Short Note Concerning Lepton Generations: Details

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As had already been communicated (see: Contribution to the leptons generation problem? http://culetto.at/private_research_associates/lepton_generation_problem.pdf , (2015)), the fit formulae given below yield pretty good approximation to the charged lepton masses, as far as just their mass eigenstates are concerned:

$$\frac{M_P}{2m_e} \approx \frac{\sqrt{2}\ln(\delta_{2D})}{\sqrt{\pi P}|c_D|\ln(\delta)} \exp(\gamma^{1/2} e^{\pi/2+1/2} \pi^{e/2+1/2}) \qquad \text{Eq.(1)}$$

$$\frac{M_P}{m_i} \approx \frac{2\ln(\delta_{2D})}{\sqrt{\xi_{0i}P}\,\Gamma(\xi_{0i})|c_D|\ln(\delta)} \exp(\gamma^{1/2} e^{B(1/2,\, \xi i)/2+1/2} B(1/2,\, \xi_i)^{e/2+1/2}),\quad i = e,\ \mu,\ \tau \qquad \text{Eq.(2)}$$

$$\xi_i \approx \left(1/2 + \frac{\pi^2 \sqrt{m(Z^0)m(W^\pm)}\ \xi_{0i}^2}{4\left(M(1/2, P)m(Z^0) + (1 - M(1/2, P))m(W^\pm)\right)\Gamma(1/2 - \xi_{0i})}\right), \qquad \text{Eq.(3)}$$

$$\xi_{0e} = 1/2,\ \xi_{0\mu} = \sqrt{P/2},\ \xi_{0\tau} = P$$

With $m(Z^0) = 91.1876[\mathrm{GeV}/c^2]$ and $m(W^\pm) = 80.385[\mathrm{GeV}/c^2]$ the product $(M_P/m_e)(m_i/M_P)m_{e\,exp}$ [in GeV] yields 0.105 5̲90 474 [GeV] versus 0.105 658 3745(24) [GeV] of the CODATA /NIST 2015 muon mass energy equivalent, and 1.776 89̲3 [GeV] compared to 1.776 82(16) [GeV] of the corresponding tau lepton mass energy equivalent. The empirical fit formulae Eq.(1 - 3) were thought to be ba<u>sed</u> on lepton universality. Interestingly, the external angles 1/2 and P's *geometric mean* $\sqrt{P/2}$ used instead of their *arithmetic - geometric mean* M(1/2, P) in Eq.(3) reproduces the muon mass value better by far, giving 0.105 658 36̲9 [GeV], whereas the same operation would overestimate the tau mass-energy, yielding 1.778̲ 546 [GeV] in this case. The situation thus points towards a possible *slight violation of lepton universality* in the muon or the tau case, but it remains unclear whether the archetype version of Eq.(3), i.e.

$$\xi_i = \left(1/2 + \frac{\pi^2 \Gamma(\pi/2 + 1/2)^2 \xi_{0i}^2}{4\Gamma((e/2 + 1/2)\ln(\pi))\Gamma(1/2 - \xi_{0i})}\right), \qquad \text{Eq.(4)}$$

thought of being sufficiently precise in case of lepton universality, indeed is, and one thus may neglect higher order- in- ξ_{0i} terms, or such are really absent, respectively. There's room for ambiguity in the problem as it seems. On the other hand, the results nevertheless are comparably precise in view of the Planck scale initially been involved.

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