Maxwell-Dirac

The coupled Maxwell-Dirac equations are the simple core of the Wave Electrodynamics approach. In effect, this is all there is to the approach.

Maxwell’s equations for the electromagnetic field in the Lorenz gauge, operating on the EM potential A, in four-vector notation:

- \[ \partial_\mu \partial^\mu A^\mu = k_\mu J^\mu \]

The four-potential is:

- \[ A^\mu = (A_0, \vec{A}) = (A_0, A_x, A_y, A_z) \]

The four-current is:

- \[ J^\mu = (\rho, \vec{J}) = (\rho, J_x, J_y, J_z) \]

The four-constants are:

- \[ k_\mu = \left( \frac{1}{\epsilon_0}, \mu_0, \mu_0, \mu_0 \right) \]

The Dirac equation for an electron charge wave, in second-order wave form, operating on four field variables (2 complex numbers), interacting with the EM field through B and E vectors derived from A, and by giving rise to current density J.

- \[ \left[ i\hbar \partial_\mu - \frac{e}{c} A_\mu \right]^2 + \frac{e}{c} \vec{\sigma} \cdot (\vec{B} + i\vec{E}) \psi = m_0^2 c^2 \psi \]
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