317(4): Development of the ECE2 Field Equations.

Electrostatics

In this case:

$$\underline{B} = \underline{0} \quad -(1)$$

and

$$\underline{\nabla} \cdot \underline{E} = 2\underline{E} \cdot \left(\frac{1}{r^{(0)}} \underline{q} - \underline{\omega} \right) -(2)$$

Coulomb's law is represented by eq. (2), and is one of the most accurately tested laws. It can be written as:

$$\underline{E} = E_r \, \underline{e}_r = -\frac{e}{4\pi\epsilon_0 r^2} \underline{e}_r \quad -(3)$$

So

$$E_r = -\frac{e}{4\pi\epsilon_0 r^2} \quad -(4)$$

and

$$\underline{\nabla} \cdot \underline{E} = -\frac{\partial}{\partial r} \left(\frac{e}{4\pi\epsilon_0 r^2} \right) \quad -(4)$$

$$= \frac{e}{2\pi\epsilon_0 r^3}$$

So

$$\frac{\partial E_r}{\partial r} = \frac{e}{2\pi\epsilon_0 r^3} = 2E_r \left(\frac{1}{r^{(0)}} q_r - \omega_r \right) \quad -(5)$$

From eqns (4) and (5):

$$\boxed{\omega_r - \frac{1}{r^{(0)}} q_r = \frac{1}{r}} \quad -(6)$$

2)

Therefore:

$$\underline{\omega} - \frac{1}{r^{(0)}}\underline{v} = \frac{\underline{e}_r}{r} = \frac{r\underline{e}_r}{r^2} = \frac{\underline{r}}{r^2} \quad -(7)$$

so Coulomb's law becomes:

$$\boxed{\underline{\nabla} \cdot \underline{E} = -2\frac{\underline{E} \cdot \underline{r}}{r^2}} \quad -(8)$$

From the ECE2 Faraday law of induction under the condition (1):

$$\underline{\nabla} \times \underline{E} = 2\left(\underline{\omega} - \frac{\underline{v}}{r^{(0)}}\right) \times \underline{E} \quad -(9)$$

$$= \underline{0}$$

because:

$$\underline{E} = -\frac{e}{4\pi\epsilon_0 r^2}\underline{e}_r \quad -(10)$$

and

$$\underline{\omega} - \frac{1}{r^{(0)}}\underline{v} = \frac{\underline{e}_r}{r} \quad -(11)$$

so

$$\boxed{\underline{\nabla} \times \underline{E} = \underline{0}} \quad -(12)$$

Magnetostatics

In this case:

$$\underline{E} = \underline{0} \quad -(13)$$

3) and

$$\underline{\nabla} \cdot \underline{B} = 2\underline{B} \cdot \left(\underline{\omega} - \frac{1}{r^{(0)}} \underline{v} \right). \quad -(14)$$

From the ECE2 Ampère Maxwell law under condition (13):

$$\underline{\nabla} \times \underline{B} = 2 \left(\frac{\underline{v}}{r^{(0)}} - \underline{\omega} \right) \times \underline{B} = \mu_0 \underline{J} \quad -(15)$$

In the usual view:

$$\underline{\nabla} \cdot \underline{B} = 0 \quad -(16)$$

and

$$\underline{\nabla} \times \underline{E} + \frac{\partial \underline{B}}{\partial t} = \underline{0} \quad -(17)$$

but this has been highly controversial experimentally for over a century. Eq. (16) requires:

$$\underline{B} \perp \left(\underline{\omega} - \frac{1}{r^{(0)}} \underline{v} \right) \quad -(18)$$

Condition (17) for the Faraday law of induction requires, from the ECE2 law:

$$\omega_0 = \frac{v_0}{r^{(0)}} \quad -(19)$$

and

$$\underline{E} \parallel \left(\underline{\omega} - \frac{\underline{v}}{r^{(0)}} \right) \quad -(20)$$

because the ECE2 Faraday law of induction is

$$\frac{\partial \underline{B}}{\partial t} + \underline{\nabla} \times \underline{E} = 2\left[c\left(\omega_0 - \frac{q_0}{r^{(0)}}\right)\underline{B} + \left(\underline{\omega} - \frac{\underline{q}}{r^{(0)}}\right) \times \underline{E}\right] \quad -(21)$$

Eq. (14) reduces to Eq. (16) if:

$$\underline{B} \perp \left(\underline{\omega} - \frac{1}{r^{(0)}}\underline{q}\right) \quad -(22)$$

So from eqs. (20) and (22) the usual view of eqs. (16) and (17) requires:

$$\boxed{\underline{E} \perp \underline{B}} \quad -(23)$$

Q. E. D.

Eq. (23) is also given by the Evans torsion identity as in UFT 314 and UFT 315, and self consistently, eq. (23) is a solution of eqs. (16) and (17).

Therefore ECE2 is rigorously self-consistent.

In magnetostatics, the condition (19) means that the ECE2 Ampère law is:

$$\underline{\nabla} \times \underline{B} = 2\left(\frac{\underline{q}}{r^{(0)}} - \underline{\omega}\right) \times \underline{B} = \mu_0 \underline{J} \quad -(24)$$

where:

$$\underline{B} \perp \left(\underline{\omega} - \frac{1}{r^{(0)}}\underline{q}\right) \quad -(25)$$

Eq. (24) is the magnetic analogy of Ohm's Law.

If the controversial equations (16) and (17) are accepted for the sake of argument, then the ECE2 Ampère Maxwell Law simplifies to:

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2}\frac{\partial \underline{E}}{\partial t} = 2\left(\frac{\underline{q}}{r^{(0)}} - \underline{\omega}\right) \times \underline{B}$$

$$= \mu_0 \underline{J} \quad -(26)$$

Plane Wave Solutions in Electrodynamics

The plane wave solutions of eqs. (16) and (17) are well known to be:

$$\underline{E} = \frac{E^{(0)}}{\sqrt{2}}(\underline{i} - i\underline{j})\, e^{i(\omega t - \kappa Z)} \quad -(27)$$

and

$$\underline{B} = \frac{B^{(0)}}{\sqrt{2}}(i\underline{i} + \underline{j})\, e^{i(\omega t - \kappa Z)} \quad -(28)$$

From eqs. (27) and (28):

6)

$$\underline{E} \cdot \underline{B} \stackrel{?}{=} 0 \quad -(29)$$

So

$$\underline{E} \perp \underline{B} \quad -(30)$$

Q.E.D.

From eqs. (18), (20), (27) and (28), a possible result is:

$$\boxed{\underline{\omega} - \frac{1}{r^{(0)}}\underline{q} = \frac{1}{\sqrt{2}\,r^{(0)}}\left(\underline{i} - i\underline{j}\right)e^{i(\omega t - \kappa Z)}} \quad -(31)$$

These equations can now be augmented by the first and second Cartan Maurer structure equations adapted for ECE2, i.e.:

$$T = D \wedge q \rightarrow F = D \wedge A \quad -(32)$$

and

$$R = D \wedge \omega \rightarrow F = D \wedge W \quad -(33)$$

and this will lead to ECE2 spin connection resonance theory.