ECE THEORY OF PARTICLE PHYSICS: DEFINITIVE REFUTATION OF THE BASICS OF STANDARD ELECTROWEAK THEORY

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Abstract: In preparation for the development of a new ECE particle physics it is shown that a basic equation of standard electroweak theory is algebraically incorrect to such an extent that the whole theory is refuted. By careful analysis with hand calculation and computer algebra it is shown that the initial claims of standard electroweak theory lead to an absurd result, that the U(1) electromagnetic potential interacts only with the left handed electron. There are also serious inconsistencies in the way in which standard electroweak theory is defined. This refutation is yet another demonstration of the fact that the Higgs boson does not exist.

Keywords: ECE particle theory, definitive refutation of standard electroweak theory.

1. INTRODUCTION

During the course of development of ECE physics in this series of papers and books [1 - 10] many refutations have been made of standard physics, and these refutations have been accepted by the impartial community of scientists. Computer feedback analysis of the reception given to these papers shows that each one is studied continuously by almost the entire scientific community worldwide. Each refutation paper is subjected to exhaustive checking using computer algebra, so human error is eliminated. The refutation technique aims to examine the basics of the claims made in standard physics, and aims to simplify the refutation to its essence, so that the results are clear and logically irrefutable. All sectors of standard physics have been refuted in many ways, not only by the AIAS group of authors but by many others for almost a century. So standard physics has been shown to be the repetition of unscientific dogma, a fantasy that does not exist in nature. In this paper the basics of electroweak theory are subjected to rigorous algebraic scrutiny and are found to fail so badly that the whole theory must be rejected as meaningless. It is not known why such major errors were perpetrated to such an alarming extent, and it is not known why such errors were cited so many times in an uncritical manner. The standard electroweak theory cannot predict anything because of these errors.

In Section 2 our method of refutation is applied to two textbook [11] equations of the theory. Both equations are worked out in complete detail for maximum clarity and comprehension. The equations are checked by hand and also by computer, so any possibility of human error in our work is removed. It is found that even the most basic definitions of the theory are inconsistent, different authors use different definitions of the basic covariant derivatives [11 - 14]. The starting definitions of the standard physics lead to results with major algebraic errors, none of which were found by the standard physics community or by the readership of well cited textbooks. So it appears that citation in standard physics is a process that does not read the original material being cited.

2. ALGEBRAIC CHECK OF TWO BASIC EQUATIONS OF ELECTROWEAK THEORY

The first equation to be checked is Eq. (8.79) of ref. (11), a well cited textbook in quantum field theory. After a series of obscure assumptions the Higgs field is defined as the column vector:

$$\phi = \begin{bmatrix} 0 \\ \eta + \frac{\sigma}{\sqrt{2}} \end{bmatrix} \tag{1}$$

where η and σ are adjustable parameters. The covariant derivative of the Higgs field is defined as:

$$D_\mu \phi = \partial_\mu \begin{bmatrix} 0 \\ \frac{\sigma}{\sqrt{2}} \end{bmatrix} - \left(\frac{ig}{2} \begin{bmatrix} W_\mu^3 & W_\mu^1 - iW_\mu^2 \\ W_\mu^1 + iW_\mu^2 & -W_\mu^3 \end{bmatrix} + \frac{ig'}{2} X_\mu \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \right) \begin{bmatrix} 0 \\ \eta + \frac{\sigma}{\sqrt{2}} \end{bmatrix} \tag{2}$$

using gauge theory. This process introduces the adjustable parameters:

$$\eta, \sigma, g, g', W_\mu^3, W_\mu^1, W_\mu^2, X_\mu \tag{3}$$

so there are eight adjustables at this stage of the theory. Note carefully that two minus signs are used in the definition of the covariant derivative by Ryder [11], but other authors use different definitions of the same basic covariant derivative, including Weinberg [12], one of the original proponents of the theory. The definition of the weak neutral field and electromagnetic field depends critically on this arbitrary choice of sign. The theory is built on dogma, that the lagrangian must be gauge invariant. A mass term spoils this gauge invariance, so the particles must be massless initially. To an objective ECE scientist this is complete nonsense, and notable scientists such as Pauli and Dirac dismissed the theory at the outset. The massless particles are said to gain mass by the Higgs mechanism, by spontaneous symmetry breaking of degenerate vacua which have never been observed experimentally. The Higgs type theory of the vacuum is in error by up to a hundred orders of magnitude as is well known. That is a “slight error”. The ECE particle physics [1 - 10] accepts mass at the outset and eliminates the Higgs mechanism and gauge theory from UFT71 onwards.

Eq. (2) is worked out for maximum clarity and understanding as follows:

$$D_\mu\phi = \partial_\mu\begin{bmatrix}0\\ \frac{\sigma}{\sqrt{2}}\end{bmatrix} - \frac{ig}{2}\begin{bmatrix}\left(W_\mu^1 - iW_\mu^2\right)\left(\eta + \frac{\sigma}{\sqrt{2}}\right)\\ -W_\mu^3\left(\eta + \frac{\sigma}{\sqrt{2}}\right)\end{bmatrix} - \frac{ig'}{2}X_\eta\begin{bmatrix}0\\ \eta + \frac{\sigma}{\sqrt{2}}\end{bmatrix} =$$

$$= \frac{-i}{2}\begin{bmatrix}g\left(\eta + \frac{\sigma}{\sqrt{2}}\right)\left(W_\mu^1 - iW_\mu^2\right)\\ i\sqrt{2}\partial_\eta\phi - g\left(\eta + \frac{\sigma}{\sqrt{2}}\right)W_\mu^3 + g'X_\mu\left(\eta + \frac{\sigma}{\sqrt{2}}\right)\end{bmatrix} =$$

$$= \frac{-i}{2}\begin{bmatrix}g\left(\eta + \frac{\sigma}{\sqrt{2}}\right)\left(W_\mu^1 - iW_\mu^2\right)\\ i\sqrt{2}\partial_\eta\phi - \eta\left(gW_\mu^3 - g'X_\mu\right) - \frac{\sigma}{\sqrt{2}}\left(gW_\mu^3 - g'X_\mu\right)\end{bmatrix} \tag{4}$$

and this is the result given in ref. (11), eq. (8.80). In this case Ryder is algebraically correct, but the result depends critically on his choice of a double negative covariant derivative.

This choice of sign is arbitrary. In the textbook by Weinberg [12], electric charge is defined by:

$$q = \frac{e}{g}t_3 - \frac{e}{g'}y \tag{5}$$

where e is the proton charge, and where there are four adjustable parameters:

$$t_3, y, g \text{ and } g' \tag{6}$$

Spontaneous symmetry breaking is claimed to lead to:

$$A_\alpha^\mu = C_\alpha A^\mu + \ldots \tag{7}$$

from which Weinberg defines the neutral field and electromagnetic field as:

$$Z^\mu = A_3^\mu \cos\theta + B^\mu \sin\theta \tag{8}$$

$$A^\mu = -A_3^\mu \sin\theta + B^\mu \cos\theta \tag{9}$$

in his notation. However Ryder [11[defines the same fields as:

$$Z_\mu = W_\mu^3 \cos\theta - X_\mu \sin\theta \tag{10}$$

$$A_\mu = W_\mu^3 \sin\theta + X_\mu \cos\theta \tag{11}$$

so there is an inconsistency even in the basic definitions of the theory. Other authors [13, 14] have yet different definitions. Weinberg [12] claims to arrive "by inspection" (*sic*) at:

$$q = -t_3 \sin\theta + y\cos\theta \tag{12}$$

from Eqs. (8) and (9). By comparison of Eqs. (5) and (12) it is claimed that:

$$g = \frac{-e}{\sin\theta},\ g' = \frac{-e}{\cos\theta} \tag{13}$$

The original results given by Weinberg in 1967 [12] are:

$$m_W = \frac{37.3}{|\sin\theta|}\mathrm{GeV},\ m_Z = \frac{74.6}{|\sin 2\theta|}\mathrm{GeV} \tag{14}$$

where m_W and m_Z are claimed to be boson masses. The masses cannot be measured without knowledge of θ. It will be shown in this Section that there exists a gross algebraic error that negates Eq. (14) and the entire theory. Note carefully [14] that the Higgs mechanism allows fermions to acquire mass, but the value of the mass is not fixed by the theory, the Higgs mechanism just introduces adjustable parameters.

There is a glaring internal inconsistency in Ryder's choice of sign for the $U(1)$ covariant derivative of the theory. In the first of his Eqs. (8.67) it is defined by:

$$D_\mu L = \partial_\mu L + \frac{i}{2} g' X_\mu L \tag{15}$$

i.e. with a positive sign. Similarly in the second of his Eqs. (8.67) it is defined again by a positive sign:

$$D_\mu R = \partial_\mu R + i g' X_\mu R \tag{16}$$

and in his Eq. (3.84) it is defined by a positive sign:

$$D_\mu \phi = \partial_\mu \phi + ieA_\mu \phi \tag{17}$$

However in his Eq. (8.72) it is defined by a negative sign. The $SU(2)$ covariant derivative is defined by a negative sign as in his Eq. (8.66), and the complete covariant derivative by two negative signs as in his Eq. (8.72):

$$D_\mu \phi = \left(\partial_\mu - \frac{i}{2} g \boldsymbol{\tau} \cdot \mathbf{W}_\mu - \frac{i}{2} g' X_\mu \right) \phi \tag{18}$$

The fundamental definitions (10) and (11) depend on Eq. (18). If Ryder were internally consistent the complete covariant derivative should be:

$$D_\mu \phi = \left(\partial_\mu - \frac{i}{2} g \boldsymbol{\tau} \cdot \mathbf{W}_\mu + \frac{i}{2} g' X_\mu \right) \phi \tag{19}$$

This leads to:

$$D_\mu \phi = \frac{-i}{2} \begin{bmatrix} g\left(\eta + \frac{\sigma}{\sqrt{2}}\right)\left(W_\mu^1 - iW_\mu^2\right) \\ i\sqrt{2}\partial_\mu \phi - \eta\left(gW_\mu^3 + g'X_\mu\right) - \frac{\sigma}{\sqrt{2}}\left(gW_\mu^3 + g'X_\mu\right) \end{bmatrix} \tag{20}$$

instead of Eq. (4). The hermitian transpose of Eq. (20) is:

$$\left(D_\mu\phi\right)^+ = \frac{i}{2}\left[g\left(\eta+\frac{\sigma}{\sqrt{2}}\right)\left(W_\mu^1+iW_\mu^2\right), -i\sqrt{2}\partial_\mu\phi-\eta\left(gW_\mu^3+g'X_\mu\right)-\frac{\sigma}{\sqrt{2}}\left(gW_\mu^3+g'X_\mu\right)\right] \quad (21)$$

so

$$\left(D_\mu\phi\right)^+\left(D_\mu\phi\right)=\frac{1}{2}\left(\partial_\mu\phi\right)^2+\frac{g^2}{4}\left(\eta+\frac{\sigma}{\sqrt{2}}\right)^2\left(W_\mu^{1\,2}+W_\mu^{2\,2}\right)+$$
$$+\frac{\eta^2}{4}\left(qW_\mu^3+g'X_\mu\right)^2+\frac{\sigma^2}{8}\left(qW_\mu^3+g'X_\mu\right)^2+\ldots \quad (21)$$

If the covariant derivative (18) is used, we arrive at Eq. (8.80) of Ryder:

$$\left(D_\mu\phi\right)^+\left(D_\mu\phi\right)=\frac{1}{2}\left(\partial_\mu\phi\right)^2+\frac{g^2}{4}\left(\eta+\frac{\sigma}{\sqrt{2}}\right)^2\left(W_\mu^{1\,2}+W_\mu^{2\,2}\right)+\frac{\eta^2}{4}\left(qW_\mu^3-g'X_\mu\right)^2+\ldots \quad (22)$$

from Eq. (22) it is claimed that:

$$Z_\mu=\frac{gW_\mu^3-g'X_\mu}{\left(g^2+g'^2\right)^{1/2}} \quad (23)$$

upon normalization. However, Eq. (21) would give:

$$Z_\mu=\frac{gW_\mu^3+g'X_\mu}{\left(g^2+g'^2\right)^{1/2}} \quad (24)$$

Even the most basic definitions of the theory are therefore arbitrary.

In order to show the gross error in the basics of electroweak theory we first use Weinberg's definitions:

$$e_L=\frac{1}{2}\left(1+\gamma_5\right)e \quad (25)$$

$$e_R=\frac{1}{2}\left(1-\gamma_5\right)e \quad (26)$$

where γ_5 is the Dirac gamma five matrix defining chirality [11, 12]:

$$\gamma_5=\begin{bmatrix}1&0&0&0\\0&1&0&0\\0&0&-1&0\\0&0&0&-1\end{bmatrix} \quad (27)$$

Adding Eqs. (25) and (26):

$$e = e_L + e_R \quad (28)$$

Ryder [11] does not define this wavefunction in his entire book. It is claimed in Ryder's Eq. (8.85) that

$$
\begin{aligned}
& i\bar{R}\gamma^{\mu}\left(\partial_{\mu}+ig'X_{\mu}\right)R+i\bar{L}\gamma^{\mu}\left(\partial_{\mu}+\frac{i}{2}\left(g'X_{\mu}-g\boldsymbol{\tau}\cdot\mathbf{W}_{\mu}\right)\right)L= \\
& =i\bar{e}\gamma^{\mu}\partial_{\mu}e+i\bar{\upsilon}\gamma^{\mu}\partial_{\mu}\upsilon-g\sin\theta\bar{e}\gamma^{\mu}eA_{\mu}+ \\
& +\frac{g}{\cos\theta}\left(\sin^{2}\theta\bar{e}_{R}\gamma^{\mu}e_{R}-\frac{1}{2}\cos2\theta\bar{e}_{L}\gamma^{\mu}e_{L}+\frac{1}{2}\bar{\upsilon}\gamma^{\mu}\upsilon\right)Z_{\mu} \\
& :=\mathcal{L}_{1}
\end{aligned} \tag{29}
$$

Here:

$$
\begin{aligned}
& W_{\mu}=\frac{1}{\sqrt{2}}\left(W_{\mu}^{1}+iW_{\mu}^{2}\right),\ \cos\theta=\frac{g}{\left(g^{2}+g'^{2}\right)^{1/2}},\ \sin\theta=\frac{g'}{\left(g^{2}+g'^{2}\right)^{1/2}} \\
& Z_{\mu}=W_{\mu}^{3}\cos\theta-X_{\mu}\sin\theta,\ A_{\mu}=W_{\mu}^{3}\sin\theta+X_{\mu}\cos\theta, \\
& R=e_{R},\ \bar{R}=\bar{e}_{R},\ L=\begin{bmatrix}\upsilon\\ e_{L}\end{bmatrix},\ \bar{L}=\left[\bar{\upsilon},\bar{e}_{L}\right] \\
& D_{\mu}R=\partial_{\mu}R+ig'X_{\mu}R,\ D_{\mu}L=\left(\partial_{\mu}+\frac{i}{2}\left(g'X_{\mu}-\boldsymbol{\tau}\cdot\mathbf{W}_{\mu}\right)\right)L \\
& \boldsymbol{\tau}\cdot\mathbf{W}_{\mu}=\begin{bmatrix}W_{\mu}^{3} & W_{\mu}^{1}-iW_{\mu}^{2}\\ W_{\mu}^{1}+iW_{\mu}^{2} & -W_{\mu}^{3}\end{bmatrix}
\end{aligned} \tag{30}
$$

The essence of the theory is therefore to mix the wavefunction of the left hand electron, e_L with that of the parity violating neutrino, υ. The right hand electron e_R does not mix with the neutrino.

To start our check we note that:

$$
\begin{aligned}
& i\bar{R}\gamma^{\mu}D_{\mu}R=i\bar{e}_{R}\gamma^{\mu}\left(\partial_{\mu}+ig'X_{\mu}\right)e_{R}= \\
& =i\bar{e}_{R}\gamma^{\mu}\partial_{\mu}e_{R}-g'X_{\mu}\bar{e}_{R}\gamma^{\mu}e_{R}
\end{aligned} \tag{31}
$$

The other term is given by:

$$
\begin{aligned}
& i\bar{L}\gamma^{\mu}D_{\mu}L=i\left[\bar{\upsilon}\ \bar{e}_{L}\right]\left(\partial_{\mu}+\frac{i}{2}g'X_{\mu}\begin{bmatrix}1&0\\0&1\end{bmatrix}-\frac{ig}{2}\begin{bmatrix}W_{\mu}^{3} & W_{\mu}^{1}-iW_{\mu}^{2}\\ W_{\mu}^{1}+iW_{\mu}^{2} & -W_{\mu}^{3}\end{bmatrix}\right)\begin{bmatrix}\upsilon\\ e_{L}\end{bmatrix}= \\
& =i\left[\bar{\upsilon}\bar{e}_{L}\right]\gamma^{\mu}\partial_{\mu}\begin{bmatrix}\upsilon\\ e_{L}\end{bmatrix}-\frac{g'}{2}X_{\mu}\left[\bar{\upsilon}\ \bar{e}_{L}\right]\gamma^{\mu}\begin{bmatrix}\upsilon\\ e_{L}\end{bmatrix}+ \\
& +\frac{g}{2}\left[\bar{\upsilon}\bar{e}_{L}\right]\gamma^{\mu}\begin{bmatrix}W_{\mu}^{3} & W_{\mu}^{1}-iW_{\mu}^{2}\\ W_{\mu}^{1}+iW_{\mu}^{2} & -W_{\mu}^{3}\end{bmatrix}\begin{bmatrix}\upsilon\\ e_{L}\end{bmatrix}= \\
& =i\bar{\upsilon}\gamma^{\mu}\partial_{\mu}\upsilon+i\bar{e}_{L}\gamma^{\mu}\partial_{\mu}e_{L}-\frac{g'}{2}X_{\mu}\bar{\upsilon}\gamma^{\mu}\upsilon-\frac{g'}{2}X^{\mu}\bar{e}_{L}\gamma^{\mu}e_{L}+ \\
& +\frac{g}{2}\left[\bar{\upsilon}\ \bar{e}_{L}\right]\gamma^{\mu}\begin{bmatrix}W_{\mu}^{3}\upsilon+\left(W_{\mu}^{1}-iW_{\mu}^{2}\right)e_{L}\\ \left(W_{\mu}^{1}+iW_{\mu}^{2}\right)\upsilon-W_{\mu}^{3}e_{L}\end{bmatrix}=
\end{aligned}
$$

$$= i\bar{\upsilon}\gamma^{\mu}\partial_{\mu}\upsilon + i\,\bar{e}_L\gamma^{\mu}\partial_{\mu}e_L - \frac{g'}{2}X_{\mu}\bar{\upsilon}\gamma^{\mu}\upsilon - \frac{g'}{2}X_{\mu}\bar{e}_L\gamma^{\mu}e_L +$$
$$+\frac{g}{2}W^3_{\mu}\bar{\upsilon}\gamma^{\mu}\upsilon + \frac{g}{2}\left(W^1_{\mu} - iW^2_{\mu}\right)\bar{\upsilon}\gamma^{\mu}e_L +$$
$$\frac{g}{2}\left(W^1_{\mu} + iW^2_{\mu}\right)\bar{e}_L\,\gamma^{\mu}\upsilon - \frac{g}{2}W^3_{\mu}\,\bar{e}_L\gamma^{\mu}e_L \tag{32}$$

and the complete lagrangian is the sum of the terms in Eqs. (31) and (32)

$$\mathcal{L}_1 = i\,\bar{e}_R\gamma^{\mu}\partial_{\mu}e_R - g'X_{\mu}\bar{e}_R\gamma^{\mu}e_R + i\bar{\upsilon}\gamma^{\mu}\partial_{\mu}\upsilon + i\,\bar{e}_L\gamma^{\mu}\partial_{\mu}e_L -$$
$$-\frac{g'}{2}X_{\mu}\bar{\upsilon}\gamma^{\mu}\upsilon - \frac{g'}{2}X_{\mu}\bar{e}_L\gamma^{\mu}e_L + \frac{g}{2}W^3_{\mu}\bar{\upsilon}\gamma^{\mu}\upsilon + \frac{g}{2}\left(W^1_{\mu} - iW^2_{\mu}\right)\bar{\upsilon}\gamma^{\mu}e_L +$$
$$+\frac{g}{2}\left(W^1_{\mu} + iW^2_{\mu}\right)\bar{e}_L\gamma^{\mu}\upsilon - \frac{g}{2}W^3_{\mu}\bar{e}_L\gamma^{\mu}e_L \tag{33}$$

There are ten terms in all.

Ryder claims that Eq. (29) and Eq. (33) are the same. It is seen immediately that this claim cannot be true because:

$$i\bar{e}\gamma^{\mu}\partial_{\mu}e = i\bar{e}_R\gamma^{\mu}\partial_{\mu}e_R + i\bar{e}_L\gamma^{\mu}\partial_{\mu}e_L + i\bar{e}_R\gamma^{\mu}\partial_{\mu}e_L + i\bar{e}_L\gamma^{\mu}\partial_{\mu}e_R \tag{34}$$

but Ryder omits the mixing terms:

$$i\bar{e}_R\gamma^{\mu}\partial_{\mu}e_L + i\bar{e}_L\gamma^{\mu}\partial_{\mu}e_R \tag{35}$$

Some terms in Eqs. (29) and (30) are the same:

$$\frac{gW^+_{\mu}}{\sqrt{2}}\bar{\upsilon}\gamma^{\mu}e_L = \frac{g}{2}\left(W^1_{\mu} - iW^2_{\mu}\right)\bar{\upsilon}\gamma^{\mu}e_L \tag{36}$$

$$\frac{g}{\sqrt{2}}W_{\mu}\bar{\upsilon}\gamma^{\mu}e_L = \frac{g}{2}\left(W^1_{\mu} - iW^2_{\mu}\right)\bar{\upsilon}\gamma^{\mu}e_L \tag{37}$$

$$i\,\bar{\upsilon}\gamma^{\mu}\partial_{\mu}\upsilon = i\,\bar{\upsilon}\gamma^{\mu}\partial_{\mu}\upsilon \tag{38}$$

Putting aside the incorrect omission of the mixing terms (35), and taking into account the terms (36) to (38), Ryder must therefore be making the claim:

$$-g\sin\theta\bar{e}\gamma^{\mu}eA_{\mu} + \frac{g}{\cos\theta}\left(\sin^2\theta\bar{e}_R\gamma^{\mu}e_R - \frac{1}{2}\cos 2\theta\bar{e}_L\gamma^{\mu}e_L + \frac{1}{2}\bar{\upsilon}\gamma^{\mu}\upsilon\right)Z_{\mu} =$$
$$= ?- g'X_{\mu}\bar{e}_R\gamma^{\mu}e_R - \frac{1}{2}\left(g'X_{\mu} + gW^3_{\mu}\right)\bar{e}_L\gamma^{\mu}e_L - \frac{1}{2}\left(g'X_{\mu} - gW^3_{\mu}\right)\bar{\upsilon}\gamma^{\mu}\upsilon \tag{39}$$

Only one term in this claim is however correct:

$$\frac{1}{2}\bar{\upsilon}\gamma^{\mu}\upsilon\left(gW^3_{\mu} - g'X_{\mu}\right) = \frac{1}{2}\frac{g}{\cos\theta}Z_{\mu}\bar{\upsilon}\gamma^{\mu}\upsilon \tag{40}$$

So Ryder's claim must reduce to

$$-g'X_\mu \bar{e}_R \gamma^\mu e_R - \frac{1}{2}\left(g'X_\mu + gW_\mu^3\right)\bar{e}_L \gamma^\mu e_L = ?- g\sin\theta A_\mu \bar{e}\gamma^\mu e +$$
$$+gZ_\mu \frac{\sin^2\theta}{\cos\theta}\bar{e}_R\gamma^\mu e_R - \frac{1}{2}gZ_\mu \frac{\cos 2\theta}{\cos\theta}\bar{e}_L\gamma^\mu e_L \tag{41}$$

where:

$$e = e_L + e_R,$$
$$A_\mu = W_\mu^3 \sin\theta + X_\mu \cos\theta = \frac{g'W_\mu^3 + gX_\mu}{\left(g^2 + g'^2\right)^{1/2}} \tag{42}$$

First note that the left hand side of Eq. (41) is:

$$\mathcal{L}_{em} = -g'X_\mu \bar{e}_R \gamma^\mu e_R - \frac{1}{2}\left(g^2 + g'^2\right)^{1/2} A_\mu \bar{e}_L \gamma^\mu e_L \tag{43}$$

This is the true result of electroweak theory and it is absurd, because the electromagnetic potential A_μ interacts only with the left handed electron. The electromagnetic field in any correct theory must interact with both the right and left handed electrons.

Secondly, the right hand side of Eq. (41) is:

$$\mathcal{L}_{em}(\text{RHS}) = -g\sin\theta A_\mu\left(\bar{e}_R + \bar{e}_L\right)\gamma^\mu\left(e_R + e_L\right) + gZ_\mu \frac{\sin^2\theta}{\cos\theta}\bar{e}_R\gamma^\mu e_R -$$
$$-\frac{1}{2}gZ_\mu \frac{\cos 2\theta}{\cos\theta}\bar{e}_L\gamma^\mu e_L \tag{44}$$

and contains mixed terms such as $-g\sin\theta A_\mu \bar{e}_R \gamma^\mu e_L$ which do not appear in the algebraically correct Eq. (43).

Thirdly when:

$$\cos\theta = 1, \ \sin\theta = 0 \tag{45}$$

then:

$$A_\mu = X_\mu, \ g' = 0 \tag{46}$$

$$\mathcal{L}_{em} = -\frac{g}{2} A_\mu \bar{e}_L \gamma^\mu e_L \tag{47}$$

in which case

$$e = \frac{g}{2} \tag{48}$$

When

$$\cos\theta = 0, \ \sin\theta = 1 \tag{49}$$

then

$$A_\mu = W_\mu^3, \ g = 0 \tag{50}$$

and the field interacts with both e_R and e_L, in contrast to Eq. (47), another direct internal self inconsistency.

Our hand algebra was checked with the computer, which confirmed that Ryder's Eq. (8.85) is wholly incorrect, a gross error that negates the whole electroweak theory and with it the Higgs boson theory. It is clear that there is no Higgs boson in nature.

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