1)

224(1): Criticisms of the Higgs Boson based on Photon Mass.

The usual Lagrangian for the interaction of a scalar field ϕ (no spin) with the electromagnetic field is:

$$\mathcal{L} = (\partial_\mu \phi + ieA_\mu \phi)(\partial^\mu \phi^* - ieA^\mu \phi^*) - m^2 \phi^* \phi - \frac{1}{4} F^{\mu\nu} F_{\mu\nu} \quad -(1)$$

in the usual $\hbar = c = 1$ units. Here m is the mass associated with the scalar field. The Euler Lagrange equation is:

$$\frac{\partial \mathcal{L}}{\partial A_\mu} = \partial_\nu \left(\frac{\partial \mathcal{L}}{\partial(\partial_\nu A_\mu)} \right) \quad -(2)$$

with the usual u(1) definition:

$$F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu . \quad -(3)$$

From these equations the usual theory gives:

$$\partial_\nu F^{\mu\nu} = -ie(\phi^* \partial^\mu \phi - \phi \partial^\mu \phi^*) + 2e^2 A^\mu |\phi|^2 \quad -(4)$$

$$:= -eJ^\mu$$

So the interaction current is:

$$J^\mu = i(\phi^* D^\mu \phi - \phi D^\mu \phi^*) \quad -(5)$$

2) In comparison the lagrangian of a free photon with mass is usually:

$$\mathcal{L} = -\frac{1}{4} F_{\mu\nu} F^{\mu\nu} + \frac{1}{2} m_0^2 A_\mu A^\mu \quad -(6)$$

where m_0 is the photon mass. Eqs. (2) and (6) give:

$$\partial_\mu F^{\mu\nu} + m_0^2 A^\nu = 0, \quad -(7)$$

where

$$F^{\mu\nu} = \partial^\mu A^\nu - \partial^\nu A^\mu, \quad -(8)$$

and also:

$$\partial_\mu A^\mu = 0. \quad -(9)$$

The ECE field equations are:

$$\partial_\mu F^{a\mu\nu} = \mu_0 j^{a\nu} = A^{(0)} \left(R^{a\ \mu\nu}_{\ \mu} - \omega^a_{\ \mu b} T^{b\mu\nu} \right) \quad -(10)$$

and

$$\partial_\mu \tilde{F}^{a\mu\nu} = \mu_0 \tilde{j}^{a\nu} = A^{(0)} \left(\tilde{R}^{a\ \mu\nu}_{\ \mu} - \omega^a_{\ \mu b} \tilde{T}^{b\mu\nu} \right) \quad -(11)$$

and these are <u>generally covariant</u>.

There are multiple errors and internal contradictions in eq. (3) that arise from the <u>antisymmetry</u>:

$$\partial_\mu A_\nu = -\partial_\nu A_\mu \quad -(12)$$

proven in UFT131 ff.

In addition it is seen that eq. (4) contains A^μ on the right hand side.

3) The usual inhomogeneous Maxwell Heaviside (MH) equation is:

$$\partial_\mu F^{\mu\nu} = j^\nu \quad -(13)$$

and does not contain A^ν on the right hand side. Therefore the massive scalar field ϕ cannot interact with the electromagnetic field in a meaningful way. This has been known for ninety years and is enough to refute the Higgs boson, because the latter is a massive spinless field.

It can be seen from a comparison of eqs. (7) and (4) that the last term in eq. (4) leads to:

$$m_1^2 = 2e^2|\phi|^2 \quad -(14)$$

so that mass m_1 is generated by the interaction. This is different from the mass m of the scalar field. However the $U(1)$ sector of the standard model is equivalent to a massless electromagnetic field. This is an internal contradiction.

Another well known difficulty for the standard model is that the Proca

4) Lagrangian (6) is not invariant under

$$A_\mu \rightarrow A_\mu + \frac{1}{e}\partial_\mu \Lambda \quad -(15)$$

which is the U(1) gauge transformation which is the basis of Higgs boson theory.

In ECE theory U(1) gauge invariance is not used and photon mass is defined by

$$\mu_0 j^a_\nu = -m_0^2 A^a_\nu \quad -(16)$$

in $c = 1$, $\hbar = 1$ units. The tetrad postulate produces:

$$\left(\Box + \frac{m_0^2 c^2}{\hbar^2} \right) A^a_\mu = 0 \quad -(17)$$

in S.I. units.

So ECE theory refutes the Higgs boson theory because it produces photon mass from gravity.