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\begin{center}
{\bf MASS OF THE NEUTRINO AND ITS CHARGE}
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In many works a question about the neutrino with a non - zero mass
was investigated. Analysis of existing experiments assumed [1] that
the massive Dirac neutrino must have not only magnetic moment [2] but
also electric charge. Such a conclusion one can make by following the
behaviour of the neutrino in the nucleus field. From this point of view,
the spin phenomena [3] may becomes highly useful.

In the given work the elastic scattering of electrons and their neutrinos
on a spinless nucleus has been considered at the account of fermions
charges and magnetic moments interactions with field of emitting the
virtual
photons. Starting from the processes cross sections equality for
longitudinal
polarized and unpolarized particles, it is shown that if the neutrino
corresponds to the electron $(\nu=\nu_{e}),$ between the Dirac and the
Pauli
form factors of the neutrino and electron there exists the individual as
well
as the united dependence. They states that four - component neutrino
possesses both normal and anomalous electric charges. Herewith its full
electric charge has the size
\begin{equation}
e_{\nu}=-\frac{3eG_{F}m_{\nu}^{2}}{4\pi^{2}\sqrt{2}}, \, \, \, \, e=|e|.
\label{1}
\end{equation}

Such a regularity, however, meet with many problems which gives the
pssibility to make the most diverses predictions. The treatment of any
of them would bring us too far and all they therefore will call for more
detailed description. But here we can add the following.

Using (\ref{1}) for the neutrino with mass [4] $m_{\nu}=10eV$
and taking into account [5] that $G_{F}=1,16637\cdot 10^{-5}GeV^{-2}$,
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we find
\begin{equation}
e_{\nu}=6,267\cdot10^{-25}
\left(\frac{m_{\nu}}{1eV}\right)^{2}e=6,27\cdot10^{-23}e.
\label{2}
\end{equation}

Earlier laboratory facts and conservation of charge in neutron decay define the upper limit equal to [6] $e_{\nu}< 4\cdot10^{-17}e$. Refinement of each of the electric charges of the neutron, proton and electron allow one to conclude [1] that $e_{\nu}< 10^{-21}e.$ Analysis of elastic $\overline{\nu_{e}}e$ scattering experiment [7] assumed [8] that $e_{\nu}< 2,7\cdot10^{-10}e$. Cosmological considerations for the neutrino charge leads to the estimate [9] of $e_{\nu}< 10^{-17}e$.

We recognize that (\ref{2}) violate the charge conservation law. There are many uncertainties both in the nature and in the size of the neutrino mass. Another reason of inconsistency is the absence of quality picture of $\beta-$ decay processes. Nevertheless, if we suppose [1] that $e_{\nu}< 10^{-21}e,$ taking (\ref{1}), it is not difficult to establish the theoretical bound on the neutrino mass: $m_{\nu}< 40eV.$ It is compatible with that following from the experiment [10]: $14< m_{\nu}< 46eV.$

Basing on the analysis of evolution of the Universe, it was found [11] that $m_{\nu}< 0,3eV.$ Insertion of this value in (\ref{1}) gives $e_{\nu}< 5,64\cdot 10^{-26}e.$

Having the formula (\ref{1}) and by following the fact that the force of Newton attraction between two neutrinos is less than the force of their Coulomb repulsion, we get the following estimates of
\begin{equation}
m_{\nu}>\frac{4\pi^{2}\sqrt{2}}{3G_{F}}
\left(\frac{G_{N}}{\alpha}\right)^{1/2}=1,53\cdot 10^{-3}eV,
\label{3}
\end{equation}
\begin{equation}
e_{\nu}>\frac{4\pi^{2}\sqrt{2}}{3G_{F}}
\left(\frac{G_{N}}{\alpha}\right)e=1,46\cdot 10^{-30}e,
\label{4}
\end{equation}
where G_{N} is the constant of gravitational emitting.

Of course such a definition of values of (\ref{3}) and (\ref{4}) is not very standard. At the same time existing laboratory bounds may serve as further confirmations of our earlier findings. Insofar as the discrepancy is concerned, it reflects just many properties of a certain latent regularity of general picture of massive neutrinos.

In the frame of the loop phenomena, at the condition of gauge invariance, the neutrino must be electrically neutral [12]. It appears that here on the basis of (\ref{1}) one can will decide a question about equality to zero of the neutrino physical mass. But we can say that a non - zero interaction of

Pauli arises at the expense of usual Dirac interaction. Thus, the neutrality of the neutrino in the loop approximation one must be interpreted as an indication to the new structure of electromagnetic gauge invariance.

1. S. Davidson, B. Campbell and K.D. Bailey, Phys. Rev. D43(1991)2314;

I.S. Batkin and M.K. Sundaresan, J.Phys. G20(1994)1749

2. K. Fujikawa and R.E. Shrock, Phys.Rev.Lett. 45(1980)963

3. R.S.Sharafiddinov, Dokl.Akad.Nauk RUz.Ser.Mat.Tehn.Estest.7(1998)25

4. R.G.H.Robertson et al., Phys.Rev.Lett. 67(1991)957

5. G.Bardin et al., Phys.Lett. B137(1984)135

6. J.Bernstein, M.Ruderman and G.Feinberg, Phys.Rev. 132(1963)1227

7. H.S.Gurr, F.Reines and H.W.Sobel, Phys.Rev.Lett. 28(1972)1406

8. A.P.Rekalo, Ukrain.Fiz.Zh. 18(1973)213

9. J. Panman, in: Proc.Intern.Symp. on Lepton and Photon Interactions

at High Energies (Hamburg, 1987), edited by K. Bartel and R.R\"ucke

(North-Holland,Amsterdam,1987) p.553

10. V.A. Lyubimov et al., Phys.Lett. B94(1980)266

11. K.Enqvist, V.Semikoz, A.Shukurov and D.Sokoloff, Phys.Rev.

D48(1993)4557

12. J.L.Lucio Martinez, A.Rosado and A.Zepeda, Phys.Rev. D29(1984)1539

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