88(6): Complete Set of Equations and Electrodynamics

The complete set of equations includes the ECE wave equation

$$\square A^a_\mu = - R A^a_\mu \quad - (1)$$

for each index a:

$$\square A_\mu = - R A_\mu \quad - (2)$$

As in previous work:

$$\square A_\mu = - R A_\mu = \mu_0 J_\mu \quad - (3)$$

which implies that:

$$\square \phi = \rho / \epsilon_0 \quad - (4)$$

$$\square \underline{A} = \mu_0 \underline{J} \quad - (5)$$

The complete set of antisymmetry equations is:

$$\underline{E} = - \underline{\nabla} \phi + \underline{\omega} \phi = - \frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad - (6)$$

$$\underline{B} = \underline{\nabla} \times \underline{A} - \underline{\omega} \times \underline{A} \quad - (7)$$

$$\frac{\partial A_Z}{\partial Y} + \frac{\partial A_Y}{\partial Z} = \omega_Y A_Z + \omega_Z A_Y \quad - (8)$$

$$\frac{\partial A_X}{\partial Z} + \frac{\partial A_Z}{\partial X} = \omega_Z A_X + \omega_X A_Z \quad - (9)$$

$$\frac{\partial A_Y}{\partial X} + \frac{\partial A_X}{\partial Y} = \omega_X A_Y + \omega_Y A_X \quad - (10)$$

and the trace antisymmetry equation or Lindstrom constraint:

$$\frac{1}{c^2} \left(\frac{\partial}{\partial t} + \omega_0 \right) \phi = (\underline{\nabla} - \underline{\omega}) \cdot \underline{A} \quad - (11)$$

The field equations are in terms of $\underline{B}$ and $\underline{E}$ and are:

2)

$$\underline{\nabla} \cdot \underline{B} = 0 \quad -(12)$$

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \quad -(13)$$

$$\underline{\nabla} \cdot \underline{E} = \rho / \epsilon_0 \quad -(14)$$

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2} \frac{\partial \underline{E}}{\partial t} = \mu_0 \underline{J} \quad -(15)$$

The conservation of antisymmetry means that all the above equations apply in any situation in electrodynamics. They are all fundamental laws of physics.

From eqns (4) and (14):

$$\underline{\nabla} \cdot \underline{E} = \Box \phi = \rho / \epsilon_0 \quad -(16)$$

and from eqs. (5) and (15):

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2} \frac{\partial \underline{E}}{\partial t} = \Box \underline{A} = \mu_0 \underline{J} \quad -(17)$$

Eqs. (16) and (17) have the same format as in the standard model but $\underline{E}$ and $\underline{B}$ are defined differently. Therefore

1) If ρ and $\underline{J}$ are measured, ϕ and $\underline{A}$ may be found.

2) If $\underline{E}$ and $\underline{B}$ are measured, ϕ and $\underline{A}$ may be found and ρ and $\underline{J}$ may be found.

3) Knowing $\underline{A}$ the spin connection $\underline{\omega}$ is found from Eqs (8) to (10).

4) The homogeneous equations (12) and (13) must be changed and from eqs. (7) and (12) this implies that:

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$$\underline{\nabla} \cdot \underline{\omega} \times \underline{A} = 0 \quad -(18)$$

If we define:

$$\underline{\nabla} \times \underline{A}_1 = \underline{\omega} \times \underline{A} \quad -(19)$$

then eq. (18) is obeyed by vector algebra:

$$\underline{\nabla} \cdot \underline{\nabla} \times \underline{A}_1 = 0 \quad -(20)$$

and

$$\underline{B} = \underline{\nabla} \cdot \underline{A}(\text{total}) \quad -(21)$$

where

$$\underline{A}(\text{total}) = \underline{A} + \underline{A}_1 \quad -(22)$$

Furthermore, define:

$$\begin{aligned} \underline{E} &= -\underline{\nabla}\phi + \underline{\omega}\phi \\ &:= -\underline{\nabla}\phi - \frac{\partial \underline{A}(\text{total})}{\partial t} \end{aligned} \quad -(23)$$

i.e.

$$-\frac{\partial \underline{A}(\text{total})}{\partial t} = \underline{\omega}\phi \quad -(24)$$

From eqs. (21) and (23) it follows that:

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \quad -(25)$$

Q.E.D.

) Finally the scalar spin connection must be found from

$$\underline{E} = -\frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(26)$$

and

$$\frac{1}{c^2}\left(\frac{\partial \phi}{\partial t} + \omega_0 \phi\right) = (\underline{\nabla} - \underline{\omega}) \cdot \underline{A} \quad -(27)$$

From eq. (27):

$$\omega_0 = \frac{1}{\phi}\left(c^2(\underline{\nabla} - \underline{\omega})\cdot\underline{A} - \frac{\partial\phi}{\partial t}\right) \quad -(28)$$

From eqs. (23) and (26):

$$\underline{E} = -\underline{\nabla}\phi - \frac{\partial \underline{A}}{\partial t}\,(\text{total})$$
$$= -\frac{\partial \underline{A}}{\partial t} - \omega_0 \underline{A} \quad -(29)$$

So $\underline{A}$ (total) can be found using ω_0 of eq. (28).

From eq. (24):

$$\frac{\partial \underline{A}}{\partial t}(\text{total}) = -\underline{\omega}\phi \quad -(30)$$

So

$$\underline{A}(\text{total}) = -\int \underline{\omega}\phi \, dt + \underline{C} \quad -(31)$$

where C is a constant of integration:

$$\underline{C} = \underline{A}(\text{total}) + \int \underline{\omega}\phi \, dt \quad -(32).$$

So the entire set of equations can be solved, and they are all based on Cartan geometry. They all fundamental laws of physics. The spin connection is the interaction with the VACUUM as in UFT 887.