317(8): Summary of Checked Field Equations

ECE Theory

$$\nabla \cdot \mathbf{B}^a = \boldsymbol{\omega}^a{}_b \cdot \mathbf{B}^b - \mathbf{A}^b \cdot \mathbf{R}^a{}_b(\text{spin}) \quad -(1)$$

$$\nabla \cdot \mathbf{E}^a = \boldsymbol{\omega}^a{}_b \cdot \mathbf{E}^b - c\mathbf{A}^b \cdot \mathbf{R}^a{}_b(\text{orb}) \quad -(2)$$

$$\frac{\partial \mathbf{B}^a}{\partial t} + \nabla \times \mathbf{E}^a = cA^b_0 \mathbf{R}^a{}_b(\text{spin}) + c\mathbf{A}^b \times \mathbf{R}^a{}_b(\text{orb}) - c\omega^a{}_{0b}\mathbf{B}^b - \boldsymbol{\omega}^a{}_b \times \mathbf{E}^b \quad -(3)$$

$$\nabla \times \mathbf{B}^a - \frac{1}{c^2}\frac{\partial \mathbf{E}^a}{\partial t} = \frac{\omega^a{}_{0b}}{c}\mathbf{E}^b - A^b_0 \mathbf{R}^a{}_b(\text{orb}) + \boldsymbol{\omega}^a{}_b \times \mathbf{B}^b - \mathbf{A}^b \times \mathbf{R}^a{}_b(\text{spin}) \quad -(4)$$

ECE2 Theory

$$\nabla \cdot \mathbf{B} = \boldsymbol{\kappa} \cdot \mathbf{B} \quad -(5)$$

$$\nabla \cdot \mathbf{E} = \boldsymbol{\kappa} \cdot \mathbf{E} \quad -(6)$$

$$\frac{\partial \mathbf{B}}{\partial t} + \nabla \times \mathbf{E} = c\kappa_0 \mathbf{B} + \boldsymbol{\kappa} \times \mathbf{E} \quad -(7)$$

$$\nabla \times \mathbf{B} - \frac{1}{c^2}\frac{\partial \mathbf{E}}{\partial t} = -\left(\frac{\kappa_0}{c}\mathbf{E} + \boldsymbol{\kappa} \times \mathbf{B}\right) \quad -(8)$$

where:

$$\kappa_0 = 2\left(\omega_0 - \frac{q_0}{r(0)}\right) \quad -(9)$$

$$\boldsymbol{\kappa} = 2\left(\boldsymbol{\omega} - \frac{\mathbf{q}}{r(0)}\right) \quad -(10)$$

2) In the assumed absence of a magnetic monopole:

$$\underline{\nabla} \cdot \underline{B} = 0 \quad -(11)$$

and

$$\frac{\partial \underline{B}}{\partial t} + \underline{\nabla} \times \underline{E} = \underline{0} \quad -(12)$$

This means:

$$\underline{\kappa} \perp \underline{B} \quad -(13)$$

$$\underline{\kappa} \parallel \underline{E} \quad -(14)$$

$$\kappa_0 = 0 \quad -(15)$$

So in the assumed absence of a magnetic monopole:

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

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

$$\underline{\nabla} \cdot \underline{E} = \underline{\kappa} \cdot \underline{E} \quad -(18)$$

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2} \frac{\partial \underline{E}}{\partial t} = -\underline{\kappa} \times \underline{B} \quad -(19)$$

In free space:

$$\underline{q} = r^{(0)} \underline{\omega} \quad -(20)$$

so eqs. (18) and (19) become:

$$\underline{\nabla} \cdot \underline{E} = 0 \quad -(21)$$

$$\underline{\nabla} \times \underline{B} - \frac{1}{c^2} \frac{\partial \underline{E}}{\partial t} = \underline{0} \quad -(22)$$
