Two Measured Fermion Masses
Determine All Fermion Masses and Charges

Yes, I will show, herein, that all the fermion masses may be determined from merely two well chosen constants, and all the fermion charges thereafter.

My book, "Reality is a Mathematical Model" (reference [1]), lays out the foundations of the algebraic construction of the vector-geometry of space-time and how the smooth functions represent the fundamental objects therein.

From there, my book, "A Mathematical Preon Foundation for the Standard Model" (reference [2]), gives an introductory look at how fundamental object mass originates from charge; an architecture of these fundamental objects; and the interactions of these fundamental objects.

Here, the picture of the mass of the fundamental objects is extended.

the field equations of the electromagnetic-nuclear field, which can be expressed in the form:

$$\overset{m}{\boldsymbol{\nabla}}_3 \times \mathbf{E} + D_0\mathbf{B} = \mathbf{0} \quad \text{and} \quad \overset{m}{\boldsymbol{\nabla}}_3 \cdot \mathbf{B} = \mathbf{0}$$

$$\overset{m}{\boldsymbol{\nabla}}_{3\Updownarrow} \times \mathbf{B} - D_0\mathbf{E} = \mathbf{J}_3 \quad \text{and} \quad \overset{m}{\boldsymbol{\nabla}}_{3\Updownarrow} \cdot \mathbf{E} = \rho \equiv J^0 \ ;$$

$$\text{where: } \overset{m}{\boldsymbol{\nabla}}_3 \equiv \mathbf{w}^{4;1}D_1 + \mathbf{w}^{4;2}D_2 + \mathbf{w}^{4;3}D_3$$

$$\overset{m}{\boldsymbol{\nabla}}_{3\Updownarrow} \equiv \mathbf{w}^{4;1}D_1^{\Updownarrow} + \mathbf{w}^{4;2}D_2^{\Updownarrow} + \mathbf{w}^{4;3}D_3^{\Updownarrow}$$

$$D_i^+ \equiv (\partial_i + m_i) \ , \ D_i^- \equiv (\partial_i - m_i)$$

$$D_i \equiv \begin{pmatrix} D_i^+ & 0 \\ 0 & D_i^- \end{pmatrix} \ , \ D_i^{\Updownarrow} \equiv \begin{pmatrix} D_i^- & 0 \\ 0 & D_i^+ \end{pmatrix}$$

$$\mathbf{E} = \mathbf{w}^{4;1}\left(-D_0^{\Updownarrow}f^1 - D_1f^0\right) + \mathbf{w}^{4;2}\left(-D_0^{\Updownarrow}f^2 - D_2f^0\right) + \mathbf{w}^{4;3}\left(-D_0^{\Updownarrow}f^3 - D_3f^0\right)$$

$$\mathbf{B} = \mathbf{w}^{4;1}(D_2f^3 - D_3f^2) + \mathbf{w}^{4;2}(-D_1f^3 + D_3f^1) + \mathbf{w}^{4;3}(D_1f^2 - D_2f^1)$$

$$f^i \equiv \begin{pmatrix} f_+^i \\ f_-^i \end{pmatrix}$$

that is, the mass-generalized Maxwell's or Maxwell-Cassano equations, are a representation of the equations also obtained from the Helmholtzian matrix product form noted at the begining of my video, [3]:

Now, from [2], the fermion architecture is as follows:

$e^- = e(1) = \overline{(E^1,E^2,E^3)}_1$	$\mu^- = e(2) = \overline{(E^1,E^2,E^3)}_2$	$\tau^- = e(3) = \overline{(E^1,E^2,E^3)}_3$
$\nu_e = \nu(1) = (B^1,B^2,B^3)_1$	$\nu_\mu = \nu(2) = (B^1,B^2,B^3)_2$	$\nu_\tau = \nu(3) = (B^1,B^2,B^3)_3$
$u_R = u_1(1) = (B^1,E^2,E^3)_1$	$c_R = u_1(2) = (B^1,E^2,E^3)_2$	$t_R = u_1(3) = (B^1,E^2,E^3)_3$
$u_G = u_2(1) = (E^1,B^2,E^3)_1$	$c_G = u_2(2) = (E^1,B^2,E^3)_2$	$t_G = u_2(3) = (E^1,B^2,E^3)_3$
$u_B = u_3(1) = (E^1,E^2,B^3)_1$	$c_B = u_3(2) = (E^1,E^2,B^3)_2$	$t_B = u_3(3) = (E^1,E^2,B^3)_3$
$d_R = d_1(1) = \overline{(E^1,B^2,B^3)}_1$	$s_R = d_1(2) = \overline{(E^1,B^2,B^3)}_2$	$b_R = d_1(3) = \overline{(E^1,B^2,B^3)}_3$
$d_G = d_2(1) = \overline{(B^1,E^2,B^3)}_1$	$s_G = d_2(2) = \overline{(B^1,E^2,B^3)}_2$	$b_G = d_2(3) = \overline{(B^1,E^2,B^3)}_3$
$d_B = d_3(1) = \overline{(B^1,B^2,E^3)}_1$	$s_B = d_3(2) = \overline{(B^1,B^2,E^3)}_2$	$b_B = d_3(3) = \overline{(B^1,B^2,E^3)}_3$

If the fermion masses may be described by the mass-generalized Maxwell's equations, then denote them as follows:

$m(3,1) = m_e : e^- = e(1)$	$m(3,2) = m_\mu : \mu^- = e(2)$	$m(3,3) = m_\tau : \tau^- = e(3)$
$m(0,1) = m_{\nu_e} : \nu_e = \nu(1)$	$m(0,2) = m_{\nu_\mu} : \nu_\mu = \nu(2)$	$m(0,3) = m_{\nu_\tau} : \nu_\tau = \nu(3)$
$m(2,1) = m_u : u_X = u_X(1)$	$m(2,2) = m_c : c_X = u_X(2)$	$m(2,3) = m_t : t_X = u_x(3)$
$m(1,1) = m_d : d_X = d_X(1)$	$m(1,2) = m_s : s_X = d_X(2)$	$m(1,3) = m_b : b_X = d_X(3)$

Where for an object's mass: $m(h,i)$:

h indicates the number of $E's$ In the object's $\mathbf{S_R}$ architecture.

i indicates the generation of the object's $\mathbf{S_R}$ architecture.

After much analysis, the following relationships arise.

Define:

$$f(h) \equiv [h^{T_0(h)} - 1]^{2h} + (h!)^{h-1}\left(\sqrt{2^{h-1}}\right)^h$$

$$g(h,i) \equiv \left[\frac{h^2(h-i)^2+1}{i(h+1)}\right]^{T_0(h)T_0(i-1)} \left(\left[2h + (-1)^h 2^{\frac{1}{2}[1+(-1)^h]}\right]k\right)^{(i-1)}$$

$$\Delta(h,i) \equiv -\left(\frac{h+i}{2}\right)^{h-i}\left[\left(\frac{h-1}{i}\right)^h \frac{(h\cdot i)^{(h-i)T_0(h)}}{h!}\right]T_0(i)$$

$$T_0(j) = \tfrac{1}{2}\left[j - 1 + \delta^1_{(-1)^j}\right]$$

$$\left(h,i \in \mathbb{N}\,;\ 0 \le h \le 3\ ,\ 1 \le i \le 3\right)$$

From which the masses may be written:

$$\frac{m(h,1)}{m\left(\left[h + \delta_{-1}^{(-1)^{T_0(h+1)}}\right]\delta_{-1}^{(-1)^{T_0(h+1)}},1\right)} = f(h)$$

$$\frac{m(h,i)}{m\left(h + (-1)^{h+1}\delta_{-1}^{(-1)^{T_0(h+1)}}(1-\delta_1^i),1\right)} + \Delta(h,i) = g(h,i)$$

which may be written out explicitly as:

$\dfrac{m(0,1)}{m(0,1)} = f(0)$	$\dfrac{m(0,i)}{m(0,1)} + \Delta(0,i) = g(0,i)$
$\dfrac{m(1,1)}{m(2,1)} = f(1)$	$\dfrac{m(1,i)}{m(2,1)} + \Delta(1,i) = g(1,i)\ ,\ (i \neq 1)$
$\dfrac{m(2,1)}{m(3,1)} = f(2)$	$\dfrac{m(2,i)}{m(1,1)} + \Delta(2,i) = g(2,i)\ ,\ (i \neq 1)$
$\dfrac{m(3,1)}{m(0,1)} = f(3)$	$\dfrac{m(3,i)}{m(3,1)} + \Delta(3,i) = g(3,i)$

or:

$m(0,1) = m(0,1)f(0)$	$m(0,i) = m(0,1)[g(0,i) - \Delta(0,i)]$
$m(1,1) = m(2,1)f(1)$	$m(1,i) = m(2,1)[g(1,i) - \Delta(1,i)]\ ,\ (i \neq 1)$
$m(2,1) = m(3,1)f(2)$	$m(2,i) = m(1,1)[g(2,i) - \Delta(2,i)]\ ,\ (i \neq 1)$
$m(3,1) = m(0,1)f(3)$	$m(3,i) = m(3,1)[g(3,i) - \Delta(3,i)]$

As an example:

$$\begin{aligned} f(3) &= [3^{T_0(3)} - 1]^{2 \cdot 3} + (3!)^{3-1}\left(\sqrt{2^{3-1}}\right)^3 \\ &= [3^1 - 1]^6 + (6)^2\left(\sqrt{2^2}\right)^3 = [2]^6 + (6)^2\left(\sqrt{2^2}\right)^3 \\ &= 64 + 36(2)^3 = 64 + 288 = 352 \end{aligned}$$

Continuing, the following table may be built:

$f(0) = 1$	$m_{\nu_e} = m(0,1) = m(0,1)f(0) = m(0,1)$
$f(1) = 2$	$m_d = m(1,1) = m(2,1)f(1) = 2m(2,1)$
$f(2) = 5$	$m_u = m(2,1) = m(3,1)f(2) = 5m(3,1)$
$f(3) = 352$	$m_e = m(3,1) = m(0,1)f(3) = 352m(0,1)$

The fermion measured to the greatest accuracy is the electron. So, instead of assigning a mass to the electron neutrino, the mass of the electron will be taken as the basis, and the mass of the electron neutrino determined from that and the above equation.

And, so, assigning:

$$m(3,1) = m_e = .510998928 MeV/c^2$$

$$\begin{aligned} \Rightarrow m(3,1) &= m\left(\left[0 + \delta_{-1}^{(-1)^{T_0(0+1)}}\right]\delta_{-1}^{(-1)^{T_0(0+1)}}, 1\right)\left[[3^{T_0(3)} - 1]^{2 \cdot 3} + (3!)^{3-1}\left(\sqrt{2^{3-1}}\right)^3\right] \\ &= m\left(\delta_{-1}^{(-1)^{T_0(1)}} \cdot \delta_{-1}^{(-1)^{T_0(1)}}, 1\right)\left[[3^1 - 1]^6 + (6)^2\left(\sqrt{2^2}\right)^3\right] \end{aligned}$$

$$= m\left(\delta_{-1}^{(-1)^0} \cdot \delta_{-1}^{(-1)^0}, 1\right)\left[[2]^6 + (6)^2\left(\sqrt{2^2}\right)^3\right]$$
$$= m(\delta_{-1}^1 \cdot \delta_{-1}^1, 1)\left[64 + 36(2)^3\right] = m(0 \cdot 0, 1)[64 + 288] = m(0,1)[352$$
$$\Rightarrow m(0,1) = \frac{m(3,1)}{352} = \frac{.510998928}{352} = .0014517015 MeV/c^2 = m_{\nu_e}$$

Continuing, the first generation fermion masses may be calculated into the following table.

$m_e = m(3,1) \approx .510998928 MeV/c^2$
$m_{\nu_e} = m(0,1) \approx .0014517015 MeV/c^2$
$m_u = m(2,1) \approx 2.55499464 MeV/c^2$
$m_d = m(1,1) \approx 5.10998928 MeV/c^2$

The $g(h,i)$ simplify to:

$$g(h,1) = \left[\frac{h^2(h-1)^2 + 1}{1(h+1)}\right]^{T_0(h)T_0(1-1)} \left(\left[2h + (-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{1-1} = 1$$

and:

$$g(h,2) = \left[\frac{h^2(h-2)^2 + 1}{2(h+1)}\right]^{T_0(h)T_0(2-1)} \left(\left[2h + (-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{2-1}$$
$$= \left(2h + (-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right)k$$

and:

$$g(h,3) = \left[\frac{h^2(h-3)^2 + 1}{3(h+1)}\right]^{T_0(h)T_0(3-1)} \left(\left[2h + (-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^{3-1}$$
$$= \left[\frac{h^2(h-3)^2 + 1}{3(h+1)}\right]^{T_0(h)} \left(\left[2h + (-1)^h 2^{\frac{1}{2}\left[1+(-1)^h\right]}\right]k\right)^2$$

And the $\Delta(h,i)$ to:

$$\Delta(h,1) = -\left(\frac{h+1}{2}\right)^{h-1}\left[\left(\frac{h-1}{1}\right)^h \frac{(h \cdot 1)^{(h-1)T_0(h)}}{h!}\right]T_0(1) = 0$$

and:

$$\Delta(h,2) = -\left(\frac{h+2}{2}\right)^{h-2}\left[\left(\frac{h-1}{2}\right)^h \frac{(h \cdot 2)^{(h-2)T_0(h)}}{h!}\right]T_0(2)$$
$$= -\left(\frac{h+2}{2}\right)^{h-2}\left[\left(\frac{h-1}{2}\right)^h \frac{(2h)^{(h-2)T_0(h)}}{h!}\right]$$

and:

$$\Delta(h,3) = -\left(\frac{h+3}{2}\right)^{h-3}\left[\left(\frac{h-1}{3}\right)^h \frac{(h \cdot 3)^{(h-3)T_0(h)}}{h!}\right]T_0(3)$$

$$= -\left(\frac{h+3}{2}\right)^{h-3}\left[\left(\frac{h-1}{3}\right)^{h}\frac{(3h)^{(h-3)T_0(h)}}{h!}\right]$$

Yielding:

$$m(h,1) = m(h,1)$$
$$\frac{m(h,2)}{m\left(h+(-1)^{h+1}\delta_{-1}^{(-1)^{T_0(h+1)}},1\right)} + \Delta(h,2) = g(h,2)$$
$$\frac{m(h,3)}{m\left(h+(-1)^{h+1}\delta_{-1}^{(-1)^{T_0(h+1)}},1\right)} + \Delta(h,3) = g(h,3)$$

which may be written out explicitly as:

$m(0,1) = m(0,1)$	$\frac{m(0,2)}{m(0,1)} + \Delta(0,2) = g(0,2)$	$\frac{m(0,3)}{m(0,1)} + \Delta(0,3) = g(0,3)$
$m(1,1) = m(1,1)$	$\frac{m(1,2)}{m(2,1)} + \Delta(1,2) = g(1,2)$	$\frac{m(1,3)}{m(2,1)} + \Delta(1,3) = g(1,3)$
$m(2,1) = m(2,1)$	$\frac{m(2,2)}{m(1,1)} + \Delta(2,2) = g(2,2)$	$\frac{m(2,3)}{m(1,1)} + \Delta(2,3) = g(2,3)$
$m(3,1) = m(3,1)$	$\frac{m(3,2)}{m(3,1)} + \Delta(3,2) = g(3,2)$	$\frac{m(3,3)}{m(3,1)} + \Delta(3,3) = g(3,3)$

Since the first column is a set of identities, the case: $i = 1$ may be ignored.

The $g(h,i)$ may be calculated into the following table ($i = 1$ ignored).

$g(0,2) = \left(2 \cdot 0 + (-1)^0 2^{\frac{1}{2}[1+(-1)^0]}\right)k = k[0+2^1]^1 = 2k$
$g(1,2) = \left(2 \cdot 1 + (-1)^1 2^{\frac{1}{2}[1+(-1)^1]}\right)k = k[2-2^0]^1 = k$
$g(2,2) = \left(2 \cdot 2 + (-1)^2 2^{\frac{1}{2}[1+(-1)^2]}\right)k = k[4+2^1]^1 = 6k$
$g(3,2) = \left(2 \cdot 3 + (-1)^3 2^{\frac{1}{2}[1+(-1)^3]}\right)k = k[6-2^0]^1 = 5k$
$g(0,3) = \left[\dfrac{0^2(0-3)^2+1}{3(0+1)}\right]^{T_0(0)} \left(\left[2 \cdot 0 + (-1)^0 2^{\frac{1}{2}[1+(-1)^0]}\right]k\right)^2 = 1 \cdot ([0+2^1]k)^2 = (2k)^2$
$g(1,3) = \left[\dfrac{1^2(1-3)^2+1}{3(1+1)}\right]^{T_0(1)} \left(\left[2 \cdot 1 + (-1)^1 2^{\frac{1}{2}[1+(-1)^1]}\right]k\right)^2 = 1 \cdot ([2-2^0]k)^2 = k^2$
$g(2,3) = \left[\dfrac{2^2(2-3)^2+1}{3(2+1)}\right]^{T_0(2)} \left(\left[2 \cdot 2 + (-1)^2 2^{\frac{1}{2}[1+(-1)^2]}\right]k\right)^2 = \left[\dfrac{4(-1)^2+1}{3(3)}\right]([4+2^1]k)^2 = \dfrac{5}{9}(6$
$g(3,3) = \left[\dfrac{3^2(3-3)^2+1}{3(3+1)}\right]^{T_0(3)} \left(\left[2 \cdot 3 + (-1)^3 2^{\frac{1}{2}[1+(-1)^3]}\right]k\right)^2 = \left[\dfrac{3^2(0)^2+1}{3(4)}\right]([6-2^0]k)^2 = \dfrac{1}{12}($

Likewise, the $\Delta(h,i)$ may be calculated into the following table ($i = 1$ ignored).

$\Delta(0,2) = -\left(\dfrac{0+2}{2}\right)^{0-2}\left[\left(\dfrac{0-1}{2}\right)^0 \dfrac{(0 \cdot 2)^{(0-2)T_0(0)}}{0!}\right] = -1$
$\Delta(1,2) = -\left(\dfrac{1+2}{2}\right)^{1-2}\left[\left(\dfrac{1-1}{2}\right)^1 \dfrac{(1 \cdot 2)^{(1-2)T_0(1)}}{1!}\right] = 0$
$\Delta(2,2) = -\left(\dfrac{2+2}{2}\right)^{2-2}\left[\left(\dfrac{2-1}{2}\right)^2 \dfrac{(2 \cdot 2)^{(2-2)T_0(2)}}{2!}\right] = -\dfrac{1}{8}$
$\Delta(3,2) = -\left(\dfrac{3+2}{2}\right)^{3-2}\left[\left(\dfrac{3-1}{2}\right)^3 \dfrac{(3 \cdot 2)^{(3-2)T_0(3)}}{3!}\right] = -\dfrac{5}{2}$
$\Delta(0,3) = -\left(\dfrac{0+3}{2}\right)^{0-3}\left[\left(\dfrac{0-1}{3}\right)^0 \dfrac{0^{(0-3)T_0(0)}}{0!}\right] = -\dfrac{8}{27}$
$\Delta(1,3) = -\left(\dfrac{1+3}{2}\right)^{1-3}\left[\left(\dfrac{1-1}{3}\right)^1 \dfrac{(1 \cdot 3)^{(1-3)T_0(1)}}{1!}\right] = 0$
$\Delta(2,3) = -\left(\dfrac{2+3}{2}\right)^{2-3}\left[\left(\dfrac{2-1}{3}\right)^2 \dfrac{(3 \cdot 2)^{(2-3)T_0(2)}}{2!}\right] = -\dfrac{1}{270}$
$\Delta(3,3) = -\left(\dfrac{3+3}{2}\right)^{3-3}\left[\left(\dfrac{3-1}{3}\right)^3 \dfrac{(3 \cdot 3)^{(3-3)T_0(3)}}{3!}\right] = -\dfrac{4}{81}$

From these tables the constant k may be determined, as well as a host of relationships between the fermion masses.

The upper generation fermion masses thus, fill out the following table.

$\frac{m(0,2)}{m(0,1)} - 1 = 2k$	$\frac{m(0,3)}{m(0,1)} - \frac{8}{27} = (2k)^2$
$\frac{m(1,2)}{m(2,1)} - 0 = k$	$\frac{m(1,3)}{m(2,1)} - 0 = k^2$
$\frac{m(2,2)}{m(1,1)} - \frac{1}{8} = 6k$	$\frac{m(2,3)}{m(1,1)} - \frac{1}{270} = \frac{5}{9}(6k)^2$
$\frac{m(3,2)}{m(3,1)} - \frac{5}{2} = 5k$	$\frac{m(3,3)}{m(3,1)} - \frac{4}{81} = \frac{1}{12}(5k)^2$

From which follow:

$$k = \frac{1}{2}\left[\frac{m(0,2)}{m(0,1)} - 1\right] = \frac{m(1,2)}{m(2,1)} = \frac{1}{6}\left[\frac{m(2,2)}{m(1,1)} - \frac{1}{8}\right] = \frac{1}{5}\left[\frac{m(3,2)}{m(3,1)} - \frac{5}{2}\right]$$

$$= \frac{1}{2}\sqrt{\frac{m(0,3)}{m(0,1)} - \frac{8}{27}} = \sqrt{\frac{m(1,3)}{m(2,1)}} = \frac{1}{6}\sqrt{\frac{9}{5}\left[\frac{m(2,3)}{m(1,1)} - \frac{1}{270}\right]} = \frac{1}{5}\sqrt{12\left[\frac{m(3,3)}{m(3,1)} - \frac{4}{81}\right]}$$

Now, the muon mass is well measured, which is why k was determined in terms of the muon mass.

(The table above shows that it could have been determined in terms of any other non-first generation mass - though to less accuracy.)

Assigning:

$$m(3,2) = m_\mu = 105.6583715 MeV/c^2$$

and using the already above assigned value:

$$m(3,1) = m_e = .510998928 MeV/c^2$$

$$\Rightarrow k = \frac{1}{5}\left[\frac{m(3,2)}{m(3,1)} - \frac{5}{2}\right] = \frac{1}{5}\left[\frac{m_\mu}{m_e} - \frac{5}{2}\right] = \frac{1}{5}\left[\frac{105.6583715}{.510998928} - \frac{5}{2}\right] =$$

As an example:

$$\frac{1}{5}\sqrt{12\left[\frac{m(3,3)}{m(3,1)} - \frac{4}{81}\right]} = k = \frac{1}{5}\left[\frac{m(3,2)}{m(3,1)} - \frac{5}{2}\right]$$

$$\Rightarrow m_\tau = m(3,3) = \left(\frac{1}{12}\left[\frac{m(3,2)}{m(3,1)} - \frac{5}{2}\right]^2 + \frac{4}{81}\right)m(3,1) = 1776.80640$$

The current measured value for the tauon is: $1776.82 \pm .16$.

So, this is nearly in the center of the margin of error, and in complete agreement to 5 significant figures.

All the above mass ratio relationships may be verified using this value.

And all the fermion masses may be calculated into the following table.

(in Mev/c^2)

$m_d = m(1,1) \approx 5.10998928$	$m_\mu = m(1,2) = 104.38087418$	$m_b = m(1,3) = 4264.34041$
$m_u = m(2,1) \approx 2.55499464$	$m_c = m(2,2) = 1253.20923882$	$m_t = m(2,3) = 170573.635$
$m_e = m(3,1) \approx .510998928$	$m_\mu = m(3,2) = 105.6583715$	$m_\tau = m(3,3) = 1776.80640$
$m_{\nu_e} = m(0,1) \approx .0014517015$	$m_{\nu_{\mu e}} = m(0,2) = 0.12006633125$	$m_{\nu_\tau} = m(0,3) = 9.69211289$

All the calculated masses above are accurate well within their margin of error.
The first generation 0th order estimates are in range accurate.
The higher generations first order estimates are in range accurate.
Now, it is incumbent on empiricists to narrow the margins of error to dispute these results and possibly prompt analysis corrections or further order estimates to become in range again.

Is it just a coincidence that all the fermion masses may be calculated from merely two well chosen constants, under the two field strength fundamentals founded by the constructed doublet-$\mathbb{R}$–algebra?
Even if so, how does the Higgs mechanism explain the above mass ratio relationships?
Does SUSY predict this relationship? How about S&M Theory?

Now, that it has just been shown that all the fermion masses may be determined by two well chosen constants via the mass-generalized Maxwell's equations field strengths $\mathbf{E}$ & $\mathbf{B}$; the issue of the relationship of charge to the mass-generalized Maxwell's equations field strengths and possibly to mass may be re-examined in this new context from another direction.

The relationship between the mass-generalized Maxwell's equations field strengths and the fermion charges may be established by constructing a function $c()$ is defined simply by:

$$c((R^1,R^2,R^3)_h) = c(R^1_h) + c(R^2_h) + c(R^3_h),$$
$$c\left(\overline{R^i_h}\right) = -c(R^i_h),$$
$$c(E^i_h) = x,$$
$$c(B^i_h) = y,.$$

then the objects are:

$$c(e(i)) = -3x, c(\nu(i)) = 3y, c(u_j(i)) = 2x + y, c(d_j(i)) = -(x + 2y).$$

From here, two different calibrations are consistent with current empirical evidence.
Each has its advantages.

Calibrating this with: $-1 = c(e(1)) = -3x, 0 = c(\nu(1)) = 3y \Rightarrow x = \frac{1}{3}, y = 0$
Operating this linear function on the objects, yields:
$c(e(i)) = -1, c(\nu(i)) = 0$
$c(u_j(i)) = \frac{2}{3}, c(d_j(i)) = -\frac{1}{3}$
These correspond to the charge characteristics of all the fermions.

If, on the other hand, the calibration is as follows:

Let: $x = \lambda m^2_{e((h))} \quad , \quad y = \lambda m^2_{\nu((h))}$
Calibrating this with: $-1 = c(e(1)) = -3x = -3\lambda m^2_{e((h))} \Rightarrow x = \frac{1}{3}$
and: $\lambda = \frac{1}{3} m^{-2}_{e((h))}$

$$\Rightarrow c(\nu(1)) = 3y = 3\lambda m^2_{\nu((h))} = \left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2 \Rightarrow y = \frac{1}{3}\left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2$$

Operating this linear function on the objects, yields:

$$c(e(i)) = -1, c(\nu(i)) = \left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2$$

$$c(u_j(i)) = \frac{2}{3} + \frac{1}{3}\left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2, c(d_j(i)) = -\frac{1}{3} - \frac{2}{3}\left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2$$

From the above discussion:

$$\left(\frac{m_{\nu((h))}}{m_{e((h))}}\right)^2 = \left(\frac{m(0,1)}{m(3,1)}\right)^2 = \left(\frac{.0014517015}{.510998928}\right)^2 \approx 8.07 \times 10^{-6}$$

This neutrino mass estimate is near the high end possibility, but this charge function is still within measurement error range.

The advantage of this calibrationis that because Noether's Theorem applied to the charge density (see [1]) insists the above charge function is a global invariant, so is mass/energy. Noether's Theorem doesn't have to be asserted twice, but Hamilton's principle (for charge density) is a consequence of the $\mathbb{R}$-algebra and Noether's Theorem applied to that, with the above insight, establishes conservation of charge and mass/energy, as a single consequence.

And, this illustrates that charge, being a measure of first order object (lepton) masses, only exists where a fermion rest mass exists. That is, charges do not exist in isolation - in a vacuum - but only where $\mathbf{S_R}$ field strength component matrix entries exist. The generalized electric field strength $\mathbf{S_R}$ matrix entries are basically directly proportional to the charge, and also where the preponderance of the mass of second order objects (quarks) rests.

Nowhere here was there found in this discussion Hilbert space, annhilation operators, spontaneous symmetry breaking, path integrals, Feynman diagrams, or any other inveigles or obfuscations.

The coincidences mount.

The space-time we recognize is described by the constructive $\mathbb{R}$-doublet-algebra

The vector dot and cross products we all learned in high school are natural products in the constructed $\mathbb{R}$-doublet-algebra.

The mass-generalized Maxwell's equations are satisfied for all smooth functions in the constructed $\mathbb{R}$-doublet-algebra which satisfy the four-vector-doublet Klein-Gordon equation, yet reduce to Maxwell's equations for zero mass (something the Dirac equation does not do).

The fermions and photons of the Standard Model are natural fundamental constructions from the field strengths of the mass-generalized Maxwell's equations. (and the hadrons are natural constructions therein, as well).

The charges of the fermions are a natural function of the field strengths of the mass-generalized Maxwell's equations.

The masses of the fermions may be calculated from merely two constants based on the field strengths of the mass-generalized Maxwell's equations.

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