begin{vmatrix} 0 & -m \\ -m & 0 \end{vmatrix},\ y^{+} = \begin{vmatrix} x^{+} \\ h^{+} \end{vmatrix}.$

For example schemes of disintegration of a muon look so:

$$m^{+} \rightarrow e^{+} + n_{e} + \tilde{n}_{m}\ , \quad m^{-} \rightarrow e^{-} + \tilde{n}_{e} + n_{m}\ . \qquad (1)$$

Thus, muon contains 4 cooperating neutrino and antineutrino. Therefore it is possible to generalize matrix A and consider that it is certain symmetric, nonsingular and in other way an arbitrary matrix $n \times n$.

Let's realize similarity conversion of matrix A in a diagonal form (with appropriating conversion of a column). On a diagonal there will be real eigenvalues of an initial matrix. We shall consider that A is such that all eigenvalues are various. They will be frequencies of natural oscillations of a system w_i, where $1 \le i \le n$.

The author has put forward 4 assumptions concerning these frequencies.

1 assumption. Frequencies should not be arbitrary real numbers, such, that phases of all of oscillations will never coincide. Such system is not a stable particle. To the contrary, when phases of all of oscillations coincide with the certain periodicity, it will be rather stable particle. Then should be

$$w_i = n_i \cdot w_0\ ,$$

where n_i - integers. All the periods T_i will keep within T_0 an integer of times.

The assumption 2. Among any two n_i should not be multiple one another. Otherwise these two oscillations in fact represent one degree of freedom. Therefore n_i should be simple numbers.

There is a question how to receive usual, not a diagonal matrix with specified eigenvalues? It is possible to take any symmetric nonsingular matrix and to find its eigenvectors. Set of these vectors makes a matrix of similarity conversion T. Let's carry out return transformation of a diagonal matrix with specified eigenvalues: $T \cdot A_d \cdot T^{-1}$. The received usual symmetric matrix will have the same eigenvalues. From this method and from the general mathematical approach follows that such matrixes form infinite set.

The assumption 3. w_0 is frequency of oscillation of the electron (positron), defining its mass. In favour of such assumption can speak that electron, apparently, is a base particle at other particles formation.

The assumption 4. Effective oscillation, the general for all, will be what period keeps within all T_i the minimal integer of times. It will be

$$w = \prod_{i=1}^{n} n_i \cdot w_0 .$$

The given frequency is accepted for defining particle mass.

Since the particle is characterized by one frequency, this allows to interpret it as heavy electron with the appropriating equations of movement. However, the effective frequency formed of several frequencies, apparently, is not quite stable, undergoing accidental variations. It should affect properties of a complex particle.

It is great importance of what range simple numbers get out. The quantity of simple numbers which suit to mass of a particle depends on it also. For example, if to set a range from 1 up to 97 the selection of simple numbers 19, 97 defines mass of a proton with error of 0.4 %. It seems clear that if greatly expand a range it is possible to define with good accuracy the mass of a particle by one simple number. Therefore the range and, accordingly, quantity of simple numbers are in addition defined on the basis of reasons about composition of particles on various neutrino and antineutrino. In present article the range of simple numbers from 1 up to 29 is accepted. More objectively the structure of frequencies in a particle will be defined by detailed consideration of interaction of neutrino and antineutrino in more accurate model.

Simple numbers for various particles and appropriating errors on mass are resulted in the following table 1. Masses of particles were undertook from [4], and mass of taon (1777 MeV) – from [2].

Table 1.

Particles	Simple numbers	Error on mass, %
Muon, $m^{\pm}$	11, 19	1.1
The neutral pion, p^{0}	2, 7, 19	0.7
The charged pion, $p^{\pm}$	3, 7, 13	0.1
Proton, p	2, 5, 11, 17	1.8
Neutron, n	2, 5, 11, 17	1.7
The charged kaon, $K^{\pm}$	3, 17, 19	0.3
The neutral kaon, K^{0}	3, 17, 19	0.5
Hyperon Λ^{0}	5, 19, 23	0.1
Hyperon Σ^{+}	2, 3, 17, 23	0.8
Hyperon Σ^{0}	2, 3, 17, 23	0.5
Hyperon Σ^{-}	2, 3, 17, 23	0.1
Hyperon Ξ^{0}	2, 5, 11, 23	1.7
Hyperon Ξ^{-}	2, 7, 11, 17	1.2
Hyperon Ω^{-}	1, 11, 13, 23	0.5
Taon $t^{\pm}$	2, 7, 13, 19	0.6

For an assessment of the received errors of model it is necessary to have in view that according to [3] errors of systematization of particles by means of symmetry SU (3) are within 12 %.

Structure of particles regarding electronic, muon and taon neutrino and antineutrino are defined by schemes of their disintegrations. Muon according to (1) should have following structure:

$$m^- \to n_e, \bar{n}_e, n_m, \bar{n}_e; \quad m^+ \to n_e^{\ +}, \bar{n}_e^{\ +}, n_e, \bar{n}_m.$$

However, the contradiction takes place: under table 1 in structure of muon there are 2 frequencies while under the schemes of disintegration 4 particles occur in it. To resolve this contradiction it is possible having in view that frequencies can be double: positive and negative, and on everyone maybe neutrino (antineutrino). According to this the muon structure will be the following:

$$m^- \to (n_e, \bar{n}_e), (n_m, \bar{n}_e); \quad m^+ \to \left(n_e^{\ +}, \bar{n}_e^{\ +}\right), (\bar{n}_m, n_e). \qquad (2)$$

By brackets are captured neutrino and antineutrino, being on one frequency (positive and negative). Complexes ($n_e, \bar{n}_e$) and ($n_e^{\ +}, \bar{n}_e^{\ +}$) at disintegration turn to electron and a positron. At finding in muon structure they define electric charges of muons.

Taking for a basis neutrino and antineutrino, it is necessary to see: the electromagnetic interaction is caused by that the 4-potential of an electromagnetic field is a neutrino current of transition which well interface with the electron-positron current of transition. It also shows its relationship with weak interaction.

Schemes of disintegrations of the charged pions are the following:

$$p^- \to m^- + \bar{n}_m, \quad p^+ \to m^+ + n_m. \qquad (3)$$

According to them and with table 1 the structure of pions should be the following:

$$p^- \to (n_e, \bar{n}_e), (n_m, \bar{n}_m), \bar{n}_e; \quad p^+ \to \left(n_e^{\ +}, \bar{n}_e^{\ +}\right), (n_m, \bar{n}_m), n_e. \qquad (4)$$

As well as in case of muon, $(n_e, \bar{n}_e)$ defines an electric minus (electron), $\left(n_e^{\ +}, \bar{n}_e^{\ +}\right)$ - electric plus (positron).

There are also such schemes of disintegration of pions:

$$p^- \to e^- + \bar{n}_e; \quad p^+ \to e^+ + n_e. \qquad (5)$$

Here the pion as though contains 3 particles. The contradiction is solved that in the given schemes of disintegration it is necessary to add $(n_m + \bar{n}_m)$. The given complex is destroyed at disintegration.

Comparing spins muon and pion, it is visible, that the given approximate model does not solve the problem on spin of a particle. For its decision it is necessary to involve life time of particles which can be generated from structure of the given particle. From pion structure it is possible to generate muon which life time on two orders is more, than that of pion. According to it there is disintegration on muon and neutrino, which joint spin before and later disintegration maybe zero.

The neutral pion is particular both on mass and the scheme of disintegration [5, c.150]:

$$p^0 \to 2g. \qquad (6)$$

That is it breaks up to two photons. Structure of a neutral pion maybe the following:

$$p^0 \to (n_e, \bar{n}_e), n_e^{\;+}, \bar{n}_e^{\;+}. \qquad (7)$$

Some asymmetry of negative and positive charges probably leads to that in rare cases its disintegration goes under the scheme [5, c.155]:

$$p^0 \to g + e^- + e^+. \qquad (8)$$

According to [2] one of schemes of disintegration taon has a following appearance:

$$t^- \to m^- + \tilde{n}_m + n_t, \qquad t^+ \to m^+ + n_m + \tilde{n}_t, \qquad (9)$$

In a similar way told for muon about double frequencies the following structure taon is offered:

$$t^{-} \to (n_e, \bar{n}_e), (n_m, \bar{n}_m), \bar{n}_e, n_t ; \quad t^{+} \to (n_e^{+}, \bar{n}_e^{+}), (n_m, \bar{n}_m), n_e, \bar{n}_t . \qquad (10)$$

The following scheme of taon disintegration:

$$t^{-} \to e^{-} + \tilde{n}_e + n_t , \qquad t^{+} \to e^{+} + n_e + \tilde{n}_t , \qquad (11)$$

Here taon as though contains 4 particles. The contradiction is solved that in the given schemes of disintegration it is necessary to add $(n_m + \bar{n}_m)$. This complex is destroyed at disintegration.

The following scheme of taon disintegration:

$$t^{-} \to p^{-} + n_t , \qquad t^{+} \to p^{+} + \tilde{n}_t \qquad (12)$$

quite conforms to its structure and structure of a pion.

Regarding nucleons it is considered following schemes of disintegrations and scattering:

$$n \to p + e^{-} + \bar{n}_e ; \quad \bar{n}_e + p \to n + e^{+} ; \quad n_m + n \to p + m^{-} . \qquad (13)$$

It is possible to satisfy the given schemes at such structures of a neutron and a proton:

$$n \to (n_e^{+}, \bar{n}_e^{+}), (n_e, \bar{n}_e), n_m, \bar{n}_m ; \quad p \to (n_e^{+}, \bar{n}_e^{+}), n_m, \bar{n}_m, n_e . \qquad (14)$$

Thus it is necessary to have in view of, that complexes $(n_e + \bar{n}_e)$ and $(n_m + \bar{n}_m)$ can be born and be destroyed at disintegrations and other interactions. The same concerns a complex $[(n_e, \bar{n}_e) + (n_e^{+}, \bar{n}_e^{+})]$ (electron + positron). The given position operates in all other schemes of interactions.

The structure of a proton is similar to structure of the positive pion, only entering neutrinos are carried on 4 frequencies instead of 3. Why such structure appears extremely stable, the present approximate model does not define.

Considering structures of nucleons and pions it is possible to make the assumption on a basis of strong interaction. In all these particles complexes $(n_m, \bar{n}_m)$ take place. Unlike similar complexes of electron and a positron, the muon complex does not bear opposite muon charges: no $\left(n_m{}^+, \bar{n}_m{}^+\right)$ take place. The author assumes, that the given complex bears a charge of strong interaction.

If that so the tau-lepton participates in strong interaction and consequently is not a lepton.

In connection with the considered structures of particles there is an offer to pass to more rational system of charges, near in meaning to lepton's. They are neutrino charges. As electron and a positron contain neutrino and antineutrino its neutrino charge should be zero; in a similar way at a neutron. At other particles availability of a neutrino charge is caused by availability in their structure unbalanced neutrino (antineutrino), that is those particles that does not have partners of opposite helicity. For example, in m^- are available unbalanced n_m and $\bar{n}_e$, therefore it should have a positive muon- and negative electro-neutrino charge. The proton has positive an electro-neutrino charge. Taon and pion have neutrino charges according to the given logic.

Below in the table are resulted neutrino charges of the considered particles.

Table 2

	An electro-neutrino charge	A muon-neutrino charge	A tau-neutrino charge
Muon m^-	-1	+1	0

Muon m^{+}	+1	-1	0
Taon t^{-}	-1	0	+1
Taon t^{+}	+1	0	-1
Pion p^{-}	-1	0	0
Pion p^{+}	+1	0	0
Pion p^{0}	0	0	0
Neutron	0	0	0
Proton	+1	0	0

Further strange particles are considered.

According to logic of the offered model the strangeness is caused by the being in structure of particles certain neutrino (antineutrino), not electronic or muon's. Probably it is taon neutrino and by that the tau-lepton is among other a strange particle. Let n_t defines strangeness 1, and $\bar{n}_t$ - 1. At such definition the strangeness is conserved also in weak interactions. As well as for others neutrino-antineutrino, the complex $(n_t + \bar{n}_t)$ can be born or be destroyed at interactions.

In [5, with. 173] following right parts of disintegrations K^{+}-meson are adduced:

$$p^{+} + p^{-} + p^{+}; \quad p^{+} + p^{0} + p^{0}; \quad p^{+} + p^{0};$$

$$m^{+} + p^{0} + n_m; \quad m^{+} + n_m; \quad e^{+} + p^{0} + n_e. \qquad (15)$$

It is visible, that these schemes not quite precise since breaking up meson is strange, but set of particles of disintegration is not strange. In [5] it speaks that in weak interactions the strangeness changes on 1. In the present approach in the right parts it is just necessary to add n_t . In view of it the K^+-meson structure is similar to structure of p^+ with addition n_t .

For check of an offered hypothesis about strangeness it is necessary to carry out the search an additional neutrino at kaon and hyperons disintegrations.

The charged kaon structures looks so:

$$K^- \to (n_e, \bar{n}_e), (n_m, \bar{n}_m), (\bar{n}_e, \bar{n}_t); \quad K^+ \to (n_e{}^+, \bar{n}_e{}^+), (n_m, \bar{n}_m), (n_e, n_t) . \qquad (16)$$

In [5] affirms that birth single hyperons under following schemes were never located:

$$n + p \to \Lambda^0 + p; \quad p^{\pm} + p \to K^{\pm} + p .$$

It is natural: to provide not zero strangeness of the right part is necessary to add n_t or $\bar{n}_t$ in left. But to organize participation neutrino among running up particles hardly easy.

Disintegration neutral kaons K^0 and $\tilde{K}^0$ with strangenesses 1 and-1 occurs to the following right parts (without taking into account strangenesses) [5, §14, п.9,10]:

$$p^+ + p^-;$$

$$m^- + \bar{n}_m + p^+; \quad e^- + \bar{n}_e + p^+; \quad p^+ + p^- + p^0; \quad p^0 + p^0 + p^0 . \qquad (17)$$

All these schemes are satisfied with structure of a neutral pion with addition in it and in the right parts appropriating n_t or $\bar{n}_t$ (in view of preceding note about a birth or destruction of the sums neutrino and antineutrino, electron and a positron). The given structures look so:

$$K^0 \to \left(n_e^{\,+},\bar{n}_e^{\,+}\right),\left(n_e,\bar{n}_e\right),n_t;\quad \tilde{K}^0 \to \left(n_e^{\,+},\bar{n}_e^{\,+}\right),\left(n_e,\bar{n}_e\right),\bar{n}_t. \qquad (18)$$

In [5] following right parts of hyperon Λ^0 disintegrations without taking into account strangeness are adduced:

$$p+p^-;\quad n+p^0;\quad p+e^-+\bar{n}_e;\quad p+m^-+\bar{n}_m. \qquad (19)$$

All these schemes are satisfied with structure of a neutron with addition to it and in the right parts $\bar{n}_t$. The given structure looks so:

$$\Lambda^0 \to \left(n_e^{\,+},\bar{n}_e^{\,+}\right),\left(n_e,\bar{n}_e\right),\left(n_m,\bar{n}_t\right),\bar{n}_m. \qquad (20)$$

Structures of the right parts of Σ^+- hyperon disintegration without taking into account strangeness are following [5]:

$$p+p^0;\quad n+p^+. \qquad (21)$$

These schemes are satisfied with structure of a proton with addition to it and in the right parts $\bar{n}_t$. The given structure looks so:

$$\Sigma^+ \to \left(n_e^{\,+},\bar{n}_e^{\,+}\right),\left(n_m,\bar{n}_t\right),\bar{n}_m,\bar{n}_e. \qquad (22)$$

It is interesting to note, that variation of two simple numbers in the frequency scheme and addition in structure $\bar{n}_t$ transforms a stable proton into a usual breaking up particle with lifetime of $0.8\cdot 10^{-10}$ c.

The scheme of Σ^-- hyperon disintegration without taking into account strangeness is following [5]:

$$\Sigma^- \to n+p^-. \qquad (23)$$

This scheme is satisfied with structure of a negative proton with addition to it and in the right part $\bar{n}_t$. The given structure looks so:

$$\Sigma^- \to \left(n_e,\bar{n}_e\right),\left(n_m,\bar{n}_m\right),\bar{n}_e,\bar{n}_t. \qquad (24)$$

The scheme of Σ^0- hyperon disintegration is following [5]:

$$\Sigma^0 \to \Lambda^0 + g \ , \tag{25}$$

therefore its structure is similar to Λ^0- hyperon structure.

The scheme of Ξ^-- hyperon disintegration with the incomplete account of strangeness is following [5]:

$$\Xi^- \to \Lambda^0 + p^- . \tag{26}$$

With the full account of strangeness the structure will be the following:

$$\Xi^- \to (n_e, \bar{n}_e), (n_m, \bar{n}_m), (\bar{n}_e, \bar{n}_t), \bar{n}_t \ . \tag{27}$$

The scheme of Ξ^0- hyperon disintegration with the incomplete account of strangeness is following [5]:

$$\Xi^0 \to \Lambda^0 + p^0 . \tag{28}$$

With the full account of strangeness the structure will be the following:

$$\Xi^0 \to (n_e^+, \bar{n}_e^+), (n_e, \bar{n}_e), (n_m, \bar{n}_m), (\bar{n}_t, \bar{n}_t). \tag{29}$$

The schemes of Ω^-- hyperon disintegration with the incomplete account of strangeness is following [5]:

$$\Omega^- \to \Xi^0 + p^-; \quad \Omega^- \to \Xi^- + p^0; \quad \Omega^- \to \Lambda^0 + K^- . \tag{30}$$

With the full account of strangeness the structure will be the following:

$$\Omega^- \to (n_e, \bar{n}_e), (n_m, \bar{n}_m), (\bar{n}_e, \bar{n}_t), (\bar{n}_t, \bar{n}_t). \tag{31}$$

Thus, if not to consider strangeness, on structure $K^\pm$ conform to $p^\pm$, $K^0, \tilde{K}^0$ conform to p^0, $\Lambda^0, \Sigma^0, \Xi^0$ - to a neutron, Σ^+ - to a proton, $\Sigma^-, \Xi^-, \Omega^-$ - to an antiproton.

From schemes of strong interactions in which hyperons participate, it is visible, that the strangeness of particles is defined by strangeness of Λ^0. The last turns out from the formula

$$z = T_V + (B + S)/2,$$

where z – an electric charge of a particle, T_V - a projection of isotopic spin, B – a baryon charge, S – strangeness [5].

As Λ^0 - isotopic singlet its strangeness is equal -1. If to not use the theory of isotopic spin and in an arbitrary way to put strangeness equal +1 the strangenesses of other particles will change a sign. The given circumstance will not affect in any way the balance of strangenesses at interactions.

Conclusion

If the given approximate model of elementary particles is well-founded then neutrino and antineutrino are in a basis of all particles.

References

1. V.B. Berestetskiy, E.M. Lifshits, L.P. Pitaevskiy. Kvantovaja elektrodinamika, 2 izdanie, Moskva, 1980.
2. K.N. Muhin, V.N. Tihonov. Staraja i novaja exotika v mire elementarnyh chastits, p. 3.6. Uspehi fizicheskih nauk, November 2001, vol 171, № 11.
3. Ta-Pei Cheng, Ling-Fong Li. Gauge theory of elementary particle physics, chapter 4, paragraph 4.4. Clarendon Press, Oxford, 1984.
4. Malenkaja entsiklopedia. Fizika mikromira. Moskva 1980.

5. K.N. Muhin. Experimentalnaja jadernaja fizika. Tom II. Fizika elementarnyh chastits. Moskva 1974.
6. N.F. Nelipa. Fizika elementarnyh chastits. Moskva 1977.