A simple formula for neutrino masses

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Abstract
This is a simple formula related to neutrino masses, according to which we get the absolute masses of three neutrinos.

Introduction
The three types of charged leptons are: electron, muon and tau. Their masses are: $M_e$, $M_\mu$, $M_\tau$, and the neutrino masses corresponding to them are: $m_1$, $m_2$, $m_3$. This paper assumes that neutrinos come from within charged particles, and they are related to the spin of charged particles, and then we get a simple formula for calculating the neutrino masses, as follows:

$$m_n = \frac{M_e \alpha^3}{16 g_l^2} \sqrt{\frac{M_a \alpha}{M_b}}$$

Thereinto:
- $m_n$ is the mass of the neutrino; $n = 1.2.3$.
- $M_e$ is the mass of the electron;
- $\alpha$ is the fine structure constant;
- $M_a$ is the mass of the charged lepton before decay;
- $M_b$ is the mass of the charged lepton after decay;
- $g_l$ is the orbital $g$-factor of electron, muon and tau.

Now let's start calculating the masses of the three neutrinos.

Since both muon and pottery can decay into electrons, we have $M_b = M_e$. Since the electron is a stable particle and has no decay, for the value of its $M_a$, here we use the mass of the electron in the excited state to replace it, then we have the relationship:

$$M_a = M_e + \alpha M_e$$
\(\alpha M_e\) is the equivalent mass corresponding to the electrostatic potential energy of the electron in excited state.

Now, substitute the equation (2) into the equation (1), and we get that

**The mass of the electron neutrino is:**

\[
m_1 = \frac{M_e \alpha^3}{16 g_{el}^2} \sqrt[4]{\frac{\pi/3}{1 + \alpha}} \frac{(1 + \alpha)M_e}{M_e}
\]

(3)

The calculation result of the formula (3) is: \(m_1 = 0.01257116\) eV/c². \(\sqrt{\alpha}\) is a factor related to decay, and since the electron is a stable particle, so formula (3) does not need it. \(\sqrt[3]{\pi/3}\) is a factor related to the excited state.

**The mass of the muon neutrino is:**

\[
m_2 = \frac{M_e \alpha^3}{16 g_{\mu}^2} \sqrt{\frac{M_\mu \alpha}{M_e}}
\]

(4)

The calculation result of the formula (4) is: \(m_2 = 0.01520928\) eV/c².

**The mass of the tau neutrino is:**

\[
m_3 = \frac{M_e \alpha^3}{16 g_{t}^2} \sqrt{\frac{25 M_\tau \alpha}{36 M_e}}
\]

(5)

The calculation result of the formula (5) is: \(m_3 = 0.05197472\) eV/c². For \(g_t\), we take the theoretical value of its. Since the tau has many decay modes, 25/36 is a decay rate of the tau. \(P(A \cup B)/\sqrt[3]{\pi/3} = 25/36\). \(P(A) = 64.79\%\), which is the branching ratio of the hadronic type decay of the tau; \(P(B) = 17.82\%\), which is the branching ratio of the electronic type decay of the tau [1].

**The sum of three neutrino masses is:**

\[m_1 + m_2 + m_3 = 0.07975516\) eV/c²

(6)

**The mass ordering of the three neutrinos is:**

\[m_3 > m_2 > m_1\]

(7)

**Reference**