APPENDIX 2 : SIMULTANEOUS EQUATIONS FOR ϕ AND $\underline{\omega}$.

The general resonance equation for the Coulomb Law is:

$$\nabla^2 \phi + \underline{\nabla} \phi \cdot \underline{\omega} + (\underline{\nabla} \cdot \underline{\omega}) \phi = -\rho / \epsilon_0 . \quad -(B1)$$

The limit of the standard model is reached when:

$$\underline{\nabla} \phi = \underline{\omega} \phi \quad -(B2)$$

i.e.

$$\nabla^2 \phi = \underline{\nabla} \phi \cdot \underline{\omega} + (\underline{\nabla} \cdot \underline{\omega}) \phi \quad -(B3)$$

and

$$\phi = -\frac{e}{4\pi \epsilon_0 r} . \quad -(B4)$$

Therefore:

$$\underline{\omega} = -\frac{1}{r} \underline{e}_r \quad -(B5)$$

where $\underline{e}_r$ is the radial unit vector of the spherical polar coordinate system. So:

$$\omega_r = -\frac{1}{r} . \quad -(B6)$$

Eq. (B3) is a limiting case or boundary value of the general resonance equation (B1). There is not sufficient information in Eq. (B1) alone to completely determine ϕ and $\underline{\omega}$ under all conditions, because there are two variables and only one equation. In the text of the paper it has been assumed in order to proceed that Eq. (B6) holds under all conditions, so Eq. (B1) becomes (in spherical polar coordinates):

$$\frac{\partial^2 \phi}{\partial r^2} + \frac{1}{r}\frac{\partial \phi}{\partial r} - \frac{1}{r^2}\phi = -\frac{\rho(0)}{\epsilon_0}\cos(\kappa r). \quad -(B7)$$

Eq. (B7) has been developed in the text into the undamped oscillator:

$$\frac{d^2 \phi}{dR^2} + \kappa^2 R = \frac{\rho(0)}{\epsilon_0} e^{2i\kappa R} \cos\left(e^{i\kappa R}\right) \quad -(B8)$$

and Eq. (B8) has been solved numerically and analytically to show the presence in general of an infinite number of resonant voltage peaks of theoretically infinite amplitude at which the voltage becomes infinite.

More information can be obtained about ϕ and $\underline{\omega}$ by using the ECE Faraday Law of induction:

$$\underline{\nabla} \times \underline{E}^a + \frac{\partial \underline{B}^a}{\partial t} = \mu_0 \underline{j}^a \quad -(B9)$$

where $\underline{j}^a$ is the homogeneous current density of ECE theory. When there is no magnetic field present (as in the Coulomb Law) Eq. (B9) becomes the electro-static law:

$$\underline{\nabla} \times \underline{E}^a = \mu_0 \underline{j}^a. \quad -(B10)$$

Since Eq. (B10) holds for all a it can be written simply as:

$$\underline{\nabla} \times \underline{E} = \mu_0 \underline{j} \quad -(B11)$$

where:

$$\underline{E} = -(\underline{\nabla} + \underline{\omega})\phi. \quad -(B12)$$

From Eqs. (B11) and (B12):

$$\underline{\nabla} \times (\underline{\nabla} \phi + \underline{\omega} \phi) = -\mu_0 \underline{j}. \quad -(B13)$$

Using the vector relations:

$$\underline{\nabla} \times \underline{\nabla} \phi = \underline{0}, \quad -(B14)$$

$$\underline{\nabla} \times (\phi \underline{\omega}) = \phi \underline{\nabla} \times \underline{\omega} + \underline{\nabla} \phi \times \underline{\omega}, \quad -(B15)$$

Eq. (B13) becomes:

$$\phi \underline{\nabla} \times \underline{\omega} + \underline{\nabla} \phi \times \underline{\omega} = -\mu_0 \underline{j}. \quad -(B16)$$

Thus Eqs. (B1) and (B16) are the two simultaneous equations needed to solve for ϕ and $\underline{\omega}$ under all conditions in general.

If it is assumed that gravitation has no effect on electromagnetism the homogeneous current disappears:

$$\underline{j} = \underline{0} \quad -(B17)$$

so that Eq. (B16) simplifies to:

$$\phi \underline{\nabla} \times \underline{\omega} + \underline{\nabla} \phi \times \underline{\omega} = \underline{0}. \quad -(B18)$$

Eq. (B1) and (B18) must be solved simultaneously by computer in general to find the class of solutions for the spin connection that gives resonance. In the far off resonance condition they reduce to the Poisson equation:

$$\nabla^2 \phi = -\rho / \epsilon_0 \quad -(B19)$$

and thus to the Coulomb potential (B4) and spin connection (B5). The latter is a valid solution of Eqs. (B1) and (B19) because from Eq. (B5):

$$\underline{\nabla} \times \underline{\omega} = \underline{0} \quad -(B20)$$

so Eq. (B18) reduces to:

$$\underline{\nabla} \phi \times \underline{\omega} = \underline{0}. \quad -(B21)$$

If:

$$\underline{\nabla} \phi = \underline{\omega} \phi \quad -(B22)$$

Eq. (B21) is true identically. Also, if consideration is restricted to the radial component:

$$\underline{\nabla} = \frac{\partial}{\partial r} \underline{e}_r \quad -(B23)$$

in the spherical polar coordinate system, then Eq. (B21) is valid for any radial spin connection of the type:

$$\underline{\omega} = \omega_r \underline{e}_r \quad -(B24)$$

because

$$\underline{e}_r \times \underline{e}_r = \underline{0}. \quad -(B25)$$

So Eq. (B18) is true for any radially directed spin connection. The one that gives the standard model as a limit is Eq. (B5), Q.E.D.