Once More on Dirac-Einstein Equation

Zygmunt Morawski

ABSTRACT: One has noticed that there are the Dirac matrices of the flat space-time at the left member of the Dirac-Einstein equation, but at the right member the effects of the curved space-time appear. One has deduced from this that the phenomena of the curvature at the left member of this equation are taken under consideration in the mass matrix m, potential V and spinor ψ, which in general can be a matrix. Next, the ideas of the spinor as the "curved" wave function of the electron in an atom have been developed and the necessity of the taking under consideration the gravitation effects and effects of the strong interactions at the small distances have been developed too. In connection with this the role of the mass charge tensor in the Dirac-Einstein equation has been discussed. In the end it has been noticed that the spinor (or the wave function) is the field, so the electromagnetic field may be a wave function too. In consequence of this, the wave function is the matrix, into which the components of electric and magnetic fields enter and they enter into the Dirac-Einstein equation by the matrix mass, too.

We have the Dirac-Einstein equation:

$$\left(i\hbar\gamma_\mu\partial^\mu + m + V\right)\psi = \left(R_{jk} + g_{jk}\, g^{jk}\, R_{jk}\right)\psi$$

γ_μ - the Dirac matrices of the flat space-time

At the right member there are the matrices representing the tensors of the curvature of the space-time, so at the left member the effects of the curvature must appear too. They are taken under consideration by V and ψ.

Paradoxically here the potential, mass matrix and wave function are describing the curvature of the space-time. The wave function of the electron in the atom of hydrogen is an example of it. The mass matrix can describe the effects of the curvature too. The wave function of the electron in an atom takes under consideration the effects of the curvature of the left member of the Dirac-Einstein equation.

Simultaneously one has taken into account the gravitational effects in the case of electrons, because – first of all – electrons s (but not only) may be present near or at the area of the nucleus.

Next, it is necessary to take under consideration the strong interactions by the charge-mass tensor.

The charge-mass tensor can exist in the Dirac-Einstein equation both in metric tensors and curvature tensors equivalent to mass but directly in the mass matrix, too. The wave function ψ is a field as every other field.

The field of photon is especially interesting. If ψ describes photon, ψ is generally the Maxwell matrix, which represents the tensor containing the components of electric and magnetic fields.

Simultaneously $\vec{E}$ and $\vec{B}$ enter the Dirac-Einstein equation by the mass matrix (equivalent to energy), which contains the squares E^2 and B^2 and the components of the Poynting vector.

So then the Dirac-Einstein equation depends on E and B non-linearly. So we have non-linear quantum electrodynamics.