1)

104(1) On a Simple Derivation of the ECE Field Equations of Electrodynamics

These are derived in the weak field limit from the tensor equation of the Bianchi identity and its Hodge dual. These are respectively:

$$D_\mu \tilde{T}^{\kappa\mu\nu} = \tilde{R}^{\kappa\ \mu\nu}_{\ \mu} \quad -(1)$$

and:

$$D_\mu T^{\kappa\mu\nu} = R^{\kappa\ \mu\nu}_{\ \mu} \quad -(2)$$

In the weak field limit these become:

$$\partial_\mu \tilde{T}^{\kappa\mu\nu} \doteq \tilde{R}^{\kappa\ \mu\nu}_{\ \mu} \quad -(3)$$

and

$$\partial_\mu T^{\kappa\mu\nu} \doteq R^{\kappa\ \mu\nu}_{\ \mu} \quad -(4)$$

Using the fundamental ECE hypothesis these translate into:

$$\partial_\mu \tilde{F}^{\kappa\mu\nu} \doteq A^{(0)} \tilde{R}^{\kappa\ \mu\nu}_{\ \mu} \quad -(5)$$

and

$$\partial_\mu F^{\kappa\mu\nu} \doteq A^{(0)} R^{\kappa\ \mu\nu}_{\ \mu} \quad -(6)$$

2) The Maxwell Heaviside type structure is recovered when:

$$\tilde{R}^{\kappa}{}_{\mu}{}^{\nu\omega} = 0 \; ; \; R^{\kappa}{}_{\mu}{}^{\nu\omega} \neq 0 \quad -(7)$$

and eq. (7) is the result given by the use of the Christoffel symbols. This is because:

$$\tilde{R}^{\kappa}{}_{\mu}{}^{\nu\omega} = 0 \quad -(8)$$

is the same as:

$$R^{\kappa}{}_{\mu\nu\rho} + R^{\kappa}{}_{\rho\mu\nu} + R^{\kappa}{}_{\nu\rho\mu} = 0. \quad -(9)$$

Eqs (5) and (6) are FCE field equations in which there is a balance between the electromagnetic field and the gravitational field. The former is defined by the non-zero Ricci:

$$\tilde{F}^{\kappa\mu\nu} = A^{(0)} \tilde{T}^{\kappa\mu\nu} \quad -(10)$$

$$F^{\kappa\mu\nu} = A^{(0)} T^{\kappa\mu\nu} \quad -(11)$$

In general, eqs. (5) and (6) must be solved simultaneously on a computer, because the Christoffel symbol is an approximation.