245(5): Summary of New ECE Theory

The complete non-linear field tensor is defined as in the original ECE theory by:

$$F^a_{\mu\nu} = f^a_{\mu\nu} - f^a_{\nu\mu} + \omega^a_{\mu b} A^b_\nu - \omega^a_{\nu b} A^b_\mu \quad -(1)$$

with the Proca type electromagnetic field:

$$f^a_{\mu\nu} = \partial_\mu A^a_\nu \quad -(2)$$

$$= A^{(0)} \left( \Gamma^a_{\mu\nu} - \omega^a_{\mu\nu} \right).$$

The tetrad postulate gives the Proca equations immediately:

$$\partial^\mu f^a_{\mu\nu} + R A^a_\nu = 0 \quad -(3)$$

and

$$(\Box + R) A^a_\mu = 0. \quad -(4)$$

The $\underline{B}^{(3)}$ field is given by the non linear part of eq. (1):

$$B^a_{\mu\nu} = -ig \left( A^c_\mu A^b_\nu - A^c_\nu A^b_\mu \right) \quad -(5)$$

$$= \omega^a_{\mu b} A^b_\nu - \omega^a_{\nu b} A^b_\mu$$

so

$$\omega^a_{\mu b} = -ig A^c_\mu \quad -(6)$$

Eq. (6) is an ansatz similar to that used in

2) Yang Mills theory.

The ansatz (2) looks familiar but now the electromagnetic field is defined in a wholly new way that gives a fundamental geometrical method of deriving the Proca equation. The complete electromagnetic field (1) continues to obey the Bianchi identity:

$$D \wedge T := R \wedge q \quad -(7)$$

and Evans identity:

$$D \wedge \tilde{T} := \tilde{R} \wedge q \quad -(8)$$

However the field equation can be derived more directly. The inhomogeneous field equation is directly. The homogeneous field equation is defined by eq. (3).

using:

$$g_{\mu\nu} = f_{\mu\nu} - f_{\nu\mu} = \partial_\mu A_\nu - \partial_\nu A_\mu \quad -(9)$$

for each index a. So:

$$g^{\mu\nu} = \partial^\mu A^\nu - \partial^\nu A^\mu \quad -(10)$$

and

$$\partial^\rho g^{\mu\nu} + \partial^\nu g^{\rho\mu} + \partial^\mu g^{\nu\rho} = 0 \quad -(11)$$

i.e.

$$\partial^\mu \tilde{g}_{\mu\nu} = 0 \quad -(12)$$

Possible solutions of eq. (12) are:

$$\partial^\mu \tilde{f}^a_{\mu\nu} = 0 \quad -(13)$$

and

$$\partial^\nu \tilde{f}_{\nu\mu} = 0 \quad -(14)$$

Eq. (2) also gives the possibility of explaining the Aharonov Bohm effects as being due to:

$$\Gamma^a_{\mu\nu} = \omega^a_{\mu\nu} \quad -(15)$$

so for finite $A^a_\nu$ the field $f^a_{\mu\nu}$ is zero under condition (15).

The link between $\underline{B}^{(3)}$ and photon mass $m$ is given by eqs. (1) and (3).