The Unified Field 4-Dimensional Relativistic Dirac Equation

$3 \cdot 10^{-85}$

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Abstract

- Albert Einstein, Lorentz and Minkowski together published in 1905 the Theory of Special Relativity and Einstein published in 1915 his Unified Field Theory of General Relativity based on a curved 4-dimensional Space-Time Continuum to integrate the gravitational field and the electromagnetic field in one Unified Field Theory. Since then the method of Einstein's Unifying Field Theory has been developed by many others in more than 4 dimensions resulting finally in the well-known 10-dimensional and 11-dimensional "string theory".
- The original Kaluza-Klein theory was one of the first attempts to create a unified field theory. After many years of research, the 11-dimensional Super String Theory did not lead to the fundamental answers on the fundamental questions in Physics. Why do elementary particles have the exact numbers for mass, charge and spin.
- To find answers a new path in Physics has been chosen. A path that has been based on a fundamental property in our universe. The fundamental property of Equilibrium. The whole Universe is in a perfect Equilibrium. This fundamental property of Equilibrium has been extended to a 4-dimensional Hyperspace Continuum in which a perfect equilibrium persists in any of the 4 coordinate directions. The requirement of a 4-dimensional Equilibrium results in the outcome that the Dirac Equation is only one equation in a set of 4 equations.
- The Dirac Equation originates from an electromagnetic equation in the time-energy domain. This new 4-Dimensional Hyperspace Equilibrium Theory opens a new door to an unexplored field of mathematical and physical challenges. This theory is a new approach in physics based on a 4-Dimensional Hyperspace Equilibrium resulting in the 4-dimensional Dirac Equation.
- Solving these 4 simultaneous equations requires an immense computer performance and offers the possibilities to find the answers to the fundamental questions in physics within a quantum mechanical 4-Dimensional Frame-Work.

3-Dimensional Equilibrium

Every Physical Possible Electromagnetic Configuration has to be a solution of this fundamental equation

$$-\frac{1}{c^2}\frac{\partial\,(\overline{E}\times\overline{H})}{\partial t} + \varepsilon_0\,\overline{E}\,(\nabla\,.\,\overline{E}) - \varepsilon_0\,\overline{E}\times(\nabla\times\overline{E}) + \mu_0\,\overline{H}\,(\nabla\,.\,\overline{H}) - \mu_0\,\overline{H}\times(\nabla\times\overline{H}) = \overline{0} \qquad (5)$$

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3-Dimensional Equilibrium within a Gravitational Field g

Every "Physical Possible" Electro-Magnetic Field Configuration (visible or non-visible light) under the influence of a Gravitational Field with gravitational acceleration $\overline{g}$ has to be a solution of this fundamental equation (5-a)

$$-\frac{1}{c^2}\frac{\partial\,(\overline{E}\times\overline{H})}{\partial t} + \varepsilon_0\,\overline{E}\left(\nabla\,.\,\overline{E}\right) - \varepsilon_0\,\overline{E}\times\left(\nabla\times\overline{E}\right) + \mu_0\,\overline{H}\left(\nabla\,.\,\overline{H}\right) - \mu_0\,\overline{H}\times\left(\nabla\times\overline{H}\right) - \frac{1}{2}\,\varepsilon_0^{\,2}\mu_0\left(\overline{E}\,.\,\overline{E}\right)\,\overline{g} - \frac{1}{2}\,\varepsilon_0\mu_0^{\,2}\left(\overline{H}\,.\,\overline{H}\right)\,\overline{g} = \overline{0} \qquad (5\text{-a})$$

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4-Dimensional Dirac Equation within a 4-Dimensional Equilibrium

Every Physical Possible Electromagnetic Configuration of Confinement has to be a solution of this fundamental 4-Dimensional Dirac Equation

$$(x_4)\qquad \left(\frac{i\,m\,c}{h}\,\overline{\beta} + \overline{\alpha}\,.\,\nabla\right)\psi + \frac{1}{c}\,\frac{\partial\psi}{\partial t} = 0$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix}\qquad -\frac{1}{c^2}\frac{\partial\,(\overline{E}\times\overline{H})}{\partial t} + \varepsilon_0\,\overline{E}\,(\nabla\,.\,\overline{E}) - \varepsilon_0\,\overline{E}\times(\nabla\times\overline{E}) + \mu_0\,\overline{H}\,(\nabla\,.\,\overline{H}) - \mu_0\,\overline{H}\times(\nabla\times\overline{H}) = \overline{0}$$

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Solution within a 3-Dimensional Equilibrium

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The Stationary Electro-Magnetic Field Confinement with a dimension ($2\ 10^{-58}$ [m]) (more than a "Billion Times a Billion") times smaller than Superstrings (Planck's Length $1.6\ 10^{-35}$ [m]) and an harmonic frequency $\omega = 10^{75}$ [s^{-1}] is a solution of equation (5-a) and has been presented for the Electric Field in equation (58):

$$\begin{pmatrix} e_r \\ e_\theta \\ e_\varphi \end{pmatrix} = \begin{pmatrix} 0 \\ \dfrac{e^{\frac{G1\,\varepsilon_0\,\mu_0}{8\,\pi\,r}}\,h[\theta,\varphi]\,\sin[\omega\,t]^2\sin\left[r\,\sqrt{\varepsilon_0\,\mu_0}\,\omega\right]^2}{r} \\ -\dfrac{e^{\frac{G1\,\varepsilon_0\,\mu_0}{8\,\pi\,r}}\,h[\theta,\varphi]\,\sqrt{K1-\sin[\omega\,t]^4\sin\left[r\,\sqrt{\varepsilon_0\,\mu_0}\,\omega\right]^4}}{r} \end{pmatrix} \qquad (58)$$

The Stationary Electro-Magnetic Field Confinement with a dimension ($2\ 10^{-58}$ [m]) (more than a "Billion Times a Billion") times smaller than Superstrings (Planck's Length $1.6\ 10^{-35}$ [m]) and an harmonic frequency $\omega = 10^{75}$ [s^{-1}] is a solution of equation (5-a) and has been presented for the Magnetic Field in equation (59):

$$\begin{pmatrix} m_r \\ m_\theta \\ m_\varphi \end{pmatrix} = \sqrt{\frac{\varepsilon_0}{\mu_0}}\begin{pmatrix} 0 \\ \dfrac{e^{\frac{G1\,\varepsilon_0\,\mu_0}{8\,\pi\,r}}\,h[\theta,\varphi]\,\sqrt{K1-\sin[\omega\,t]^4\sin\left[r\,\sqrt{\varepsilon_0\,\mu_0}\,\omega\right]^4}}{r} \\ \dfrac{e^{\frac{G1\,\varepsilon_0\,\mu_0}{8\,\pi\,r}}\,h[\theta,\varphi]\,\sin[\omega\,t]^2\sin\left[r\,\sqrt{\varepsilon_0\,\mu_0}\,\omega\right]^2}{r} \end{pmatrix} \qquad (59)$$

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Electric Charge Density and Magnetic Spin of EM confinement

In which the integers n = 0, ½, 1½, 2, 2½, 3, 3½,…. And m =0, ½, 1½, 2, 2½, 3, 3½,….:

$$\rho = \varepsilon_0\,\nabla.\begin{pmatrix} e_r \\ e_\theta \\ e_\varphi \end{pmatrix} = \frac{n\,\varepsilon_0\,e^{-\frac{G1\epsilon}{8\pi r}}\,\cos(n\,\theta)\,\cos(m\,\varphi)\,\sin(t\,\omega)^2\sin\left(r\,\sqrt{\varepsilon_0\,\mu_0}\,\omega\right)^2}{r}$$

For the corresponding magnetic di-pole flux density ϕ (spin) equals for n = 0 and m = + ½ (spin up) and m = - ½ (spin down):

$$\phi = \mu_0\,\nabla.\begin{pmatrix} m_r \\ m_\theta \\ m_\varphi \end{pmatrix} = \frac{m\,\sqrt{\varepsilon_0\,\mu_0}\,e^{-\frac{G1\epsilon}{8\pi r}}\,\cos(n\,\theta)\,\cos(m\,\varphi)\,\sin\left(r\,\sqrt{\varepsilon_0\,\mu_0}\,\omega\right)^2}{r}$$

Graphic Plot Electromagnetic Confinement with radius 3.10^{-85} [m]

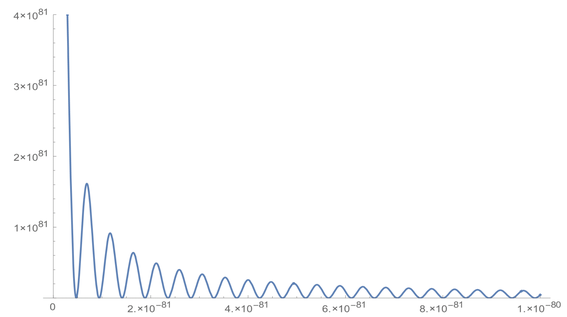

Figure 10 Equation (56): PlotGraph of the Electric Field Intensity f(r) for the region $10^{-85} < r < 10^{-80}$ with a frequency of $\omega = 10^{90}$ [s^{-1}] in which the gravitational field acceleration has been chosen accordingly an electromagnetic mass of 1.6726×10^{-27} [kg] located at the center of the confinement, according Newton's Shell Theorem.

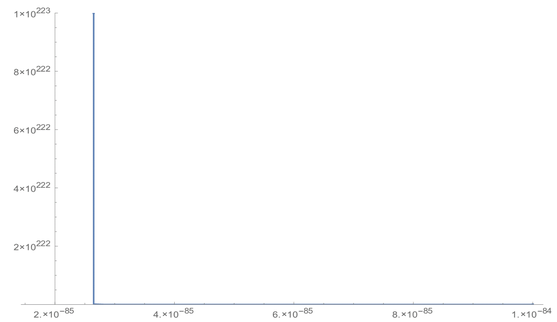

Figure 11 Equation (56): PlotGraph of the Electric Field Intensity f(r) for the region $10^{-85} < r < 10^{-84}$ with a frequency of $\omega = 10^{90}$ in which the gravitational field acceleration has been chosen accordingly an electromagnetic mass of 1.6726×10^{-27} [kg] located at the center of the confinement, according Newton's Shell Theorem.

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Conclusions

- 3-Dimensional Electromagnetic Equilibrium results in Electromagnetic Confinements with a diameter smaller than 3.10^{-85} [m] (Equation 5)
- 3-Dimensional Electromagnetic Equilibrium within a Gravitational Field $\overline{g}$ results in Electromagentic-Gravitational interaction (Equation 5-a)
- 4-Dimensional Electromagnetic Equilibrium within a 4-Dimensional Hyperspace results in the 4-Dimensional Quantum Mechanical Relativistic Dirac-Equation
- 3-Dimensional Electromagnetic Confinements result in integer numbers charge densities (positive or negative) and integer numbers spin (up and down)