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Reinterpretation of Quantum Physics

Highlights

Calculation of Macroscopic Effects

Light in Electromagnetic Interaction

Discovering Thoughts, Inventing Future

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An Experiment to Test a New Theory in Physics, Fundamentally Different From General Relativity, by Changing the Speed of Light in Electromagnetic Interaction

By Wim Vegt
Eindhoven University of Technology

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In the "New Theory" the fundamental foundation is "Equilibrium". Equilibrium for the "5 fundamental force densities in light" in any direction at any time and at any location. The New Theory describes a changing in the speed of light when corresponding monochromatic beams of light (highly coherent LASER beams) cross each other in different directions which effect would be in contradiction with the fundamental assumption in General Relativity of a constant speed of light. This experiment will be a determining test for the New Theory in Physics.

Keywords: *quantum physics, general relativity, gravitational redshift, black holes, dark matter.*

GJSFR-A Classification: *(LCC) QC173.6, QC6.5, QC354, QC761*

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Wim Vegt

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In this new theory the interaction between gravity and light has been discussed at astronomical levels: Gravitational RedShift, Black Holes and Dark Matter and at sub-atomic levels: The absorption and emission of light at sub-atomic levels in concentric spheres by an atom at discrete energy levels.

Differently than in General Relativity, the Interaction between Gravity and Light [35] fundamentally has been based on the sum of the "Stress Energy Tensor" and the introduced "Gravitational Tensor".

The theory describes "Gravitational-Electromagnetic Interaction" resulting in a mathematical Tensor presentation for BLACK HOLEs. (Gravitational Electromagnetic Confinements) [1] The "Electromagnetic Energy Gradient" creates a second order effect "Lorentz Transformation" which results in the Gravitational Field of BLACK HOLEs which determines the interaction force density between the confinement of Light (BLACK HOLE's) and the Gravitational Field.

Einstein approached the interaction between gravity and light by the introduction of the "Einstein Gravitational Constant" in the 4-dimensional Energy-Stress Tensor $\kappa T_{\mu\nu}$ (1).

In this alternative approach related to General Relativity, the interaction between gravity and light has been presented by the sum of the Electromagnetic Tensor $T_{\mu\nu}$ and the Gravitational Tensor $J_{\mu\nu}$ (2) .

The new theory describes the impact of "CURL" [38] within the gravitational fields around Black Holes and the impact on Gravitational Lensing. Gravitational "CURL" (Equation 6) is an effect which cannot be explained and calculated by General Relativity.

The new approach presents mathematical solutions for the BLACK HOLEs (Gravitational Electromagnetic Interaction) introduced in 1955 by Jonh Archibald Wheeler in the publication in Physical Review Letters in 1955 [1]. The mathematical solutions for BLACK HOLEs are fundamental solutions for the relativistic quantum mechanical Dirac equation (Quantum Physics) in Tensor presentation (41). Assuming a constant speed of light "c" and Planck's constant ħ within the BLACK HOLE, the radius "R" of the BLACK HOLE with the energy of a proton, is about 1% of the radius of the hydrogen atom (14).

The New Theory has been tested in an experiment with 2 Galileo Satellites and a Ground Station by measuring the Gravitational RedShift in an by the Ground Station emitted stable MASER frequency [2]. The difference between the calculation for Gravitational RedShift, within the Gravitational Field of the Earth, in "General Relativity" and the "New Theory" is smaller than 10^{-16} (12) and (13).

In all "General Redshift Experiments" General Relativity and the New Theory predict a Gravitational RedShift with a difference smaller than 15 digits beyond the decimal point which is beyond the accuracy of modern "Gravitational Redshift" observations. Both values are always within the measured Gravitational RedShift in all observations being published since the first observation of the gravitational redshift in the spectral lines from the White Dwarf which was the measurement of the shift of the star Sirius B, the white dwarf companion to the star Sirius, by W.S. Adams in 1925 at Mt. Wilson Observatory.

Theories which unify Quantum Physics and General Relativity [32], like "String Theory", predict the non-constancy of natural constants. Accurate observations of the NASA Messenger [11] observe in time a value for the gravitational constant "G" which constrains until ($|\dot{G}/G$ to be $< 4\times10^{-14}$ per year). One of the characteristics of the New Theory is the "Constant Value" in time for the Gravitational Constant "G" in unifying General Relativity and Quantum Physics.

Keywords: quantum physics, general relativity, gravitational redshift, black holes, dark matter.

Author: Department of Physics, Eindhoven University of Technology, The Netherlands. e-mail: wimvegt@quantumlight.science

I. An Alternative Approach in Gravity

Einstein approached the interaction between gravity and light by the introduction of the "Einstein Gravitational Constant" in the 4-dimensional Energy-Stress Tensor.

$$G_{\mu\nu} + \Lambda\, g_{\mu\nu} = \kappa\, T_{\mu\nu} \tag{1}$$

In which $G_{\mu\nu}$ equals the Einstein Tensor, $g_{\mu\nu}$ equals the Metric Tensor, $T_{\mu\nu}$ equals the Stress-Energy tensor, Λ equals the cosmological constant and κ equals the Einstein gravitational constant.

An alternative approach to Einstein's expression with the tensor $\kappa T_{\mu\nu}$, describing the curvature of the Space-Time continuum, is the sum of the Electromagnetic Tensor $T_{\mu\nu}$ and the Gravitational Tensor $J_{\mu\nu}$.

$$\kappa\, T_{\mu\nu} \Leftrightarrow \quad T_{\mu\nu} + J_{\mu\nu} \tag{2}$$

The 4-dimensional divergence of the sum of the Electromagnetic Stress-Energy tensor and the Gravitational Tensor expresses the 4-dimensional Force-Density vector (expressed in [N/m^3] in the 3 spatial coordinates) as the result of Electro-Magnetic-Gravitational interaction.

$$f^{\mu} = \partial_{\nu} \left(T^{\mu\nu} + J^{\mu\nu} \right)$$

In vector notation the 4-dimensional Force-Density vector can be written as:

$$\overline{f}^{4} = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \Box \bullet \left(\overline{\overline{T}} + \overline{\overline{J}} \right)$$

The fundamental boundary condition for this alternative approach to gravity is the requirement that the Force 4 vector equals zero in the 4 dimensions, expressing a universal 4-dimensional equilibrium:

$$\overline{f}^{4} = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \Box \bullet \left(\overline{\overline{T}} + \overline{\overline{J}} \right) = \overline{0}^{4}$$

The 3 spatial components of the Force-Density vector, as a result of Electro-Magnetic-Gravitational interaction can be written as:

$$\overline{f} = \frac{1}{c^2} \frac{\partial\, (\overline{E} \times \overline{H})}{\partial t} + \varepsilon_0\, \overline{E}\, (\nabla \cdot \overline{E}) - \varepsilon_0\, \overline{E} \times (\nabla \times \overline{E}) +$$

$$+ \mu_0\, \overline{H}\, (\nabla \cdot \overline{H}) - \mu_0\, \overline{H} \times (\nabla \times \overline{H}) + \gamma_0\, \overline{g}\, (\nabla \cdot \overline{g}) - \gamma_0\, \overline{g} \times (\nabla \times \overline{g}) = \overline{0} \quad [\mathrm{N/m^3}]$$

in which:

$\varepsilon_0\, (\nabla \cdot \overline{E}) = \rho_E$ Electric Charge Density [C/ m^3]

$\mu_0\, (\nabla \cdot \overline{H}) = \rho_M$ Magnetic Flux Density [Vs/ m^3] or [Wb/ m^3]

$\gamma_0\, (\nabla \cdot \overline{g}) = \rho_M$ Mass Density (Electromagnetic) [kg/ m^3]

Electric Energy Density: $w_E = \frac{1}{2}\, \varepsilon_0\, E^2$

Magnetic Energy Density: $w_M = \frac{1}{2}\, \mu_0\, H^2$

Gravitational Energy Density: $w_G = \frac{1}{2}\, \gamma_0\, g^2$

In which E represents the electric field intensity expressed in [V/m], H represents the magnetic field intensity expressed in [A/m] and g represents the gravitational acceleration expressed in [m/s^2]. The permittivity indicated as ε_0, the permeability indicated as μ_0 and the gravitational permeability of vacuum as γ_0.

For curl-free gravitational fields equation (6) can be written as:

$$\bar{f} = \frac{1}{c^2}\frac{\partial(\bar{E}\times\bar{H})}{\partial t} + \varepsilon_0\,\bar{E}\,(\nabla\cdot\bar{E}) - \varepsilon_0\,\bar{E}\times(\nabla\times\bar{E}) +$$

$$+\mu_0\,\bar{H}\,(\nabla\cdot\bar{H}) - \mu_0\,\bar{H}\times(\nabla\times\bar{H}) + \bar{\rho}\,g_M = \bar{0}\quad [N/m^3]$$

Substituting Einstein's $W = m\,c^2$ in (7) results in "Electro-Magnetic-Gravitational Equilibrium Field Equation" (8):

$$\bar{f} = \frac{1}{c^2}\frac{\partial(\bar{E}\times\bar{H})}{\partial t} + \varepsilon_0\,\bar{E}\,(\nabla\cdot\bar{E}) - \varepsilon_0\,\bar{E}\times(\nabla\times\bar{E}) +$$

$$+\mu_0\,\bar{H}\,(\nabla\cdot\bar{H}) - \mu_0\,\bar{H}\times(\nabla\times\bar{H}) + \frac{1}{2c^2}\bar{g}\left(\varepsilon E^2 + \mu H^2\right) = \bar{0}\quad [N/m^3]$$

The theory describes "Electromagnetic-Gravitational Interaction", "Magnetic-Gravitational Interaction" and "Electric-Gravitational Interaction". In this new theory particles do not interact with fields. The interaction between an electric charged particle and an electric field is not the interaction between a particle and a field but it is the interaction between the electric field of the particle interacting with the other electric field. Every interaction is an interaction between fields. Electric Fields interact with Electric Fields, Magnetic Fields interact with Magnetic Fields and Gravitational Fields interact with Gravitational Fields.

II. Gravitational Redshift/ Blueshift in "Light (EMR)" due to "Electromagnetic Gravitational Interaction"

To test the New Theory, the Gravitational-Redshift experiment: "Test of the Gravitational Redshift with Galileo Satellites in an Eccentric Orbit" by S. Hermann et all, has been chosen [2]. In this experiment a stable "MASER" frequency from a ground station has been emitted to 2 Galileo Satellites, measuring the frequency difference between the Ground Station and the Satellites. The frequency shift has been caused by the gravitational field of the Earth and 2 satellites has been chosen to compensate for the eccentricity of the Galileo Orbit.

Assuming a gravitational field g[z] depending on the radial direction in cartesian coordinates between the ground station and the satellites:

$$\overline{g[z]} = \left\{0,0,\frac{G\,M_{Earth}}{4\,\pi\,z^2}\right\}$$

In which G(G = 6.67428 10^{-11} Nm^2/kg^2) equals the Gravitational constant, M_{Earth} the mass of the earth and r the radial distance from the centre of the earth. The mathematical solution [5] of equation (8) for plane electromagnetic waves (expressed in cartesian {x,y,z} coordinates) related to the Electric Field Intensity equals:

$$\bar{E} = \begin{pmatrix} E_x \\ E_y \\ E_z \end{pmatrix} = \begin{pmatrix} e^{-\frac{G\,M_{Earth}\,\varepsilon_0\,\mu_0}{8\,\pi\,z}}\,h\left[\omega_0\,e^{-\frac{G\,M_{Earth}\,\varepsilon_0\,\mu_0}{4\,\pi\,z}}\left(t-\sqrt{\varepsilon\,\mu}\,z\right)\right] \\ 0 \\ 0 \end{pmatrix} \quad (10)$$

And the mathematical solution of (8) for the Magnetic Field Intensity equals:

$$\bar{H} = \begin{pmatrix} H_x \\ H_y \\ H_z \end{pmatrix} = \begin{pmatrix} 0 \\ \frac{1}{\sqrt{\varepsilon_0\,\mu_0}}\,e^{-\frac{G\,M_{Earth}\,\varepsilon_0\,\mu_0}{8\,\pi\,z}}\,h\left[\omega_0\,e^{-\frac{G\,M_{Earth}\,\varepsilon_0\,\mu_0}{4\,\pi\,z}}\left(t-\sqrt{\varepsilon\,\mu}\,z\right)\right] \\ 0 \end{pmatrix} \quad (11)$$

In which ω_0 equals the original frequency of the MASER radiation propagating in the direction of the gravitational field g[z] of the Earth in the z-direction. The exponential term demonstrates the Gravitational Redshift when the MASER radiation propagates in the direction of the Gravitational Field of the earth. The propagation speed of the Electromagnetic Radiation remains constant (the speed of light). But the amplitude of the field intensity and the frequency of the field intensity diminishes exponentially.

Calculations in Mathematica [5] demonstrate a difference between the calculation with General Relativity and the calculation with the New Theory. Choosing for the ground station a distance to the centre of the earth z_1 = 6,378,000 [m] (Radius of the Earth) and for the average distance of the ESA satellites in a Galileo orbit z_2 = 23,222,000 [m] (distance from the ESA satellite to the centre of the Earth), calculated with Mathematica, the Gravitational RedShift according General Relativity equals:

$$\Delta\,\omega_{GR} = 0.000000000040118\,15497097883\ [s^{-1}] \quad (12)$$

Calculated with Mathematica, the Gravitational RedShift according the New Theory, which is a solution of equation (8) equals:

$$\Delta\,\omega_{GR} = 0.000000000040118\,24206173742\ [s^{-1}] \quad (13)$$

Both calculated values a within the Range of the measured gravitational RedShift by the average values of both ESA satellites in the Galileo orbit

$$\Delta\,\omega_{Measured} = 0.000000000040118 \pm 2.2\,10^{-15}\ [s^{-1}] \quad (14)$$

In [2] a factor α has been defined which presents the measured deviation α between the predicted Gravitational RedShift by General Relativity and the Measured Gravitational RedShift.

$$\alpha = \Delta\,\omega_{MEASURED} - \Delta\,\omega_{GR} = (2.2 \pm 1.6) \times 10^{-5} \quad (15)$$

A comparable factor α can be used to determine which theory (General Relativity or the New Theory) has the nearest approach to the experimentally measured data. Highly accurate measuring experiments are required with an accuracy higher than 16 digits beyond the decimal point.

III. Black Holes

a) Black Holes without Singularities with dimensions smaller than the diameter of the Hydrogen Atom

A second fundamental solution for equation (8) describes a Gravitational Electromagnetic Confinement (BLACK HOLE) [1] within a radial gravitational field with acceleration $\bar{g}$ (in radial direction). This solution represents a Black Hole, the confinement of light due to its own gravitational field, and has no singularities. This solution for equation (8) describes Black Holes, dependent of time and radius, presenting discrete spherical energy levels, within a radial gravitational field with acceleration $\bar{g}$ (in radial direction) [14] has been represented in (16) and (17).

$$\begin{pmatrix} E_r \\ E_\theta \\ E_\varphi \end{pmatrix} = \begin{pmatrix} 0 \\ f(r)\,\mathrm{Sin}(k\,r)\,\mathrm{Sin}(\omega\,t) \\ -f(r)\,\mathrm{Cos}(k\,r)\,\mathrm{Cos}(\omega\,t) \end{pmatrix} \quad \begin{pmatrix} H_r \\ H_\theta \\ H_\varphi \end{pmatrix} = \sqrt{\frac{\varepsilon}{\mu}} \begin{pmatrix} 0 \\ -f(r)\,\mathrm{Sin}(k\,r)\,\mathrm{Cos}(\omega\,t) \\ -f(r)\,\mathrm{Cos}(k\,r)\,\mathrm{Sin}(\omega\,t) \end{pmatrix} \quad \bar{g} = \begin{pmatrix} \frac{G_1}{4\,\pi\,r^2} \\ 0 \\ 0 \end{pmatrix} \quad (16)$$

$$w_{em} = \left(\frac{\mu_0}{2}(\bar{m}\,.\,\bar{m}) + \frac{\varepsilon_0}{2}(\bar{e}\,.\,\bar{e})\right) =$$

$$f(r)^2\left((\mathrm{Sin}(k\,r)\,\mathrm{Sin}(\omega\,t))^2 + (\mathrm{Cos}(k\,r)\,\mathrm{Cos}(\omega\,t))^2 + \frac{\varepsilon}{\mu}(\mathrm{Sin}(k\,r)\,\mathrm{Cos}(\omega\,t))^2 + (\mathrm{Cos}(k\,r)\,\mathrm{Sin}(\omega\,t))^2\right)$$

In which the radial function f(r) equals:

$$f[r] = K\,e^{-\frac{G\,M_{BH}\varepsilon_0\mu_0}{8\,\pi\,r}} \quad (17)$$

Grepresents the Gravitational constant and Mrepresents the total confined electromagnetic mass of the BLACK HOLE. Equation (16) presents a Standing (Confined) Electromagnetic Field Configuration with a phase shift of 90 degrees between the electric field and the magnetic field with the corresponding Nodes and AntiNodes. [13]. The solution has been calculated according Newton's Shell Theorem.

Assuming a constant speed of light "c" and Planck's constant ħ within the BLACK HOLE, the radius "R" (with n = 1,2,3,4….) of the BLACK HOLE with the energy of a proton, according $W = m_{proton}c^2$, would be: $1.5009211 \times 10^{-10}$ [J].

$$R_{GEON} = n\,\lambda = n\left(\frac{c}{f}\right) = n\left(\frac{c}{W}\right)\hbar = 7.1865\,10^{-26}\left(\frac{n}{W}\right) \quad (18)$$

$$R_{GEON} = n\,3.82\,10^{-12}\ [m]$$

Black Holes are varying from atomic dimensions with dimensions of 10^{-27} [kg], Page 39 [33] until Black Holes with dimensions of 10^{40} [kg], Page 67 [34]. At these dimensions Black Holes turn into Dark Matter.The fundamental boundary condition for the confinement of Electromagnetic radiation (BLACK HOLEs) is that the energy flow (Poynting vector) $\bar{S} = \bar{E} \times \bar{H}$ equals zero at the surcface of the confinement. This is possible at every *"90 degrees Phase Shift Surface"* (*Sphere*) between the Electric Field and the Magnetic Field.

b) Black Holes with a Singular point and Large dimensions

Fig 1 represents a Black Hole with a mass of 10^{35} [kg] and a radius of about 25 [km]controlled by a different mahgematical solution for equation (8).The radius of the Black Hole equals about 25 [km] which has been controlled by a different mathematical solution (19) for equation (8).

$$f[r] = K\ e^{\left(\frac{G\,M_{BH}\ \varepsilon_0\,\mu}{8\,\pi\,r}\ -\ \log[r]\right)} \qquad [J/m^3]$$

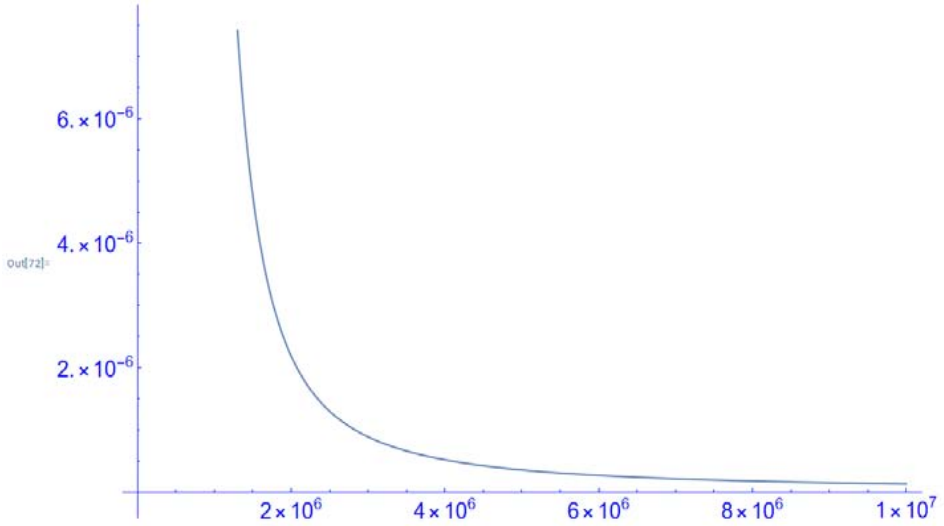


Fig. 1: The Energy Density [J/ m^3] as a function of the Radius R = max 10^7[m] of the Black Hole

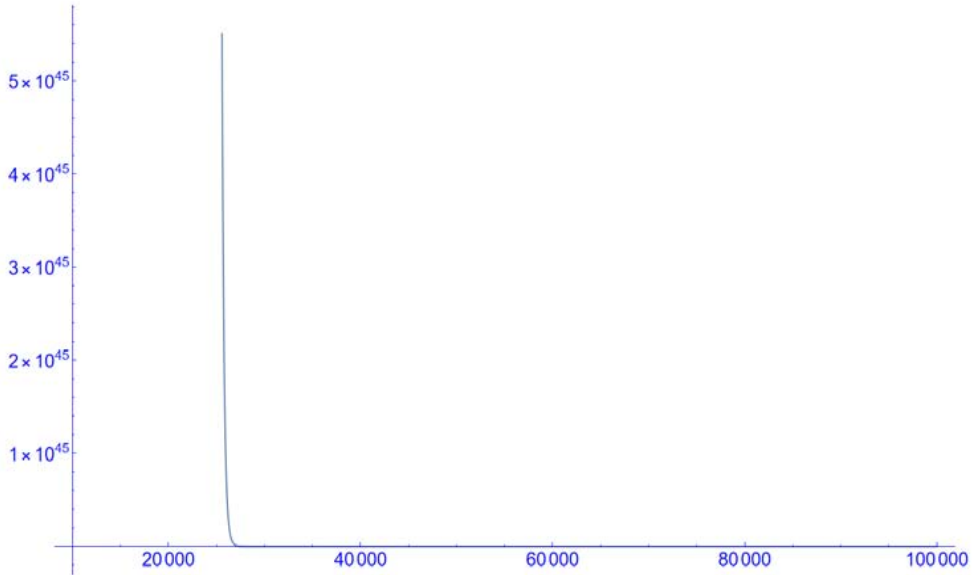


Fig. 2: The Energy Density [J/ m^3] as a function of the Radius R = max 10^5 [m]

Figure 1 and Figure 2 demonstrate the large effect of "Gravitational Intensity Shift" and "Gravitational RedShift" at the distance of 25 [km]. Over a distance of 10.000 [km] the intensity of the emitted light of the Black Hole with a mass of 10^{35} [kg] falls back with a factor of 10^{-51}. Also the frequency of the emitted light of the Black Hole falls back with a factor 10^{-51}. Emitted light in the visible spectrum of 10^{14} [Hz] falls back to a frequency of 10^{-37} [Hz]. These extreme low frequencies with extreme low intensities have never been measured which has result in the name "Black Hole" for the phenomenon of "Gravitational Intensity Shift" and "Gravitational RedShift" for a large mass. It follows from equation (8) and the solutions (10) and (11) that the speed of light does not change inside and around Black Hole. Only

the direction of the propagation of light can change due to a gravitational field.

c) Dark Matter in the Universe controlled by "Gravitational Shielding"

Fig 3 represents Dark Matter with a total mass of 10^{53} [kg] and a radius of about 10 times the size of the Milky Way Galaxy. The radius of the dark mass equals 5 10^{21} [m] which has been controlled by a different mathematical solution (20) for equation (8).

$$f[r] = K\, e^{\left(\frac{G\, M_{BH}\, \varepsilon_0 \mu_0}{8\, \pi\, r} - \log[r]\right)} \quad [J / m^3] \qquad (20)$$

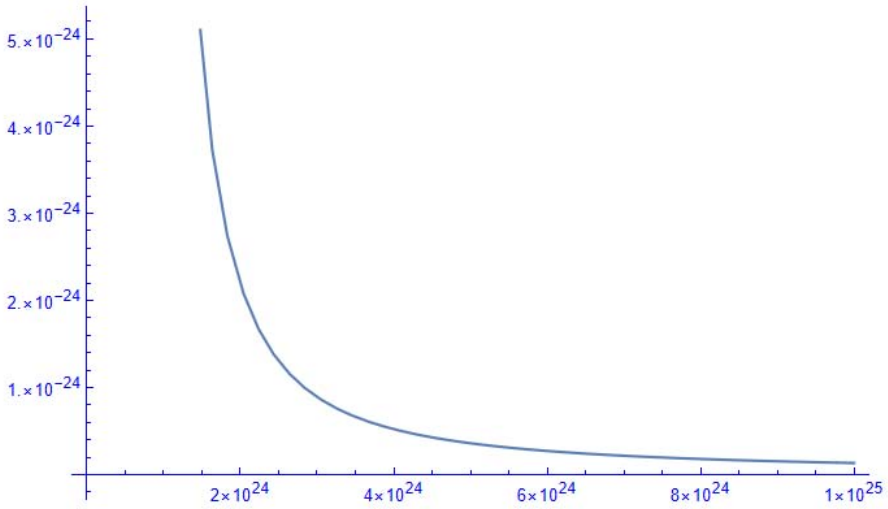


Fig. 3: The Energy Density [J/ m^3] as a function of the Radius R = max 10^{25} [m] of the Dark Matter

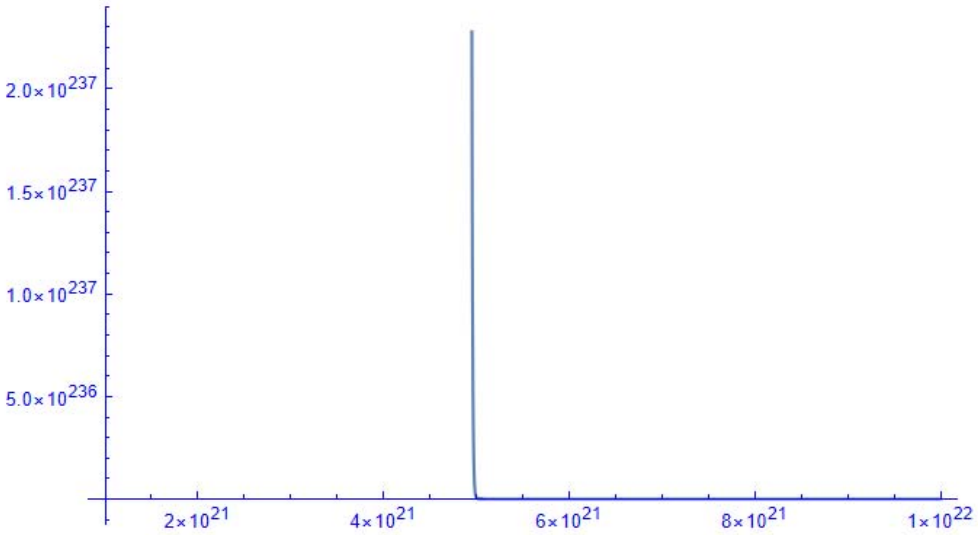


Fig. 4: The Energy Density [J/ m^3] of the Dark Matter as a function of the Radius R = max 10^{22} [m]

Figure 3 and Figure4demonstrate the large effect of "Gravitational Intensity Shift" and "Gravitational RedShift" at the distance of 5 10^{21} [m] which is 10 times the radius of the Milky Way Galaxy. Over the distance of 5 10^{21} [m] the intensity of the emitted light of the Dark Matter with a mass of 10^{53} [kg] falls back with a factor of 10^{-261}. Also the frequency of the emitted light of the Black Hole falls back with a factor 10^{-261}. Emitted light in the visible spectrum of 10^{14} [Hz] falls back to a frequency of 10^{-247} [Hz]. These extreme low frequencies with extreme low intensities have never been measured which has result in the name "Dark Matter" for the phenomenon of "Gravitational Intensity Shift" and "Gravitational RedShift" for an extreme large mass. It follows from equation (8) and the solutions (10) and (11) that the speed of light does not change inside and around the Dark Mass. Only the direction of the propagation of light can change due to the gravitational field of the Dark Mass.

IV. The Relationship between Black Holes and Quantum Physics

Introducing the Quantum Vector Function $\overline{\phi}$,

$$\overline{\phi} = \sqrt{\frac{\mu}{2}} \left(\overline{\mathrm{H}} + \mathrm{i} \, \frac{\overline{\mathrm{E}}}{c} \right) \tag{21}$$

Substituting (21) in (16) results in the quantum presentation for the BLACK HOLE:

$$\overline{\Phi(r,\theta,\varphi)} = \sqrt{\frac{\mu}{2}} \left(\overline{\mathrm{H}} + \mathrm{i} \, \frac{\overline{\mathrm{E}}}{c} \right) \mathrm{f(r)} \begin{pmatrix} \Phi_r \\ \Phi_\theta \\ \Phi_\varphi \end{pmatrix} \tag{22}$$

$$\overline{\Phi(r,\theta,\varphi)} = K \sqrt{\frac{\varepsilon}{\mu}} \, \mathrm{e}^{-\frac{G1 \, \varepsilon_0 \, \mu_0}{8 \pi \mathrm{r}}} \begin{pmatrix} 0 & 0 & 0 \\ 0 & -\mathrm{Sin}(\mathrm{k\,r}) & \mathrm{Sin}(\mathrm{k\,r}) \\ 0 & -\mathrm{i\,Cos}(\mathrm{k\,r}) & \mathrm{i\,Cos}(\mathrm{k\,r}) \end{pmatrix} \begin{Bmatrix} 0 \\ \mathrm{Cos}\,(\omega\,\mathrm{t}) \\ \mathrm{i\,Sin}\,(\omega\,\mathrm{t}) \end{Bmatrix}$$

With "K" a constant value dependend of the mass of the BLACK HOLE. The Dot product between the unit vector and the Quantum Vector Function $\overline{\phi}$ represents the quantum mechanical probability function $\Psi[r,\mathrm{t}]$ which is a fundamental solution of the Schrödinger Wave Equation.

$$\overline{\Phi(r,\theta,\varphi)} = K \sqrt{\frac{\varepsilon}{\mu}} \, \mathrm{e}^{-\frac{G1 \, \varepsilon_0 \, \mu_0}{8 \pi \mathrm{r}}} \begin{pmatrix} 0 & 0 & 0 \\ 0 & -\mathrm{Sin}(\mathrm{k\,r}) & \mathrm{Sin}(\mathrm{k\,r}) \\ 0 & -\mathrm{i\,Cos}(\mathrm{k\,r}) & \mathrm{i\,Cos}(\mathrm{k\,r}) \end{pmatrix} \begin{Bmatrix} 0 \\ \mathrm{Cos}\,(\omega\,\mathrm{t}) \\ \mathrm{i\,Sin}\,(\omega\,\mathrm{t}) \end{Bmatrix}$$

$$\Psi(\mathrm{r,t}) = \begin{Bmatrix} 1 & 1 & 1 \end{Bmatrix} \begin{Bmatrix} 0 \\ \mathrm{Cos}\,(\omega\,\mathrm{t}) \\ \mathrm{i\,Sin}\,(\omega\,\mathrm{t}) \end{Bmatrix} K \sqrt{\frac{\varepsilon}{\mu}} \, \mathrm{e}^{-\frac{G1 \, \varepsilon_0 \, \mu_0}{8 \pi \mathrm{r}}} = K \sqrt{\frac{\varepsilon}{\mu}} \, \mathrm{e}^{-\frac{G1 \, \varepsilon_0 \, \mu_0}{8 \pi \mathrm{r}}} \, \mathrm{e}^{\mathrm{i}\,\omega\,\mathrm{t}} \tag{23}$$

The Scalar function $\Psi[r,\mathrm{t}]$ represents a fundamental solution of the Quantum Mechanical Schrödinger wave equation. [36, 37]

a) Black Holes with Discrete Spherical Energy Levels at Sub-Atomic dimensions

An essential requirement for the confinement of Electromagetic Energy is that the Poymtingvector equals zero at the (spherical) surface of the confinement. For the confinement within a sphere, a standing electromagnetic wave pattern has been required which exists of concentric spheres, at every sphere an antinodal plane for E (or B) with a radius distance between each sphere of half the wavelength of the confinement. The constant k = n $\pi\lambda$, "n" a natural number(1,2,3,4…..) and λ the wavelength.

i. *Time and Radius dependent Black Holes with discrete Energy Levels.The confinements of Electromagnetic Radiation within spherical Regions*

Every concentric sphere represents an anti-nodal surface for the Electric Field (E) or the Magnetic Field (H). The Poynting Vector ^ :$\overline{\mathrm{S}} = \overline{\mathrm{E}} \times \overline{\mathrm{H}}$ at this spherical surface equals zero at any time and at any location at this sphere. The Electromagnetic Energy remains always within this sphere and the next concentric sphere. The concentric spheres have a difference in radius of one half wavelength of the electromagnetic radition within the confinement and a different discrete energy level. Every concentric sphere represents an anti-nodal suface of the electric field or the magnetic field.

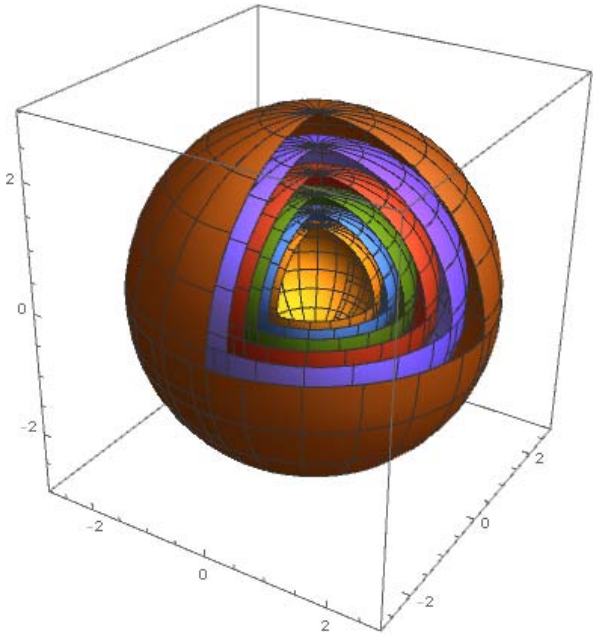


Fig. 5: Nodal and Antinodal Spheres for Standing (Confined) Spherical Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (9)

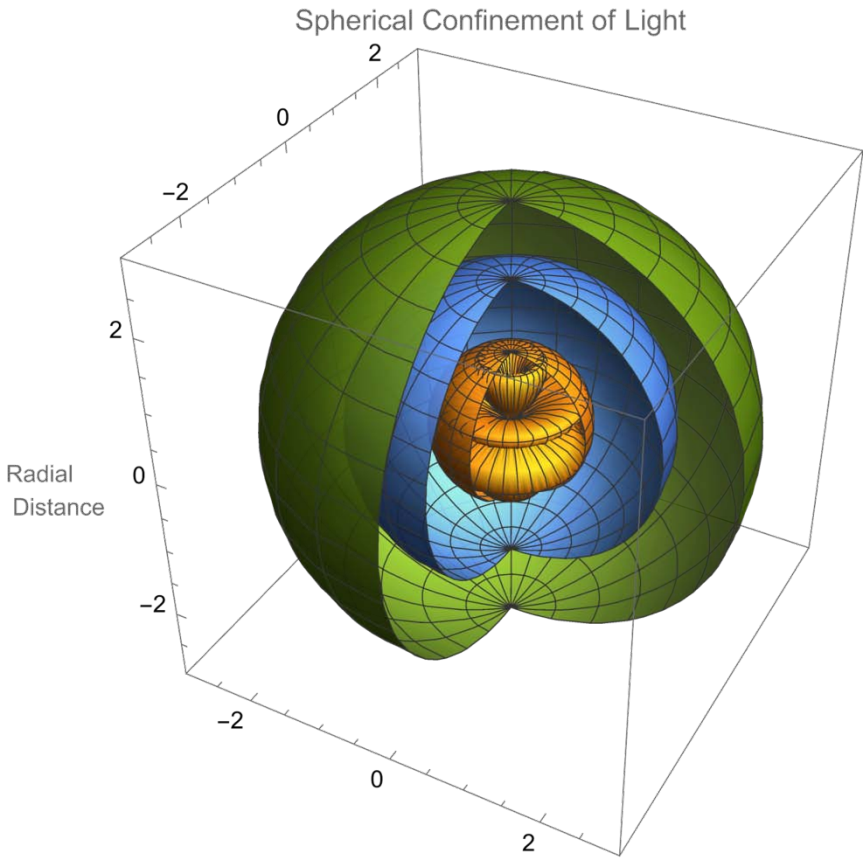


Fig. 6: Nodal- and Antinodal Spheres (k = 3) for Standing (Confined) Spherical Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (9)

Equation (24) describes a Time and Radius dependent BLACK HOLE.

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Sin}[k\ r]\ \text{Sin}[\omega\ t] \\ -\text{Cos}[k\ r]\ \text{Cos}[\omega\ t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\epsilon 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ \text{Sin}[k\ r]\ \text{Cos}[\omega\ t] \\ -\text{Cos}[k\ r]\ \text{Sin}[\omega\ t] \end{pmatrix}$$

Equation (20) represents by the function $\text{Sin}[k\ r]$ (k=1,2,3,4….) the confinement of electro-magnetic radiation between two concentric spheres. K represents the amplitude of the Electric/Magnetic Field Intensty. [14]

ii. *Time and Polar Angle dependent Black Holes*

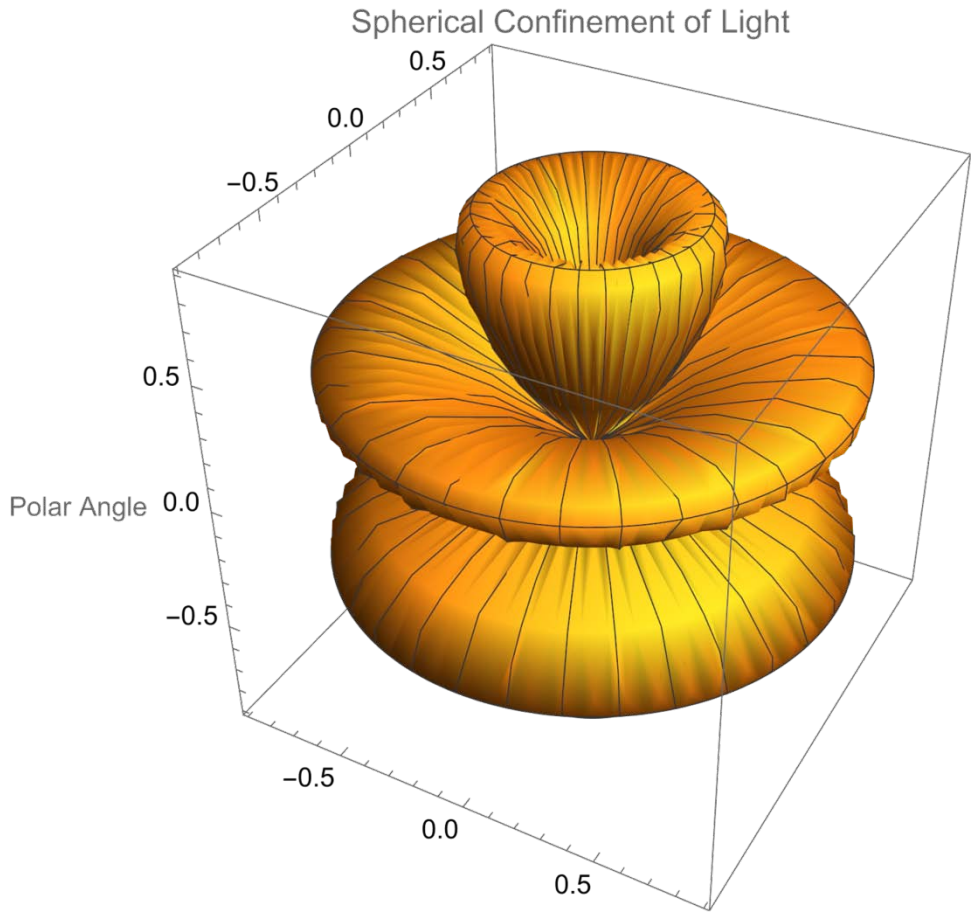


Fig. 7: Nodal- and Anti nodal Polar Angle Regions (m = 3) for Standing (Confined) Spherical Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (15)

Equation (25) describes a Time and "Polar Angle" dependent BLACK HOLE

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Sin}[m\ \theta]\ \text{Sin}[\omega\ t] \\ \text{Sin}[m\ \theta]\ \text{Cos}[\omega\ t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\epsilon 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ \text{Sin}[m\ \theta]\ \text{Cos}[\omega\ t] \\ -\text{Sin}[m\ \theta]\ \text{Sin}[\omega\ t] \end{pmatrix}$$

Equation (19) represents by the function $\text{Sin}[m\ \theta]$ (m = 1,2,3,4…..) the confinement of electromagnetic radiation between two Polar Angular Regions [15].

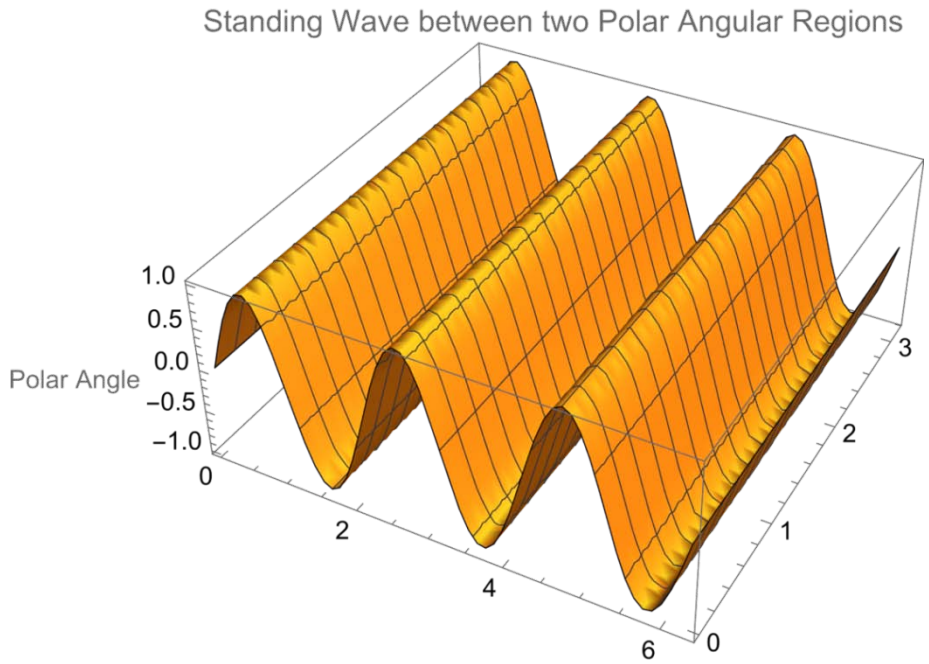


Fig. 8: Nodal- and Antinodal Polar Angle Regions (m = 3) for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (15)

iii. *Time and Azimuthal Angular dependent Black Holes*

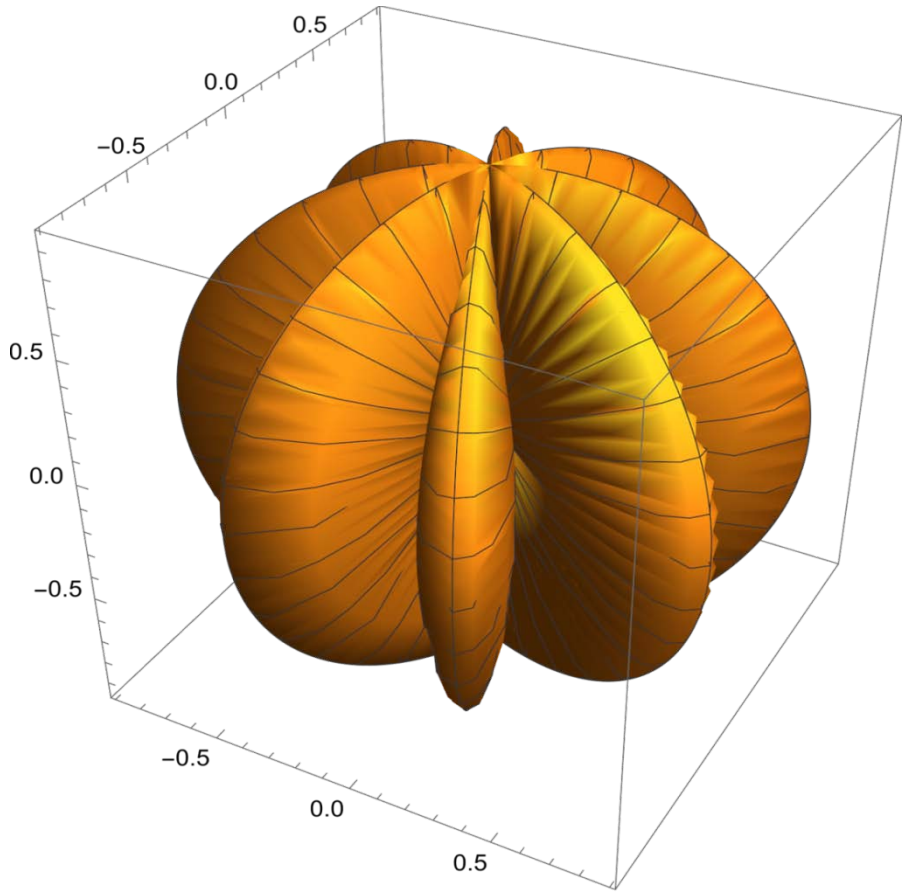


Fig. 9: Nodal- and Antinodal Azimuthal Angular Regions (n = 3) for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (16)

Equation (26) describes a Time and "Polar Angle" dependent BLACK HOLE

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Cos}[n\ \varphi]\ \text{Sin}[\omega\ t] \\ \text{Cos}[n\ \varphi]\ \text{Cos}[\omega\ t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\epsilon 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ \text{Cos}[n\ \varphi]\ \text{Cos}[\omega\ t] \\ -\text{Cos}[n\ \varphi]\ \text{Sin}[\omega\ t] \end{pmatrix} \quad (26)$$

Equation (26) represents by the function $\text{Sin}[n\ \varphi]$ (n = 1,2,3,4…..) the confinement of electromagnetic radiation between two Azimuthal Angular Regions [16].

iv. *Time, Polar- and Azimuthal Angular dependent Black Holes*

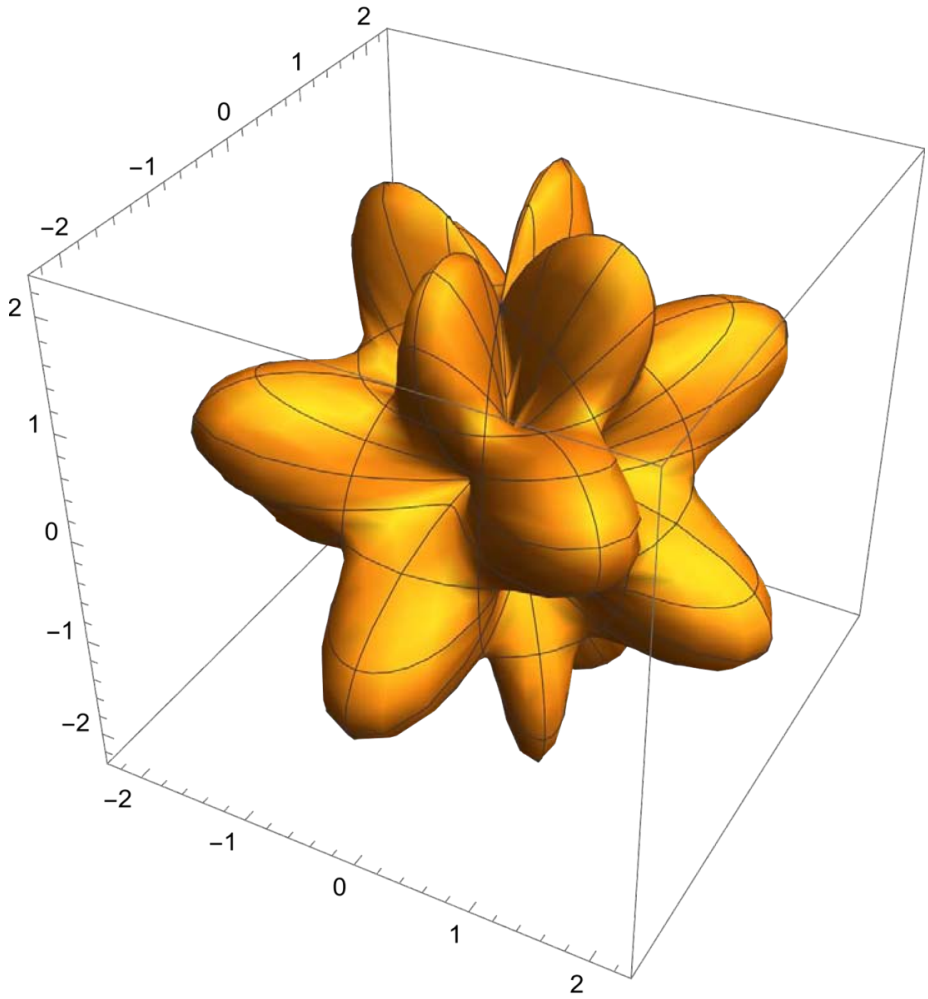


Fig. 10: Nodal- and Anti nodal Polar Angular and Azimuthal Angular Regions (n = 4 and m = 4) for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (17)

Equation (27) describes a Time "Azimuthal Angle" and "Polar Angle" dependent BLACK HOLE

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Sin}[\omega\ t] \\ \text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Cos}[\omega\ t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\epsilon 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ -\text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Cos}[\omega\ t] \\ \text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Sin}[\omega\ t] \end{pmatrix} \quad (27)$$

Equation (27) represents by the function $\mathbf{Cos[n\ \varphi]}$ (n = 1,2,3,4…..) and $\mathbf{Sin[m\ \vartheta}$ (m = 1,2,3,4…..) the confinement of electromagnetic radiation between two Azimuthal Angular Regions and two Polar Angulars Regions [17].

v. *Spherical Confinement of Light beween two Concentric Spheres within Black Holess*

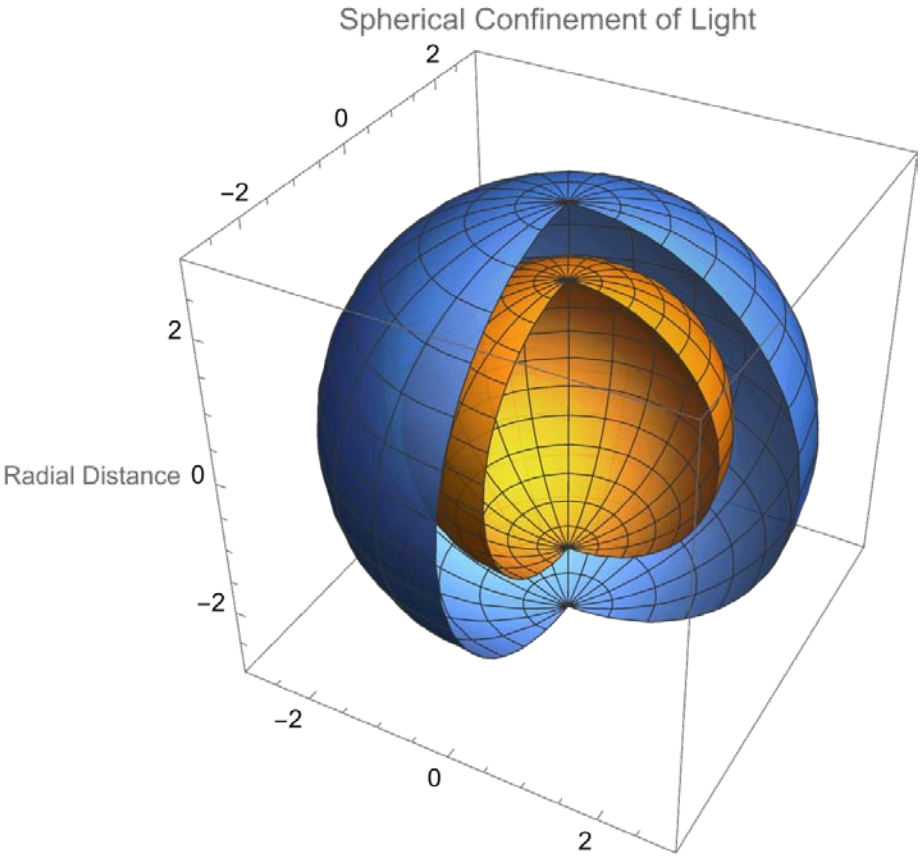


Fig. 11: Nodal- and Antinodal Regions for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (14)

Equation (18) represents the reflection of the Confined Electromagnetic Energy within the BLACK HOLE between two concentric spheres while the speed of light, depending on the variable "r", changes in direction with the frequency of the confined light (Electromagnetic Radiation).

A BLACK HOLE can split into two new BLACK HOLEs with different radi. The original BLACK HOLE falls back into a lower energy level while the new BLACK HOLE represents the difference in Energy Levels comparable with an atom falling back into a lower energy level.

$$\bar{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}}\, f\left[t - \frac{\sqrt{\varepsilon_0\ \mu_0}\ \text{Cos}[2\,k\,r]}{2\,k}\right]\begin{pmatrix} 0 \\ \text{Sin}[k\,r]\ \text{Sin}[\omega\,t] \\ -\text{Cos}[k\,r]\ \text{Cos}[\omega\,t] \end{pmatrix}$$

$$\bar{H} = K\, e^{-\frac{G1\epsilon 0\mu 0}{8\pi r}}\, f\left[t - \frac{\sqrt{\varepsilon_0\ \mu_0}\ \text{Cos}[2\,k\,r]}{2\,k}\right]\sqrt{\frac{\varepsilon_0}{\mu_0}}\begin{pmatrix} 0 \\ -\text{Sin}[k\,r]\ \text{Cos}[\omega\,t] \\ -\text{Cos}[k\,r]\ \ \text{Sin}[\omega\,t] \end{pmatrix} \quad (28)$$

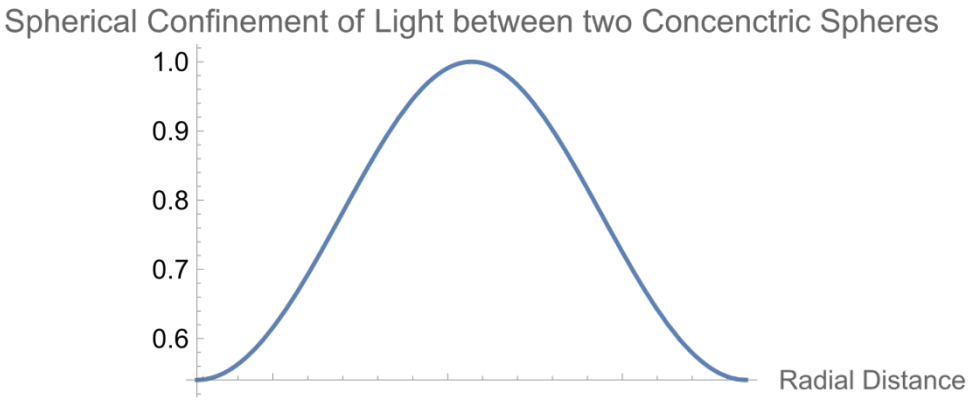


Fig. 12: Nodal- and Antinodal Regions for Standing (Confined) Electromagnetic within two concentric spheres. Equation (18)

V. Universal Equilibriumin the "Concept of Quantum Mechanical Probability" in "The New Theory"

The 4-dimensional notation forthe divergence of the Stress-Energy Tensor (25) expresses in the 4th dimension (time dimension) the law of Conservation of Energy". For an Electromagnetic Field the law for conservation of Energy has been expressed as:

$$\bar{f}^4 = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \square \bullet \bar{\bar{T}} = \begin{pmatrix} \nabla \cdot \bar{S} + \frac{\partial w}{\partial t} \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \bar{0}^4 \qquad (29)$$

From the equation for the "Conservation of Electromagnetic Energy"(38.1) the "Fundamental Equation for Confined Electromagnetic Interaction" in "The New Theory" will be derived, which equals the Relativistic Quantum Mechanical "Dirac" equation and the Schrödinger wave equation at velocities relative low compared to the speed of light.

The "Fundamental Equation for Confined Electromagnetic Interaction" in "The Proposed Theory" can be considered to be the relativistic version of the Quantum Mechanical Schrödinger wave equation, which equals the Quantum Mechanical Dirac Equation.

a) Confined Electromagnetic Energy within a 4-dimensional Equilibrium

The physical concept of quantum mechanical probability waves has been created during the famous 1927 5th Solvay Conference. During that period there were several circumstances which came just together and made it possible to create a unique idea of "Material Waves"(Solutions of Schödinger's wave equation) being complex (partly real and partly imaginary) and describing the probability of the appearance of a physical object (elementary particle) generally indicated as "Quantum Mechanical Probability Waves".

The idea of complex (probability) waves is directly related to the concept of confined (standing) waves. Characteristic for any standingacoustical wave is the fact that the Velocity and the Pressure (Electric Field and Magnetic Field in QLT) are always shifted over 90 degrees. The same principle does exist for the standing (confined) electromagnetic waves,

For that reason every confined (standing) Electromagnetic wave can be described by a complex sum vector $\bar{\phi}$ of the Electric Field Vector $\bar{E}$ and the Magnetic Field Vector $\bar{\mathbf{B}}$ ($\bar{E}$ has 90 degrees phase shift compared to $\bar{\mathbf{B}}$).

The vector functions $\bar{\phi}$ and the complex conjugated vector function $\bar{\phi}^*$ will be written as:

$$\bar{\phi} = \frac{1}{\sqrt{2\,\mu}} \left(\bar{B} + i \frac{\bar{E}}{c} \right) \qquad (30)$$

$\bar{\mathbf{B}}$ equals the magnetic induction, $\bar{\mathbf{E}}$ the electric field intensity ($\bar{E}$ has + 90 degrees phase shift compared to $\bar{\mathbf{B}}$) and c the speed of light.

The complex conjugated vector function $\bar{\phi}^*$ equals:

$$\bar{\phi}^* = \frac{1}{\sqrt{2\,\mu}} \left(\bar{B} - i \frac{\bar{E}}{c} \right) \qquad (31)$$

The dot product equals the electromagnetic energy density w:

$$\bar{\phi} \cdot \bar{\phi^*} = \frac{1}{2\mu}\left(\bar{B} + i\frac{\bar{E}}{c}\right) \cdot \left(\bar{B} - i\frac{\bar{E}}{c}\right) = \frac{1}{2}\mu H^2 + \frac{1}{2}\varepsilon E^2 = w \tag{32}$$

Using Einstein's equation $W = m c^2$, the dot product equals the electromagnetic mass density w:

$$\bar{\phi} \cdot \bar{\phi^*}\frac{1}{c^2} = \frac{\varepsilon}{2}\left(\bar{B} + i\frac{\bar{E}}{c}\right) \cdot \left(\bar{B} - i\frac{\bar{E}}{c}\right) = \frac{1}{2}\varepsilon\mu^2 H^2 + \frac{1}{2}\varepsilon^2 E^2 = \rho\ [kg/m^3] \tag{33}$$

The cross product is proportional to the Poynting vector (Ref. 3, page 202, equation 15).

$$\bar{\phi} \times \bar{\phi^*} = \frac{1}{2\mu}\left(\bar{B} + i\frac{\bar{E}}{c}\right) \times \left(\bar{B} - i\frac{\bar{E}}{c}\right) = i\sqrt{\varepsilon\mu}\ \bar{E} \times \bar{H} = i\sqrt{\varepsilon\mu}\ \bar{S} \tag{34}$$

This article presents a new "Gravitational-Electromagnetic Equation" describing Electromagnetic Field Configurations which are simultaneously the Mathematical Solutions for the Scalar Quantum Mechanical "Schrodinger Wave Equation" and more exactly the Mathematical Solutions for the Tensor representation of the "Relativistic Quantum Mechanical Dirac Equation" (41).

The 4-dimensional divergence of the sum of the Electromagnetic Stress-Energy tensor expresses the 4-dimensional Force-Density vector (expressed in [N/m^3] in the 3 spatial coordinates) as the result of Electro-Magnetic-Gravitational interaction.

$$f^{\mu} = \partial_{\nu} T^{\mu\nu} = 0 \tag{35}$$

In vector notation the 4-dimensional Force-Density vector can be written as:

$$\bar{f}^4 = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \Box \bullet \bar{\bar{T}} = 0$$

The fundamental boundary condition for this alternative approach to gravity is the requirement that the Force 4 vector equals zero in the 4 dimensions, expressing a universal 4-dimensional equilibrium:

The 3 spatial components of the Force-Density vector, as a result of Electro-Magnetic-Gravitational interaction can be written as:

Substituting the electromagnetic values for the electric field intensity "E" and the magnetic field intensity "H" in (36) results in the 4-dimensional representation of the Electro-Magnetic-Gravitational Fields Equation (37):

Energy-Time Domain

$$(f_4) \Leftrightarrow \nabla \cdot (\bar{E} \times \bar{H}) + \frac{1}{2}\frac{\partial\left(\varepsilon_0\left(\bar{E} \cdot \bar{E}\right) + \mu_0\left(\bar{H} \cdot \bar{H}\right)\right)}{\partial t} = 0$$

3-Dimensional Space Domain

$$\begin{pmatrix} f_3 \\ f_2 \\ f_1 \end{pmatrix} \Leftrightarrow -\frac{1}{c^2}\frac{\partial(\bar{E} \times \bar{H})}{\partial t} + \varepsilon_0 \bar{E}(\nabla \cdot \bar{E}) - \varepsilon_0 \bar{E} \times (\nabla \times \bar{E}) + \mu_0 \bar{H}(\nabla \cdot \bar{H}) - \mu_0 \bar{H} \times (\nabla \times \bar{H}) = \bar{0}$$

In which f_1 , f_2 , f_3, represent the force densities in the 3 spatial dimensions and f_4 represent the force density (energy flow) in the time dimension (4th dimension). Equation (37) can be written as:

Energy-Time Domain

Conservation of Energy

B -7

$$\left(f_4\right) \qquad \nabla \cdot \bar{S} + \frac{\partial w}{\partial t} = 0 \qquad (38.1)$$

3-Dimensional Space Domain

B -1 B -2 B -3

$$\begin{pmatrix} f_3 \\ f_2 \\ f_1 \end{pmatrix} \quad -\frac{1}{c^2}\frac{\partial (\bar{E}\times\bar{H})}{\partial t} + \varepsilon_0 \bar{E}\,(\nabla\cdot\bar{E}) - \varepsilon_0 \bar{E}\times(\nabla\times\bar{E}) +$$

B -4 B -5

$$+\mu_0 \bar{H}\,(\nabla\cdot\bar{H}) - \mu_0 \bar{H}\times(\nabla\times\bar{H}) = \bar{0} \qquad (38.2) \qquad (38)$$

The 4th term in equation (38.1) can be written in the terms of the Poynting vector "S" and the energy density "w" representing the electromagnetic law for the conservation of energy (Newton's second law of motion).

b) The 4-dimensional Relativistic Dirac Equation

Substituting (32) and (34) in Equation (38.1) results in The 4-Dimensional Tensor presentation for the relativistic quantum mechanical Dirac Equation (39):

$$\left(x_4\right) \qquad \nabla\cdot(\bar{\phi}\times\bar{\phi}^*) + \frac{i}{c}\frac{\partial\bar{\phi}\cdot\bar{\phi}^*}{\partial t} = 0$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad \frac{i}{c}\frac{\partial(\bar{\phi}\times\bar{\phi}^*)}{\partial t} - \left(\bar{\phi}\times(\nabla\times\bar{\phi}^*) + \bar{\phi}^*\times(\nabla\times\bar{\phi})\right) + \left(\bar{\phi}\,(\nabla\cdot\bar{\phi}^*) + \bar{\phi}^*\,(\nabla\cdot\bar{\phi})\right) = 0 \qquad (39)$$

To transform the electromagnetic vector wave function $\bar{\phi}$ into a scalar (spinor or one-dimensional matrix representation), the Pauli spin matrices σ and the following matrices (Ref. 3 page 213, equation 99) are introduced:

$$\bar{\alpha} = \begin{bmatrix} 0 & \sigma \\ \sigma & 0 \end{bmatrix} \quad \text{and} \quad \bar{\beta} = \begin{bmatrix} \delta_{ab} & 0 \\ 0 & -\delta_{ab} \end{bmatrix} \qquad (40)$$

The Equations (6), (32) and (34) can be written in tensor presentation as the 4-Dimensional Relativistic Quantum Mechanical Dirac Equation: [3] (Equation 102, page 213)

$$\left(x_4\right) \qquad \left(\frac{imc}{h}\bar{\beta} + \bar{\alpha}\cdot\nabla\right)\psi = -\frac{1}{c}\frac{\partial\psi}{\partial t} \qquad (41.1)$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad -\frac{1}{c^2}\frac{\partial(\bar{E}\times\bar{H})}{\partial t} + \varepsilon_0 \bar{E}\,(\nabla\cdot\bar{E}) - \varepsilon_0 \bar{E}\times(\nabla\times\bar{E}) +$$

$$+\mu_0 \bar{H}\,(\nabla\cdot\bar{H}) - \mu_0 \bar{H}\times(\nabla\times\bar{H}) + \gamma_0 \bar{g}\,(\nabla\cdot\bar{g}) - \gamma_0 \bar{g}\times(\nabla\times\bar{g}) = \bar{0} \qquad (41.2) \qquad (41)$$

VI. The Fundamental Experiment to Validate the New Theory in Physics

The fundamental foundation for Einstein's Theory of General Relativity is the "Curvature of Space and Time" due to a Gravitational Field. In the "Theory of General Relativity" Gravitational RedShift has been explained by a change in time and space resulting is a change in the observed frequency shift in the spectrum of the light being emitted by far away Galaxies. The foundation for Einstein's theory of General Relativity is a constant value for the speed of light in the absence of a gravitational field.

In the "New Theory" the fundamental foundation is "Equilibrium". Equilibrium for the "5 fundamental force densities in light" in any direction at any time and at any location. The 5 fundamental forces in light are:

1) "Inertia Force" (Energy has always inertia according Einstein's $E = m c^2$)
2) "Electric Force"
3) "Magnetic Force"
4) "Electric Force" due to the "Lorentz Transformation" of the "Magnetic Force"
5) "Magnetic Force" due to the "Lorentz Transformation" of the "Electric Force"

The speed of light has been fully controlled by the perfect equilibrium between the 5 fundamental force densities in any direction at any time and at any location.

For a single beam of light the perfect equilibrium between the 5 fundamental forces always results in the speed of light:

$$c = 1/\sqrt{\varepsilon\,\mu} \tag{42}$$

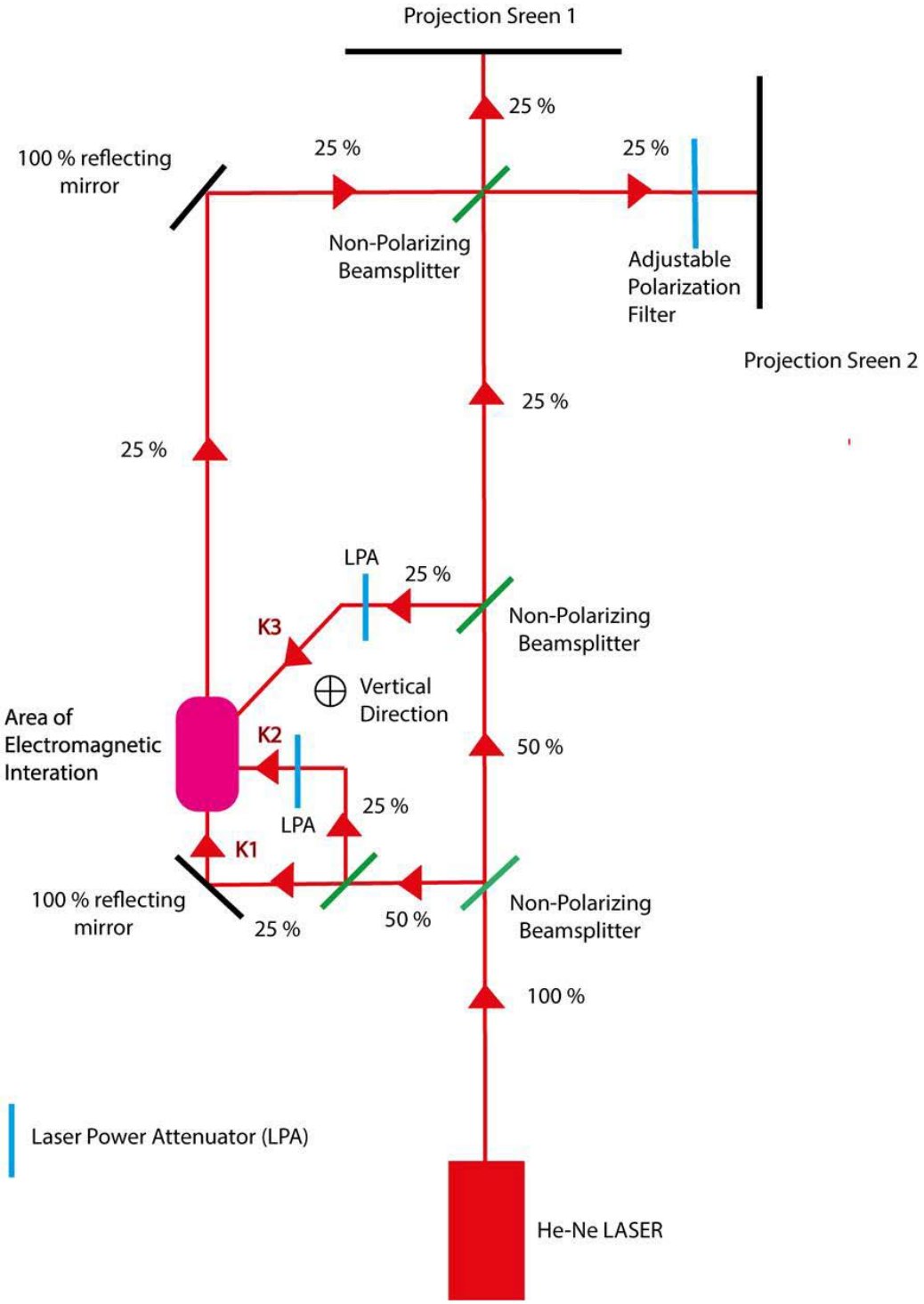
However in this experiment 3 beams of light with the same frequency and the same phase and 3 controllable (LPA) different intensities K1, K2 and K3 will cross each other in 3 orthogonal directions. This will result in different boundary conditions for the total electromagnetic radiation and will be measurable by a changing in the speed of light. In this experiment by a changing of the speed of light in the chosen z-direction. The changing of the speed of light will become visible by a change in the interference patterns of the 2 LASER beams. The original beam and the manipulated beam.

The solution for equation (8) has been calculated in Mathematica when 3 laser beams cross each other perpendicular and will cause a change in the speed of light within the intersection of the 3 crossing Laser Beams due to Electromagnetic Interaction. According the calculations in Mathematica 11.3 at the exact "location dependent speed of lightc[x,y,z]" there will be a perfect equilibrium between all the electromagnetic- inertia- and radiation pressure force densities at any time in any direction:

$$\frac{1}{c(x,y,z)} = h[x,y,z] = \frac{\left(K_2^{\,2}\,x \;-\; K_1 K_3\,x + K_3^{\,2}\,y + K_1^{\,2}\,z \;-\; K_2\left(K_1\,y \;+\; K_3\,z\right)\right)}{K_1^{\,2} + K_2^{\,2} + K_3^{\,2}}\,\sqrt{\epsilon_0}\,\sqrt{\mu_0} \tag{43}$$

The result in equation (43) has been presented in Ref [39]. The change in the speed of light in the cross section will become visible in the interference patterns on screen 1 and screen 2 by changing the intensity of the secondary and third LASER beams by the two "LASER Power Attenuators" (indicated in blue) after passing the beamsplitter(s).

Technical Setup for the Experiment to demonstrate that the speed of light will change in the area of Electromagnetic Interaction



VII. Conclusions

Based on the assumption of the zero rest mass of photons, General Relativity describes the interaction between Gravity and Light within a 4-dimensional curvature in Space and Time due to a gravitational field. Light follows a path defined by this curved 4-dimensional Space and Time geometry.

The new theory, describes a bi-directional separation between mass and inertia for light (photons). Inertia can only exist only in the direction of propagation of the beam of light (photons) which determines the speed of light. Mass of the beam of light (photons) can only exist in the plane perpendicular to the direction of propagation (directions of confinement), which determines the deflection of a beam of light (photons)

by a gravitational field in the plane perpendicular to the direction of propagation.

BLACK HOLEs (Gravitational-Electromagnetic Confinements) are fundamental solutions of the relativistic quantum mechanical Dirac equation. Black Holes represent the large impact of "Gravitational Intensity Shift" and "Gravitational RedShift" due to a gravitational field. Both phenomena can maybe observed in the future with extremely sensitive observatories at extreme low frequency levels.

The new theory describes the impact of "CURL" [38] within the gravitational fields around Black Holes and the impact on Gravitational Lensing. Gravitational "CURL" (Equation 6) is an effect which cannot be explained and calculated by General Relativity

Within a 4-Dimensional Equilibrium and taking into account the inertia- and the gravitational- force densities within the electromagnetic field configurations, Gravitational Electromagnetic Confinements (BLACK HOLEs at sub-atomic dimensions) are a physical reality and are solutions of the Relativistic Quantum Mechanical Dirac Equation (39, 41) and present spherical confinements with discrete separate energy levels.

To test the proposed theory with General Relativity, an experiment [2] has been required which measures the interaction between gravity and light within a well-defined gravitational field like the gravitational field of the earth. The difference between the calculation for Gravitational RedShift, within the Gravitational Field of the Earth, in "General Relativity" and "The New Theory" is smaller than 10^{-16} and cannot be determined with present observation equipment (maximum accuracy of 10^{-15} for GRS). Validation of both theories requires higher accuracies.

Dark Matter does exist because of "Gravitational RedShift" and Gravitational Intensity Shift". A complete Galaxy, existing of billions bright light emitting star constellations, with a total mass of 10^{53} [kg] becomes invisible for any observatory like the "James Webb Space Telescope" at the distance of 5 10^{21} [m] (which is 10 times the radius of the Milky Way Galaxy). This distance of "Gravitational Shielding" has been controlled by the mathematical solution (20) for equation (8). The gravitatonal field of these Galaxies has not been effected by the effect of "Gravitationa RedShift" and "Gravitational IntensityShift" at all.

For this reason a large percentage of the total mass in the Universe beyond te border of "Gravitational Shielding" becomes invisible for our observatories on and close around the earth. While the gravitational fields of these galaxies still has the full influence onour universe.

The results of the experiment to test the new theory and evaluate these experimatal values cannot be published yet because the many results of the experint has to be tested and controlled by a large number of scientific institutes before any important conclusion can be drawn form this experiment. The observed fluctuations in the interference patterns can have many reasons and this fundamental experiment has to be done and evaluated by scientific teams worldwide.

a) Data Availability

All Data and Calculations have been published at: https://quantumlight.science/

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Solar Alpha Particle Radiation Increases Human Mortality – Examples from the Neoplasms Mortality in the Europe and Mediterranean

By Nikolay Takuchev
Trakia University

Abstract- A dangerous phenomenon for humanity is described. In the joint analysis of data from satellites in orbit around the Earth and from the health statistics source EUROSTAT, it became clear that, by some mechanism, flows of positively charged particles with high energy entering the Earth's orbit increase mortality on the planet's surface. The increase in mortality is in a band of maximum risk in the Northern Hemisphere, parallel to the Equator and bounded by the parallels of 30° and 50° north latitude. Examples are given for the European Union mortality from neoplasms, confirming the described phenomenon. A hypothetical mechanism based on observational evidence has been proposed, according to which this dangerous phenomenon is due to solar alpha particles of high energy sufficient to overcome the atmosphere's resistance and reach the Earth's surface in a limited area of maximum death impact.

Keywords: mortality, neoplasms, satellites GOES, cosmic alpha radiation, EUROSTAT.

GJSFR-A Classification: (LCC): RC268.5

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I. Introduction

In a series of publications [1 – 23], a dangerous phenomenon of cosmic origin for humanity was described – the presence of a high correlation between the flows of positively charged particles with high kinetic energy recorded from satellites in the Earth orbit and mortality on the Earth's surface from many diseases. The main focus of the mentioned publications was on the effect of solar alpha radiation on mortality from diseases, killer number one of mankind – those of the circulatory system. The harmful effects of solar alpha radiation are also observed on many other organs and systems in the human organism, turning this invisible effect into one of the main causes of death for humanity. The mentioned dangerous phenomenon of cosmic origin is unevenly spread on the planet's surface. Europe and the Mediterranean are among the most affected. However, in [1 – 23] are described many examples, where this phenomenon is also observable in several countries from the Northern Hemisphere – Asia, America, and even Africa. The European Union has a tradition of maintaining reliable mortality statistics, in which the discussed multifaceted influence of solar alpha radiation on mortality stands out clearly. Below, based on data from mortality statistics in the European Union, the unexpected association between solar alpha radiation and mortality from neoplasms is shown. The high-energy alpha radiation can ionize the atoms in the living organism, which drastically worsens the normal metabolism in living cells. This type of radiation may be the leading external cause of neoplasms.

Author: Ph.D., Associate professor, Trakia University, Stara Zagora, Bulgaria. e-mail: nnnpppttt@gmail.com

II. Material and Methods

a) Mortality data

The analysis below is based on an authoritative source of health data – EUROSTAT [24].

In the study, the parameter *annual mortality rate* – number of deaths per 100,000 inhabitants was used as a characteristic of mortality. EUROSTAT offers free access to data on mortality rates from causes in the countries of the European Union, the European Economic Area, and the candidate countries for membership in the union. Geographically, these countries occupy Europe and the Mediterranean. Data are grouped by NUTS (Nomenclature Des Unités Territoriales Statistiques in French, the nomenclature of territorial units for statistics). In the study, mortality data from the EUROSTAT shortlist were used, in which mortality rates are grouped by causes of death into 92 groups, mostly diseases. The groups are related to the classes in the International Disease Classifier ICD-10, (10th revision). The shortlist contains mortality data for EU countries (NUTS-1) and EU regions (NUTS-2, smaller areas of the larger NUTS-1 countries). Currently (2023) the shortlist includes mortality rate data for the interval 2011 – 2020. Annual mortality rate data were extracted for 353 European regions (NUTS-2) separately from each of the shortlist groups for the interval 2011 – 2019 (the last pre-pandemic year).

b) Satellite data

Satellite data on corpuscular radiation – protons and alpha particles recorded by the satellites of the series GOES (Geostationary Operational Environmental Satellites) were obtained from an NOAA site [25].

The satellites of the GOES series fly in geostationary orbit (above the Earth's equator), at an altitude of 36,000 kilometers above the Earth's surface, make one lap in 24 hours, that is, they "hang" over a certain point on the Earth's surface and are not shade by the Earth at their circumference around it.

Data on alpha-particle and proton fluxes (unit: (number of particles).cm^{-2}.s^{-1}.sr^{-1}.MeV^{-1}) with energies of the range 3.8 – 21.3 MeV were used. The fluxes were recorded by the satellite high-energy particle detectors: 1. Energetic Particles Sensor (EPS), and 2. Energetic Proton, Electron, and Alpha Detector (EPEAD). The data are available averaged over a 5-minute interval, during which there are up to 25 reports of the instrument.

c) Data processing

The correlation coefficients [26] between the annual averaged alpha radiation flux and the annual mortality rate were calculated.

Maps were created showing (with black isolines) the distribution of the annual mortality for 353 NUTS-2 European regions from the EUROSTAT shortlist death causes: "Neoplasms" (EUROSTAT mortality shortlist number 8), "Malignant neoplasms (C00-C97)" (shortlist number 9), and "Other malignant neoplasms (remainder of C00-C97)" (shortlist number 31) for 2012, the year with the highest solar activity (and mortality) in the studied time interval 2011 – 2019. Below the three groups of causes are collectively referred to as "neoplasms". With red isolines, the maps show the distribution across the territory of Europe and the Mediterranean of the correlation coefficient between the annual mortality rate from neoplasms with the annually averaged alpha particle flux for the time interval 2011 – 2019. Data on the coordinates, latitude, and longitude [Google Earth] of the centroids of the NUTS-2 regions included in the study were used in the map. Mapping was performed with Golden Software Surfer10. The kriging interpolation procedure was selected.

In mathematical statistics, the level of statistical significance [26] is a parameter, indicating the degree of reliability of the calculated correlation coefficient. The smaller the number of this parameter, the more reliably the correlation coefficient is established, i.e. the more reliably a cause-and-effect relationship has been established, in the case between the annual flux of solar alpha radiation and mortality from causes of neoplasms.

The correlation coefficient and the level of statistical significance are related. For the 9 years included in the study, a minimum correlation coefficient of 0.668 corresponds to a statistical significance level of 0.05 [26]. In scientific studies, a level of statistical significance no greater than 0.05 is accepted as a criterion for the reliability of the correlation coefficient. The red isolines on the correlation coefficient distribution in the map enclose the regions with statistically significant values of the correlation coefficients around and up to a significance level of 0.05. Correlation coefficients with a significance level above 0.05 are of high reliability (the higher the number, the lower the significance level) i.e. the existence of a causal relationship between cosmic alpha radiation and mortality from the causes of neoplasms can be considered reliably established in the mentioned areas enclosed by red isolines of the correlation coefficient.

If there is a coincidence for some of the maxima for mortality rate and correlation coefficients, then in the region of these maxima, the impact of alpha radiation contributes noticeably to the mortality from neoplasms.

To the extent that the hypothetical mechanism proposed below explaining the observed phenomenon assumes that charged particles of high energy pass through the atmosphere and reach the Earth's surface, the energy required for this was calculated from databases and calculators PSTAR and ASTAR [27, 28]. Geomagnetic field data were obtained from the INTERMAGNET site [29].

III. Results

The described dangerous phenomenon is observed in the form of dependence between the annual average flux of radiation from positively charged particles (protons and alpha particles) with high kinetic energy, recorded by satellites in orbit around the Earth, and the annual mortality rate in the statistics of several countries from all continents in the Northern Hemisphere. The countries in whose mortality statistics the phenomenon is observed are located in a band parallel to the equator with approximate boundaries along the parallels of 30° and 60° north latitudes. It is observed in the annual mortality statistics of small countries. It is not noticeable in the statistics of large countries in the same band. It can be inferred that the impact on the Earth's surface is short-lived and over a limited area the size of a small country, but is masked in large country statistics because it does not affect the entire area of the large country at the same time. This conclusion is confirmed for the USA, for which there is data on mortality in individual states [10].

The mortality statistic of the European Union is suitable for the study because it is based on statistical regions, smaller than a country, but still big enough, to include a statistically sufficient number of inhabitants.

This phenomenon would be expected to influence mortality in countries south of the Equator, however, the mortality statistics for them are scarce, unreliable, or absent, preventing reliable inferences about such an influence in the Southern Hemisphere.

For particle energies of the order of 3.8 – 21.3 MeV, the year-averaged fluxes of protons and alpha particles are highly correlated, i.e. the studied phenomenon of lethality is noticeable in both the mean proton flux and the mean alpha particle flux data. For the reason explained below, only the average flux of high-energy alpha particles is included as the incident radiation in the next examples.

With black isolines, Figure 1 shows the distribution of the mortality rate for EUROSTAT shortlist death cause „Other malignant neoplasms (remainder of

C00-C97)" for Europe and the Mediterranean, for 2012 the year of maximum solar activity (and mortality), from the studied interval. With red isolines in the figure, the distribution of the statistically significant correlation coefficient between solar alpha particle fluxes and the mortality rate for "Other malignant neoplasms (remainder of C00-C97)" is shown. The statistically significant influence of alpha radiation on mortality from "Other malignant neoplasms (remainder of C00-C97)" is limited to a band parallel to the Equator with approximate dimensions between 30° and 60° north latitude. The impact of alpha radiation on mortality in the mentioned band does not continuously cover the entire band but is of the nature of limited spots in it, covering mainly mountainous areas. A pronounced effect – a statistically significant coincidence between areas with increased annual "Other malignant neoplasms (remainder of C00-C97)" mortality rate and its correlation with annual alpha radiation flux is observed for two narrow bands around 40th and 55th parallels.

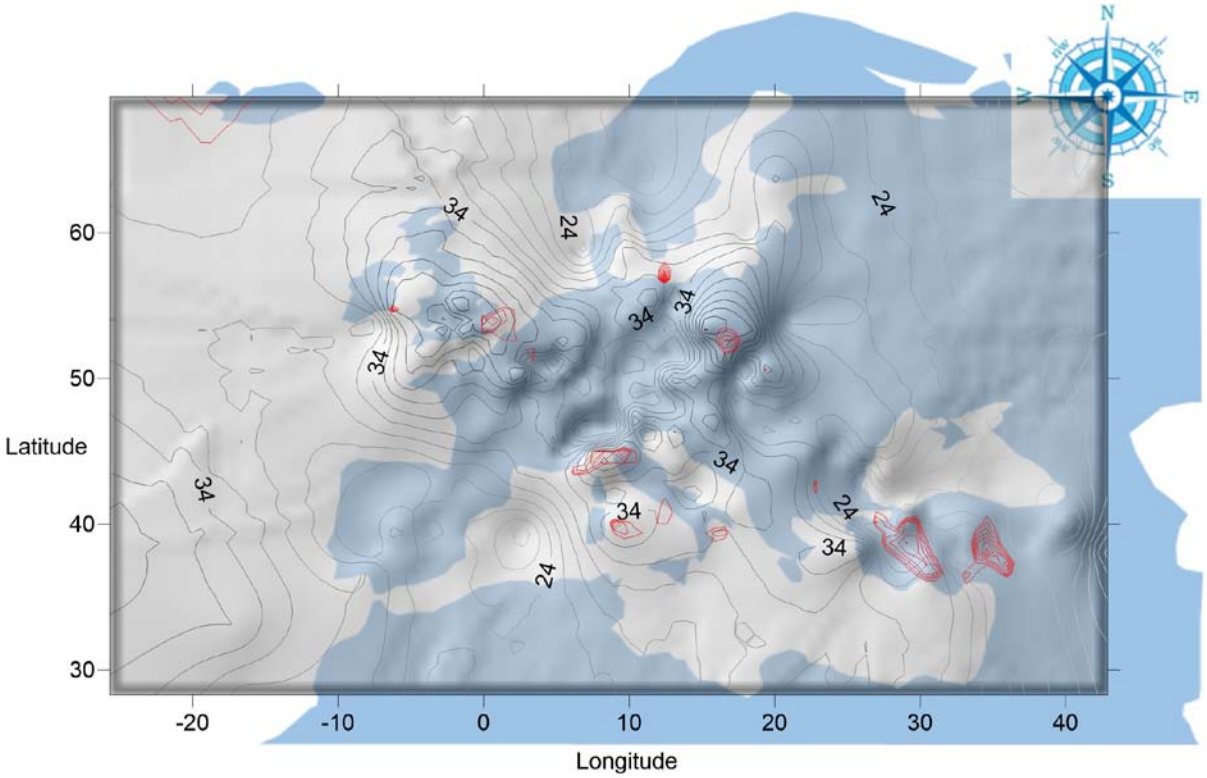

Figure 1: Europe and the Mediterranean, the "Other malignant neoplasms (remainder of C00-C97)" mortality rate for 2012 (black isolines), and its statistically significant correlation with annual alpha particle flux (red isolines) for the studied interval 2011 – 2019

Figures 2, 3, 5, 6, 7, and 9 show the time dependence in the interval 2011 – 2019 of two numerical sequences:

- Of the recorded annual fluxes of alpha particles from satellites of the GOES series – 10, 11, 12, 13, and 14, and,
- Of the "Neoplasms", "Malignant neoplasms (C00-C97)", and "Other malignant neoplasms (remainder of C00-C97)" annual mortality rate for some of the NUTS-2 regions of the European Union.

The high correlation between the two numerical sequences can be seen, indicating the existence of a causal relationship between them.

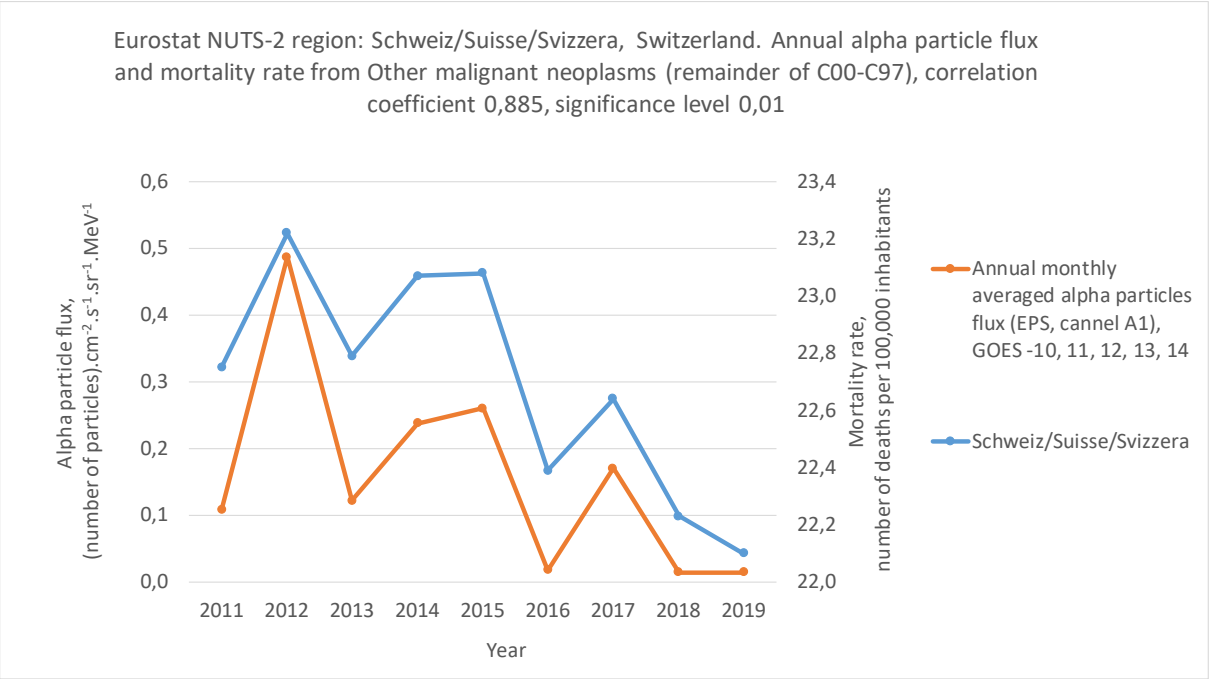

Figure 2: The high statistically significant correlation between annual fluxes of cosmic alpha radiation and the "Other malignant neoplasms (remainder of C00-C97)" mortality rate for the EUROSTAT NUTS-2 region Schweiz/ Suisse/Svizzera, Switzerland, indicates the presence of a causal relationship between the two phenomena.

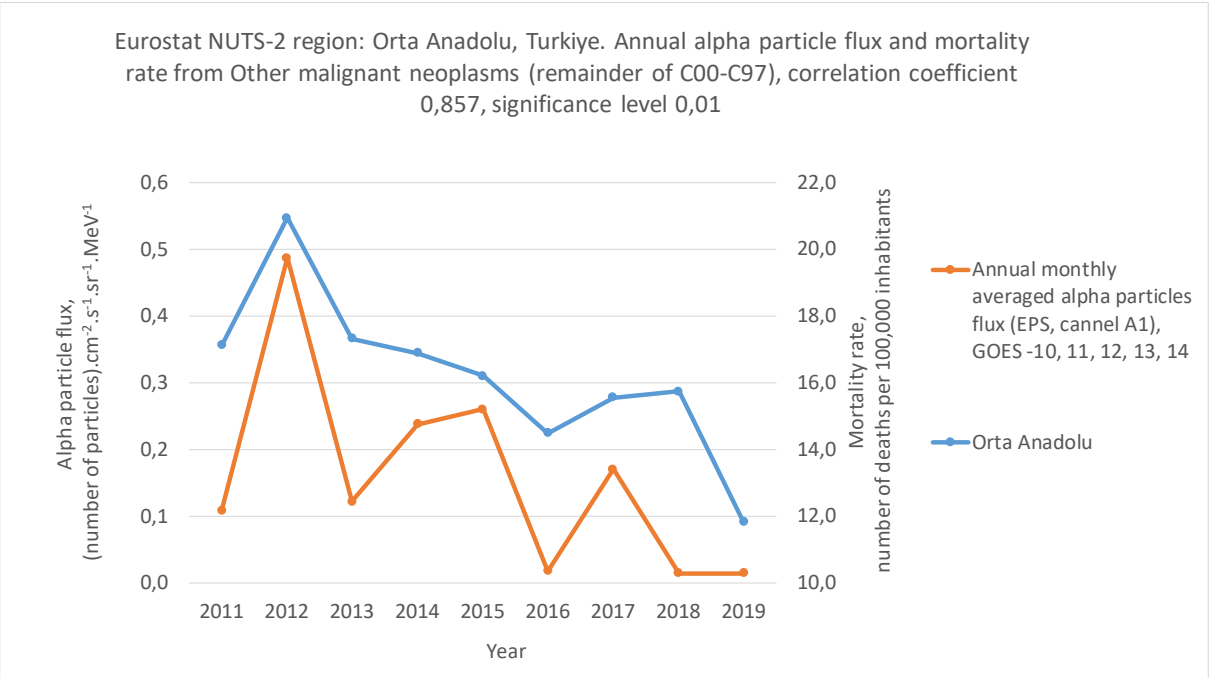

Figure 3: The high statistically significant correlation between annual fluxes of cosmic alpha radiation and the "Other malignant neoplasms (remainder of C00-C97)" mortality rate for the EUROSTAT NUTS-2 region Orta Anadolu, Turkiye, indicates the presence of a causal relationship between the two phenomena.

Figure 4 shows the distribution of the mortality rate for EUROSTAT shortlist death cause „Malignant neoplasms (C00-C97)" for Europe and the Mediterranean, under the same conditions and designations as in Figure 1. Areas with increased statistically significant correlation are scattered throughout Europe. A pronounced effect – a statistically significant coincidence between areas with increased annual "Malignant neoplasms (C00-C97)" mortality rate and its correlation with annual alpha radiation flux is observed for the two narrow meridional bands between -5° to +5° and 10° to 20°.

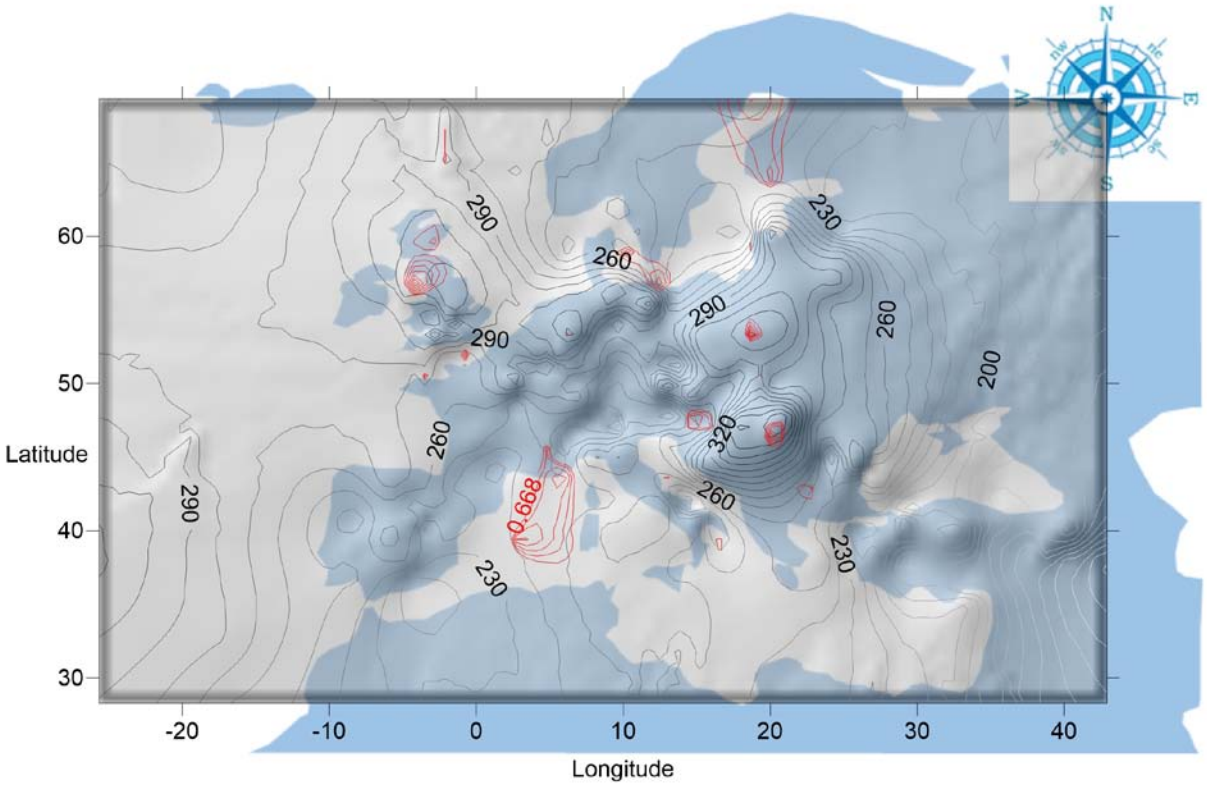

Figure 4: Europe and the Mediterranean, the "Malignant neoplasms (C00-C97)" mortality rate for 2012 (black isolines), and its statistically significant correlation with annual alpha particle flux (red isolines) for the studied interval 2011 – 2019

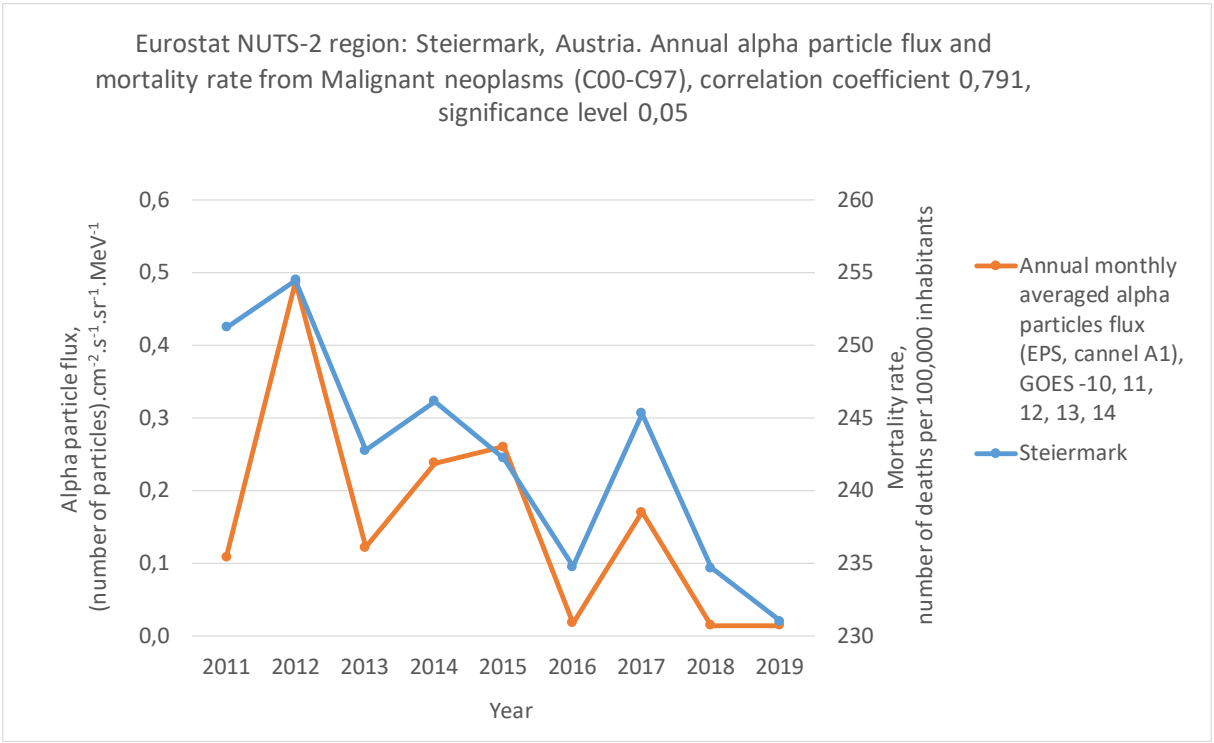

Figure 5: The high statistically significant correlation between annual fluxes of cosmic alpha radiation and the "Malignant neoplasms (C00-C97)" mortality rate for the EUROSTAT NUTS-2 region Steiermark, Austria, indicates the presence of a causal relationship between the two phenomena

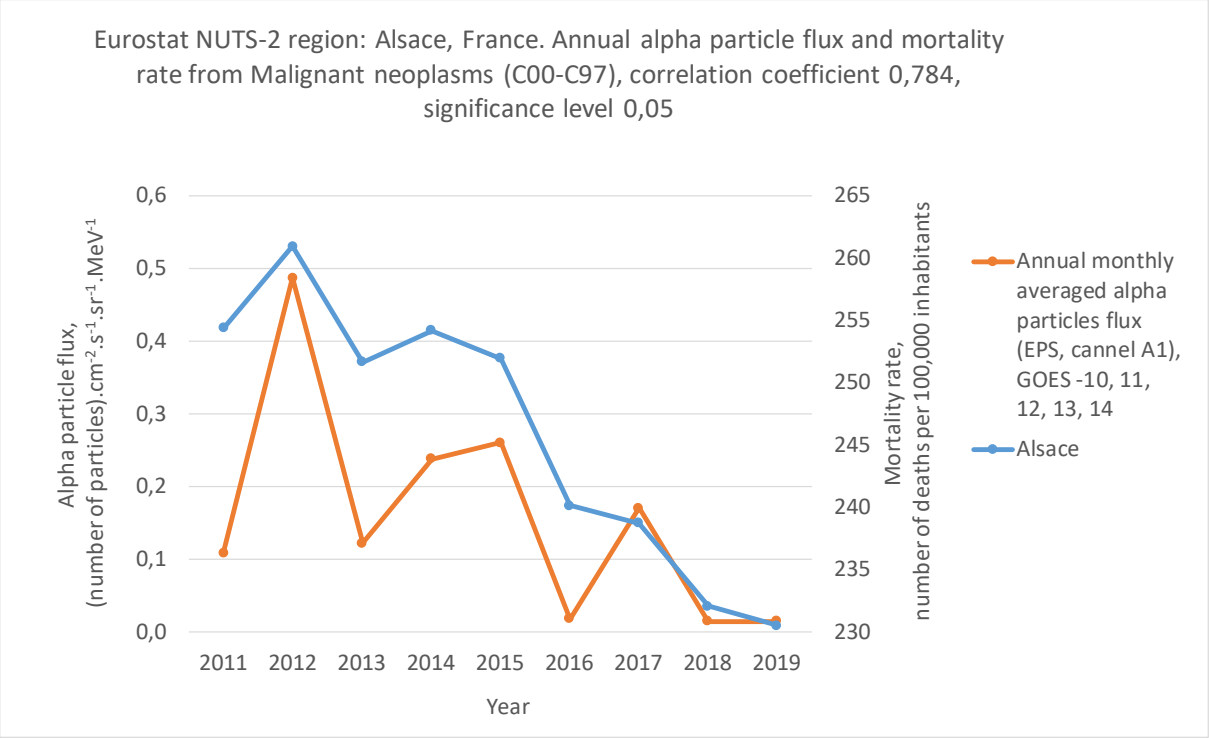

Figure 6: The high statistically significant correlation between annual fluxes of cosmic alpha radiation and the "Malignant neoplasms (C00-C97)" mortality rate for the EUROSTAT NUTS-2 region Alsace, France, indicates the presence of a causal relationship between the two phenomena

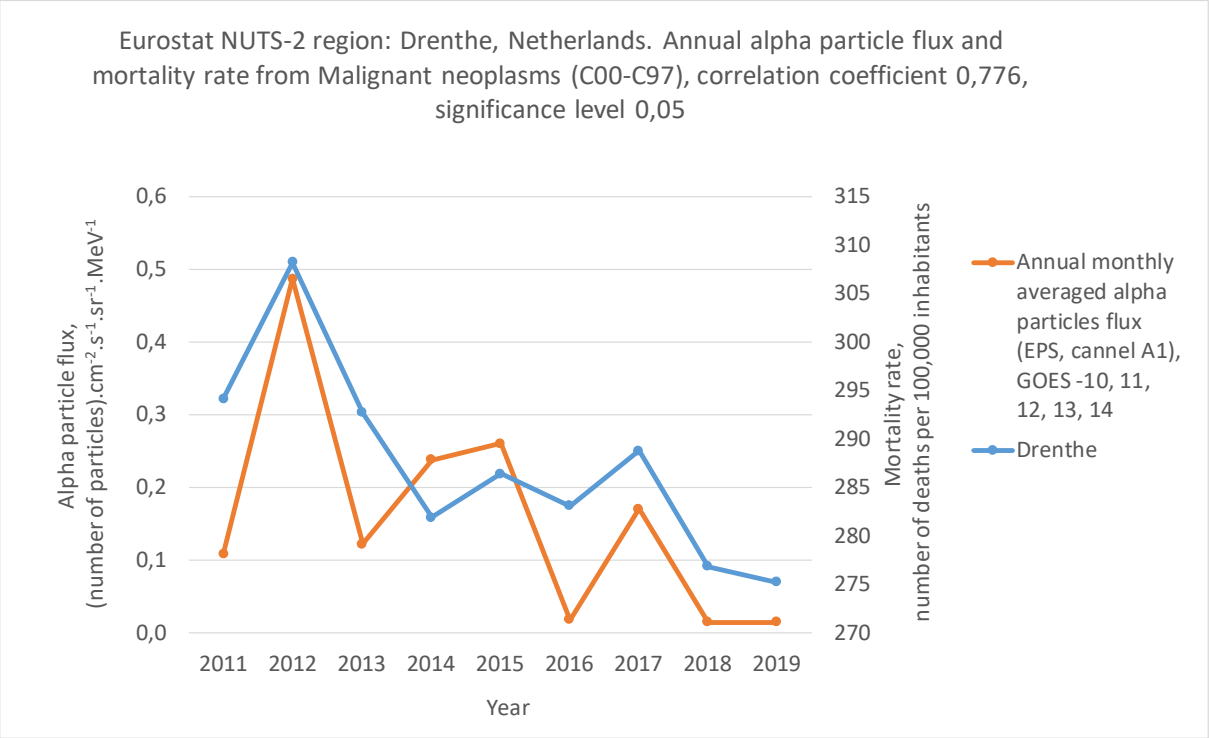

Figure 7: The high statistically significant correlation between annual fluxes of cosmic alpha radiation and the "Malignant neoplasms (C00-C97)" mortality rate for the EUROSTAT NUTS-2 region Drenthe, Netherlands, indicates the presence of a causal relationship between the two phenomena

Figure 8 shows the distribution of the mortality rate for EUROSTAT shortlist death cause "Neoplasms" for Europe and the Mediterranean, under the same conditions and designations as in Figure 1. The areas with increased statistically significant correlation are scattered throughout Europe their pattern is similar to the mix of the patterns in Figures 1 and 4.

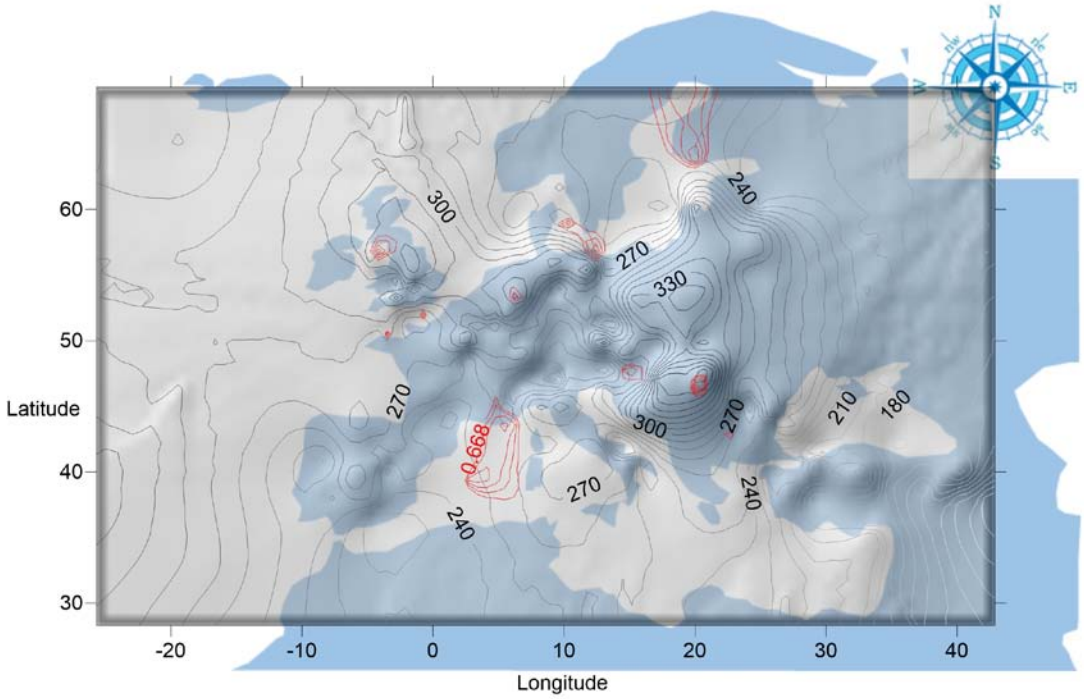

Figure 8: Europe and the Mediterranean, the "Neoplasms" mortality rate for 2012 (black isolines), and its statistically significant correlation with annual alpha particle flux (red isolines) for the studied interval 2011 – 2019

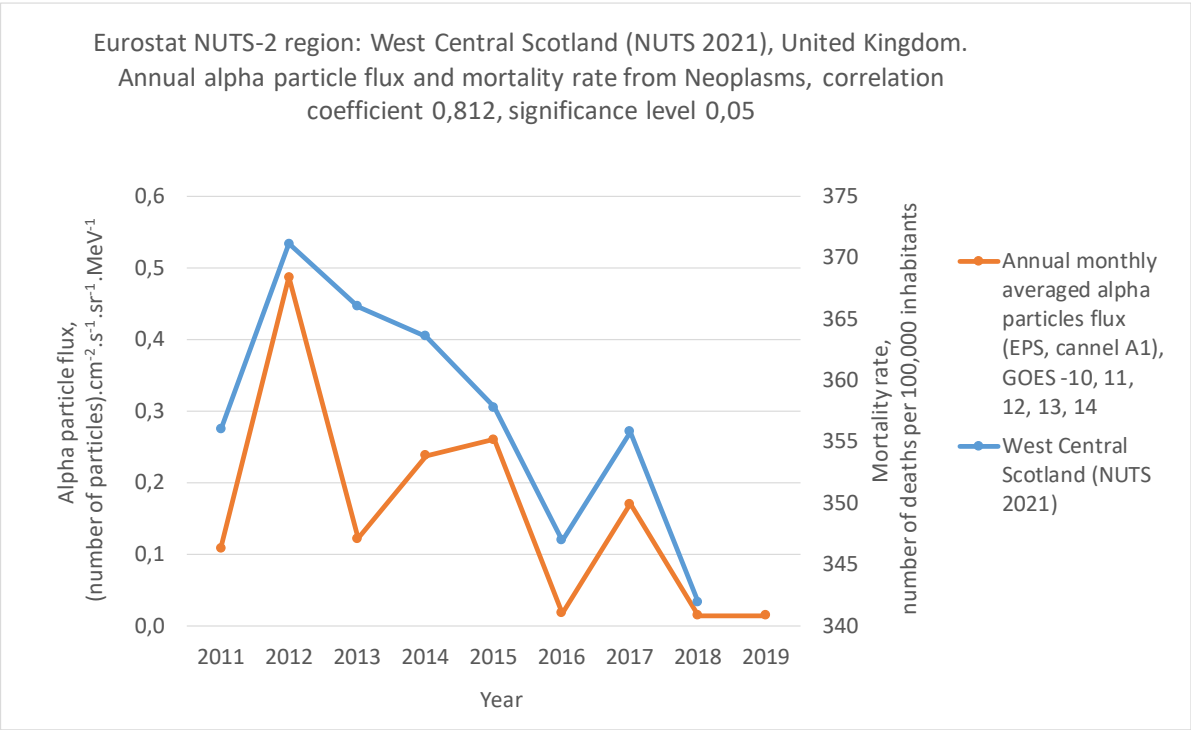

Figure 9: The high statistically significant correlation between annual fluxes of cosmic alpha radiation and the "Neoplasms" mortality rate for the EUROSTAT NUTS-2 region West Central Scotland (NUTS 2021), United Kingdom, indicates the presence of a causal relationship between the two phenomena

IV. Discussion

The given examples convincingly prove the existence of an influence of cosmic radiation flux on neoplasm mortality. The problem of the mechanism of the described influence remains unclear. A hypothesized mechanism of this influence is outlined below, answering many of the questions that arise.

1. An observed phenomenon – mortality from many diseases in the statistics of many countries located mainly in the 30°N – 60°N band, is strongly correlated with fluxes of positively charged particles with energy of the order of 4 – 21 MeV, recorded by the GOES series satellites in Earth orbit.
2. The recorded alpha particle flows are mostly pulses with a duration of less than 5 minutes (the averaging interval of the recording device).
3. Proposed hypothesis – positively charged particles with high energy penetrate through the Earth's atmosphere to the Earth's surface and damage human health, causing death mainly in elderly people.
4. As the average altitude of the affected countries increases, the particle flux-correlated mortality shows an increasing trend [4, 10]. It is probably due to the more intense radiation flux penetrating the thinner atmosphere over the mountainous region of Earth's surface – an argument favoring the hypothesis.
5. The source of the flows of positively charged particles is the Sun – mortality increases with observable processes on the Sun – from Solar Mass Ejections directed to Earth (a phenomenon on the solar surface that could be observed with other astronomical means) [4, 8]. The Alpha Magnetic Spectrometer (AMS-02) on the International Space Station measures cosmic rays, excluding those of solar origin (when shielded from the Sun by the station's solar panels). In particular, it measures the flow of 3He and 4He (alpha particles) in cosmic rays. The measurements show [30] increasing annual flux of alpha particles in cosmic rays for the interval of years from 2011 to 2017 (last available data), while the flux of GOES registered (solar?) alpha particles for the same interval of years is decreasing (Figures 2 and 9 for example). Indirect evidence for the Sun as a source of high-energy alpha particles is that this assumption convincingly explains the downstream processes that ultimately lead to death.
6. Positively charged solar particles capable of penetrating through the Earth's atmosphere to the Earth's surface are high-energy alpha particles. Calculators PSTAR [28] and ASTAR [29] calculate the penetration parameters of protons, respectively alpha particles in different substances, in particular in air. Calculations with data for a homogeneous atmosphere – an atmospheric model with constant density, temperature, and pressure decreasing with height [4] show that only particles whose energy is above 2.4 GeV for protons and over 6.2 GeV for alpha particles can penetrate the Earth's atmosphere to the surface. There are no registered by GOES satellites protons above 0.7 GeV, but there are registered alpha particles with energy above 3.4 GeV, hypothetically also those with energy above 6.2 GeV [4, 10, and 12], i.e. the particles that penetrate to the Earth's surface are probably high-energy alpha particles. Only fluxes of alpha particles with a magnitude of at least (1000 particles).$cm^{-2}.s^{-1}.sr^{-1}.MeV^{-1}$ is correlated with the mortality of the Earth's surface.
7. It is assumed that the alpha particles recorded by the satellites were emitted simultaneously with the hypothetical fast alpha particles in a common explosive process (flares?) on the solar surface. It can be calculated that particles with an energy of 7 GeV need 8.87 min to reach the Earth's surface from the Sun's surface, and registered by satellites particles with energies of 5 – 10 MeV travel about 2 hours. The registered alpha particles do not have enough energy to penetrate the atmosphere, unlike the hypothetical fast alpha particles that reach the surface of the Earth in minutes from the center of the solar disk. However, the registered alpha particles are an indicator that two hours earlier there was an irradiation of the Earth's surface with fast (unregistered) alpha particles.
8. Although alpha particle streams irradiate the entire illuminated part of the atmosphere, penetration of fast alpha particles to the surface occurs only in a limited area of the surface (death spot), for which two conditions favoring penetration are combined:
   a. The Sun is culminating for the center of the death spot. During the year, the apparent position of the Sun relative to the point of observation shifts, so that the maximum angle of elevation of the Sun's disk above the horizon (solar culmination at local noon) changes depending on the date. The latitude and longitude of a point on the Earth's surface where the solar disk is at its culmination at that moment of registration of the incoming alpha particle flow – the point of registration, can be determined from the date (latitude), and the hours and minutes of registration (longitude). The center of the dead spot can be calculated – it is approximately 30° east of the registration point [10]. The Earth's angular velocity is 15° per hour. Figure 10 shows the registration points for cases of intense alpha radiation fluxes with an intensity of at least 1000 $cm^{-2}.s^{-1}.sr^{-1}.MeV^{-1}$ for 1974 and 1975. They are located on meridians located about 30° westward of meridional bands of high correlation between alpha particle fluxes and

mortality from "Malignant neoplasms (C00-C97)" (Figure 4).

Figure 10: Points of registration of pulses of alpha particles with a flux not less than 1000.cm^{-2}.s^{-1}.sr^{-1}.MeV^{-1} of the western coast of Europe. A Google Earth map was used

b. For the center of the death spot, a coincidence is in effect – the direction of the geomagnetic induction vector coincides with the direction of the alpha particle intrusion – the alpha particle movement is not affected by the deflecting magnetic force. Such a coincidence occurs twice a year for latitudes in the band from 28°N to 48°N [4]. For latitudes outside this band, such a coincidence is impossible, the fast alpha particles do not reach the Earth's surface, or their flux on the surface decreases fast with their moving away from the band.

The moment of occurrence of a flow of fast alpha particles cannot be predicted, but the dates of increased risk for a given point on the Earth's surface between 30°N – 50°N can be calculated by the latitude of the location [10]. For example, for the EUROSTAT NUTS-2 region Switzerland (Bern) (See Figure 2), with latitude 47°N, the dates with maximum risk are around May 24 and July 20. On these dates, the inclination (63.6°) of the geomagnetic vector for Switzerland is close in magnitude to or coincides with the culmination of the Sun (the Earth's atmosphere is thinnest at the moment of the Sun's culmination, and there is no deflecting magnetic force for alpha particles if they intrude at this time from the Sun). The increased risk of health incidents outdoors around local noon is a further argument for the healthfulness of the indoor midday break ('siesta') practiced in Mediterranean countries.

The arguments given above reveal a new, previously unsuspected cosmic cause of neoplasm mortality – solar corpuscular alpha radiation. This type of radiation may be the leading external cause of neoplasm diseases. The risk, in particular for neoplasms, is highest for inhabitants in the mountainous regions. During the day, the hours around local noon are the riskiest for a cosmic impact causing subsequent illness. The risk is also increased during certain days of the year (depending on the latitude of the observation point) during which the solar culmination coincides with the angle of the geomagnetic vector (inclination). If a stream of high-energy solar alpha particles were to hit the Earth at this time, there would be no deflecting magnetic force on them, making it easier for them to reach the Earth's surface.

A part of the recorded pulses of alpha particles forms an unnatural series with fixed periods (meaning a permanent meridian, both for the registration point and the death point) and relatively constant magnitudes, which allows the hypothesis of their artificial origin [12].

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Astrophysics of Shadows: The Dead Universe Theory – An Alternative Perspective On The Genesis of the Universe

By Joel Almeida
UNIFIL University

Abstract- This article presents the theory of the "dead universe" as a new perspective on the origin and evolution of the cosmos. It proposes that our universe may have emerged from remnants of a previous universe, vastly larger than the observable universe, which collapsed and perished, transforming into a defunct entity whose laws still influence our cosmos. Furthermore, the theory suggests a second hypothesis, in which this universe, from its very creation, has always been immersed in a state of death—not in the traditional sense of stellar death, but as a primordial existence characterized by the total absence of light. In this chaotic context, light, which was not an intrinsic quality of this universe, emerged as a cosmic anomaly, culminating in the formation of the observable universe, which now resides at the center of a black hole belonging to the dead universe.

Keywords: dead universe theory, cosmic heat death, universe's end, big freeze scenario, universe's ultimate fate, massive black holes, axion dark matter, UNO particle theory, cold dark universe, dark matter dominance, entropic cosmology, future of cosmic structures.

GJSFR-A Classification: (LCC): QB991.D35, QB793.5

Strictly as per the compliance and regulations of:

Astrophysics of Shadows: The Dead Universe Theory — An Alternative Perspective On The Genesis of the Universe

Joel Almeida

Abstract- This article presents the theory of the "dead universe" as a new perspective on the origin and evolution of the cosmos. It proposes that our universe may have emerged from remnants of a previous universe, vastly larger than the observable universe, which collapsed and perished, transforming into a defunct entity whose laws still influence our cosmos. Furthermore, the theory suggests a second hypothesis, in which this universe, from its very creation, has always been immersed in a state of death—not in the traditional sense of stellar death, but as a primordial existence characterized by the total absence of light. In this chaotic context, light, which was not an intrinsic quality of this universe, emerged as a cosmic anomaly, culminating in the formation of the observable universe, which now resides at the center of a black hole belonging to the dead universe.

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I. Introduction

For more than a century, the Big Bang theory has been considered a valid model by science. However, various historical gaps have not been overcome, and new doubts arise as the theory is disseminated in academic and educational settings worldwide. The fact that it is widely accepted does not imply that it is unquestionably true, nor that the universe originated exactly as proposed by it.

Moreover, a scientific theory must be supported by empirical evidence that favors it. The evidence that once reinforced the Big Bang now also supports new theories, such as the "Dead Universe" theory discussed in this article. The Big Bang theory is undeniably a well-accepted model, but the cosmological model of the Dead Universe theory may prove inevitable. The validity of this new theory can be more clearly demonstrated through technological advancements and mathematical calculations in the field of quantum computing rather than merely through the work of astrophysicists seeking precision to corroborate the theory.

Author: UNIFIL University, Londrina, Brazil.
e-mail: j.almeida@extractodao.com
ORCID: 0009-0003-4015-7694

Before Edwin Hubble made his mark on the study of the cosmos, Alexander Friedmann and Georges Lemaître had already established the theoretical foundation that would challenge the prevailing conceptions of the universe. In 1922, Friedmann, a Russian mathematician, pioneered the application of relativity theory equations to predict an expanding universe, an idea initially met with skepticism. In parallel, in 1927, the Belgian priest and astronomer Georges Lemaître independently proposed a similar model that included the notion of a "primordial atom" — the theoretical precursor of what would later be known as the Big Bang.

In the scenario prepared by these visionary minds, Edwin Hubble emerged as a transformative figure. Throughout his career, he dedicated himself to studying the redshift of galaxies, a phenomenon he highlighted through meticulous observations. In 1929, Hubble published his results, establishing a direct relationship between redshift and the apparent brightness of galaxies, corroborating and expanding the theories of Friedmann and Lemaître.

This discovery, known as Hubble's Law, transcended existing theoretical models and transformed the concept of the expanding universe from a mere mathematical abstraction into an empirically verifiable reality. With this contribution, Hubble not only reinforced the work of his predecessors but also inaugurated a new era in cosmology, where the idea of a dynamic and expanding universe became a central pillar in modern understanding of space and time.

Hawking (1988) postulated that Hubble's observations suggested that there was a moment, called the Big Bang, when the universe was infinitesimally small and infinitely dense. Under such conditions, all laws of science, and therefore all ability to predict the future, would fail. If there were events before this moment, they could not affect what happens in the present. Their existence could be ignored because they would have no observational consequences. One could say that time began at the Big Bang, in the sense that earlier times simply would not have a definition [1]. Hawking, S. (1988). A Brief History of Time.

II. The Dead Universe Theory Hypotheses

The hypotheses of the "Dead Universe" suggest an alternative cosmological model. It explores the origin and evolution of our universe from the chaos of a pre-existing universe. This previous universe would be composed of exotic and hypothetical shadow elements. According to this theory, this "dead universe" would be billions of times larger than our observable universe. It would be mainly composed of dark matter, dark energy, and hypothetical particles such as axions and UNO (A New Order of invisible particles).

At the beginning of the Book of Genesis, we find a fundamental description of the universe's creation that offers an interesting perspective on the origin of light relative to darkness:

The connection to the Dead Universe Theory is evident: both in theology and science, light emerges as an anomaly in an originally dark and chaotic cosmos. From the perspective of the Dead Universe, the light and energetic activity we observe today (such as in stars and the Sun) can be seen as interruptions in a universe that, in its essence, is inert and somber. This cosmological paradigm proposes that, as in the Genesis account, light is not a constant but an exception — a temporary and anomalous phenomenon in a universe that is, by nature, dark.

Two hypotheses are advanced within the framework of the "Dead Universe" theory. Initially, the term "dead" is redefined, transcending the traditional notion of stellar extinction, to denote a universe whose fundamental characteristic since its inception is the intrinsic absence of light. In this model, light is considered a cosmic anomaly arising from fusion and collision events between supermassive bodies within the expanse of a primordial dark universe. Furthermore, this theory asserts that black holes and fusions are not the creators of the universe in which we reside.

The first hypothesis postulates that phenomena such as supermassive black holes, dark energy, and dark matter constitute the elementary components of this primordial universe. Interestingly, light appears under specific circumstances, possibly as a byproduct of complex gravitational interactions, acting as a catalyst for the transition to an illuminated cosmos similar to what we observe today.

The second hypothesis proposes that an ancestral universe, vastly larger than the currently known cosmos, serves as the final relic for the death that devastated all galaxies and extinguished the light of a once vibrant universe. This predecessor universe could provide crucial evidence of cosmological processes that culminated in the current observable state of the universe.

The Dead Universe, in its nature, may be composed of Axion particles and possibly the UNO particle proposed in the article (Almeida, J. (2024) The “Dead Universe” Theory: Natural Separation of Galaxies Driven by the Remnants of a Supermassive Dead Universe. Natural Science, 16, 65-101. doi: 10.4236/ns.2024.166006.). This perspective proposes an inevitable break from the conventional Big Bang theory, particularly concerning dark matter, the expansion of the universe, and the interpretation of phenomena such as gravitational waves.

After the collapse of this vast cosmos, without light and in chaos, matter and light emerged from the darkness as cosmic anomalies. These anomalies compose the primitive reality of this dead universe, characterized by black holes. In its remote origins, this universe exists in a vast darkness where inactivity prevails. However, it still influences phenomena such as the separation of galaxies under the laws of the dead universe.

Within this cosmic abyss, complex and highly improbable fusions occurred. These fusions involve interactions between axions, UNO particles, and other exotic components. They were born from extreme conditions and a rare convergence of energies. They resulted in small ruptures in the structure of the dead universe, giving rise to luminous phenomena and the matter we know.

These ruptures, though anomalous and limited in scope, were powerful enough to create bubbles of existence. Our observable universe is one of these bubbles, encapsulated within a black hole of this dead universe.

These fusions are not simple events but intricate processes that defy conventional laws of physics. They occur in a scenario where the collapse of space-time allows exotic particles to merge in ways that would normally be impossible. The resulting light and matter are seen as byproducts of these anomalous cosmic fusions. They represent exceptions in a predominantly dark and stagnant universe. In essence, these fusions act as resurgence mechanisms within a dead system, where life and light are only brief flashes in a vast sea of darkness.

Theories such as the Antiuniverse, Multiverse, Universe as an Information Processor, Big Rip, Big Freeze, Hubble's Theory of Universe Expansion, and even Albert Einstein's Theory of General Relativity depend on the Big Bang model for their support. The Big Bang has served as the foundation for these theories for many years, providing an essential theoretical base.

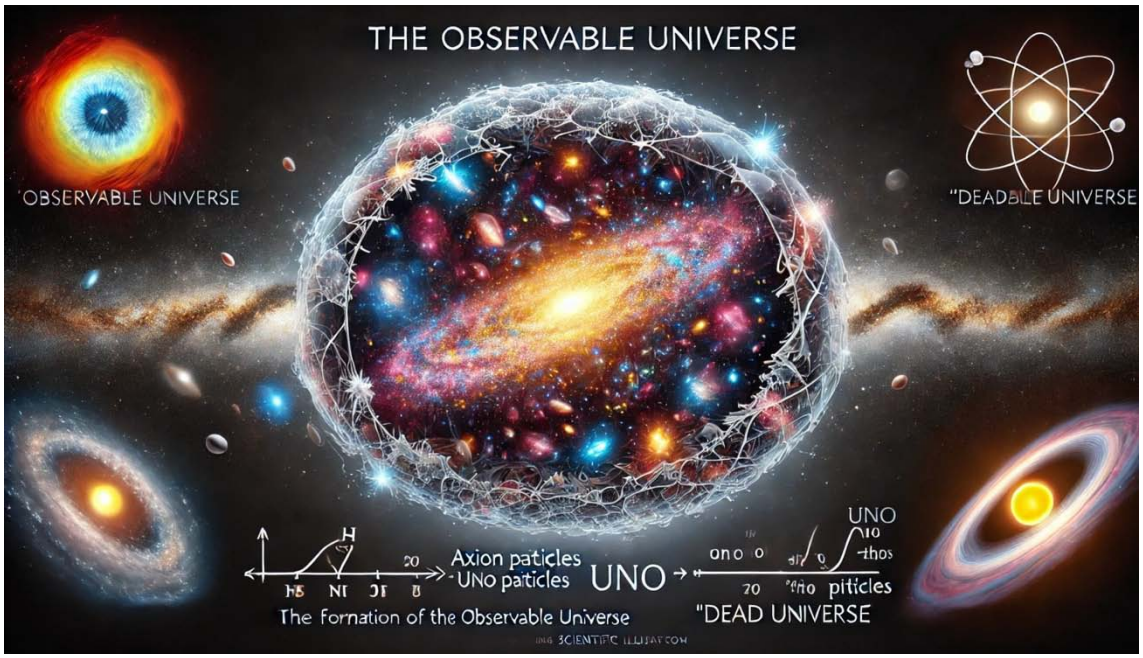

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Figure 1: The images in this article were generated using advanced computational technology, specifically designed to visually represent complex astrophysical concepts. Each visualization is crafted through precise algorithms to reflect the intricacies of theories like the "Dead Universe," utilizing specific parameters based on scientific data and theoretical models to ensure the most accurate representation possible within the theoretical context presented

On the other hand, the Dead Universe Theory offers an alternative cosmological model that does not rely on the Big Bang as its foundation. It proposes that our current universe is merely a small part of the remnants of a preexisting universe, billions of times larger than the observable universe. This dead universe was primarily composed of a cold mass of exotic elements such as axions, dark matter, dark energy, and UNO particles. The Dead Universe Theory challenges traditional notions and compels us to reconsider the origins of the cosmos from a new perspective.

"The cold axion population is produced in the process of axion field relaxation, commonly called vacuum realignment. The key point is that when the axion mass becomes larger than the inverse age of the universe at that time, the axion field is not initially at the minimum of its effective potential. It then begins to oscillate, and since the axion is very weakly coupled, these oscillations do not dissipate into other forms of energy. The energy density in relic axion field oscillations is a form of cold dark matter (Ipser and Sikivie, 1983). In fact, among all widely considered dark matter candidates, axions are the coldest." — Sikivie, Pierre. [1]

III. Foundations for an Astrophysics of Shadows and the Origins of the Dead Universe

On the other hand, the Dead Universe Theory directs us to experiments through simulations with greater rigor, especially regarding the new generation of astrophysicists who are working with the support of quantum computing. As a proposed model, the Dead Universe Theory proves adequate and capable of establishing itself solidly on the evidence and observations. These technological advances enable simulations and models that reveal new perspectives on the formation and evolution of the universe.

Unlike other theories that face difficulties in reconciling quantum and relativistic concepts, the Dead Universe Theory not only aligns with general relativity and quantum mechanics but also strengthens them. It offers a new view of the universe's expansion and the nature of galaxies, providing a more comprehensive and cohesive explanation for phenomena like the cold spot of the universe that traditional theories cannot fully explain.

Recent observations by the James Webb Space Telescope of galaxies that are "dead" provide empirical evidence of a stellar death escalation in the past cosmos, which may support the theory that soon we may discover a universe much larger than the

observable one in the depths of darkness. A secondary hypothesis of this theory posits that our universe is inherently dead and that light is a cosmic anomaly resulting from cataclysmic mergers that gave rise to the luminous and living universe as we know it today.

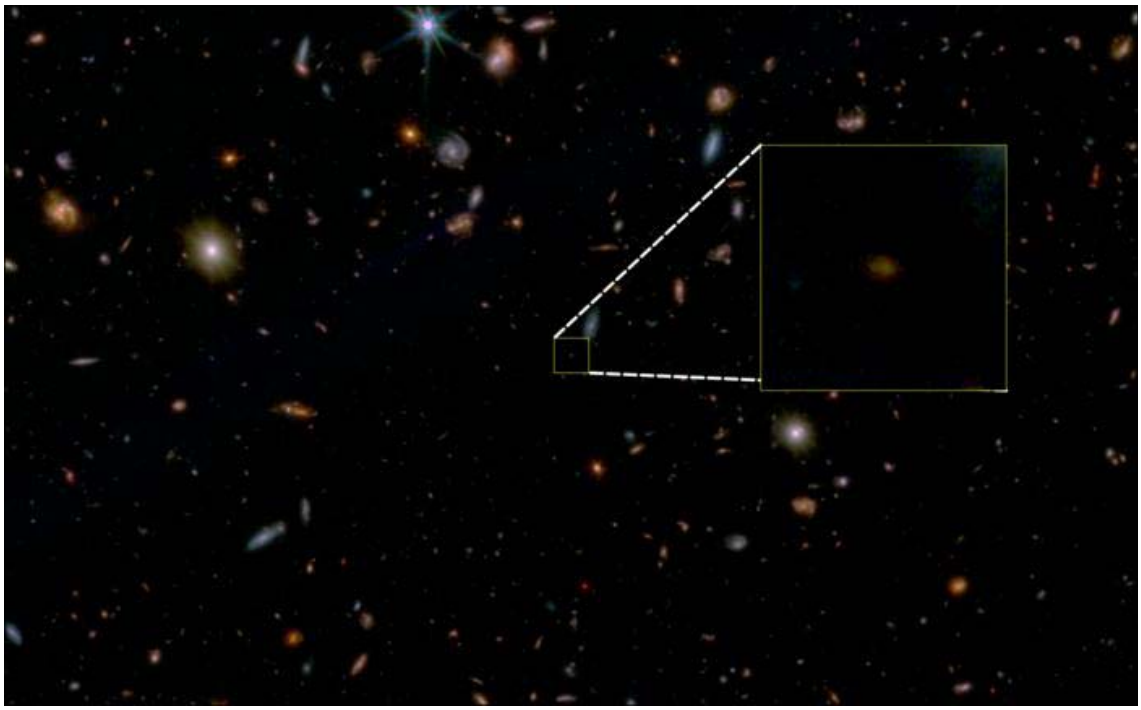


Image: JWST false-color image of a small fraction of the GOODS-South field, highlighting JADES-GS-z7-01-QU, an extremely rare type of galaxy.

Credit: JADES Collaboration

License: Public Domain

Figure 2: Astronomers Discover the Oldest "Dead" Galaxy Ever Observed

In light of the "Dead Universe" theory, where darkness precedes light, the biblical references to God's association with darkness can be viewed through a scientific and cosmological lens. When Solomon states in 2 Chronicles 6:1, "The Lord said that He would dwell in thick darkness," and Psalm 18:11 mentions, "He made darkness His hiding place; His canopy around Him was dark waters and thick clouds of the skies," these verses can be interpreted as metaphors for the primordial state of the cosmos.

The "Dead Universe" theory suggests that before the emergence of light, the universe existed in a state of total darkness—a condition that, far from being merely the absence of light, represents the original and fundamental nature of the universe. This darkness, much like the biblical portrayal, embodies mystery, power, and the incomprehensible nature of the universe's origins. Just as God's presence in darkness signifies His transcendence and inaccessibility, the darkness of the early universe can be seen as a state of potential, where the laws and conditions that govern our cosmos were hidden and unfathomable until the anomaly of light emerged, bringing forth the observable universe.

In this context, the thick darkness that surrounds God may symbolize the primordial universe—a vast, enigmatic realm of potentiality, where the principles that would eventually give rise to light and matter were concealed within the depths of cosmic darkness. Thus, the scriptural portrayal of God dwelling in darkness aligns with the scientific notion that the universe's origins are rooted in a dark, hidden state, from which light and creation eventually emerged.

These biblical passages dialogue with contemporary theories about the universe, suggesting that the cosmos' primordial state—characterized by darkness and chaos—is both a scientific reality and a religious perception.

Beyond the conventional view that supports the natural paradigm of the universe in its current state, a second hypothesis can be considered. This second perspective, grounded in the theory of the Dead Universe, proposes an alternative interpretation of celestial phenomena, including the behavior of stars.

As we gaze upon the Sun and other stars, it's hard not to ponder the strangeness of their apparent frenzied activity. The intense emissions of light and radiation emanating from these celestial bodies may appear incompatible with the conception of a dead and

inert universe. However, by embracing the theory of the Dead Universe, we can perceive this activity as an anomaly that precipitated the existence of the universe as we comprehend it.

Within the framework of the Dead Universe theory, two hypotheses hold sway. The first postulates a universe in its natural state of death, wherein light would be regarded as an alien presence amidst the otherwise dormant cosmos. The second hypothesis introduces a grander notion: a universe trillions of times larger than our current one, which gradually slipped into a continual state of death. In this expansive cosmos, comprised of light and normal stars, the very essence of existence was altered, manifesting a state where light and stellar phenomena were commonplace. By delving into these hypotheses, we are compelled to reevaluate our understanding of cosmic phenomena. Rather than mere aberrations, they become enigmatic clues, hinting at the profound intricacies of the universe's genesis and its potential demise.

According to the Dead Universe theory, the natural state of the cosmos would be one of total inactivity, without the presence of bright stars, solar flares, or any other form of radiant energy. In this paradigm, starlight and the energetic events associated with it would be seen as unusual disturbances in a universe that would otherwise remain in a state of eternal calm.

Solar flares, coronal mass ejections, and other stellar phenomena would be interpreted as temporary deviations from the inert equilibrium that characterizes the Dead Universe. These manifestations of extreme energy activity would be considered anomalies that arose from exceptional conditions or catastrophic events within this supposedly static universe.

Therefore, by embracing the Dead Universe theory, we are led to reassess our understanding of starlight and celestial phenomena. Instead of being viewed as natural aspects of the cosmos, they become signs of a fundamental disruption that gave rise to the universe as we know it. This alternative perspective challenges our conventional perception and invites us to explore new ways of understanding the nature and origin of the cosmos.

Anomaly of Light: Light, a fundamental manifestation of electromagnetic energy, occupies a pivotal role in the physics of the universe as we know it. To propose that light is an anomaly in this theory is not simply to invoke complexity; rather, it offers answers to some of the most profound questions in classical physics. This approach does not just reinterpret established physical concepts but also proposes a new way to understand the nature of the universe.

The creation of light in stars is a complex process that primarily occurs through thermonuclear reactions in their cores.

Nuclear Fusion: The primary mechanism for creating light in stars is nuclear fusion. In the stellar core, especially in stars like the Sun, hydrogen atoms are fused to form helium in a process called nuclear fusion. During this fusion, a small fraction of the atoms' mass is converted into energy according to the famous equation by Einstein, E = mc2. This energy is released in the form of light and heat.

Pressure of Radiation and Gravitational Pressure: Within a star, nuclear fusion generates an immense amount of energy in the form of radiation and high-energy particles. This radiation exerts an outward pressure in all directions. Simultaneously, the star's massive mass creates a significant gravitational attraction, attempting to compress it toward the center. Hydrostatic equilibrium occurs when these two forces - radiation pressure outward and gravity inward - balance each other.

Fusion Cycle: In the sun and other stars of similar size, the primary fusion process is the proton-proton cycle, where four hydrogen nuclei combine to form a helium nucleus, releasing photons (light particles) in the process.

Gravitational Pressure: Nuclear fusion only occurs in stars due to the immense gravitational pressure in their cores, which forces the hydrogen nuclei to approach close enough to overcome the electrical repulsion between them and allow fusion.

Hydrostatic equilibrium: The light generated by nuclear fusion exerts an outward pressure, balancing the force of gravity that is trying to compress the star. This hydrostatic equilibrium keeps the star stable and in its current state.

Pressure of radiation and gravitational pressure: Within a star, nuclear fusion generates an immense amount of energy in the form of radiation and high-energy particles. This radiation exerts an outward pressure in all directions. At the same time, the massive mass of the star generates a significant gravitational attraction, attempting to compress it toward the center. Hydrostatic equilibrium occurs when these two forces - radiation pressure outward and gravity inward - balance each other.

Stellar stability: When hydrostatic equilibrium is achieved, the star becomes stable. Any disturbance that causes an imbalance between radiation pressure and gravity will result in changes in the stellar structure. For example, if radiation pressure decreases, gravity will begin to compress the star, increasing pressure and temperature at its core. This may lead to an acceleration in the rate of nuclear fusion to restore equilibrium. On the other hand, if radiation pressure becomes too intense, it can overcome gravity and expand the star, resulting in an eventual explosion or ejection of stellar material.

Stellar lifecycle: Hydrostatic equilibrium is crucial to understanding the lifecycle of stars. For most of their lives, stars maintain this equilibrium, remaining stable and generating energy through nuclear fusion. However, as nuclear fuel is consumed, radiation pressure decreases and gravity begins to dominate. Depending on the mass of the star, this can result in different fates, such as transformation into a red giant, supernova, or even a black hole.

Dynamic equilibrium: It is important to note that hydrostatic equilibrium is not a static state but rather a dynamic balance. Conditions within a star are constantly changing due to energy production, movement of stellar material, and other physical interactions. However, hydrostatic equilibrium is essential to ensure that these changes occur in a controlled and balanced manner, keeping the star relatively stable throughout its life.

The premise that, in the origins of the universe, light was not present; it was created subsequently. Whether according to the belief of creationists, who suggest that the universe was shrouded in darkness and that God said "let there be light," or from the scientific perspective of these primordial events, it is undeniable that darkness preceded light.

Primitive Elements: While black holes, dark matter, and dark energy are well-established concepts in modern cosmology, they are generally regarded as emergent phenomena and not necessarily as primordial components of the universe. Nevertheless, the dead universe theory provides a plausible explanation for their origins, presenting them as fundamental elements of a previously inert cosmos. Although dark matter and dark energy are areas of intense research and debate, with their origins still undefined by consensus, this theory presents one of the first rational approaches attempting to elucidate these enigmatic phenomena.

Expansion of Cosmic Understanding: These ideas challenge our imagination regarding the universe and provide fertile ground for theoretical discussions and speculative narratives. Although they remain distant from current scientific consensus, these theoretical considerations seek to expand our comprehension of the possible states of the universe and the fundamental forces that govern its evolution and potential finality. Thus, while respecting the limitations of endorsed scientific knowledge, these propositions allow for speculative exploration based on alternative theories and hypotheses.

The "dead universe" theory implies that the cosmos we know is the residual aftermath of a bygone vastness, where the concept of stellar birth is reversed to universal death. In this scenario, black holes are not the catalysts of creation but rather the epitaph of a universe that has expended its vitality. Rather than being generative singularities, these primordial black holes are the remaining gravitational beacons of a cosmos that no longer exists.

The galaxies and stars we observe, in their seeming youthfulness, are actually the embers of a cosmic fire long extinguished.

Dark matter and dark energy, the enigmatic elements of our universe, may be interpreted as the faint echo of this ultimate cataclysmic event.

Among the theories describing the ultimate fate of the universe, hypotheses of the "Big Freeze," "Big Rip," "Big Crunch," and "Big Slurp" suggest dramatic scenarios based on the continuous expansion, contraction, or phase transitions of space-time. However, the theory of the "Dead Universe" presents a more serene and fundamentally different outcome for the cosmos.

IV. UNO and Axion Particles

Origin: Axions are hypothetical particles initially proposed to solve the CP symmetry violation problem in particle physics, specifically in the context of strong interactions.

Properties: Axions are neutral particles with low mass and weak coupling with ordinary matter and electromagnetic fields. They are considered candidates for cold dark matter due to their ability to interact very weakly with other particles and fields.

Cosmological Implications: As dark matter, axions do not absorb, emit, or reflect light, making them invisible and primarily detectable by their gravitational effects.

a) UNO Particle (New Order of Invisible Particles)

Concept: In this scenario, we assume that the UNO particle is a new form of "neutrino" with universal oscillatory properties, potentially capable of transmuting between different types of mass and energy.

Properties: We suggest that the UNO particle can oscillate between different energy states, possibly allowing the conversion of dark energy into ordinary matter or radiation under certain conditions.

Role in the Universe: The UNO could be a catalyst for converting energy forms in the early universe, influencing the formation of the first galaxies and stars, and possibly acting as a bridge between dark matter and visible matter.

V. Interaction between Axion and UNO

The central hypothesis is that at the beginning of the universe, Axion mass particles, forming a dark matter field, began interacting with UNO particles. This interaction could involve the transfer of energy from Axions to UNO particles, resulting in oscillations that convert this energy into electromagnetic radiation—light.

This light could form the basis for the observable universe we know.

The Dead Universe is described as a completely dark space, composed of Axion particles, UNO particles, and dark matter. Additionally, there are dark radiation stars, dark nebulas, and planets immersed in darkness and chaos. These characteristics align with the initial hypothesis of a Dead Universe composed of inert stellar elements. Simultaneously, the second hypothesis suggests that this darkness and chaos result from stellar death on a massive scale. In both scenarios, the Dead Universe remains a vastly unknown structure where life and light are rare exceptions in a predominantly extinguished cosmos.

The representation in the image is based on the "Dead Universe" theory, a new interpretation of the cosmos' origin and evolution. This hypothesis suggests that our universe may have originated from the remnants of a previous universe and that we are merely remaining fragments of a cosmos that entered a state of stellar death or that, in its original nature, was essentially dead. Thus, we inhabit an immense black hole, while countless supermassive bodies are situated on the margins of this Dead Universe. Possibly, supermassive black holes exist, some of which, in a single unit, may be larger than the observable universe.

Behind the primary conception of the Dead Universe, in the sense of stellar death, numerous galaxies are inert. The dating of the Big Bang, estimated at 13.8 billion years, may be reconsidered to understand that the universe's structure may have much more time. Studying these dead galaxies, just as we study dinosaur fossils, and with the help of technology and quantum computing, we may conclude that we have been wrong for more than 100 years. In the second hypothesis, as proposed in this article, the Dead Universe theory assumes a different perspective, while the Big Bang model completely loses its validity as a paradigm for studying this primitive structure. In this hypothesis, the Dead Universe still exists in hypothetical primitive particles, such as UNO, Axion, dark energy, and dark matter.

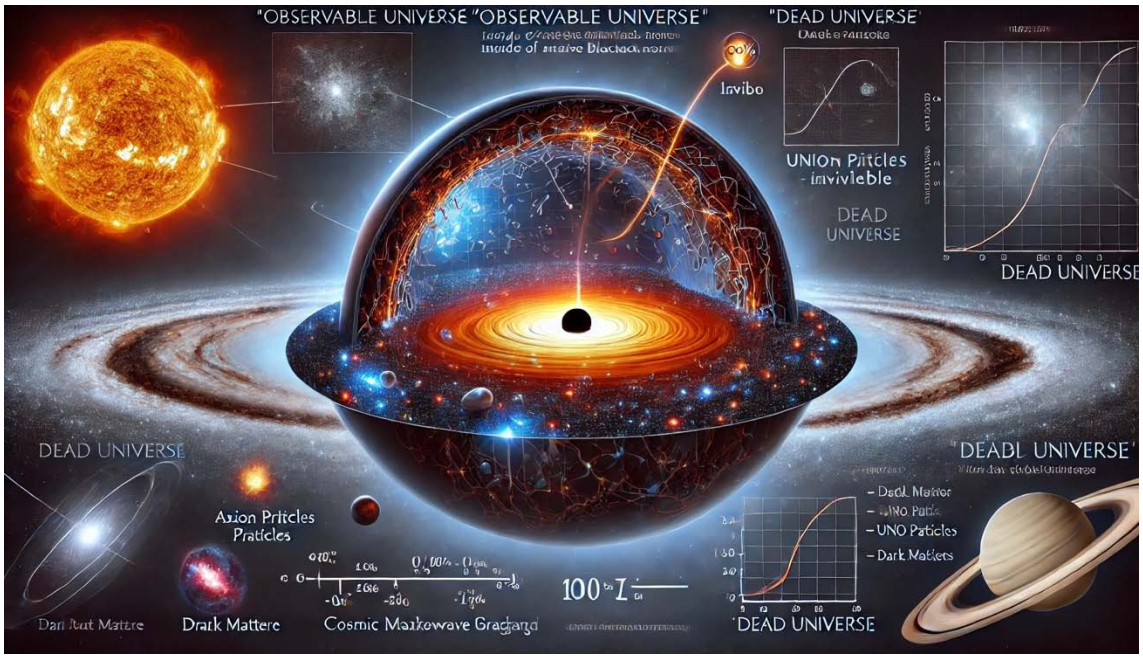


Figure 4: The images in this article were generated using computational technology designed to visually represent complex astrophysical concepts. Each visualization is created through precise algorithms to reflect the intricacies of the "Dead Universe" theories, utilizing specific parameters based on scientific data and theoretical models to ensure the most accurate representation possible within the theoretical context presented. Image Credits: Global Journals. https://globaljournals.org/

We can formulate a simplified equation to describe the rate of energy conversion from Axions to light through interaction with UNO particles:

The image above illustrates the theoretical interaction between Axion particles and UNO particles, which could have led to the formation of the observable universe. Axion particles form a dark matter field that, when interacting with UNO particles, results in the conversion of energy into electromagnetic radiation, or light, thus creating the universe we know.

Between the observable universe and the dead universe, there is a layer of plasma composed of Axion particles and another layer of UNO particles. The Axion plasma, which is the origin of the dark matter that forms black holes, acts as a barrier, while the UNO plasma, being invisible, allows for the separation and interaction

of the two regions. Within a magnetic field, Axions could generate a small electric field, creating oscillations in the plasma, similar to tuning a radio to find the correct dark matter frequency.

VI. Observable Universe

The observable universe, which is just the last particles of the dead cosmos, is located inside an immense black hole formed from the death of the dead universe that became an entity without light. It is possible that, upon entering a black hole, our universe's fate is a transition to the "dead universe" — an ancient cosmic structure that interacts with the remaining memories of the cosmos, activated by the death of stars and galaxies under its fundamental laws.

Our observable universe, characterized by lights and galaxies, can be seen as a cosmic anomaly, as proposed in the second hypothesis of the Dead Universe Theory. These anomalies result from the initial interaction between Axion particles and UNO particles during the birth of our universe, suggesting that the luminous state in which we exist is an exception in a vastly dark and stagnant cosmos.

In the theory of the “Dead Universe,” the observed expansion is not the result of an initial impulse from an explosion, as in the Big Bang, but is seen as a simple distancing of galaxies due to the influence of gravity and other yet-to-be-understood laws emanating from the nature of the “Dead Universe” itself. This movement is interpreted as a manifestation of the intrinsic and residual properties of a cosmos that is no longer active in the traditional sense.

In other words, while Hubble’s Law describes what we observe, the theory of the “Dead Universe” attempts to explain why we observe it. It suggests that the unknown laws of the “Dead Universe” may be residual forces or echoes of a previous cosmic reality, which now direct the dynamics of the observable universe. These forces could be different from the known classical gravity and could explain why galaxies continue to move apart even when the original energy of the Big Bang should have dissipated.

Therefore, the expansion would not be a sign of continuous growth or birth, but a gradual return to the quiescent and fundamental state of the “Dead Universe”, a final state of rest after the end of anomalies like light and the complex structures that characterize our current universe. Thus, the theory of the “Dead Universe” adds a new layer of understanding to the ultimate fate of the cosmos and offers an intriguing counterpoint to prevailing cosmological theories.

VII. Dead Universe

Surrounding the observable universe is the "dead universe," a vast dark region estimated to be a trillion times larger than the visible universe. This universe is predominantly composed of Axion particles, which form dark matter fields, and UNO particles, which are invisible and hypothetical. Stars and planets within this dead universe are formed by dark matter and Axion particles, without emitting luminous radiation, making it completely opaque and dark. The idea is that, upon entering a black hole, we could end up in the dead universe, which is the primordial space from which our observable universe emerged.

The "Dead Universe" theory proposes an alternative view to the traditional concept of an expanding or cyclically regenerating universe. Instead of continuously inflating or undergoing processes of rebirth, the universe is thought to be in a prolonged state of decay, possibly lasting for trillions of years. This perspective suggests that the cosmos is actually slowly retracting and gradually losing its vitality.

From a scientific standpoint, this theory posits that dead galaxies—those that no longer form new stars and whose stellar fusion processes have ceased—are evidence of a dying universe. These now inactive galaxies represent cosmic remnants that have exhausted their fuel for star creation. The stellar formation process that still occurs in some regions of the universe can be seen as the "last breath" of a declining cosmos, replicating its cosmic memories as its energy slowly dissipates.

Supernovae and young stars that still shine in the vast emptiness of the universe are not necessarily signs of vitality but may be understood as remnants of an ancient process, a residual manifestation of what was once a vibrant universe. As time passes, these cosmic events become less frequent, and the universe approaches a state of maximum entropy—where all usable energy is dispersed, and cosmic activity ceases entirely.

In this scenario, the universe is not expanding infinitely, but galaxies continue to move away from each other due to the residual influence of the "dead universe" laws. While we still observe the formation of new stars, the universe, in its essence, is in a state of decline compared to its more remote times. Galaxies are dying and gradually fading, and this process of cosmic death intensifies as time progresses.

The idea that the universe is "losing its breath" suggests that, instead of a future marked by continuous expansion, we are witnessing the final stages of a cosmos inexorably heading toward its extinction. In this process, all light and movement will eventually cease, resulting in a universe where darkness prevails, marking the silent and complete end of all cosmic activity. This vision contrasts with the idea of a vibrant and growing universe, presenting it instead as an organism in its final breaths, replicating traces of its former vitality before ultimately succumbing to total cosmic inactivity.

This view challenges current cosmological interpretations and suggests that, instead of a universe that renews itself, we are observing a universe that is slowly dying, replicating its memories in its last stellar expansions before finally succumbing to total cosmic inactivity.

VIII. Interaction between Axion and UNO

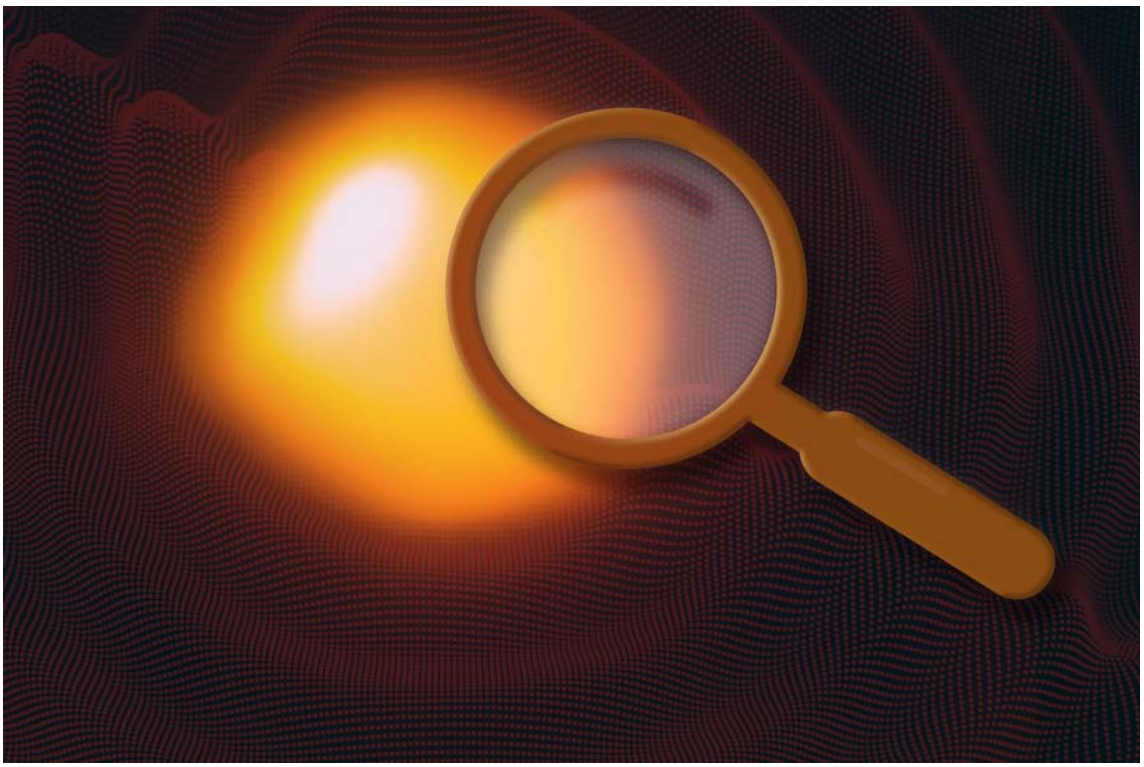
The theory suggests that, in the early stages of the universe, Axion particles began to interact with UNO particles. This process involved the transfer of energy from Axion particles to UNO particles, resulting in oscillations that transformed that energy into electromagnetic radiation — light. This phenomenon gave rise to the observable universe, creating the foundation for the existence of the luminous radiation we know today.

IX. Cold Spot

The image also highlights the "cold spot" of the observable universe, a region where the cosmic microwave background radiation is affected by the presence of the dead universe. This low-temperature region manifests as a "thermal anomaly," caused by the gravitational influence of the dead universe on our visible universe.

The existence of Axions is predicted by physical theories to be produced in extreme environments, such as in stellar cores during events like supernovae. These particles, when emitted by stars into the universe, could briefly interact with surrounding magnetic fields, temporarily converting into photons and potentially becoming detectable.

"In the specific case of Betelgeuse, a red giant star on the verge of becoming a supernova, MIT conducted research to search for axions due to its condition as a 'natural factory' of these particles. Utilizing the NuSTAR space telescope, the researchers searched for axion signatures in the form of X-ray photons but found no detectable signals. These results significantly narrowed the possible characteristics of axions, setting more stringent constraints on their existence and properties."



A search led by MIT for axions from the nearby star Betelgeuse (pictured here) yielded no results, significantly narrowing the search for hypothetical dark matter particles. Credits: Image: MIT News Collage. Image of Betelgeuse courtesy of ALMA (ESO/NAOJ/NRAO)/E. O'Gorman/P. Kervella

The conclusions show that if axions exist, they interact very weakly with photons, making them difficult to detect. The research suggests that future investigations should explore other energy ranges, such as gamma rays, especially in events like supernovae.

However, in 2021, the results of these searches did not detect the expected axion signatures in the form of X-ray photons. These findings indicated that ultralight axions, which could interact with photons across a wide range of energies, were excluded by the research.

Axions, proposed as hypothetical dark matter particles, could explain the composition of 85% of the universe. The theory suggests that stars like Betelgeuse, in their final stages, could function as "natural factories" of axions, which, when interacting with magnetic fields, could convert into detectable photons.

X. UNO Hypothetical Particle

The UNO particle is conceptualized as the "zero equation" of all particles, representing a primordial state of masslessness. In the initial quantum fluctuations of the universe, the UNO could have manifested as a fundamental entity. This entity, by dividing or interacting with the quantum vacuum, gave rise to all other particles, generating the complexity of the universe we observe today. The axion, being a hypothetical particle with nearly zero mass, can be considered one of the first elements to emerge in the cosmos after the manifestation of the UNO. Although practically undetectable due to its extremely light mass, the axion could have acted as a multiplier, triggering the processes that led to the formation of more complex particles and eventually the structuring of the universe. Combining these concepts, the UNO, by its nature as the "zero equation" (a state prior to what we consider particles), provides the foundation upon which particles like the axion manifested. In this way, the axion could be seen as the first tangible step in the evolution of the cosmos, directly influencing the formation of matter and the expansion of the universe according to contemporary particle physics models. The UNO particle, described as the "zero equation" of all particles, can be understood as a primordial state of perfect symmetry. This state would not be exactly "nothing," but rather a form of infinite potential, containing within it all the possibilities for the manifestation of particles and forces. This concept can be related to the idea of perfect symmetry in particle physics, where the early universe was highly symmetrical, and only after the breaking of this symmetry did particles and forces as we know them emerge. To deepen the concept of how the UNO particle divides or interacts to create other particles, we can compare it to the Higgs Field. The Higgs Field is known for giving mass to particles through interaction with the Higgs boson. Similarly, the UNO could be seen as a fundamental field that, through a "symmetry break," gave rise to other particles, such as quarks, leptons, and bosons. This symmetry break could occur through a process of intense quantum fluctuations in the early moments of the universe. These fluctuations would allow the UNO to "fragment" into various particles, each with its own properties of mass, charge, and interaction. The UNO Particle theory can be integrated into the standard model of particle physics, particularly concerning the Higgs Field. While the Higgs Field is responsible for giving mass to particles through interaction with the Higgs boson, the UNO can be seen as the precursor to this field. In other words, the UNO would be the fundamental state that, upon "breaking," created both the Higgs Field and the particles that interact with it.

Figure 6: The images in this article were generated using computing technology, designed to visually represent complex astrophysical concepts. Each visualization is created through precise algorithms to reflect the complexities of the "Dead Universe" theories, utilizing specific parameters based on scientific data and theoretical models to ensure the most accurate representation possible within the presented theoretical context. Image credits: Global Journals. https://globaljournals.org

Moreover, the interaction between UNO and the axion could provide insights into the nature of dark matter. The axion, being a lightweight and weakly interacting particle, may have emerged as a byproduct of UNO's symmetry breaking. Thus, while the Higgs Field explains how conventional particles acquire mass, UNO could explain the origin of dark matter particles like the axion.

This approach connects UNO and the axion as fundamental elements in the creation of the universe, with the axion acting as a crucial intermediary in the transition from absolute nothingness to the universe filled with matter and energy that we know.

Today, we know of the existence of supermassive bodies, black holes composed of mass billions of times greater than the Sun. It seems to us that the dead universe calls our universe to its strange origins, beyond our telescopes. The existence of such massive and enigmatic phenomena challenges our understanding of physics and suggests that the laws governing these objects may be radically different from those operating in known particle physics.

The "dead universe" theory, let us consider the hypothesis that the fundamental laws of physics may have been different at the beginning of the universe. This could explain the predominance of dark matter and dark energy, which are almost completely imperceptible through our traditional observation methods, but clearly exert a massive influence on the structure and expansion of the universe.

These primitive conditions may have given rise to a "shadow astrophysics," a theoretical branch that studies celestial bodies and phenomena that operate primarily through non-luminous interactions. This would include not only dark matter planets and dark stars but also nebulas and entire galaxies composed of these invisible forms of matter and energy, which could form the vast majority of the universe."

"Dark stars and their undetectable radiation: As mentioned, "dark stars" may be dead celestial bodies that, unlike normal stars that emit light due to nuclear fusion, emit forms of radiation or interact with common matter in ways that we cannot currently detect directly. These stars could emit 'dark light or dark radiation,' a form of energy that is not visible to our current instruments, but could be detectable through gravitational effects or by new technologies that capture different types of electromagnetic or gravitational interactions.

Modified Gravity Laws: The laws of gravity in regions dominated by dark matter could be radically different. This could explain the anomalous movement patterns in galaxies and galaxy clusters that we observe, which do not align with predictions based on Newtonian gravity or Einstein's general relativity. Theories such as modified gravity (MOG), loop quantum gravity, or emerging gravity theories could offer better models for understanding these phenomena.

Connection with Cosmology and Metaphysics: The "dead universe" theory also paves the way for a new cosmology that is both a science and a metaphysics, questioning the very concept of "existence" and "reality." The idea that the original dead state of the universe was of total darkness, with light and matter as later and secondary developments, radically challenges our preconceived notions about the cosmos and our position within it.

Impact on Philosophy and Religion: Finally, this theory may have profound philosophical and theological implications. If the primordial universe was of total darkness, as proposed in Genesis, and light was an anomaly, this could suggest that the creation and emergence of light (as described in religious texts) represent an act of transformation by God and His revelation to allow the existence of life, where the divine not only creates order from chaos but also infuses the essence of being — light, heat, and energy — into a cosmos that would otherwise be a dark and formless void.

Cyclic Cosmology: This does not exist, nor does the concept of the multiverse; the "dead universe" may represent only an initial phase in the cosmos' life that will reduce to a complete death. According to this view, the universe may also alternate between periods of luminous explosion, like the Big Bang, and long periods of darkness dominated by dark matter and dark energy on its path to its final cosmic coffin.

Dark Matter as the Universe's Substrate: Expanding the notion of dark matter as the main constituent of the universe, we could explore the idea that it acts as a substrate in which visible matter and energy emerge and interact temporarily. In this sense, dark matter would not just be a passive entity but an active source of potential that defines the structure and dynamics of the universe on a large scale.

Dark Energy and the Recession of Galaxies: Dark energy and the gravity laws of the dead universe, which are responsible for the acceleration of the galaxies' recession since there is no expansion of the universe, could be seen as a mechanism by which the universe prepares for a transition back to the "dead universe" state. Instead of being merely a repulsive force, dark energy could be interpreted as an indicator that the universe is degenerating into its total mummification."

Recent research by Dmitry Levkov has reshaped our understanding of the cosmos, introducing the notion of "dark matter stars," or "axion stars," as they are also known, that behave like colossal atoms. This innovative concept offers an impressive parallel to the "dead universe" theory. It is hypothesized that these axion stars are scattered throughout the dead universe, potentially explaining the mysterious dark matter that

does not emit light. Contrary to previous assumptions that considered much of space "empty," this new perception suggests that the universe is predominantly composed of dark energy and dark matter, with dark energy constituting about 70% of the universe, dark matter about 25%, and common baryonic matter only 5%. Together, these elements form the basis of the so-called dead universe that permeates the observable universe. [5]

In this scientific discourse, the "dead universe" theory is reinforced by empirical evidence from research on axion stars, presenting a strong argument for a cosmos primarily shaped by dark matter and dark energy, rather than being mere residual elements. This narrative highlights the evolution of our understanding of the most fundamental constituents of the cosmos, uniting advanced theoretical physics with metaphysical questions about existence and reality. [4]

The work of Dmitry Levkov highlighted that axion stars may form at a faster rate than previously thought, depending on the axion's mass. These discoveries suggest that such stars may be forming within the universe's lifetime and could significantly influence the structure of dark matter, being potentially detectable through their gravitational interactions or photon decay, which could lead to observable radio bursts. [5]

The discovery that axion stars can transform into Bose-Einstein condensates under extreme conditions — where all axions occupy the same quantum state, essentially behaving as a massive particle — profoundly deepens our understanding of the cosmos' fundamental structure. Such states have been observed in laboratory conditions on Earth, where atoms are cooled to near absolute zero, presenting a critical phase in which matter exhibits superfluid characteristics, flowing perfectly without friction.

Furthermore, updated gravitational laws proposed by Russian researchers align with the "dead universe" theory's view on the unique gravitational behaviors in areas overloaded with dark matter. These new gravitational theories, including modified gravity (MOG), loop quantum gravity, or emerging gravity theories, provide a framework for understanding the unconventional movements observed in galaxies and galaxy clusters, movements that transcend the explanations offered by Newtonian gravity or Einstein's general relativity.

Axion stars, as theorized, may serve as a crucial element of this dark universe. These stars differ from conventional stars as they do not emit light from nuclear fusion processes. Instead, they are believed to emit "dark radiation" or "dark light," types of energy that are invisible with current instrumentation but can be detected through indirect gravitational effects or innovative detection techniques that explore various electromagnetic or gravitational interactions.

Finally, the "dead universe" theory proposes a cosmos dominated by dark matter and dark energy — components like axions that minimally interact with visible matter or light. In this framework, the universe is imagined as a vast dark expanse where traditional forms of light and matter are seen as exceptions, not the rule.

Jamie Farnes, an astrophysicist at the University of Oxford, introduced an innovative theory suggesting a unification of dark matter and dark energy under a single concept known as "dark fluid," which exhibits properties of negative gravity. This revolutionary theory proposes that the forces known for holding galaxies together (dark matter) and for driving the accelerated expansion of the universe (dark energy) are, in fact, manifestations of the same physical phenomenon. [6] [4]

According to Farnes, this dark fluid constitutes about 95% of the universe and operates through an unusual mechanism of negative gravity, where objects with negative mass behave counter intuitively: instead of repelling, they attract when pushed. This contrasts sharply with traditional gravity laws, which describe the attraction between positive masses.

Farnes' theoretical model explores the hypothesis that, under extreme conditions, these negative masses could group together to form axion stars, or dark matter stars, capable of forming Bose-Einstein condensates. In this state, axions would occupy the same quantum state, behaving as a single gigantic particle. This phenomenon is analogous to what is observed in Earth-based laboratories, where atoms cooled to near absolute zero form a super fluid that flows without friction. [6] [4]

In Farnes' model, the interaction between negative and positive masses creates a dynamic "cosmic halo" around galaxies, allowing them to maintain their structural integrity even while spinning at high speeds. This repulsive force generated by the negative mass fluid, as it approaches a galaxy, increases the galaxy's attractive force, creating a delicate balance that keeps the cosmic fabric united and in constant expansion.

This innovative approach aligns with the "dead universe" theory, suggesting that the original cosmos is predominantly composed of a dark substance whose fundamental nature we are only beginning to understand. Both theories significantly expand our theoretical framework on dark matter and dark energy, proposing a universe where most of its constitution is not only invisible but functionally inverse to the expectations of traditional physics.

The premise that, at the origins of the universe, light was not present; it was created later. Whether according to the creationist belief, which suggests that the universe was enveloped in darkness and that God said "let there be light," or from the scientific perspective of these primordial events, it is undeniable that darkness preceded light.

Primitive elements: although black holes, dark matter, and dark energy are well-established concepts in modern cosmology, they are generally considered emerging phenomena and not necessarily primordial components of the universe. However, the dead universe theory provides a plausible explanation for their origins, presenting them as fundamental elements of a previously inert cosmos. While dark matter and dark energy are areas of intense research and debate, with their origins still undefined by consensus, this theory presents one of the first rational approaches attempting to elucidate these enigmatic phenomena. [4]

Expansion of cosmic understanding: these ideas challenge our imagination regarding the universe and provide fertile ground for theoretical discussions and speculative narratives. While they remain distant from the current scientific consensus, these theoretical considerations seek to expand our understanding of the possible states of the universe and the fundamental forces that govern its evolution and potential finality. Thus, while respecting the limitations of endorsed scientific knowledge, these propositions allow speculative exploration based on alternative theories and hypotheses. [4]

The "dead universe" theory implies that the cosmos we know is the residual aftermath of a past vastness, where the concept of stellar birth is reversed to universal death. In this scenario, black holes are not the catalysts of creation but rather the epitaph of a universe that has exhausted its vitality. Instead of being generative singularities, these primordial black holes are the remaining gravitational beacons of a cosmos that no longer exists.

The galaxies and stars we observe, in their apparent youth, are actually the embers of a long-extinguished cosmic fire.

Dark matter and dark energy, the enigmatic elements of our universe, can be interpreted as the faint echo of this final cataclysmic event. [1] [4]

Psalm 97:2 - "Clouds and darkness are around Him; righteousness and justice are the foundation of His throne." [8]

XI. Exploration of Dead Galaxies and Validation of the Dead Universe Theory

The "Dead Universe" theory proposes an innovative view of the origin and evolution of the cosmos, suggesting that our observable universe may be a byproduct of a previous, vastly larger, and primarily dark universe. To solidify this hypothesis, it is essential to develop empirical predictions that can be tested through astronomical observations and experiments. A special focus on observing dead galaxies may provide the necessary evidence to validate this theory.

XII. Axion Stars: A Promising Target

Axion stars are proposed as key components of the dead universe. These hypothetical low-mass particles can interact with magnetic fields, converting into photons, making their detection possible in regions rich in dark matter, such as dwarf spheroidal galaxies. By utilizing space telescopes like Chandra and James Webb, it is possible to search for X-ray signatures or other forms of radiation resulting from these interactions. These observations may not only validate the existence of axion stars but also provide direct evidence of the dead universe, corroborating the proposed theory.

XIII. Axion and UNO Oscillations: A New Avenue of Investigation

The "Dead Universe" theory suggests that interactions between axions and UNO particles generate electromagnetic radiation and common matter. To test this hypothesis, observations should focus on regions dense in dark matter. The James Webb Space Telescope offers a unique opportunity to detect anomalies in the electromagnetic spectrum, especially in the infrared and X-ray bands, which could indicate these interactions. If these oscillations occurred during the early stages of the universe, their signatures may still be detectable, providing crucial evidence for the theory.

XIV. Observational and Experimental Strategies

In addition to direct observations, it is essential to implement robust experimental strategies to test the theory's predictions. The detection of gravitational waves, for example, can offer significant empirical validation. Fusions between axions and UNO particles could generate gravitational waves with characteristics distinct from those generated by black holes. By using advanced detectors like LIGO and Virgo, these unique signatures can be sought. The detection of these waves would be a powerful confirmation of the existence of the dead universe.

Simultaneously, the exploration of dead galaxies can provide a deeper understanding of the composition of the dead universe. These galaxies, which show no stellar formation activity, are ideal candidates for studies seeking irregularities in the distribution of dark matter. The Chandra X-ray Observatory can be used to map these galaxies and identify anomalies that do not align with current theories, suggesting the presence of axions and UNO particles.

XV. Simplification and Scientific Communication of the Dead Universe Theory

The "Dead Universe" theory was developed to reach a broader audience by simplifying the presentation of complex theoretical models, making them more convincing and accessible without compromising scientific depth. The goal is to make this theory more convincing than the Big Bang model. Intuitive analogies play an essential role in this process. For example, the interaction between axions and UNO particles can be compared to waves crossing in an ocean, generating "bubbles" of light — the stars and galaxies we observe. This approach facilitates the understanding of concepts, making the theory more accessible to both the general public and researchers from different disciplines without sacrificing its scientific integrity.

XVI. Scientific Rigor and Differentiation Between Evidence and Speculation

Maintaining scientific rigor in this theory is essential to clearly distinguish between hypotheses based on robust evidence and speculation. The "Dead Universe" theory relies on solid observational data, such as Hubble's laws, general relativity theory, and evidence of dark energy, dark matter, and black holes. Additionally, the theory utilizes particle physics experiments and observations, such as the "cold spot" in the universe, an anomaly that traditional astrophysics still does not fully explain. By addressing this issue, the theory suggests that the cold spot may be influenced by a dead and cold universe, offering a potential solution to a problem that the Big Bang model has not yet satisfactorily resolved.

The idea that the cold spot is the result of a collision with another universe within an infinite multiverse structure is questionable from a rational standpoint. If this explanation were valid, we should observe numerous cold spots in the universe resulting from multiple collisions. This leads us to seriously consider the possibility that we are part of a larger structure that has already entered decline and death.

Although the fusion of UNO particles has not yet been directly observed, the theoretical basis for this interaction is solid within the "Dead Universe" theory. Highlighting this distinction between evidence and speculation strengthens the theory's credibility, ensuring that it is evaluated based on its scientific merits.

XVII. Philosophical and Metaphysical Considerations

Although there are philosophical and metaphysical connections in the "Dead Universe" theory, these ideas only serve to enrich the discussion and should not be interpreted as scientific conclusions. It is crucial that the theory be evaluated based on its scientific merits, maintaining a clear separation between science and philosophy. Analogies with religious concepts, such as the primordial darkness mentioned in Genesis, can be useful for illustrating ideas, but they should be understood as philosophical interpretations and not empirical evidence.

XVIII. Comparison with the Big Bang and Response to Criticism

The "Dead Universe" theory offers an alternative to the Big Bang model, making it essential to compare the predictions of both theories in detail. For example, while the Big Bang predicts a uniform cosmic background radiation, the "Dead Universe" theory suggests variations associated with the interaction of axions and UNO particles. These differences show how the "Dead Universe" theory can provide more robust explanations for phenomena such as dark matter and dark energy.

The idea of a dead universe encapsulating the observable universe may generate skepticism at this early stage of the theory's development. However, as new scientific data emerge, especially related to dead galaxies and older, inactive structures, this hypothesis may become a more tangible reality. The theory offers an effective counter-argument by showing how these ideas align with observational anomalies that the Big Bang model fails to satisfactorily explain, such as the "cold spot" in the cosmic microwave background.

XIX. The Focus on Inactive Galactic Structures and UNO Particle Detectors

Studies focused on dead galaxies, where there is no stellar formation activity, can provide valuable clues about the dead universe. The absence of activity in these galaxies may indicate that they are remnants of a previous universe. The use of advanced telescopes to map these structures and search for signs that support this hypothesis is a promising direction for future research.

The development of detectors capable of identifying interactions between axions and UNO particles is another crucial step in validating the theory. These detectors, based on quantum physics principles such as light particle interferometry, can open new avenues for detecting these particles. A collaborative project with particle physics laboratories could provide direct empirical evidence for the theory, leveraging the future of quantum computing technology and advanced telescopes.

XX. Conclusion

"Shadow Astrophysics" reveals that, although the observable universe is illuminated by stars and galaxies, the true essence of the cosmos lies in darkness. Dark matter and dark energy, still mysterious fundamental components, make up the majority of the universe, profoundly influencing its dynamics. This study forces us to rethink our definitions of presence and absence, light and shadow. While technological advances, such as computational astrophysics and observations from next-generation telescopes like the James Webb, continue to uncover secrets hidden in cosmic shadows, we are only at the beginning of a journey that promises to redefine our understanding of the cosmos and our place in it. Future research should focus on unraveling the interactions between dark matter and dark energy with visible matter, hoping that this knowledge may further illuminate the deep mysteries that inhabit the shadows of the universe.

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A Reinterpretation of Quantum Physics

By Wim Vegt

Eindhoven University of Technology

Abstract- Erwin Heisenberg's groundbreaking work, published in 1925 in the journal "Zeitschrift für Physik" under the title "On the quantum-theoretical reinterpretation of kinematical and mechanical relationships," marked a pivotal shift in Physics. This publication, often referred to as "Die Umdeuting," laid the groundwork for modern quantum physics.

Causality, a central concept shared by Philosophy, Theology, and Physics, has historically linked Newtonian Physics with philosophical and religious perspectives. However, Heisenberg's introduction of the Uncertainty Principle in 1920 challenged this unifying concept of Causality, disrupting the traditional connections between these fields.

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Keywords: *quantum physics, general relativity, gravitational redshift, black holes, dark matter.*

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Strictly as per the compliance and regulations of:

A Reinterpretation of Quantum Physics

A Fundamental choice in Physics between Causality and Uncertainty

Wim Vegt

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Heisenberg's publication, "Die Umdeuting," in 1920 had a profound impact on the dialogue between science and religion by challenging notions of causality and responsibility within the fundamental fabric of our reality. It questioned the assumption of a deterministic universe and raised complex philosophical questions about human agency and accountability.

The article also explores Einstein's cautionary stance during the 1927 Solvay Conference, where he warned against disregarding the principle of causality in Physics. This warning, exemplified by his famous statement, "God does not play Dice," underscored the importance of understanding the consequences of our choices and the interconnectedness of philosophical, scientific, and ethical considerations.

Furthermore, the article presents a new theoretical framework challenging Heisenberg's Uncertainty Principle by revisiting the relationship between wavelength and frequency in electromagnetic waves, particularly in gravitationally confined environments. This alternative interpretation aims to demonstrate that fundamental uncertainty may not be as inherent as previously thought, shedding new light on the interplay between gravity and light in phenomena such as Black Holes.

The implications of this new theory extend to experimental validations involving gravitational red shift measurements and the constant value of the gravitational constant "G." By comparing predictions from General Relativity and the proposed theory, the article highlights potential discrepancies and reaffirms the importance of reconciling Quantum Physics and General Relativity in our quest for a comprehensive understanding of the universe.

Keywords: quantum physics, general relativity, gravitational redshift, black holes, dark matter.

Author: Department of Physics, Eindhoven University of Technology, The Netherlands. e-mail: wimvegt@quantumlight.science

I. Gravity

Einstein approached the interaction between gravity and light by the introduction of the "Einstein Gravitational Constant" in the 4-dimensional Energy-Stress Tensor.

$$G_{\mu\nu} + \Lambda\, g_{\mu\nu} = \kappa\, T_{\mu\nu} \tag{1}$$

In which $G_{\mu\nu}$ equals the Einstein Tensor, $g_{\mu\nu}$ equals the Metric Tensor, $T_{\mu\nu}$ equals the Stress-Energy tensor, Λ equals the cosmological constant and κ equals the Einstein gravitational constant.

An alternative approach to Einstein's expression with the tensor $\kappa T_{\mu\nu}$, describing the curvature of the Space-Time continuum, is the sum of the Electromagnetic Tensor $T_{\mu\nu}$ and the Gravitational Tensor $J_{\mu\nu}$.

$$\kappa \; T_{\mu\nu} \Leftrightarrow T_{\mu\nu} + J_{\mu\nu} \tag{2}$$

The 4-dimensional divergence of the sum of the Electromagnetic Stress-Energy tensor and the Gravitational Tensor expresses the 4-dimensional Force-Density vector (expressed in [N/m3] in the 3 spatial coordinates) as the result of Electro-Magnetic-Gravitational interaction.

$$f^{\mu} = \partial_{\nu} \left(T^{\mu\nu} + J^{\mu\nu} \right) \tag{3}$$

In vector notation the 4-dimensional Force-Density vector can be written as:

$$\overline{f}^{4} = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \square \, \square \left(\overline{\overline{T}} + \overline{\overline{J}} \right) \tag{4}$$

The fundamental boundary condition for this alternative approach to gravity is the requirement that the Force 4 vector equals zero in the 4 dimensions, expressing a universal 4-dimensional equilibrium:

$$\bar{f}^4 = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \square \square \left(\bar{\bar{T}} + \bar{\bar{J}} \right) = \bar{0}^4 \tag{5}$$

The 3 spatial components of the Force-Density vector, as a result of Electro-Magnetic-Gravitational interaction can be written as:

$$\bar{f} = \frac{1}{c^2} \frac{\partial (\bar{E} \times \bar{H})}{\partial t} + \varepsilon_0 \bar{E} (\nabla . \bar{E}) - \varepsilon_0 \bar{E} \times (\nabla \times \bar{E}) +$$

$$+ \mu_0 \bar{H} (\nabla . \bar{H}) - \mu_0 \bar{H} \times (\nabla \times \bar{H}) + \gamma_0 \bar{g} (\nabla . \bar{g}) - \gamma_0 \bar{g} \times (\nabla \times \bar{g}) = \bar{0} \quad [N/m^3]$$

$$\varepsilon_0 (\nabla . \bar{E}) = \rho_E \text{ Electric Charge Density } [C/m^3]$$

in which: $\mu_0 (\nabla . \bar{H}) = \rho_M$ Magnetic Flux Density [Vs/ m^3] or [Wb/ m^3] (6)

$$\gamma_0 (\nabla . \bar{g}) = \rho_M \text{ Mass Density (Electromagnetic) [kg/ } m^3]$$

Electric Energy Density: $w_E = \frac{1}{2} \varepsilon_0 E^2$

Magnetic Energy Density: $w_M = \frac{1}{2} \mu_0 H^2$

Gravitational Energy Density: $w_G = \frac{1}{2} \gamma_0 g^2$

In which E represents the electric field intensity expressed in [V/m], H represents the magnetic field intensity expressed in [A/m] and g represents the gravitational acceleration expressed in [m/s^2]. The permittivity indicated as ε_0, the permeability indicated as μ_0 and the gravitational permeability of vacuum as γ_0.

For curl-free gravitational fields equation (6) can be written as:

$$\bar{f} = \frac{1}{c^2} \frac{\partial (\bar{E} \times \bar{H})}{\partial t} + \varepsilon_0 \bar{E} (\nabla . \bar{E}) - \varepsilon_0 \bar{E} \times (\nabla \times \bar{E}) +$$

$$+ \mu_0 \bar{H} (\nabla . \bar{H}) - \mu_0 \bar{H} \times (\nabla \times \bar{H}) + \bar{\rho}_M = \bar{0} \quad [N/m^3] \tag{7}$$

Substituting Einstein's W = m c2in (7) results in "Electro-Magnetic-Gravitational Equilibrium Field Equation" (8):

$$\bar{f} = \frac{1}{c^2} \frac{\partial (\bar{E} \times \bar{H})}{\partial t} + \varepsilon_0 \bar{E} (\nabla . \bar{E}) - \varepsilon_0 \bar{E} \times (\nabla \times \bar{E}) +$$

$$+ \mu_0 \bar{H} (\nabla . \bar{H}) - \mu_0 \bar{H} \times (\nabla \times \bar{H}) + \frac{1}{2 c^2} \bar{g} \left(\varepsilon E^2 + \mu H^2 \right) = \bar{0} \quad [N/m^3] \tag{8}$$

The theory presented outlines the interactions between electromagnetic-gravitational, magnetic-gravitational, and electric-gravitational fields. A key distinction in this new theory is that particles do not directly interact with fields; rather, interactions occur between the fields themselves. For instance, when an electrically charged particle interacts with an electric field, this interaction is not particle-to-field but rather an interplay between the electric fields associated with each entity. This concept extends to all interactions within the theory: Electric fields interact with electric fields, magnetic fields interact with magnetic fields, and gravitational fields interact with gravitational fields. Therefore, every interaction is essentially a dynamic exchange between these respective fields rather than direct particle-field interactions. This framework emphasizes the critical role of field interactions in shaping the behavior and dynamics of particles and offers a unique perspective on the fundamental forces at play in the universe.

II. "Gravitational RedShift/BlueShift in "Light (EMR)" due to "Electromagnetic Gravitational Interaction"

In order to evaluate the New Theory, the experiment on Gravitational Redshift, titled "Test of the Gravitational Redshift with Galileo Satellites in an Eccentric Orbit" authored by S. Hermann and colleagues, has been selected. For this particular experiment, a stable frequency from a ground station's MASER was transmitted to 2 Galileo Satellites, with the goal of analyzing the frequency variance between the ground station and the satellites. The gravitational field of the Earth induced the frequency shift, and 2 satellites were specifically chosen to offset the eccentricity of the Galileo Orbit.

If we consider a gravitational field g[z] that varies along the radial axis in Cartesian coordinates connecting the ground station to the satellites:

$$\overline{g[z]} = \left\{0,0,\ \frac{G\ M_{Earth}}{4\ \pi\ z^2}\right\} \tag{9}$$

In which G(G = 6.67428 10^{-11} Nm^2 / kg^2) equals the Gravitational constant, M_{Earth} the mass of the earth and r the radial distance from the centre of the earth. The mathematical solution [5] of equation (8) for plane electromagnetic waves (expressed in cartesian {x,y,z} coordinates) related to the Electric Field Intensity equals:

$$\overline{E} = \begin{pmatrix} E_x \\ E_y \\ E_z \end{pmatrix} = \begin{pmatrix} e^{-\frac{G\,M_{Eearth}\ \varepsilon_0\ \mu_0}{8\ \pi\ z}}\ h\left[\ \omega_0\ e^{-\frac{G\,M_{Earth}\ \varepsilon_0\ \mu_0}{4\ \pi\ z}}\left(t - \sqrt{\varepsilon\ \mu}\ z\right)\ \right] \\ 0 \\ 0 \end{pmatrix} \tag{10}$$

And the mathematical solution of (8) for the Magnetic Field Intensity equals:

$$\overline{H} = \begin{pmatrix} H_x \\ H_y \\ H_z \end{pmatrix} = \begin{pmatrix} 0 \\ \frac{1}{\sqrt{\varepsilon_0\ \mu_0}}\ e^{-\frac{G\,M_{Earth}\ \varepsilon_0\ \mu_0}{8\ \pi\ z}}\ h\left[\ \omega_0\ e^{-\frac{G\,M_{Earth}\ \varepsilon_0\ \mu_0}{4\ \pi\ z}}\left(t - \sqrt{\varepsilon\ \mu}\ z\right)\ \right] \\ 0 \end{pmatrix} \tag{11}$$

In this scenario, the original frequency of the MASER radiation traveling in the direction of the Earth's gravitational field g[z] is represented by ω_0. The presence of the exponential term signifies the Gravitational Redshift experienced when the MASER radiation moves in the Earth's Gravitational Field. Although the speed of propagation of Electromagnetic Radiation (the speed of light) remains constant, both the field intensity's amplitude and frequency experience an exponential decrease.

Mathematica calculations compare the results obtained from General Relativity with those from the New Theory. By setting the distance from the ground station to the Earth's center as z_1 = 6,378,000 [m] (Earth's radius) and the average distance of ESA satellites in a Galileo orbit as z_2 = 23,222,000 [m] (distance from the ESA satellite to the Earth's center), the Gravitational Redshift according to General Relativity is determined to be:

$$\Delta\ \omega_{GR} = 0.00000000004011815497097883\ [s^{-1}] \tag{12}$$

Calculated with Mathematica, the Gravitational RedShift according the New Theory, which is a solution of equation (8) equals:

$$\Delta\ \omega_{GR} = 0.00000000004011824206173742\ [s^{-1}] \tag{13}$$

Both calculated values a within the Range of the measured gravitational RedShift by the average values of both ESA satellites in the Galileo orbit

$$\Delta\omega_{Measured} = 0.000000000040118 \quad \pm 2.2\ 10^{-15}\ [s^{-1}] \tag{14}$$

In [2] a factor has been defined which presents the measured deviation between the predicted Gravitational RedShift by General Relativity and the Measured Gravitational RedShift.

$$\alpha = \Delta\omega_{MEASURED} - \Delta\omega_{GR} = (2.2 \pm 1.6) \times 10^{-5} \quad (15)$$

A comparable factor can be used to determine which theory (General Relativity or the New Theory) has the nearest approach to the experimentally measured data. Highly accurate measuring experiments are required with an accuracy higher than 16 digits beyond the decimal point.

III. Black Holes

a) Black Holes without Singularities with dimensions smaller than the diameter of the Hydrogen Atom

A second fundamental solution for equation (8) describes a Gravitational Electromagnetic Confinement (BLACK HOLE) [1] within a radial gravitational field with acceleration (in radial direction). This solution represents a Black Hole, the confinement of light due to its own gravitational field, and has no singularities. This solution for equation (8) describes Black Holes, dependent of time and radius, presenting discrete spherical energy levels, within a radial gravitational field with acceleration (in radial direction)[14]has been represented in (16) and (17).

$$\begin{pmatrix} E_r \\ E_\theta \\ E_\varphi \end{pmatrix} = \begin{pmatrix} 0 \\ f(r)\ \mathrm{Sin}(k\,r)\ \mathrm{Sin}(\omega\,t) \\ -f(r)\ \mathrm{Cos}(k\,r)\ \mathrm{Cos}(\omega\,t) \end{pmatrix} \quad \begin{pmatrix} H_r \\ H_\theta \\ H_\varphi \end{pmatrix} = \sqrt{\frac{\varepsilon}{\mu}} \begin{pmatrix} 0 \\ -f(r)\ \mathrm{Sin}(k\,r)\ \mathrm{Cos}(\omega\,t) \\ -f(r)\ \mathrm{Cos}(k\,r)\ \mathrm{Sin}(\omega\,t) \end{pmatrix} \quad \bar{g} = \begin{pmatrix} \frac{G_1}{4\,\pi\,r^2} \\ 0 \\ 0 \end{pmatrix}$$

$$w_{em} = \left(\frac{\mu_0}{2}\left(\bar{m}\ .\ \bar{m}\right) + \frac{\varepsilon_0}{2}\left(\bar{e}\ .\ \bar{e}\right)\right) =$$

$$f(r)^2 \left((\mathrm{Sin}(k\,r)\ \mathrm{Sin}(\omega\,t))^2 + (\mathrm{Cos}(k\,r)\ \mathrm{Cos}(\omega\,t))^2 + \frac{\varepsilon}{\mu}(\mathrm{Sin}(k\,r)\ \mathrm{Cos}(\omega\,t))^2 + (\mathrm{Cos}(k\,r)\ \mathrm{Sin}(\omega\,t))^2 \right)$$

In which the radial function f(r) equals:

$$f[r] = K\ e^{-\frac{G\ M_{BH}\ \varepsilon_0 \mu}{8\,\pi\,r}} \quad (17)$$

Grepresents the Gravitational constant and Mrepresents the total confined electromagnetic mass of the BLACK HOLE. Equation (16) presents a Standing (Confined) Electromagnetic Field Configuration with a phase shift of 90 degrees between the electric field and the magnetic field with the corresponding Nodes and Anti Nodes. [13]. The solution has been calculated according Newton's Shell Theorem.

Assuming a constant speed of light "c" and Planck's constant ħ within the BLACK HOLE, the radius "R" (with n = 1,2,3,4….) of the BLACK HOLE with the energy of a proton, according $W = m_{proton}\ c^2$, would be: $1.5009211 \times 10^{-10}$[J].

$$R_{GEON} = n\,\lambda = n\left(\frac{c}{f}\right) = n\left(\frac{c}{W}\right)\hbar = 7.1865\ 10^{-26}\left(\frac{n}{W}\right)$$

$$R_{GEON} = n\ 3.82\ 10^{-12}\ [m] \quad (18)$$

Black Holes are varying from atomic dimensions with dimensions of 10-27 [kg], Page 39 [33] until Black Holes with dimensions of 1040 [kg], Page 67 [34]. At these dimensions Black Holes turn into Dark Matter. The fundamental boundary condition for the confinement of Electromagnetic radiation (BLACK HOLEs) is that the energy flow (Poynting vector) equals zero at the surcface of the confinement. This is possible at every "90 degrees Phase Shift Surface" (Sphere) between the Electric Field and the Magnetic Field.

b) Black Holes with a Singular point and Large dimensions

Fig 1 represents a Black Hole with a mass of 1035 [kg] and a radius of about 25 [km]controlled by a different mahgematical solution for equation (8).The radius of the Black Hole equals about 25 [km] which has been controlled by a different mathematical solution (19) for equation (8).

$$f[r] = K\ e^{\left(\frac{G\ M_{BH}\ \varepsilon_0 \mu}{8\,\pi\,r} - \log[r]\right)} \quad [J/m^3] \quad (19)$$

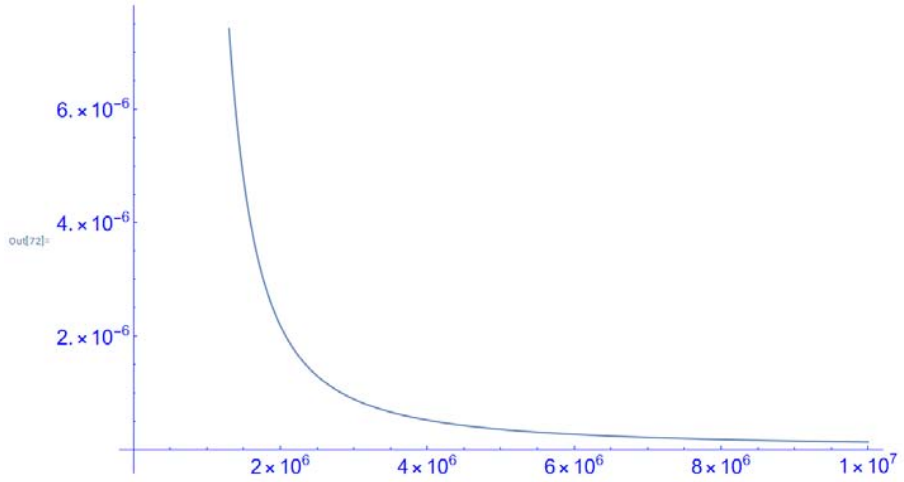

Fig. 1: The Energy Density [J/ m3] as a function of the Radius R = max 107[m] of the Black Hole

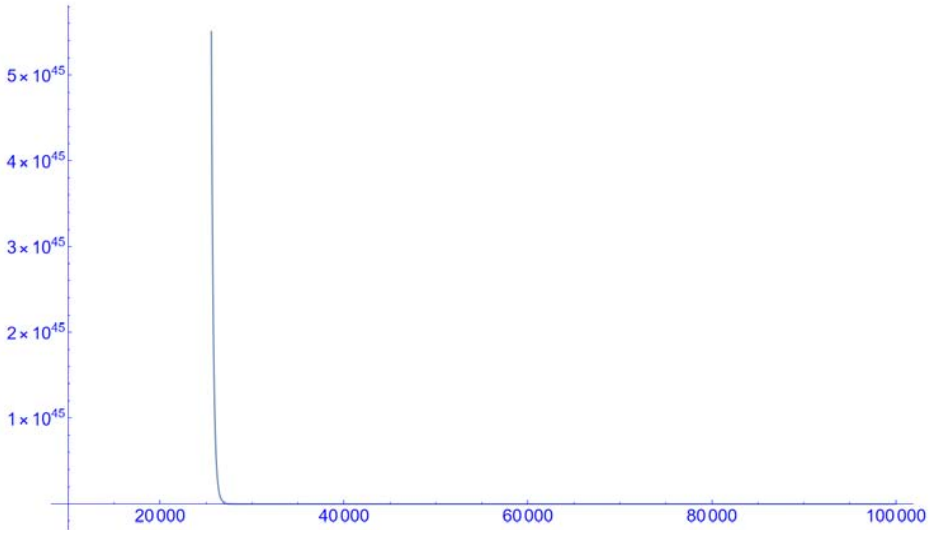

Fig. 2: The Energy Density [J/ m3] as a function of the Radius R = max 105 [m]

Figures 1 and 2 showcase the significant impact of "Gravitational Intensity Shift" and "Gravitational RedShift" at a distance of 25 km. Over a distance of 10,000 km, the intensity of light emitted by a Black Hole with a mass of 10^{35} kg decreases by a factor of 10^{-51}. Similarly, the frequency of the emitted light from the Black Hole decreases by a factor of 10^{-51}. For instance, light emitted in the visible spectrum at 10^{14} Hz drops to a frequency of 10^{-37} Hz. These extremely low frequencies with minimal intensities have not been observed, leading to the term "Black Hole" being used to describe the phenomena of "Gravitational Intensity Shift" and "Gravitational RedShift" in the presence of a massive object.

According to equation (8) and solutions (10) and (11), it is deduced that the speed of light remains constant within and around a Black Hole. The only potential change is in the direction of light propagation due to the influence of a gravitational field.

c) Dark Matter in the Universe controlled by "Gravitational Shielding"

Fig 3 represents Dark Matter with a total mass of 10^{53} [kg] and a radius of about 10 times the size of the Milky Way Galaxy. The radius of the dark mass equals 5 10^{21} [m] which has been controlled by a different mathematical solution (20) for equation (8).

$$f[r] = K\ e^{\left(\frac{G\,M_{BH}\,\varepsilon_0\,\mu}{8\,\pi\,r}\ -\ \log[r]\right)} \qquad [J/m^3] \quad (20)$$

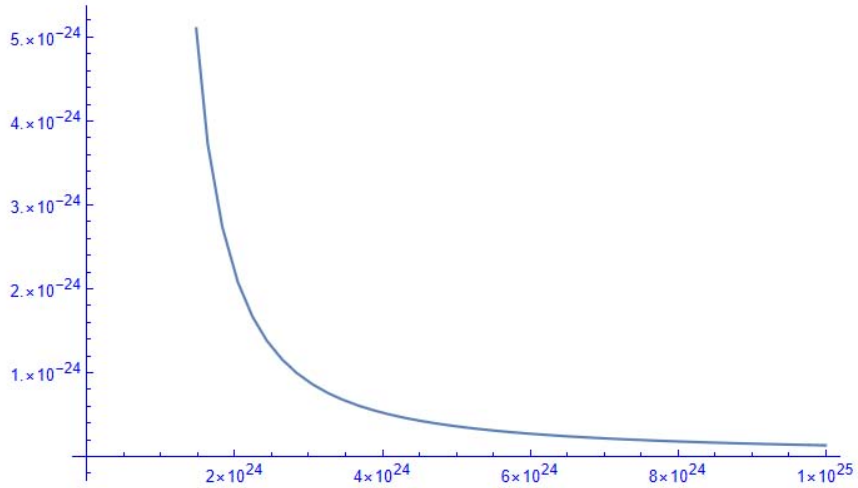

Fig. 3: The Energy Density [J/ m^3] as a function of the Radius R = max 10^{25} [m] of the Dark Matter

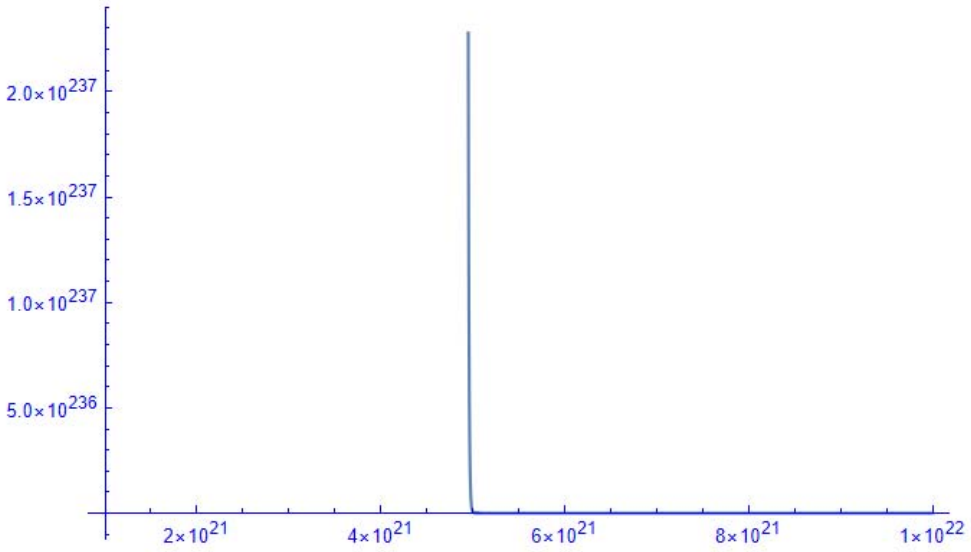

Fig. 4: The Energy Density [J/ m^3] of the Dark Matter as a function of the Radius R = max 10^{22} [m]

Figures 3 and 4 highlight the considerable impact of "Gravitational Intensity Shift" and "Gravitational RedShift" at a distance of 5 x 10^21 meters, which is equivalent to 10 times the radius of the Milky Way Galaxy. Over this vast distance, the intensity of the light emitted by Dark Matter with a mass of 10^53 kg decreases by a factor of 10^-261. Similarly, the frequency of the emitted light from Dark Matter decreases by a factor of 10^-261. For example, light initially emitted in the visible spectrum at 10^14 Hz drops to an incredibly low frequency of 10^-247 Hz. These incredibly low frequencies with extremely weak intensities have not been observed, leading to the term "Dark Matter" being assigned to describe the phenomena of "Gravitational Intensity Shift" and "Gravitational RedShift" in the presence of an immensely massive object.

From equation (8) and the solutions (10) and (11), it is concluded that the speed of light remains constant within and around the Dark Matter. The only possible alteration is in the direction of light propagation due to the gravitational influence of the Dark Matter.

IV. The Relationship between Black Holes and Quantum Physics

Introducing the Quantum Vector Function $\overline{\phi}$,

$$\overline{\phi} = \sqrt{\frac{\mu}{2}} \left(\overline{H} + i \frac{\overline{E}}{c} \right) \tag{21}$$

Substituting (21) in (16) results in the quantum presentation for the BLACK HOLE:

$$\overline{\Phi(r,\theta,\varphi)} = \sqrt{\frac{\mu}{2}}\left(\overline{H} + i\,\frac{\overline{E}}{c}\right) f(r) \begin{pmatrix} \Phi_r \\ \Phi_\theta \\ \Phi_\varphi \end{pmatrix}$$

$$\overline{\Phi(r,\theta,\varphi)} = \omega K t \sqrt{\frac{\varepsilon}{\mu}}\, e^{-\frac{G1\,\varepsilon_0\,\mu}{8\,\pi\,r}} \begin{pmatrix} 0 & 0 & 0 \\ 0 & -\mathrm{Sin}(k\,r) & \mathrm{Sin}(k\,r) \\ 0 & -i\,\mathrm{Cos}(k\,r)\,\omega\,t & i\,\mathrm{Cos}(k\,r) \end{pmatrix} \begin{Bmatrix} 0 \\ \mathrm{Cos}(\;) \\ i\,\mathrm{Sin}(\;) \end{Bmatrix} \tag{22}$$

With "K" a constant value dependend of the mass of the BLACK HOLE. The Dot product between the unit vector and the Quantum Vector Function $\overline{\phi}$ represents the quantum mechanical probability function $\Psi[r,t]$ which is a fundamental solution of the Schrödinger Wave Equation.

$$\overline{\Phi(r,\theta,\varphi)} = K\omega\,t \sqrt{\frac{\varepsilon}{\mu}}\, e^{-\frac{G1\,\varepsilon_0\,\mu}{8\,\pi\,r}} \begin{pmatrix} 0 & 0 & 0 \\ 0 & -\mathrm{Sin}(k\,r) & \mathrm{Sin}(k\,r) \\ 0 & -i\,\mathrm{Cos}(k\,r)\,\omega\,t & i\,\mathrm{Cos}(k\,r) \end{pmatrix} \begin{Bmatrix} 0 \\ \mathrm{Cos}(\;) \\ i\,\mathrm{Sin}(\;) \end{Bmatrix}$$

$$\Psi(r,t) = \begin{matrix} \{1 & 1 & 1\} \\ \omega\,t & & \end{matrix} \begin{Bmatrix} 0 \\ \mathrm{Cos}(\;) \\ i\,\mathrm{Sin}(\omega\,t) \end{Bmatrix} K e \sqrt{\frac{\varepsilon}{\mu}} = -\frac{G1\,\varepsilon_0\,\mu}{8\,\pi\,r} \qquad K e \sqrt{\frac{\varepsilon}{\mu}} \quad -\frac{G1\,\varepsilon_0\,\mu}{8\,\pi\,r}\; e^{i\,\omega\,t} \tag{23}$$

The Scalar function represents a fundamental solution of the Quantum Mechanical Schrödinger wave equation. [36, 37]

a) *Black Holes with Discrete Spherical Energy Levels at Sub-Atomic dimensions*

A critical condition for the containment of Electromagnetic Energy is that the Poynting vector equals zero at the spherical surface of the confinement. In the case of confinement within a sphere, a standing electromagnetic wave pattern necessitates the presence of concentric spheres. At each sphere, there exists an antinodal plane for either the electric field (E) or the magnetic field (B), with a distance in radius between each sphere equivalent to half the wavelength of the confinement. The constant k is defined as $k = n * \pi * \lambda$, where "n" is a natural number (1, 2, 3, 4, ...) and λ represents the wavelength.

i. *Time and Radius dependent Black Holes with discrete Energy Levels. The confinements of Electromagnetic Radiation within spherical Regions*

Every concentric sphere represents an anti-nodal surface for the Electric Field (E) or the Magnetic Field (H). The Poynting Vector $\hat{}:\overline{S} = \overline{E} \times \overline{H}$ at this spherical surface equals zero at any time and at any location at this sphere. The Electromagnetic Energy persists within each sphere and the subsequent concentric sphere. These concentric spheres are characterized by a difference in radius equivalent to half a wavelength of the electromagnetic radiation contained within the confinement, corresponding to distinct discrete energy levels. Each concentric sphere serves as an antinodal surface for either the electric field or the magnetic field.

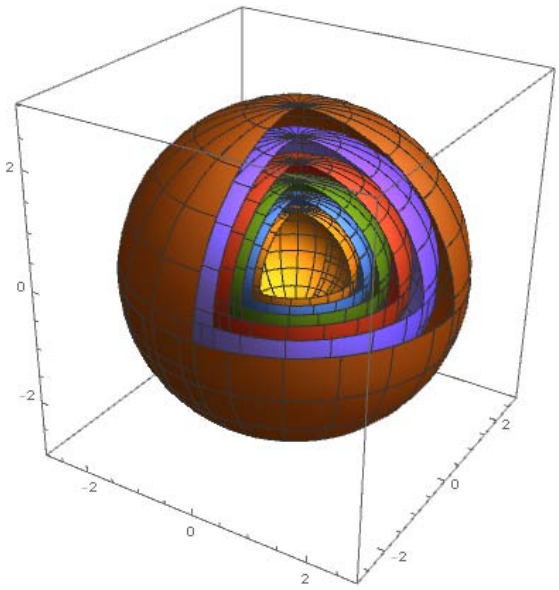

Fig. 5: Nodal and Antinodal Spheres for Standing (Confined) Spherical Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (9)

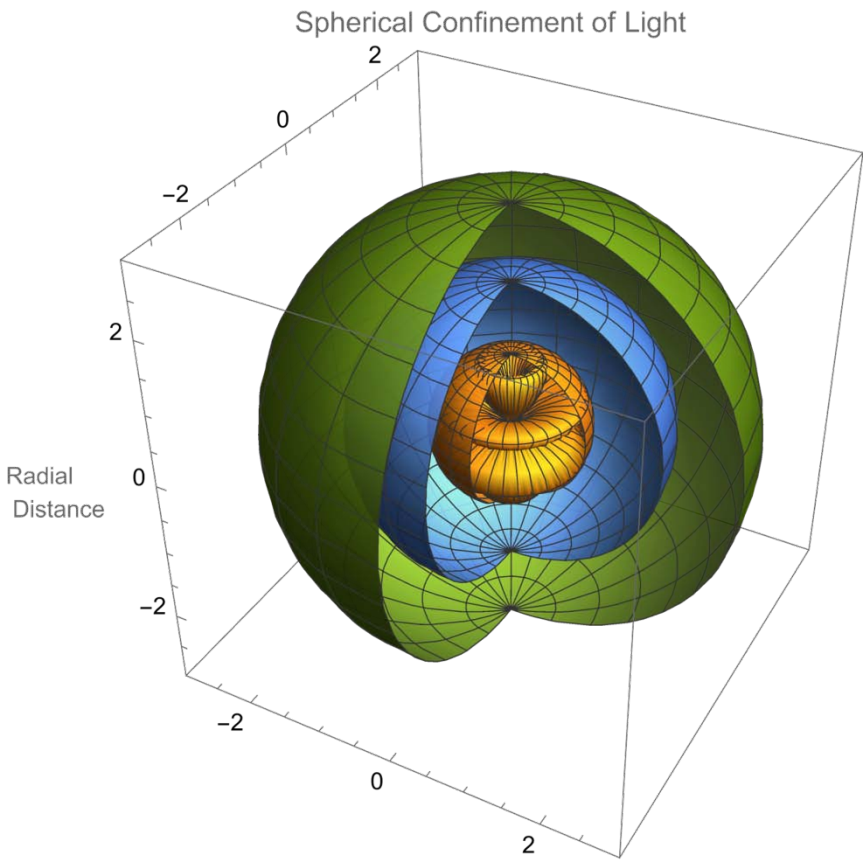

Fig. 6: Nodal- and Antinodal Spheres (k = 3) for Standing (Confined) Spherical Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (9)

Equation (24) describes a Time and Radius dependent BLACK HOLE.

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Sin}[k\ r]\ \text{Sin}[\omega\ t] \\ -\text{Cos}[k\ r]\ \text{Cos}[\omega\ t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\eth 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ \text{Sin}[k\ r]\ \text{Cos}[\omega\ t] \\ -\text{Cos}[k\ r]\ \text{Sin}[\omega\ t] \end{pmatrix} \quad (24)$$

Equation (20) represents by the function $\text{Sin}[k\ r]$ (k = 1,2,3,4….) the confinement of electromagnetic radiation between two concentric spheres. K represents the amplitude of the Electric/ Magnetic Field Intensty. [14]

ii. *Time and Polar Angle dependent Black Holes*

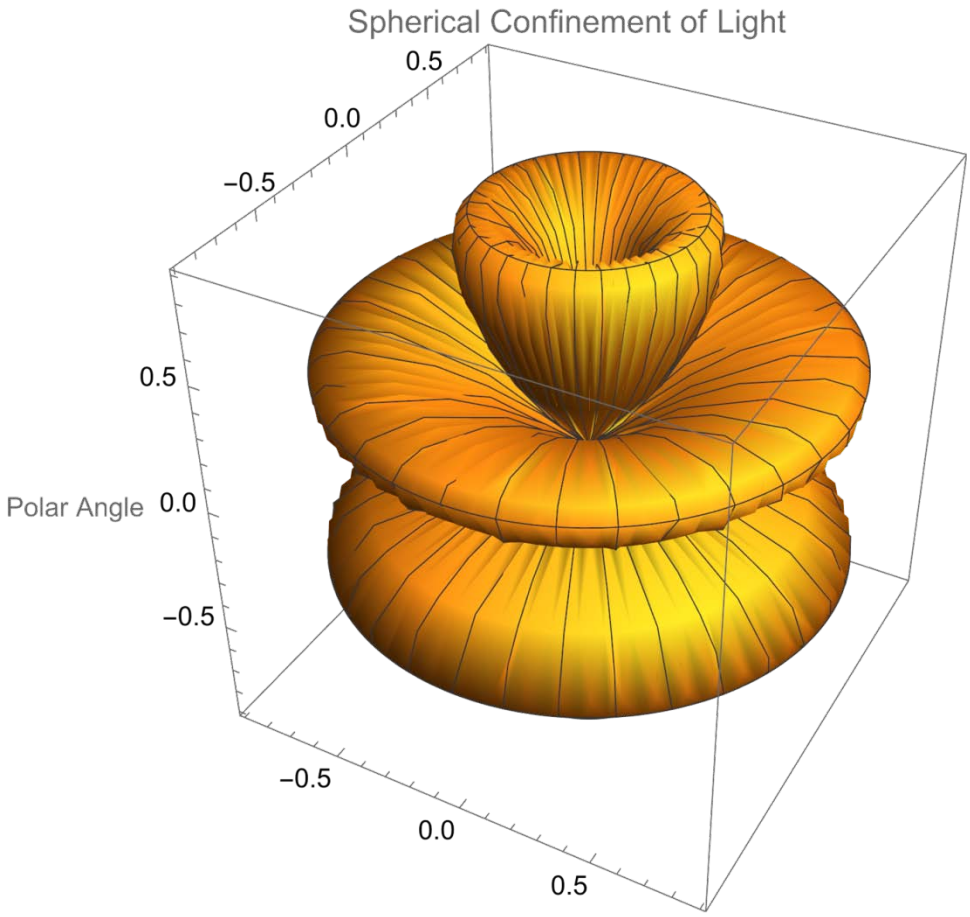

Fig. 7: Nodal- and Antinodal Polar Angle Regions (m = 3) for Standing (Confined) Spherical Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (15)

Equation (25) describes a Time and "Polar Angle" dependent BLACK HOLE

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Sin}[m\,\theta]\,\text{Sin}[\omega\, t] \\ \text{Sin}[m\,\theta]\,\text{Cos}[\omega\, t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\eth 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ \text{Sin}[m\,\theta]\,\text{Cos}[\omega\, t] \\ -\text{Sin}[m\,\theta]\,\text{Sin}[\omega\, t] \end{pmatrix} \quad (25)$$

Equation (19) represents by the function $\text{Sin}[m\,\theta]$ (m=1,2,3,4…..) the confinement of electro-magnetic radiation between two Polar Angular Regions [15].

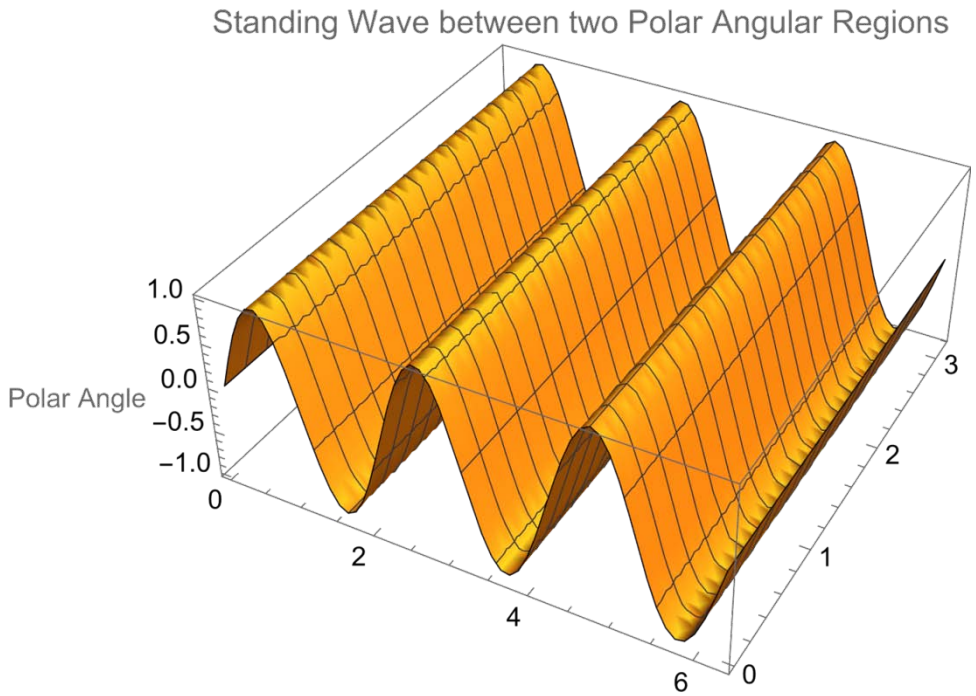

Fig. 8: Nodal- and Antinodal Polar Angle Regions (m = 3) for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (15)

iii. *Time and Azimuthal Angular dependent Black Holes*

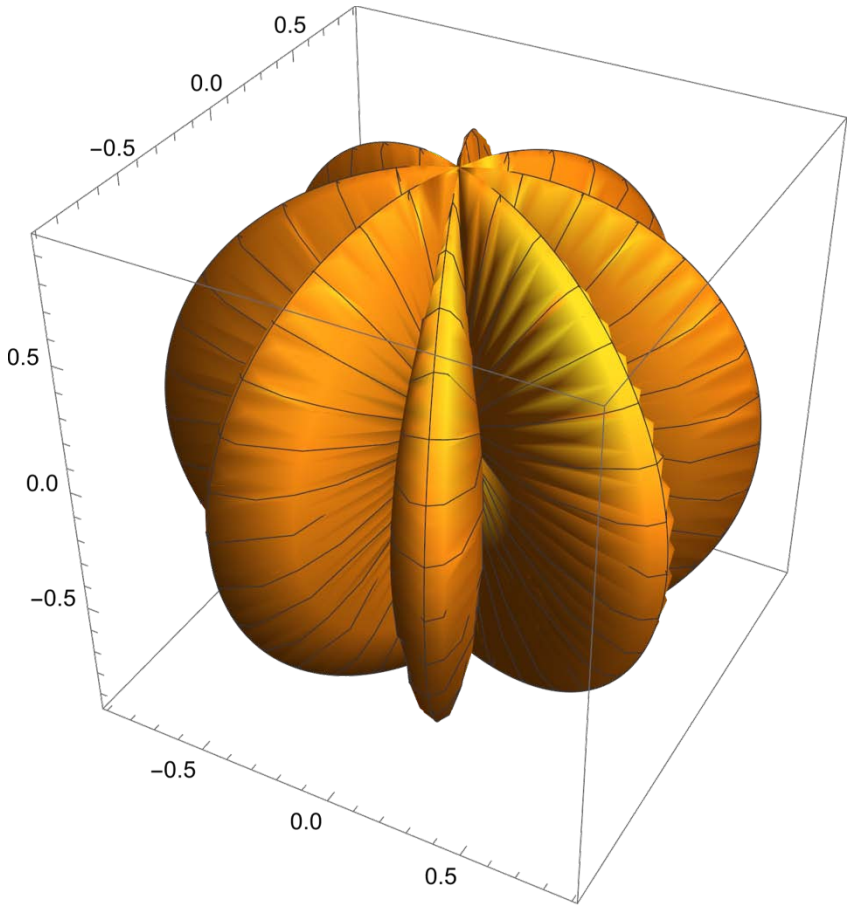

Fig. 9: Nodal- and Antinodal Azimuthal Angular Regions (n=3) for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (16)

Equation (26) describes a Time and "Polar Angle" dependent BLACK HOLE

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Cos}[n\ \varphi]\ \text{Sin}[\omega\ t] \\ \text{Cos}[n\ \varphi]\ \text{Cos}[\omega\ t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\eth 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ \text{Cos}[n\ \varphi]\ \text{Cos}[\omega\ t] \\ -\text{Cos}[n\ \varphi]\ \text{Sin}[\omega\ t] \end{pmatrix} \quad (26)$$

Equation (26) represents by the function $\text{Sin}[n\ \varphi]$ (n=1,2,3,4…..) the confinement of electro-magnetic radiation between two Azimuthal Angular Regions [16].

iv. *Time, Polar- and Azimuthal Angular dependent Black Holes*

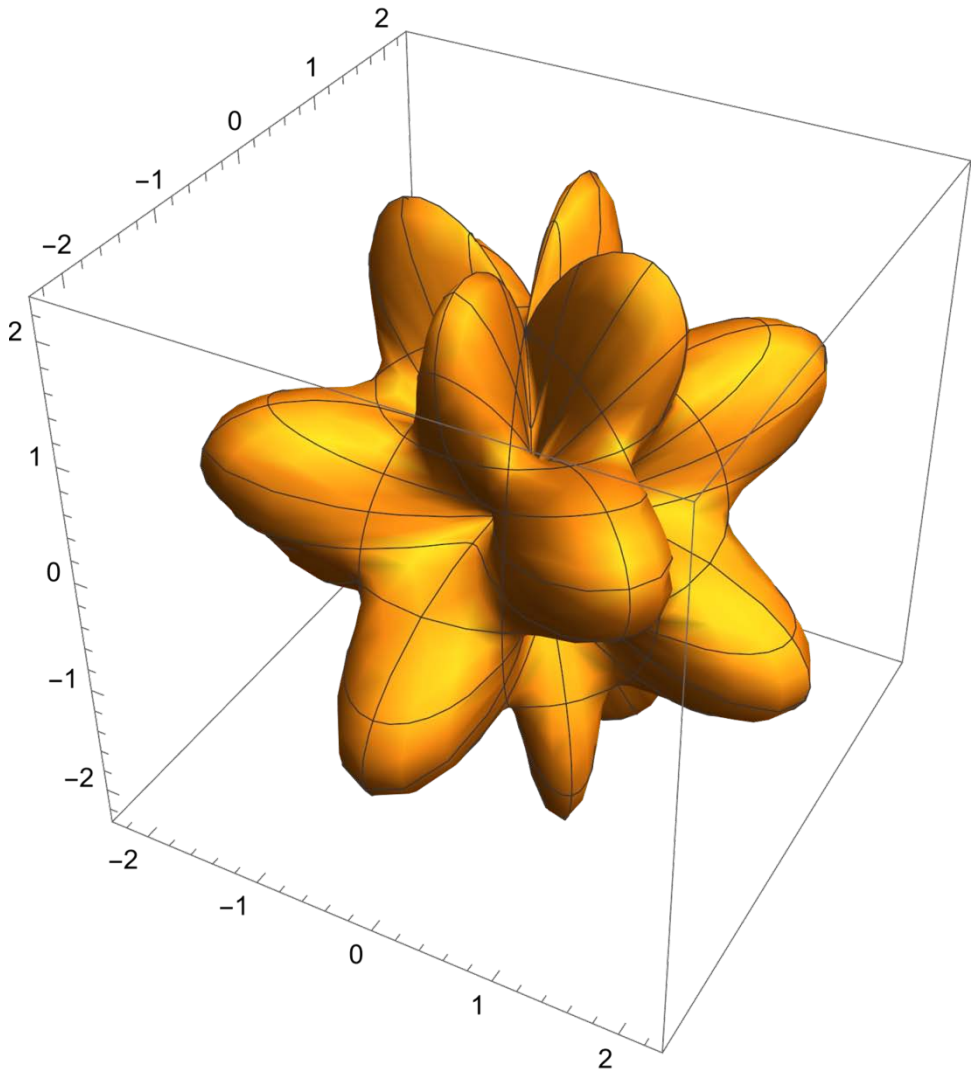

Fig. 10: Nodal- and Antinodal Polar Angular and Azimuthal Angular Regions (n = 4 and m = 4) for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (17)

Equation (27) describes a Time “Azimuthal Angle” and “Polar Angle” dependent BLACK HOLE

$$\overline{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} \begin{pmatrix} 0 \\ \text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Sin}[\omega\ t] \\ \text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Cos}[\omega\ t] \end{pmatrix}$$

$$\overline{H} = K\, e^{-\frac{G1\partial 0\mu 0}{8\pi r}} \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ -\text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Cos}[\omega\ t] \\ \text{Cos}[n\ \varphi]\ \text{Sin}[m\ \theta]\ \text{Sin}[\omega\ t] \end{pmatrix} \quad (27)$$

Equation (27) represents by the function (n = 1,2,3,4…..) and (m = 1,2,3,4…..) the confinement of electromagnetic radiation between two Azimuthal Angular Regions and two Polar Angulars Regions [17].

v. *Spherical Confinement of Light between two Concentric Spheres within Black Holess*

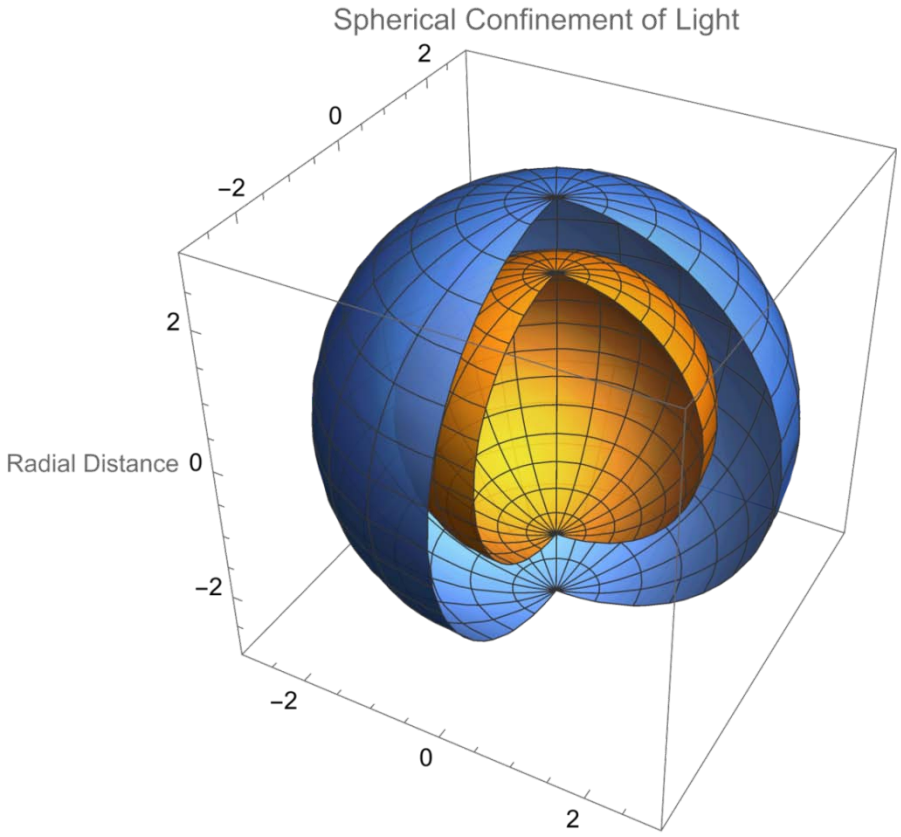

Fig. 11: Nodal- and Antinodal Regions for Standing (Confined) Electromagnetic waves with a 90 degrees phase shift between the Electric field and the Magnetic field. Equation (14)

Equation (18) in the context of this theory illustrates the phenomenon of reflected electromagnetic energy confined within a Black Hole between two concentric spheres. Within this framework, the speed of light, influenced by the variable "r," undergoes directional changes in accordance with the frequency of the confined light, or electromagnetic radiation.

A noteworthy concept introduced is the idea that a Black Hole has the potential to undergo a process of splitting into two distinct Black Holes with varying radii. During this process, the original Black Hole transitions to a lower energy state while the newly formed Black Hole embodies the energy differential, akin to an atom transitioning to a lower energy level. This analogy underscores the dynamic nature of Black Holes and the intricate interplay between energy levels within these cosmic structures.

$$\bar{E} = K\, e^{-\frac{G1\varepsilon 0\mu 0}{8\pi r}} f\left[t - \frac{\sqrt{\varepsilon_0\,\mu_0}\,\mathrm{Cos}[2\,k\,r]}{2\,k}\right] \begin{pmatrix} 0 \\ \mathrm{Sin}[k\,r]\,\mathrm{Sin}[\\ -\mathrm{Cos}[k\,r]\,\mathrm{Cos}[\omega\,t] \end{pmatrix}$$

$$\bar{H} = K\, e^{-\frac{G1\partial 0\mu 0}{8\pi r}} f\left[t - \frac{\sqrt{\varepsilon_0\,\mu_0}\,\mathrm{Cos}[2\,k\,r]}{2\,k}\right] \sqrt{\frac{\varepsilon_0}{\mu_0}} \begin{pmatrix} 0 \\ -\mathrm{Sin}[k\,r]\,\mathrm{Cos}[\omega\,t] \\ -\mathrm{Cos}[k\,r]\;\mathrm{Sin}[\omega\,t] \end{pmatrix} \quad (28)$$

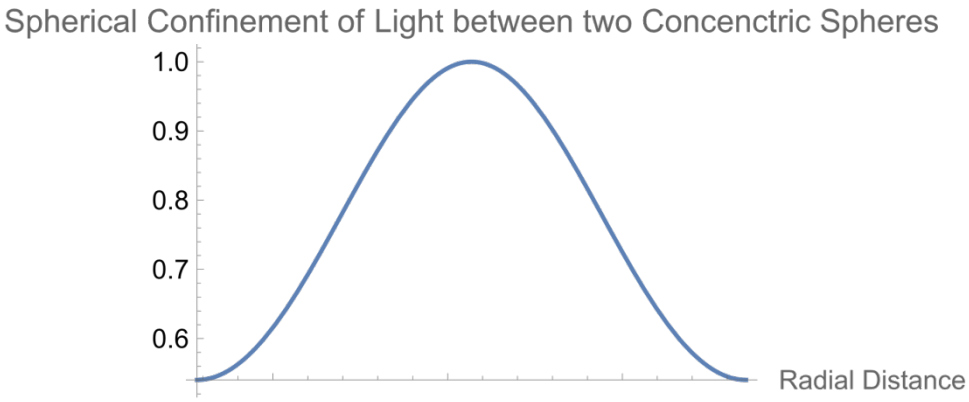

Fig. 12: Nodal- and Antinodal Regions for Standing (Confined) Electromagnetic within two concentric spheres. Equation (18)

V. Universal Equilibrium in the "Concept of Quantum Mechanical Probability" in "The New Theory"

The 4-dimensional notation for the divergence of the Stress-Energy Tensor (25)expresses in the 4th dimension (time dimension) the law of Conservation of Energy". For an Electromagnetic Field the law for conservation of Energy has been expressed as:

$$\bar{f}^4 = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \square\ \square\, \bar{\bar{T}} = \begin{pmatrix} \nabla \cdot \bar{S} + \frac{\partial w}{\partial t} \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \bar{0}^4 \quad (29)$$

The process of deriving the "Fundamental Equation for Confined Electromagnetic Interaction" in the proposed theory from the equation for the "Conservation of Electromagnetic Energy" (38.1) leads to a significant revelation. This fundamental equation serves as the cornerstone of the theory, resembling the Relativistic Quantum Mechanical "Dirac" equation and the Schrödinger wave equation, particularly when dealing with velocities significantly lower than the speed of light.

In essence, this "Fundamental Equation for Confined Electromagnetic Interaction" can be viewed as the relativistic counterpart to the Quantum Mechanical Schrödinger wave equation, aligning closely with the Quantum Mechanical Dirac Equation. This unification and connection between these fundamental equations shed light on the intricate relationship between electromagnetic interactions, quantum mechanics, and relativistic dynamics within the proposed theoretical framework.

a) Confined Electromagnetic Energy within a 4-dimensional Equilibrium

The physical concept of quantum mechanical probability waves has been created during the famous 1927 5th Solvay Conference. During that period there were several circumstances which came just together and made it possible to create a unique idea of "Material Waves"(Solutions of Schödinger's wave equation) being complex (partly real and partly imaginary) and describing the probability of the appearance of a physical object (elementary particle) generally indicated as "Quantum Mechanical Probability Waves".

The idea of complex (probability) waves is directly related to the concept of confined (standing) waves. Characteristic for any standing acoustical wave is the fact that the Velocity and the Pressure (Electric Field and Magnetic Field in QLT) are always shifted over

90 degrees. The same principle does exist for the standing (confined) electromagnetic waves,

For that reason every confined (standing) Electromagnetic wave can be described by a complex sum vector $\bar{\phi}$ of the Electric Field Vector $\bar{E}$ and the Magnetic Field Vector $\bar{\mathbf{B}}$ ($\bar{E}$ has 90 degrees phase shift compared to $\bar{\mathbf{B}}$).

The vector functions $\bar{\phi}$ and the complex conjugated vector function $\bar{\phi}^*$ will be written as:

$$\bar{\phi} = \frac{1}{\sqrt{2\,\mu}}\left(\bar{B} + i\,\frac{\bar{E}}{c}\right) \tag{30}$$

$\bar{\mathbf{B}}$ equals the magnetic induction, $\bar{\mathbf{E}}$ the electric field intensity ($\bar{E}$ has + 90 degrees phase shift compared to $\bar{\mathbf{B}}$) and c the speed of light.

The complex conjugated vector function $\overline{\phi^*}$ equals:

$$\overline{\phi^*} = \frac{1}{\sqrt{2\,\mu}}\left(\bar{B} - i\,\frac{\bar{E}}{c}\right) \tag{31}$$

The dot product equals the electromagnetic energy density w:

$$\bar{\phi}\,.\,\overline{\phi^*} = \frac{1}{2\,\mu}\left(\bar{B} + i\,\frac{\bar{E}}{c}\right).\left(\bar{B} - i\,\frac{\bar{E}}{c}\right) = \frac{1}{2}\,\mu H^2 + \frac{1}{2}\,\varepsilon E^2 = w \tag{32}$$

Using Einstein's equation $W = m\,c^2$, the dot product equals the electromagnetic mass density w:

$$\bar{\phi}\,.\,\overline{\phi^*}\frac{1}{c^2} = \frac{\varepsilon}{2}\left(\bar{B} + i\,\frac{\bar{E}}{c}\right).\left(\bar{B} - i\,\frac{\bar{E}}{c}\right) = \frac{1}{2}\varepsilon\,\mu^2 H^2 + \frac{1}{2}\varepsilon^2 E^2 = \rho\ [kg/m^3] \tag{33}$$

The cross product is proportional to the Poynting vector (Ref. 3, page 202, equation 15).

$$\bar{\phi} \times \overline{\phi^*} = \frac{1}{2\,\mu}\left(\bar{B} + i\,\frac{\bar{E}}{c}\right) \times \left(\bar{B} - i\,\frac{\bar{E}}{c}\right) = i\sqrt{\varepsilon\,\mu}\ \bar{E} \times \bar{H} = i\sqrt{\varepsilon\,\mu}\ \bar{S} \tag{34}$$

Within this article, a novel "Gravitational-Electromagnetic Equation" is put forth, offering a detailed description of Electromagnetic Field Configurations. These configurations not only serve as mathematical solutions for the Scalar Quantum Mechanical "Schrödinger Wave Equation" but also, more precisely, correspond to the mathematical solutions encapsulated in the Tensor representation of the "Relativistic Quantum Mechanical Dirac Equation" (Equation 41).

By establishing this linkage between the Gravitational-Electromagnetic Equation and the fundamental equations of Quantum Mechanics, specifically the Schrödinger Wave Equation and the Dirac Equation, the article outlines a comprehensive framework that integrates gravitational and electromagnetic interactions within the context of relativistic quantum mechanics. This synthesis of concepts aims to provide a deeper understanding of the dynamics governing electromagnetic fields and their connections to quantum mechanical phenomena at a relativistic scale. The 4-dimensional divergence of the sum of the Electromagnetic Stress-Energy tensor expresses the 4-dimensional Force-Density vector (expressed in [N/m^3] in the 3 spatial coordinates) as the result of Electro-Magnetic-Gravitational interaction.

$$f^{\mu} = \partial_{\nu}\,T^{\mu\nu} = 0 \tag{35}$$

In vector notation the 4-dimensional Force-Density vector can be written as:

$$\bar{f}^4 = \begin{pmatrix} f_4 \\ f_3 \\ f_2 \\ f_1 \end{pmatrix} = \square\ \square\,\bar{\bar{T}} = 0 \tag{36}$$

The pivotal boundary condition in this alternative gravitational approach necessitates that the Force 4-vector equals zero across the 4 dimensions, reflecting a universal equilibrium within the multidimensional framework.

The spatial components of the Force-Density vector, arising from the intricate interplay of Electro-Magnetic-Gravitational interactions, can be explicitly articulated.

By integrating the specific electromagnetic values for the electric field intensity "E" and the magnetic field intensity "H" into the formulation described in equation (36), the resulting expression encapsulates the 4-dimensional manifestation of the Electro-Magnetic-Gravitational Fields Equation (37). This amalgamation of electromagnetic and gravitational fields within the 4-dimensional realm underscores the comprehensive nature of the proposed framework and its implications for understanding the interactions between these fundamental forces.

Energy-Time Domain

$$\left(f_4\right) \quad \Leftrightarrow \quad \nabla \cdot \left(\bar{E} \times \bar{H}\right) + \frac{1}{2} \frac{\partial\left(\varepsilon_0 \left(\bar{E} \cdot \bar{E}\right) + \mu_0 \left(\bar{H} \cdot \bar{H}\right)\right)}{\partial t} = 0$$

3- Dimensional Space Domain

$$\begin{pmatrix} f_3 \\ f_2 \\ f_1 \end{pmatrix} \quad \Leftrightarrow \quad \frac{1}{c^2}\frac{\partial\left(\bar{E} \times \bar{H}\right)}{\partial t} + \varepsilon_0 \bar{E}\left(\nabla \cdot \bar{E}\right) - \varepsilon_0 \bar{E} \times \left(\nabla \times \bar{E}\right)$$

$$+ \mu_0 \bar{H}\left(\nabla \cdot \bar{H}\right) - \mu_0 \bar{H} \times \left(\nabla \times \bar{H}\right) = \bar{0} \tag{37}$$

In which f_1 , f_2 , f_3, represent the force densities in the 3 spatial dimensions and f_4 represent the force density (energy flow) in the time dimension (4th dimension). Equation (37) can be written as:

Energy-Time Domain

Conservation of Energy

B -7

$$\left(f_4\right) \qquad \nabla \cdot \bar{S} + \frac{\partial w}{\partial t} = 0 \tag{38.1}$$

3-Dimensional Space Domain

B -1 B -2 B -3

$$\begin{pmatrix} f_3 \\ f_2 \\ f_1 \end{pmatrix} \quad -\frac{1}{c^2}\frac{\partial\left(\bar{E} \times \bar{H}\right)}{\partial t} + \varepsilon_0 \bar{E}\left(\nabla \cdot \bar{E}\right) - \varepsilon_0 \bar{E} \times \left(\nabla \times \bar{E}\right) +$$

B -4 B -5

$$+ \mu_0 \bar{H}\left(\nabla \cdot \bar{H}\right) - \mu_0 \bar{H} \times \left(\nabla \times \bar{H}\right) = \bar{0} \tag{38.2}$$

(38)

The 4th term in equation (38.1) can be written in the terms of the Poynting vector "S" and the energy density "w" representing the electromagnetic law for the conservation of energy (Newton's second law of motion).

b) The 4-dimensional Relativistic Dirac Equation

Substituting (32) and (34) in Equation (38.1) results in The 4-Dimensional Tensor presentation for the relativistic quantum mechanical Dirac Equation (39):

$$\left(x_4\right) \qquad \nabla \cdot \left(\bar{\phi} \times \overline{\phi^*}\right) + \frac{i}{c}\frac{\partial \bar{\phi} \cdot \bar{\phi}^*}{\partial t} = 0$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad \frac{i}{c}\frac{\partial\left(\bar{\phi} \times \overline{\phi^*}\right)}{\partial t} - \left(\bar{\phi} \times \left(\nabla \times \overline{\phi^*}\right) + \overline{\phi^*} \times \left(\nabla \times \bar{\phi}\right)\right) + \left(\bar{\phi}\left(\nabla \cdot \overline{\phi^*}\right) + \overline{\phi^*}\left(\nabla \cdot \bar{\phi}\right)\right) = 0 \tag{39}$$

To transform the electromagnetic vector wave function $\bar{\phi}$ into a scalar (spinor or one-dimensional matrix representation), the Pauli spin matrices σ and the following matrices (Ref. 3 page 213, equation 99) are introduced:

$$\bar{\alpha} = \begin{bmatrix} 0 & \sigma \\ \sigma & 0 \end{bmatrix} \quad \text{and} \quad \bar{\beta} = \begin{bmatrix} \delta_{ab} & 0 \\ 0 & -\delta_{ab} \end{bmatrix} \tag{40}$$

The Equations(6), (32) and (34) can be written in tensor presentation as the 4-Dimensional Relativistic Quantum Mechanical Dirac Equation: [3] (Equation 102, page 213)

$$(x_4) \qquad \left(\frac{imc}{h}\bar{\beta} + \bar{\alpha}.\nabla\right)\psi = -\frac{1}{c}\frac{\partial\psi}{\partial t} \tag{41.1}$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad -\frac{1}{c^2}\frac{\partial(\bar{E}\times\bar{H})}{\partial t} + \varepsilon_0\bar{E}(\nabla.\bar{E}) - \varepsilon_0\bar{E}\times(\nabla\times\bar{E}) + \tag{41.2}$$

$$+\mu_0\bar{H}(\nabla.\bar{H}) - \mu_0\bar{H}\times(\nabla\times\bar{H}) + \gamma_0\bar{g}(\nabla.\bar{g}) - \gamma_0\bar{g}\times(\nabla\times\bar{g}) = \bar{0} \tag{41}$$

VI. Heisenberg's Uncertainty Relationship

a) The Inertia of Confined Electromagnetic Radiation

According to the insights derived from equation (23), the solutions of the Schrödinger wave equation depict confined electromagnetic waves characterized by a distinct 90-degree phase shift between the electric and magnetic fields.

This segment delves into exploring the concept of inertia associated with confined electromagnetic waves. To elucidate the calculation of inertia pertaining to confined electromagnetic radiation, a hypothetical scenario involving electromagnetic radiation trapped between two perfectly reflective mirrors will be considered. The radiation beams emanating from these mirrors, referred to as the emitted radiation, can be likened to light emitted from a source of electromagnetic radiation.

In this scenario, when an observer moves towards the emitter, the intensity of light at the observer's position undergoes a transformation in accordance with the Lorentz transformation formula, where "v" signifies the relative velocity between the emitter and the observer. At relatively low velocities, the term in the Lorentz transformation equation simplifies to 1, reflecting the behavior observed in this regime.

When the observer moves away from the emitter, the intensity of the light at the location of the observer will decrease with $\gamma\,(1 - v/c)$ according the Lorentz transformation. At low velocities the Lorentz contraction term:

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{42}$$

will equal 1 ("v" equals the relative velocity between object and observer and c equals the speed of light).

In the scenario where light is confined between two perfectly reflective mirrors, a significant observation emerges: the speeds of both mirrors remain consistently equal relative to each other. This equilibrium ensures that the radiation pressures exerted on each mirror are also in balance; these opposing radiation pressures effectively cancel each other out. Consequently, the system—comprising the two perfect mirrors and the confined electromagnetic radiation—will either remain at rest or continue moving at a uniform speed. This dynamic equilibrium underscores the intricate interplay between the confined electromagnetic radiation and the reflective surfaces in this conceptual framework.

i. *The Resulting Radiation Pressure for accelerated or decelerated confined electromagnetic radiation*

In the context of acceleration, an interesting phenomenon arises where the time taken for light to travel between the mirrors at the speed of light can introduce variations. If we designate one mirror as the emitter and the other as the observer, the apparent speeds of the emitter and observer differ due to the time delay inherent in light propagation during acceleration. This time discrepancy gives rise to a situation where the opposing radiation pressures on the mirrors are no longer balanced, leading to an imbalance in forces. This disparity in radiation pressures may engender a resultant force as per Newton's second law of motion during acceleration.

To embark on this analysis, an imaginary experiment is envisioned. Two perfectly reflective mirrors, labeled as B and A and situated opposite each other in the x-y plane at a specific distance, serve as the setting. Within this framework, a single harmonic electromagnetic wave is confined between the mirrors, giving rise to a "Standing Electromagnetic Wave" akin to the solution described in equation (23). This standing

wave configuration is the outcome of two waves propagating in opposite directions along the z-axis, underpinning the dynamics of this experimental scenario.

The Poynting vector corresponding with the electromagnetic wave propagating along the z-axis in the + direction (positive direction of the z-axis) has been indicated as $\overline{S}^{+} = \overline{E}^{+} \times \overline{H}^{+}$ and the Poynting vector corresponding with the electromagnetic wave propagating along the z-axis in the - direction (opposite direction) has been indicated as $\overline{S}^{-} = \overline{E}^{-} \times \overline{H}^{-}$. The system is at rest. The radiation pressures, caused by the confined electromagnetic radiation, on both mirrors A and B are opposite and equal in magnitude:

$$\mathbf{P_A} = \frac{2\ \mathbf{S_A}}{\mathbf{c}} = \frac{2\ \mathbf{S_B}}{\mathbf{c}} = \mathbf{P_B} \quad (43)$$

To calculate the radiation pressure on Mirror A, the velocities, only relative to Mirror A for the waves with the respective Poynting vectors $\overline{S}^{+} = \overline{E}^{+} \times \overline{H}^{+}$ and $\overline{S}^{-} = \overline{E}^{-} \times \overline{H}^{-}$, have to be calculated.

ii. *The radiation pressure on Mirror A, when Mirror A moves with a velocity v in the direction of the positive z-axis*

When the system of two Mirrors "B - A" moves in the direction of the positive z-axis, Mirror A moves in the direction of the positive z-axis and the Poynting vector for the emitted radiation $\overline{S}^{+} = \overline{E}^{+} \times \overline{H}^{+}$ will decrease according the Lorentz transformation.

$$\overline{S}_{v}^{+} = \overline{E}_{v}^{+} \times \overline{H}_{v}^{+} = \gamma^2 \left(1 - \frac{v}{c}\right)^2 \left(\overline{E}^{+} \times \overline{H}^{+}\right) \quad (44)$$

When the system of two Mirrors "B - A" moves in the direction of the positive z-axis, Mirror A moves in the direction of the positive z-axis. The Poynting vector for the incident radiation $\overline{S}^{-} = \overline{E}^{-} \times \overline{H}^{-}$ will increase according the Lorentz transformation.

$$\overline{S}_{v}^{-} = \overline{E}_{v}^{-} \times \overline{H}_{v}^{-} = \gamma^2 \left(1 + \frac{v}{c}\right)^2 \left(\overline{E}^{+} \times \overline{H}^{+}\right) \quad (45)$$

The total radiation pressure, caused by the confined electromagnetic radiation, on mirror A equals:

$$P_A = \frac{S_A^{+} + S_A^{-}}{c} = \frac{\gamma^2 \left(\left(1 - \frac{v}{c}\right)^2 + \left(1 + \frac{v}{c}\right)^2\right)\left(\overline{E}^{+} \times \overline{H}^{+}\right)}{c} \quad (46)$$

iii. *The radiation pressure on Mirror B when Mirror B moves with a velocity v in the direction of the positive z-axis*

When the system of two Mirrors "B – A" moves in the direction of the positive z-axis, Mirror B moves in the direction of the positive z-axis and the Poynting vector for the by mirror "B" emitted radiation will increase according the Lorentz transformation.

$$\overline{S}_{v}^{-} = \overline{E}_{v}^{-} \times \overline{H}_{v}^{-} = \gamma^2 \left(1 + \frac{v}{c}\right)^2 \left(\overline{E}^{+} \times \overline{H}^{+}\right) \quad (47)$$

When the system of two Mirrors "B – A" moves in the direction of the positive z-axis, Mirror B moves in the direction of the positive z-axis the Poynting vector for the on mirror B incident radiation $\overline{S}^{+} = \overline{E}^{+} \times \overline{H}^{+}$ will decrease according the Lorentz transformation.

$$\overline{S}_{v}^{+} = \overline{E}_{v}^{+} \times \overline{H}_{v}^{+} = \gamma^2 \left(1 - \frac{v}{c}\right)^2 \left(\overline{E}^{+} \times \overline{H}^{+}\right) \quad (48)$$

The total radiation pressure, caused by the confined electromagnetic radiation, on mirror B equals:

$$P_B = \frac{S_B^{+} + {}_B^{-}S}{c} = \frac{\gamma^2 \left(\left(1 + \frac{v}{c}\right)^2 + \left(1 - \frac{v}{c}\right)^2\right)\left(\overline{E}^{+} \times \overline{H}^{+}\right)}{c} \quad (49)$$

P_A and P_B are still equal in magnitude and both in opposite direction and still cancel each other. The system of confined radiation validates Newton's first law of motion.

iv. *Newton's second Law of Motion (Inertia) for Confined Electromagnetic Radiation*

When the system of two Mirrors "B – A" accelerates, the velocity increases with $\Delta \mathbf{v}$ in a time interval $\Delta \mathbf{t}$. At time "t" the opposite radiation pressures on mirror A and mirror B are presented in (46) and (49). At time $\mathbf{t} + \Delta\, \mathbf{t}$ the radiation pressures on Mirror A and Mirror B will different.

The radiation pressure at time $\mathbf{t} + \Delta\, \mathbf{t}$ caused by the confined electromagnetic radiation, on mirror A equals:

$$P_A = \frac{S_A^{+} + S_A^{-}}{c} = \frac{\gamma^2 \left(\left(1 + \frac{(v)}{c}\right)^2 + \left(1 - \frac{(v + \Delta v)}{c}\right)^2\right)\left(\overline{E}^{+} \times \overline{H}^{+}\right)}{c} \quad (50)$$

Because the electromagnetic wave with Poynting vector $\overline{S}^{+} = \overline{E}^{+} \times \overline{H}^{+}$ has left Mirror B at "t"

and during the time interval Δt the magnitude of $\overline{E}_t^+ = \left(1+\frac{v}{c}\right)\overline{E}^+$ and $\overline{H}_t^+ = \left(1+\frac{v}{c}\right)\overline{H}^+$ has not changed.

The radiation pressure at time $t + \Delta t$ caused by the confined electromagnetic radiation, on mirror B equals:

$$P_B = \frac{S_B^+ + S_B^-}{c} = \frac{\gamma^2\left(\left(1+\frac{(v+\Delta v)}{c}\right)^2 + \left(1-\frac{(v)}{c}\right)^2\right)\left(\overline{E}^+ \times \overline{H}^+\right)}{c} \quad (51)$$

Because the wave with Poynting vector $\overline{S}^- = \overline{E}^- \times \overline{H}^-$ has left Mirror A at "t" and during the time interval Δt the magnitude of $\overline{E}_t^- = \left(1+\frac{v}{c}\right)\overline{E}^-$ and $\overline{H}_t^- = \left(1+\frac{v}{c}\right)\overline{H}^-$ has not changed.

The radiation pressures on Mirror A and Mirror B do not counterbalance each other anymore and the resulting radiation pressure equals:

$$P_B - P_A = \frac{\gamma^2 (4\ \Delta v\ ) S}{c^2} \quad (52)$$

Equation (52) can be written as:

$$P_B - P_A = \frac{\gamma^2 (4\Delta v) S}{c^2} = \frac{\gamma^2 \left(4\frac{\Delta v}{\Delta t}\right) S \Delta t}{c^2} = \gamma^2 \left(\frac{W}{c^2}\right) a = \gamma^2 m a \quad (53)$$

In which the acceleration $a = \frac{\Delta v}{\Delta t}$ and the inertia $m = \frac{W}{c^2}$. At non-relativistic velocities $\gamma = 1$ and (53) validates Newton's second law of motion for confined electromagnetic radiation presented in equation (23). According Einstein's $W = m c^2$ the confined electromagnetic energy "W" equals the total confined electromagnetic mass.

By superposition and integration over arbitrary surfaces it is possible to prove that all confined electromagnetic radiation equals (53) which represents that confined electromagnetic energy validates Newton's second law of motion (F = m a).

b) Heisenberg's Uncertainty Relationship

For confined electromagnetic radiation represented in (23) the mass has been represented in (53). According Planck's law the energy "W" is proportional to the frequency of the confined electromagnetic radiation:

$$W = \hbar f$$

$$W = m c^2 = \hbar f \quad (54)$$

Both sides in equation (54) are multiplied by the velocity of the confined electromagnetic radiation.

$$(m v) c^2 = \hbar f v$$

$$p = \frac{\hbar f v}{c^2} \quad (55)$$

Resulting in an expression for the momentum "p" of the confined radiation. According Planck a variation in the momentum "p" will result in the variation of the frequency "f" of the confined electromagnetic radiation.

$$\Delta p = \frac{\hbar (\Delta f)}{c^2} v \quad (56)$$

Because of the relationship between the frequency "f" and the wavelength "λ" (56) can be written as:

$$\Delta p = \left(\frac{\hbar \Delta f}{c^2}\right) v$$

$$\Delta p = \left(\frac{\hbar}{c \Delta \lambda}\right) v \quad (57)$$

Presenting confined electromagnetic radiation, equation (57) can be written in a way comparable with Heisenberg's uncertainty relationship:

$$(\Delta \lambda \Delta p) = \hbar \left(\frac{v}{c}\right) \quad (58)$$

For uniform moving electromagnetic confinements the velocity "v" remains constant and the product of the uncertainty in the wavelength (dimension of the confinement) and the uncertainty in the momentum (frequency) of the confinement represents a constant value.

It follows from equation (58) there is no fundamental uncertainty. Heisenberg's "Uncertainty Relationship" represents the constant relationship between the wavelength (dimension) and the frequency (momentum) for gravitationally confined light and in general gravitationally confined electromagnetic waves.

VII. Conclusions

The integration of General Relativity with the new proposed theory provides a fascinating perspective on the interaction between gravity and light within a 4-dimensional spacetime curvature defined by a gravitational field. In this framework, light's trajectory is dictated by the curved spacetime geometry, illustrating the profound relationship between gravity and electromagnetic phenomena.

The new theory introduces a novel concept of bi-directional separation between mass and inertia for light, specifically photons. In this view, inertia is exclusively present in the direction of light propagation, influencing the speed of light. On the other hand, mass of light exists in a plane perpendicular to the propagation direction, affecting the deflection of light by gravitational fields perpendicular to the propagation. This distinction sheds light on the nuanced dynamics of light-matter interactions within gravitational fields.

Black Holes, as gravitational-electromagnetic confinements, are fundamental solutions derived from the relativistic quantum mechanical Dirac equation. These enigmatic cosmic entities highlight the significant gravitational intensity shift and redshift induced by gravitational fields. The impact of "CURL" within gravitational fields surrounding Black Holes remains a distinctive feature that challenges conventional explanations afforded by General Relativity.

By considering a 4-dimensional equilibrium encompassing inertia and gravitational force densities within electromagnetic field configurations, the theory presents Black Holes as physical entities at sub-atomic scales. These solutions exhibit spherical confinements with discrete energy levels, offering a unique perspective on the quantum nature of these phenomena.

In experimental validation, the theory proposes measuring the interaction between gravity and light in well-defined gravitational fields, such as that of Earth. Discrepancies in gravitational redshift calculations between General Relativity and the new theory, albeit minuscule, underscore the need for higher accuracy observations to discern between the two frameworks effectively.

Dark Matter's existence is postulated based on gravitational redshift and gravitational intensity shift phenomena. The concept of "Gravitational Shielding" elucidates how entire galaxies, with immense mass, may become invisible due to gravitational effects, even with advanced observatories like the James Webb Space Telescope. This invisibility beyond a certain distance poses intriguing challenges for observational astronomy and underscores the mysterious nature of dark matter within our universe.

Lastly, equation (58) within the theory establishes a clear relationship without fundamental uncertainty. Heisenberg's Uncertainty Principle is redefined in the context of gravitationally confined light, presenting a constant relationship between wavelength and frequency for electromagnetic waves in such settings.

a) Data Availability

All Data and Calculations have been published at: https://quantumlight.science/

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The Nature of Thermal Radiation from the Universe, Hawking Radiation and Quasar Disks as Natural Masers

By S. I. Konstantinov

Herzen State Pedagogical University of Russia

Abstract- The article examines the nature of thermal radiation from the Universe, black holes as a baryonic matter factory and quasar disks as natural masers.

Keywords: *baryonic matter, dark matter, black hole, basov's maser.*

GJSFR-A Classification: *(LCC): QB460, QB980*

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I. Introduction

Despite all the successes of modern astrophysics, the cosmological theory of the birth and evolution of the Universe remains a territory of delusions, scientific speculations about inflationary theories and pseudoscientific opuses, like the "Universal Law of Antigravity"in the standard cosmological model ΛCDM [1].Martin Ries, the cosmologist and the astrophysicist, President of the Royal Society of London, believes that the birth of the universe will remain a mystery to us forever. He declares: "We do not understand the laws of the universe. And we'll never know how the universe appeared and what awaits it. The hypotheses about the Big Bang, which allegedly gave rise to the world around us, or that there may be many others in parallel with our Universe, or about the holographic nature of the world, will remain unproved assumptions." The authors of the new theory of the origin of the Universe are N. Anshordi, R. Mann and R. Purhasan suggested that our Universe could have arisen as the result of implosion (explosion inward) of a star from four-dimensional space predecessor of the Universe [2]. The presence of in homogeneities of the background radiation was discovered as a result of astronomical observations and can serve as confirmation of the energetic connection of our Universe with the external enveloping Cosmos[2]. According to the latest data, interaction between parallel universes is possible through wormholes. Physicists divide wormholes into passable and impassable. Traversable wormholes can potentially connect different regions of space-time Fig.1

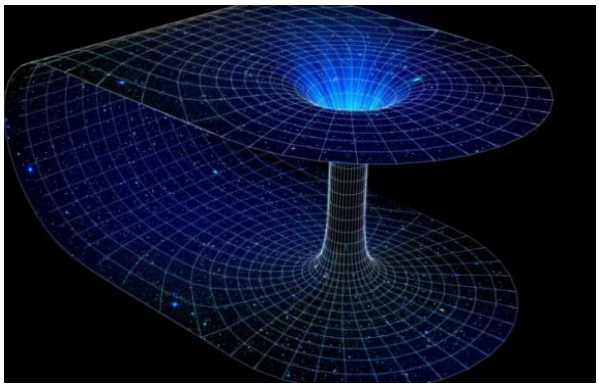


Figure 1: Wormhole (walkable)

In particular, a field flux created by objects on opposite sides of the hole can pass through such a hole, so the objects will feel each other long before they fall into the hole. Physicists from China and the United States have evaluated how objects on opposite sides of the wormhole interact. It turned out that due to the "glueing" of fields at the border of "our" and "alien" spaces, observers feel the electric, scalar and gravitational fields of objects from the opposite edge of the hole [3]. A clarification needs to be made here. Recently, astrophysicists discovered the shadow of a black hole's exit caused by gravitational lensing [4]. This fact suggests that physicists from China and the United States found the electric, scalar and gravitational fields of objects in your universe located on the other side of the black hole. Scientists from the Center for Astrophysical Research in the Fermi Laboratory (Fermilab) are now working on creating a Holometer device. With the help of the Golometer device, experts hope to prove or disprove the insane assumption that the three-dimensional Universe, as we know it, does not exist more than a kind of hologram. In other words, the surrounding reality is an illusion and nothing more. Until the illusory nature of our world is proven, scientists have hope to understand the laws of the universe. The new cosmological theory of Professor Valery Etkin on the local expansion and contraction of the Universe, based on the hypothesis of an uneven distribution of baryonic and non-baryonic matter in the Cosmos, is based on the energy-dynamic theory of the evolution of the Universe, which rejects the Big Bang as the beginning of all things [5].

Author: *Department of Physical Electronics, Herzen State Pedagogical University of Russia, St. Petersburg , RSC "Energy", Russian Federation. e-mail: konstantinov.s.i@yandex.com*

II. The Theory of Local Expansion and Contraction of the Universe

In the new cosmological model, the quantum vacuum is understood as a super fluid heterogeneous medium of dark matter and dark energy forming a galactic and intergalactic environment, which accounts for 95% of the average density of matter in the Universe [6]. In this case, ordinary baryonic matter accounts for only about 5%. Possessing the property of gravity, super fluid dark matter forms a halo around galaxies, which, rotating together with them, forms apredominantly flat or nearly flat structure of the Universe [6]. Lawrence Livermore National Laboratory of the United States announced on 2022 about the sensational results. This laboratory has long-term observations and analysis with the Supercomputer. A space model of our entire Universe was created on the Supercomputer, and it turned out that our Universe has a flat structure, and all Galaxies about half a million light years in size are located at a distance of six billion light years from each other and lie in the same plane. This picture of our Universe does not correspond to the Big Bang model. Today, with the creation of the largest James Webb space telescope, astrophysicists have the opportunity to look into the depths of the Universe, 13 billion years old in the infrared, and there they did not see the expected picture of the Big Bang. Astrophysicists are in a panic. In July 2022, a large group of astrophysicists published an article called "Panic!" [7]. According to the latest astrophysical data, the number of small galaxies and their location in the depths of the Universe, aged 13 billion years, does not correspond to the expected picture of the Big Bang. Astrophysicists tend to think that the Universe has always existed and the Big Bang, like the singularity, is Einstein's unscientific fantasy. Based on the latest conclusions of astrophysicists, the nature of the background radiation discovered in 1965 by A. Penzias and R. Wilson cannot be a relic, which means that the hypothesis of cold nuclear fusion in the space environment acquires a scientific status. Nature offers humanity various options for atomic fusion: on the one hand, it is uncontrolled thermonuclear fusion realized in the depths of the sun and accompanied by coronary emissions that have a detrimental effect on all life on the planets: on the other hand, the thermal radiation of the universe realized in the form of cold nuclear fusion in the interstellar medium. The detected thermal background radiation of the Universe, discovered in 1965 by A. Penzias and Robert Wilson, in the microwave range from 10 GHz to 33 GHz received in astrophysics an insufficiently convincingly justified name "relict". This may be a process of cold nuclear fusion occurring in the space environment, with the release of energy sufficient to raise the temperature of the Universe to 2.7 K. The theory of local expansion and contraction of the infinite Universe does not need the Big Bang and the inflationary theory of the expansion of a point into the existing Universe 13 billion years from its birth [5]. This could be a process of cold nuclear fusion occurring in the cosmic environment, releasing enough energy to raise the temperature of the Universe to 2.7 K. From the point of view of the unitary quantum theory (UQT) of Professor L. Sapogin, the motion of electrons in tunnel junctions can occur even very low temperatures [8]. This is confirmed by the experiments of American scientists who managed to establish tunnel effects near the absolute zero temperature (in liquid helium) [9]. Under normal conditions, a vacuum quantum behaves like a quasiparticle in a condensed state. In a state of excitation, a vacuum quantum loses its original state and passes into a new one - into the state neutron n^0 (1840;1;0), which then transforms into three particles, proton p^0(1836;1;1), electron e^-(1;1; -1) and antineutrino γ^-(1;-1;0) [10]. During the birth of a neutron, several types of elementary particles are released. They form the corresponding radiation, by the combination of which one can detect the processes of production of the proton, deuterium and tritium neutrons:

γ-quanta γ^-(0;1;0) and γ^+(0;1;0) – form γ-radiation;

neutrino ${}^b\gamma^-$(-1;-1;0) and γ^+(1;1;0) – neutrino radiation;

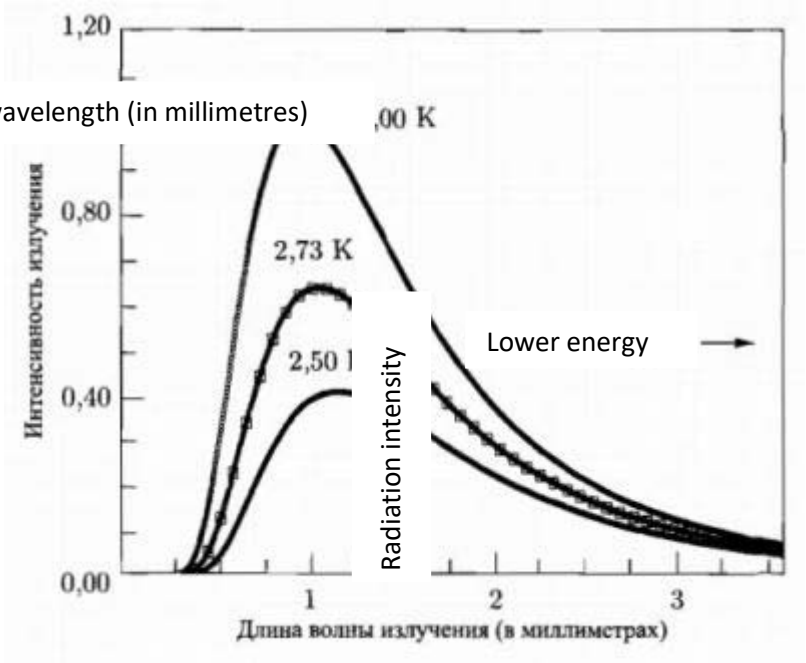
electrons and positrons ${}^We^-$ (-1;-1;-1) and e^+(1;1;1) – forms β-radiation;

generated single neutrons n^0 (1840;1;0) give neutron radiation;

neutrons grouped in pairs form α-radiation [10].

It is in this interstellar medium that cold nuclear fusion occurs, allowing the creation of thermal background radiation from the Universe in the microwave range from 10 GHz to 33 GHz. When a vacuum is irradiated by third-party γ quanta, the vacuum must be transformed into matter, in which case the above five types of radiation will be present, and high energy and temperature will also be released [10]. However, there is one argument in favour of the existence of a big bang in the past. In the standard Big Bang model, the Big Bang problem is solved very well. At high density, immediately after the explosion, matter and radiation were a homogeneous mixture, and interacting with each other according to the laws of statistical physics, they reached an equilibrium distribution. When, after several hundred years, the radiation "broke away" from the substance that suddenly became transparent, the photons inherited the same pristine equilibrium distribution for the entire subsequent history, despite the progressive drop in temperature. An essential feature of the observed cosmological background is the frequency distribution of energy. In nature, blackbody radiation is recorded (with an effective temperature of 2.7 degrees Kelvin). The COBE satellite (Figure 2) measured the spectrum of

cosmic background radiation; each square in this figure corresponds to a different dimension. The three curves shown show the dependence of the radiation intensity of a black body on the wavelength for three different temperatures. Notice how closely COBE's measurements match the curve depicting blackbody radiation at 2.73 degrees. The Big Bang Theory predicts the exact shape of this curve.



The middle dashed curve represents black body radiation at 2.73 degrees
Solid curves are actual measurements made by COBE

Figure 2: The cosmic microwave background spectrum measured by the FIRAS instrument on the COBE

Thus, in the new cosmological theory of the Universe by Professor Valery Etkin [5], it is possible to explain the nature of background radiation by cold nuclear fusion (CNS) occurring in the galactic and intergalactic medium at a temperature of 2.7 degrees Kelvin and high energy released when irradiating the vacuum by external γ-quanta [10]. Until the 1970s, it was believed that the Big Bang gave birth to the Universe and all its contents, arising from some infinitesimal point - a singularity. However, in the late 70s, a new theory appeared - cosmological inflation. According to it, the early Universe expanded at an exponentially rate, and then, at the end of this period, continued to grow, but more slowly. The acceleration of this expansion due to dark energy began after the age of the Universe had already exceeded 7.7 billion years (5.4 billion years ago). The contributions to the theory were made by Soviet and American physicist Andrei Linde, Russian theoretical physicist Alexei Starobinsky and American physicist Alan Gut: in 2014 the three of them received the Kavli Prize for this theory. However, new astronomical observations and the creation of more advanced space telescopes have allowed astrophysicists to propose new cosmological theories of the development of the Universe. In them, black holes constantly replenish the Universe with both baryonic and non-baryonic matter and make it possible to abandon the Big Bang theory as a necessary condition for origin Universe. The Universe is eternal and infinite.

In September 2021, Professors Xavier Calmett and Folkert Kuipers from the Department of Physics and Astronomy at the University of Sussex published a report that the structure of black holes is more complex than previously thought; and quantum gravity can lead to pressure black holes on the quantum environment. Xavier Calmett said: “Our finding that Schwarzschild black holes have a pressure as well as a temperature is even more exciting given that it was a total surprise Hawking's famous intuition that black holes are not black, but have a spectrum of radiation very similar to that of a black body, makes black holes an ideal laboratory for studying the interactions between quantum mechanics, gravity and thermodynamics’’[12]. At the edge of a black hole, the physical vacuum is in a conditionally stressed state, as a result of which it is po quantum polarized. Nothing of the kind follows from Einstein's General Theory of Relativity. Einstein's general relativity, in general, is incompatible with quantum concepts. Studying the behavious of quantum fields near a black hole, Stephen Hawking predicted that a black hole necessarily radiates particles into outer space and thereby loses mass [13]. This effect is called Hawking radiation (evaporation). Polarization of the vacuum occurs under the influence of monstrous

gravitational and magnetic fields, as a result of which the formation of not only virtual, but also real particle-antiparticle pairs is possible. According to Hawking, on the surface of the event horizon the direction of expansion of generated particles ceases to be random, i.e. becomes polarized, orthogonal to the surface of the black hole. [11]. The existence of stable Hawking radiation - the process of emission of various particles by a black hole - was first proved by specialists from the Israel Institute of Technology. The experiment, conducted by Israeli scientists, had to be repeated 97 thousand times over a period for 124 days. To create an analogue of a black hole 0.1 millimeters long, researchers needed 800 rubidium atoms. Itis assumed that in the future specialists will be able to extract energy from black holes using a single reactor. According to the theory, the energy will be generated by Hawking radiation. Scientific material describing the creation of a sound-like black hole in the laboratory was published on February 19, 2021, on Phys.org. [14]. As a result, a considerable amount of matter is thrown into the surrounding space of the black hole. This matter a plasma of the most elementary particles of the universe. It is a huge and still very dense cloud of plasma, retaining the shape of a disk. Its rotation speed is close to the speed of light, and the direction of rotation coincides with the direction of rotation of the original black hole. The radial displacement of matter in the accretion disk is accompanied by the release of gravitational energy, part of which is converted into kinetic energy (acceleration of gas movement when approaching the star), and the other part is converted into heat and heats the disk matter. Therefore, the accretion disk emits thermal electromagnetic radiation. The kinetic energy of the gas upon collision with the star's surface is also transformed into thermal energy and radiated. The main property of the formation of such X-ray sources will be magnetic solid radiation. Its magnetic field and induction can reach several thousand Tesla, researchers from the LaPlaz Institute, National Research Nuclear University MEPhI and the CELIA laboratory of the University of Bordeaux note in their work [15]. The uniqueness of the experiment is that the parameters of the resulting plasma do not need to be scaled; they correspond to the actual parameters of the plasma in the vicinity of the black hole of close binary systems like Cygnus X-1 (Figure 3). Matter with a temperature of billions of degrees, a density of 10^{18} particles per cm^3 and a frozen magnetic field of more than 2,000 Tesla. It is these parameters that can be detected in the plasma of the active region of X-ray sources. The volume of hot magnetized matter was sufficient to have the essential characteristics of its space prototype [15].

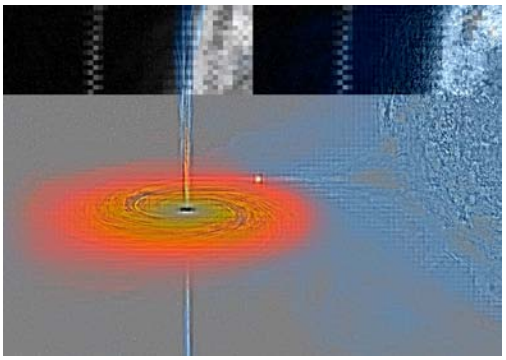


Figure 3: Black hole Swan X-1

The substance of a plasma disk formed by Hawking radiation hear a black hole is gradually stratified into electrons-positrons and neutrons. The mass appearance of neutrons on the outskirts of the plasma disk marks a fundamentally new stage in the life of the formation of the universe. From this moment, the assembly line for the production of chemical elements begins to work. Experimental physics has established for certain that a free neutron decays into a proton and an electron after about 15 minutes. Hydrogen atoms gradually accumulate around the rotating disk of protoplasm and envelop it in a reasonably dense layer. At some point, the density of the hydrogen blanket reaches a critical value, and the free escape of neutrons from the plasma disk becomes difficult. The next cycle of synthesis of atoms of matter begins. The next chemical element of the periodic table – helium.Similar processes of wrapping a neutron centrifuge in a gas cushion are repeated for each new chemical element. The further we move along the periodic table, the denser the outer nucleon layer becomes, and the fewer atoms of a new substance are formed at the output. Therefore, in our Universe, hydrogen makes up 70% of the total mass of all chemical elements. The described process allows us to understand how the synthesis of all chemical components of the universe proceeds. Similar processes of wrapping a neutron centrifuge in a gas cushion are repeated for each new chemical element. Thanks to this, the most common substance in the universe, hydrogen, is born at the output. Professor Vladimir Strelnitsky's article "Masers, Lasers and the Interstellar Medium" discusses the results obtained in three areas of astrophysics: interstellar supersonic turbulence, circumstellar disks, and natural masers and lasers [16]. The masers in the hydrogen recombination lines detected by the Kuiper observatory originate in quasars surrounding massive black holes. They make it possible to study the kinematics and structure of the quasar disk. The lines of hydrogen recombination in the far infrared range turned out to be enhanced. They are the first known natural amplifiers of electromagnetic waves in the laser wavelength region. Analysis of their emissions as well as emissions in other recombination lineages provides a possible clue absence of optical

lasers in the Universe. The role of Maxwell's demon, realizing the separation of excited positronium particles from unexcited in the vicinity of black holes, is played by inhomogeneous gravitational and magnetic fields. That is, the event horizon is a gate that Maxwell's Demon opens, deflecting unexcited particles towards a strong field and excited particles towards a weak field. This process is similar to the process implemented in the ammonia molecular generator (Basov's maser) – "Maxwell's Demon of the 20th century", considered in detail by Professor R. Poplavsky in [17]. The role of Maxwell's demon, which separates excited molecules from unexcited ones in the Basov maser, is played by an inhomogeneous electric field that deflects unexcited molecules towards a strong fiel, and excited molecules towards a weak field. If a sufficient number of excited molecules enter a resonator with a high quality factor per unit time, then the self-excitation conditions are met and the molecular generator will operate in a continuous mode. However, in a molecular generator based on ammonia, the negentropy of separation is far from being fully used: as a useful effect, it is only necessary to consider the energy stored in excited molecules at the frequency ν [17]. There is also a thermodynamically interesting method for directly converting thermal energy into coherent radiation. Without going into details of this (thermal) excitation method, described in detail in [17], we note that here, at first, an equilibrium distribution corresponding to the heater temperature is established at all three levels. Then, at the refrigerator temperature, the population inversion of the lower and middle levels is achieved due to the much shorter relaxation time between the upper and middle levels (at the idler frequency) than at the other two frequencies (signal and auxiliary). It was shown in [18] that the quantum efficiency η_i is greater than the efficiency η_r of the Carnot cycle. The specialists of the Israel Institute of Technology are right when they proposed extracting energy from black holes using a singular reactor based on Hawking radiation, similar to how it is implemented today in installations using coherent radiation from artificial masers and lasers.Considering the Maxwell demon in Leo Sapogin's Unitary Quantum Theory as a system of two potential barriers leads to the conclusion that the 1st and 2nd laws of thermodynamics are violated. This conclusion is confirmed by experimental data [19].

III. Conclusion

The astrophysical observations and experiments presented in the article force physicists to take a critical approach to the standard cosmological model ΛCDM (Λ-Cold Dark Matter).The Universe is a dynamic system that continuously generates baryon masses of matter and dark matter and regulates their density, expanding its boundaries. This circumstance leads to new, more general conservation laws inherent in the physics of open systems. In the article by Professor Valery Etkin "The Perpetuum Mobile of the Universe" the concept of the dynamic Universe is substantiated, according to which the field (continuum) and corpuscular phases of matter with their inherent forms of energy are circulated in it. In this circuit, gravity is a "perpetual motion machine" that allows the Universe to function in time and space indefinitely, bypassing the state of equilibrium [20].

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Calculation of Macroscopic Effects of Quantum Gravity in General Static Isotropic Gravitational Fields

By Gang Lee

Abstract- In this paper we calculated the self-interaction of the gravitational field in coordinate space by approximate method, and find the functional relationship between gravitational source and distance and self-interaction of quantum gravity. The calculation result shows that the self-interaction of quantum gravity can explain the gravitational effects of dark matter. In the solar system, the self-interaction is extremely weak, but it is enough to explain the the Pioneer anomaly.

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Calculation of Macroscopic Effects of Quantum Gravity in General Static Isotropic Gravitational Fields

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I. Introduction

In the paper [1] we discusses the effects of self-interaction of quantum gravity and given the expression of self-interaction in momentum space. In this paper we calculated the effects of self-interaction of quantum gravity in coordinate space. We find the functional relationship between self-interaction of quantum gravity and gravity source and distance. By substituting observational data directly into the calculation, we can determine whether it can be used to explain the gravitational effects of dark matter and the the Pioneer anomaly.

II. Self-Interaction of Noncommutative Quantum Gravity

This paper omits the introduction of the quantum gravity theory. For details of the quantum gravity theory, please refer to [1] [2] [3] [4].

Let's discuss the general static isotropic gravitational field. The spherical polar coordinate system of a general static isotropic gravitational field is $r^i = (r, \theta. \phi, t)$. The general static isotropic metric is

$$ds^2 = g_{rr}dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2 - g_{tt}dt^2$$

$$g_{rr} = \left[1 - \frac{2MG}{r}\right]^{-1}, \quad g_{tt} = \left[1 - \frac{2MG}{r}\right] \tag{2.1}$$

At the point r of the spherical polar coordinate system r^i, we establish a spherical polar coordinate system $l^m = (l, \Theta, \Phi, T)$. The direction of the polar axis l is consistent with the polar axis r of the spherical polar coordinate system r^i, the time axis T is the same as the time axis t. In the quantum gravitational

Author: e-mail: ganglee69@msn.com

field, there exists the self-interaction between gravitons, after considering the effects of all gravitons, the locally inertial coordinate system $\lambda(\xi^\alpha)$ at point r have to written as

$$\lambda(\xi^\alpha) = \xi^\alpha + \Delta\xi^\alpha$$

$$\Delta\xi^\alpha = \int d^4l\, \xi^\alpha((r+l),|l|) \tag{2.2}$$

$$= \int d^4l \left(C^\alpha(r+l) \cdot \exp(-\left|\frac{l}{L_P(x+l)}\right|) \right)$$

In a general static isotropic gravitational field, the equipotential surface are the spherical surface. On a small range and far away from the gravitational source, the equipotential surface can be regarded as a plane. Therefore the increment $\Delta\xi^m$ of the locally inertial coordinate system is

$$\Delta\xi^\alpha = \int dl\, d\Theta\, d\Phi\, dT \left(C^\alpha(r + l\cos\Theta) \cdot \exp(-\frac{l}{|L_P(r+l)|}) \right) \tag{2.3}$$

At the point l of the coordinate system l^i, the metric of gravitational field can be written as

$$g_{ij}(r+l) = \frac{\partial C^\alpha(r+l\cos\Theta)}{\partial r^i} \frac{\partial C^\beta(r+l\cos\Theta)}{\partial r^j} \cdot \eta_{\alpha\beta}$$

$$ds^2 = \left[1 - \frac{2MG}{r+l\cos\Theta}\right]^{-1} dr^2 + r^2 d\theta^2 + r^2\sin^2\theta d\phi^2 - \left[1 - \frac{2MG}{r+l\cos\Theta}\right] dt^2 \tag{2.4}$$

Then we have

$$\begin{cases} \dfrac{\partial C^{\alpha}(r+l\cos\Theta)}{\partial r} = \left[1-\dfrac{2MG}{r+l\cos\Theta}\right]^{-1/2} \\ \dfrac{\partial C^{\alpha}(r+l\cos\Theta)}{\partial \theta} = 1 \\ \dfrac{\partial C^{\alpha}(r+l\cos\Theta)}{\partial \phi} = 1 \\ \dfrac{\partial C^{\alpha}(r+l\cos\Theta)}{\partial t} = \left[1-\dfrac{2MG}{r+l\cos\Theta}\right]^{1/2} \end{cases} \tag{2.5}$$

From Eq,[2.3] and Eq.[2.5], for the increment $\Delta\xi^m$ of locally inertial coordinate system, we have

$$\frac{\partial \Delta\xi^{\alpha}}{\partial r} = \left(\frac{\partial \Delta\xi^{l}}{\partial r}, \frac{\partial \Delta\xi^{\Theta}}{\partial r}, \frac{\partial \Delta\xi^{\Phi}}{\partial r}, \frac{\partial \Delta\xi^{T}}{\partial r}\right) \tag{2.6}$$

where

$$\begin{aligned} \frac{\partial \Delta\xi^{l}}{\partial r} &= \int dl\, d\Theta\, d\Phi \left(\frac{\partial C^{l}(r+l\cos\Theta)}{\partial r}\cdot \exp(-\frac{l}{\left|L_P(r+l)\right|})\right) \\ &= \int dl\, d\Theta\, d\Phi \left(\left[1-\frac{2MG}{r+l\cos\Theta}\right]^{-1/2}\cdot \exp(-\frac{l}{\left|L_P(r+l)\right|})\right) \\ &= \int dl\, d\Theta\, d\Phi \left(\sqrt{\frac{l\cos\Theta+r}{l\cos\Theta+r-2MG}}\cdot \exp(-\frac{l}{\left|L_P(r+l)\right|})\right) \end{aligned} \tag{2.7}$$

$$\frac{\partial \Delta\xi^{\Theta}}{\partial r} = 0$$

$$\frac{\partial \Delta\xi^{\Phi}}{\partial r} = 0$$

$$\frac{\partial \Delta\xi^{T}}{\partial r} = 0$$

We need to calculate the radial changes in the spatial part of the metric of gravitational field. Denote

$$F_r(r, M) \equiv \frac{\partial \Delta \xi^l}{\partial r} \tag{2.8}$$

From Eq.[2.7] we have

$$F_r(r, M) = \int dl\, d\Theta\, d\Phi \left(\sqrt{\frac{l\cos\Theta + r}{l\cos\Theta + r - 2MG}} \cdot \exp(-\frac{l}{\left|L_P(r+l)\right|}) \right) \tag{2.9}$$

First, integrate over l, it can be written as follows

$$\int_0^\infty dx \left(\sqrt{\frac{Ax + C}{Ax + D}} \cdot \exp(Bx) \right) \tag{2.10}$$

where

$$\text{variable}: \ x = l$$

$$\text{constant}: \ A = \cos\theta, \ B = -\frac{1}{\left|L_P(r+l)\right|}, \ C = r, \ D = r - 2MG \tag{2.11}$$

Using substitution rule for definite integrals, let

$$y = \sqrt{\frac{Ax + C}{Ax + D}} \tag{2.12}$$

Then

$$x = \frac{Dy^2 - C}{A(1 - y^2)}$$

$$dx = \frac{2(D - C)y}{A(1 - y^2)^2} dy \tag{2.13}$$

Using definite integration by parts, we have

$$\int dx \left(\sqrt{\frac{Ax+C}{Ax+D}} \cdot \exp(Bx) \right)$$

$$= \int dy \left(y \cdot \frac{2(D-C)y}{A(1-y^2)^2} \cdot \exp(B \cdot \frac{Dy^2-C}{A(1-y^2)}) \right)$$

$$= \frac{1}{B} \cdot y \cdot \exp(B \cdot \frac{Dy^2-C}{A(1-y^2)}) - \frac{1}{B} \cdot \int dy \, \exp(B \cdot \frac{Dy^2-C}{A(1-y^2)}) \tag{2.14}$$

$$= -|L_P| \cdot \sqrt{\frac{Ax+C}{Ax+D}} \cdot \exp(-\frac{x}{|L_P|}) \Big|_0^\infty - \frac{1}{B} \cdot \int dy \, \exp(B \cdot \frac{Dy^2-C}{A(1-y^2)})$$

$$= -|L_P| \cdot \sqrt{\frac{C}{D}} - \frac{1}{B} \cdot \int dy \, \exp(B \cdot \frac{Dy^2-C}{A(1-y^2)})$$

The integrand in the second term can be represented as the McLaughlin series

$$-\frac{1}{B} \cdot \int dy \, \exp(B \cdot \frac{Dy^2-C}{A(1-y^2)})$$

$$= |L_P| \cdot \int dy \left(\sum_{n=0}^{\infty} \frac{\left(-\frac{1}{|L_P|} \cdot \frac{Dy^2-C}{A(1-y^2)} \right)^n}{n!} \right) \tag{2.15}$$

$$= |L_P| \cdot \sum_{n=0}^{\infty} \left(\frac{1}{n!} \int_a^b dy \left(\frac{1}{|L_P|} \cdot \frac{Dy^2-C}{A(y^2-1)} \right)^n \right)$$

If $x \in (0, \infty)$, we have $y \in \left(\sqrt{\frac{C}{D}}, \, 1 \right)$. Notice that the McLaughlin series are undefined while $y = 1$. Since we only need to integrate within a small range

at point r, we can make a infrared cutoff. To simplify the calculation, we set the integral interval as $y \in (a,\, b) = \left(\sqrt{\frac{C}{D}},\, \sqrt{\frac{C+1}{D+1}}\right)$.

The McLaughlin series (2.15) rapidly decays if the variable x is extremely small. In weak-field approximation, we take the first two terms of the McLaughlin series for approximate calculation

$$
\begin{aligned}
&|L_P| \cdot \sum_{n=0}^{\infty} \left(\frac{1}{n!} \int_a^b dy \left(\frac{1}{|L_P|} \cdot \frac{Dy^2 - C}{A(y^2-1)} \right)^n \right) \\
&\approx |L_P| + |L_P| \cdot \int_a^b dy \left(\frac{1}{|L_P|} \cdot \frac{Dy^2 - C}{A(y^2-1)} \right) \\
&= |L_P| + \left(\int_a^b dy \left(\frac{Dy^2}{A(y^2-1)} \right) - \int_a^b dy \left(\frac{C}{A(y^2-1)} \right) \right) \\
&= |L_P| + \left(\frac{D}{A} y \right) \Big|_a^b - \frac{C-D}{A} \cdot \int_a^b dy \left(\frac{1}{y^2-1} \right) \\
&= |L_P| + \left(\frac{D}{A} y \right) \Big|_a^b - \left(\frac{C-D}{2A} \ln \frac{y-1}{y+1} \right) \Big|_a^b \\
&= |L_P| + \left(\frac{D}{A} \left(\sqrt{\frac{C+1}{D+1}}) - \sqrt{\frac{C}{D}} \right) \right) - \left(\frac{C-D}{2A} \ln \frac{y-1}{y+1} \right) \Big|_a^b
\end{aligned}
\tag{2.16}
$$

Then

$$
\begin{aligned}
&\int dx \left(\sqrt{\frac{Ax+C}{Ax+D}} \cdot \exp(Bx) \right) \\
&= -|L_P| \cdot \sqrt{\frac{C}{D}} + |L_P| + \left[\frac{D}{A} \left(\sqrt{\frac{C+1}{D+1}} - \sqrt{\frac{C}{D}} \right) \right] - \left(\frac{C-D}{2A} \ln \frac{y-1}{y+1} \right) \Big|_a^b
\end{aligned}
\tag{2.17}
$$

If $r \gg 2MG \gg 1$, we have

$$-|L_P| \cdot \sqrt{\frac{C}{D}} + |L_P| + \frac{D}{A}\left(\sqrt{\frac{C+1}{D+1}} - \sqrt{\frac{C}{D}}\right) \approx 0 \tag{2.18}$$

Then Eq.[2.17] can be written as

$$\int dx \left(\sqrt{\frac{Ax+C}{Ax+D}} \cdot \exp(Bx)\right) \approx -\left(\frac{C-D}{2A} \ln \frac{y-1}{y+1}\right)\Big|_a^b \tag{2.19}$$

Next, by calculate the multiple integrals over Θ and Φ, we can get a coefficient K. Then $F_r(r, M)$ can be written as

$$F_r(r, M) = \int d\Theta d\Phi \left[-\left(\frac{C-D}{2A} \cdot \ln \frac{y-1}{y+1}\right)\Big|_a^b\right]$$

$$= \int d\Theta d\Phi \left[-\frac{2MG}{2A}\left(\ln \frac{\sqrt{C+1}-\sqrt{D+1}}{\sqrt{C+1}+\sqrt{D+1}} - \ln \frac{\sqrt{C}-\sqrt{D}}{\sqrt{C}+\sqrt{D}}\right)\right]$$

$$= K \cdot MG \cdot \ln\left(\frac{\sqrt{C+1}+\sqrt{D+1}}{\sqrt{C+1}-\sqrt{D+1}} \cdot \frac{\sqrt{C}-\sqrt{D}}{\sqrt{C}+\sqrt{D}}\right) \tag{2.20}$$

Substituting Eq.(2.11) into Eq.(2.20) we have

$$F_r(r, M)$$

$$= KMG \cdot \ln \frac{\left(\sqrt{r^2+r} - \sqrt{(2MG)^2+2MG}\right) + \left(\sqrt{r(1+2MG)} - \sqrt{2MG(1+r)}\right)}{\left(\sqrt{r^2+r} - \sqrt{(2MG)^2+2MG}\right) - \left(\sqrt{r(1+2MG)} - \sqrt{2MG(1+r)}\right)} \tag{2.21}$$

Denote

$$\Delta_r \equiv F_r(r, M) \cdot \left[1 - \frac{2MG}{r}\right]^{1/2} \tag{2.22}$$

Then the metric $\mathbf{g}_{ij}$ of gravitational fields with self-interaction can be written as

$$ds^2 = (1+\Delta_r)^2 \cdot \left[1-\frac{2MG}{r}\right]^{-1} dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2$$

$$-(1+\Delta_t)^2 \cdot \left[1-\frac{2MG}{r}\right] dt^2 \tag{2.23}$$

Similar as the Schwarzschild metric g_{ij}, we can also express the true metric $\mathbf{g}_{ij}$ in the equivalent isotropic form, by introducing a new radius variable ρ

$$\rho \equiv \frac{1}{2}\left[(1+\Delta_r)^{-1} \cdot r - MG + \left((1+\Delta_r)^{-2} \cdot r^2 - 2MG\,(1+F_r)^{-1} \cdot r \right)^{1/2} \right] \tag{2.24}$$

or

$$r = \rho\,(1+\Delta_r)\left(1+\frac{MG}{2\rho}\right)^2 \tag{2.25}$$

Substituting it into Eq.(2.23) gives the isotropic form as follows

$$ds^2 = (1+\Delta_r)^2 \cdot \left(1+\frac{MG}{2\rho}\right)^4 \left(d\rho^2 + \rho^2 d\theta^2 + \rho^2 \sin^2\theta d\phi^2\right)$$

$$-(1+\Delta_t)^2 \cdot \left(\frac{1-MG/2\rho}{1+MG/2\rho}\right)^2 dt^2 \tag{2.26}$$

From Eq.(2.25), we can find a radial scale change $r \to (1+\Delta_r)\cdot r$. Therefore due to the self-interaction, the spacetime described by the true metric $\mathbf{g}_{ij}$ has been expanded compared to the space described by the Schwarzschild metric g_{ij}. The radius has expanded to $(1+\Delta_r)$ times. Because the boundary condition is determined by the same gravitational field equation, from the view point of gravity, the extended spacetime described by the true metric $\mathbf{g}_{ij}$ is equivalent to the spacetime described by the Schwarzschild metric g_{ij}. The spacetime described by the metric g_{ij} follows the inverse square law, therefore the gravity of the extended spacetime is stronger than what is given by the inverse square law. In the spacetime described by the true metric $\mathbf{g}_{ij}$, the gravity at a distance

of $(1+\Delta_r)\cdot r$ from the gravitational source is equal to the gravity of the inverse square law at a distance of r from the gravitational source.

Because the general static isotropic metric doesn't implicit the time variable, the increment Δ_t is extremely small

$$\begin{aligned} F_t(r,M) &= \frac{\partial \Delta\xi^T}{\partial t} \\ &= \left[1-\frac{2MG}{r}\right]^{1/2}\cdot\int_{-\infty}^{\infty} dT\ \exp(-\frac{|T|}{|L_P|}) \\ &= 2|L_P|\cdot\left[1-\frac{2MG}{r}\right]^{1/2} \end{aligned} \tag{2.27}$$

$$\begin{aligned} \Delta_t &\equiv F_t(r,M)\left[1-\frac{2MG}{r}\right]^{-1/2} \\ &= 2|L_P| \end{aligned}$$

From Eq.(2.21) and Eq.(2.22), we can see that the strength of the self-interaction is close to a linear relationship with the mass M of the gravitational source if $r \gg 2MG$. In the solar system, because the gravitational source M isn't strong, the self-interaction is extremely weak, but it is enough to explain the Pioneer anomaly. In galaxies containing supermassive black holes, the gravitational source M is very strong, then the self-interaction is strong enough to explain the gravitational effects of dark matter. Due to the mass of supermassive black holes is billions of times greater than that of the Sun, when the gravitational source is a supermassive black hole, the effect of the self-interaction is also billions of times stronger than the effect that caused the Pioneer anomaly, which is sufficient to explain the gravitational effect of dark matter. Because the increment Δ_t is extremely small, the gravitational redshift has no observable changes.

III. Conclusion

In this paper. we calculate the macroscopic effects of quantum gravity in the general static isotropic gravitational field. It can be seen that the strength of the self-interaction of quantum gravity depends on the strength of the gravitational source. In the solar system, due to the weak gravitational source, the self-interaction is extremely weak, but this is enough to explain the Pioneer anomaly.

When the gravitational source is a supermassive black hole, the effect of the self-interaction is very strong to explain dark matter. And there is no observable change in gravitational redshift due to the self-interaction in a static field.

This paper can lead to the conclusion that although the inverse square law is correct, the true gravitational field does not follow the inverse square law due to the self-interaction. The stronger the gravitational source, the greater the deviation from the inverse square law.

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On the Incompatibility of the Laws of Energy and Pulse Conservation

By Valeriy Etkin

Integrative Reseaerch Institute (Israel)

Abstract- The discrepancy between the laws of conservation of impulse and its momentum to the nature of the evolution of the Universe is revealed. Based on a strict definition of the conserved quantity, the incompatibility of the laws of conservation of quantitative measures of carriers of various forms of energy with the law of its conservation is revealed. It is shown that in the general case of nonequilibrium multivariate systems, these laws give way to the principle of interconversion of pulses of translational, rotational, and oscillatory motion of various energy carriers. Experimental confirmation of the possibility of creating on this basis new types of ground and space propulsion systems is given.

Keywords: *conservation laws, impulse, momentum, form of motion, sources, evolution.*

GJSFR-A Classification: *(LCC): QC173.6*

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On the Incompatibility of the Laws of Energy and Pulse Conservation

Valeriy Etkin

Abstract- The discrepancy between the laws of conservation of impulse and its momentum to the nature of the evolution of the Universe is revealed. Based on a strict definition of the conserved quantity, the incompatibility of the laws of conservation of quantitative measures of carriers of various forms of energy with the law of its conservation is revealed. It is shown that in the general case of nonequilibrium multivariate systems, these laws give way to the principle of interconversion of pulses of translational, rotational, and oscillatory motion of various energy carriers. Experimental confirmation of the possibility of creating on this basis new types of ground and space propulsion systems is given.

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I. Introduction

It is believed that the laws of conservation of energy, mass, charge, momentum, and momentum form the foundation of modern natural science [1]. In this case, checking the reliability of this foundation becomes necessary at every new stage in the development of science, when doubts arise about the validity of at least one of them. Once again, such a need arose in connection with the advent of propulsion systems running in violation of Newton's laws, as well as the discovery of the accelerated expansion of the Universe, showing a spontaneous increase for motion in it.

This forces us to return again and again to the origins of the laws mentioned. This retrospective analysis takes us back to R. Descartes [2], whose worldview influenced the way of thinking of scientists of many later generations. His first law of nature said the conservation of momentum of the studied set of moving bodies. For each of the bodies in this collection, the amount of motion was determined by the product of the amount of matter in it M (later called its mass) by the modulus of its velocity υ, not only because vector algebra did not yet exist in those days, but because only then the total amount of motion did not depended on the direction of movement of these bodies and remained constant during the transformation of ordered (observable) movement into hidden (unobservable). Subsequently, this law led to the concept of energy as a general measure of all forms of motion and to the understanding of heat as a measure of hidden (chaotic) motion.

Author: D-r Techn.Sc., Prof., Integrative Reseaerch Institute (Israel), ORSID 0000-0003-2815-1284. e-mail: v_a_etkin@bezeqint.net

At the same time, without considering the direction of movement, the concept of momentum $M\upsilon$ was clearly insufficient. Even G. Galileo, through his experiments with cylindrical bodies sliding and rolling down an inclined plane, showed that under the influence of the same "dead force" (gravity), sliding bodies buy a lower speed than sliding ones. This showed the dependence of the amount of motion on its direction. Much confirmation of this was provided by the study of indirect and inelastic impact, when the experimental results turned out to depend on the direction of the velocity, the point of application of the force and the nature of the interaction. As G. Leibniz showed [3], the conserved quantity in these cases is not the total amount of internal motion of the i-th bodies $\Sigma_i M_i\upsilon_i$, but their "living force" $\Sigma_i M_i\upsilon_i^2$.

The resulting dispute about the true measure of momentum could not be resolved by Newtonian mechanics [4]. It went ahead from the laws of motion of a material point devoid of spatial extension. Therefore, for her, not only the concept of internal, but also external rotational motion of a point did not make sense. This significantly simplified the study, making the "applied" force $F = dP/dt$ the only reason for the change in momentum $P = M\upsilon$, cutting the need to take into account the angular momentum. In this case, the constancy of the momentum in a closed system ($F = 0$) at once followed from the very definition of force, which was consistent with the views of Descartes.

The concept of "force impulse" $Fdt = dP$ or simply "impulse" $P = M\upsilon$ as a vector quantity began to be used only with the advent of vector algebra (W. Hamilton, 1845). This made it easier to distinguish between the concepts of "impulse" (vector) and "quantity of motion" (scalar), with the concept of "living force," which was later replaced by the concept of "energy" (T. Jung, 1807). As a result, the incompatibility discovered by Leibniz in a number of experiments between two measures of motion $\Sigma_i M_i\upsilon_i$ and $\Sigma_i M_i\upsilon_i^2$ was explained by the difference in the processes that conduct the transfer and transformation of mechanical energy. The position of G. Leibniz also strengthened, which later resulted in the law of conservation of the sum of potential En and kinetic Ek energy as successors to the concept of "dead" and "living" forces [1]. However, fierce discussions about the incompatibility of the law of conservation of energy with the laws of conservation of momentum and its angular momentum have not

stopped to this day and from time to time spill out onto the pages of not only scientific forums, but also magazines and books [5...14] contrary to the theorem of E. Noether, which classified them as a consequence of the homogeneity and isotropy of space and time [15].

The fundamental importance of the question of the status of the laws of conservation of energy and quantities of motion of various kinds forces us to look for new ways to resolve this protracted dispute. In this article, the question of the status of conservation principles will be considered from the standpoint of the thermodynamics of irreversible processes [16...18], which made the difference in flows and impulses of energy and its energy carriers especially distinct.

II. General Criteria for Energy Conservation

`Differential balance equations for any extensive quantity Θ_i (mass M, number of moles of kth substances N_k, charge Z, entropy S, etc.), a material carrier of energy (for short, an energy carrier), play a key role in field theory [17]. If the local density $\rho_i(r,t) = d\Theta_i/dV$ of any energy carrier Θ_i is arbitrarily distributed in a given volume V, then its change in time $d\Theta_i/dt$ can be due to two reasons: its transfer across the boundaries of the system $d_c\Theta_i/dt = -\int j_i \cdot df$ (where j_i is the density of its flux through the vector element df of the closed surface of the system in the direction of the external normal n), or the presence inside volume V of sources or sinks of this quantity $d_i\Theta_i/dt = \int \sigma_i dV$(where σi is the density of this source) . If we use the Gauss-Ostrogradsky theorem $\int j_i \cdot df = \int \nabla \cdot j_i dV$, this obvious position can be expressed in a simple differential form:

$$d\rho_i/dt + \nabla \cdot j_i = \sigma_i \qquad (1)$$

According to (1), any physical quantity Θ_i remains unchanged in an isolated system (where $\nabla \cdot j_i = 0$) if there is no source in the system ($\sigma_i = 0$). The question of whether any energy carrier obeys this law can be resolved exclusively experimentally [17]. In particular, the law of conservation of internal energy U, written following N. Umov (1873) in the form [19]:

$$dU/dt + \int j_e \cdot df = 0, \qquad (2)$$

(where j_e is the energy flux density through the vector element df of the closed surface of a system of constant volume V in the direction of the external normal n), the balance equation without sources corresponds:

$$d\rho_e/dt + \nabla \cdot j_e = 0. \qquad (3)$$

This expression reflects the experimental fact that internal energy U does not simply disappear at some points in space and appear at others but is transferred across the boundaries of the system by an energy flow with density j_e, W m^{-2} (Figure 1).

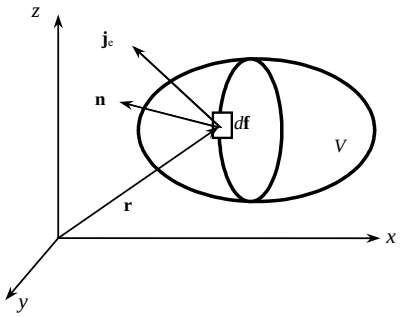

Fig. 1: The flow of energy across system boundaries

To connect the energy flow j_e with the energy carrier flows ji, we express it through its components jei, presenting each of them as a product of the specific energy value (potential)$\psi_i = \partial U/\partial \Theta_i$ by the energy carrier momentum flux density $j_i = \rho \upsilon_i$, where $\rho = dM/dV$ is the density of the system, υi is the transfer speed of the corresponding energy carrier in a fixed coordinate system [18]:

$$j_e = \Sigma_i j_{ei} = \Sigma_i \psi_i j_i, \ \text{Вт м}^{-2} \qquad (4)$$

Flows ji also have the meaning of the momentum of thei-th energy carrier, which makes it necessary to distinguish between the concepts of momentum density $\rho\upsilon$ (scalar) and its momentum $\rho\upsilon$ (vector). After decomposing $\nabla \cdot j_e = \Sigma_i \nabla \cdot (\psi_i j_i)$ into terms $\Sigma_i \psi_i \nabla j_i + \Sigma_i j_i \cdot \nabla \psi_i$, the energy conservation law (3) will take the form [18]:

$$d\rho_e/dt = -\Sigma_i \psi_i \nabla \cdot j_i + \Sigma_i x_i \cdot j_i = 0, \qquad (5)$$

where $x_i \equiv -\nabla \psi_i$ are intensive parameters of the system's heterogeneity, characterizing the "strength" of the potential field ψi (thermal, baric, chemical, electrical, etc.) and called "thermodynamic forces in their energy representation" [17].

From this law it directly follows the connection of sources σi of various energy carriers σi with energy dynamic forces x_i and flows j_i:

$$\Sigma_i \psi_i \sigma_i = \Sigma_i x_i \cdot j_i. \qquad (6)$$

This relationship is fundamentally different from the dissipative function $T\sigma_s$ in the thermodynamics of irreversible processes (IP) [16]

$$T \cdot_s = \Sigma_i X_i \cdot J_i, \qquad (7)$$

(where $X_i \cdot J_i$ are thermodynamic forces and flows) in that it does not make entropy a "scapegoat" for any relaxation processes in a nonequilibrium system. It emphasizes that internal sources exist not only for

entropy σ_s, but in principle for all forms of partial energy U_i, including chemical elements and countless of their compounds that arise or disappear during chemical reactions. They also exist for polarization charges arising under the influence of an external field, as well as for electrons and positrons, as evidenced by the predominance of the latter in fluxes of cosmic particles [20]. Sources also appear in various phases of matter, including baryonic matter as a product of "condensation" of non-baryonic (hidden) matter. Thus, from the law of conservation of energy it follows that it is possible to interconvert not only any forms of partial energy, but also their energy carriers. In this case, a natural question arises about the origin of statements of an opposite nature, moreover, claiming to be laws of nature.

III. Inconsistency of the Laws of Conservation of Momentum and Momentum

It is known that Newtonian mechanics did not consider internal processes occurring in accelerating bodies (material points), believing that they remained in a state of internal equilibrium. In this case, □□ji = 0 for any energy carrier, and the only reason for the change in momentum P = Mυ was the external force F [4]:

$$F = dP/dt. \qquad (8)$$

However, by (1), this expression refers to the source of momentum $\int p_i dV = d_c p_i/dt$. Indeed, in the general case of open systems (exchanging matter with the environment), a change for internal motion in the system Mυ is also possible through the diffusion of matter at a rate different from v. Thus, in reality, I. Newton from the very beginning limited himself to the case when the change in the momentum of bodies Mυ is caused exclusively by long-range forces F, i.e., in a way different from the "convective" exchange of it with the environment. Hence Newton's definition of force (8), relating it to the source of momentum σ_i, and not to its convective term $\nabla \cdot j_i$. Such sources σi should be called "external" σie in contrast to "internal" sources σii, caused by the action of thermodynamic (internal) forces X_i. In this case, the correspondence of the momentum Mυ to the balance equation (1) with sources, i.e., its belonging to non-conserved quantities, would not raise any doubts.

Let us now show that the law of conservation of momentum P = Mυat F =dP/dt does not exist in nature. Formally, this becomes clear already when applying the balance equation (1) to the components $P_\alpha = M\upsilon_\alpha$ of the impulse Mυ (α= 1,2,3), in which in this case the terms σ_α^e of the external source of impulse appear. The same is true for the components of angular momentum $L=I_\omega\omega$, expressed as the product of the moment of inertia I_ω and the angular velocity ω.

However, it may seem that to preserve energy carriers Θ_i, the homogeneity of the system (x_i = 0) is sufficient. In this case, equation (4) takes the form:

$$d\rho_e/dt = -\Sigma_i \psi_i \nabla \cdot j_i \qquad (9)$$

Since in homogeneous systems the potentials ψi are identical at any point in the volume of the system V and can be taken out of the integral sign (2), and $\int \nabla \cdot j_i dV = \int j_i \cdot df = d\Theta_i/dt$in accordance with equation (6), then in integral form this expression is a combined equation of the 1st and 2nd principles of classical thermodynamics in the form of the generalized Gibbs relation:

$$dU = \Sigma_i \psi_i d\Theta_i, \qquad (10)$$

In such systems, energy carriers Θ_i can change due to their transfer across the system boundaries ($\int \nabla \cdot j_i dV \neq 0$), which does not contradict the balance equations (1). However, this does not exclude the presence of external forces F_i and their internal sources σii, i.e., violation of conservation laws. To verify this, let us write relation (6) in integral form, having previously taken out a certain average value $X_i = -\overline{\nabla \psi_i}$ force x_i from the integral sign (6):

$$dU/dt = \Sigma_i \int \psi_i \sigma_i dV = \Sigma_i X_i J_i, \qquad (11)$$

where $J_i = \int j_i dV$ is the impulse of the system as a whole.

It follows that the movement of the system as a whole ($J_i \neq 0$) can only occur if the main vector X_i of internal forces xi is not equal to zero, i.e., there are external forces causing this movement. This position is fully consistent with Newtonian mechanics, but again emphasizes the presence of internal sources of σii, i.e., a violation of conservation laws.

This conclusion seems to contradict the well-known theorem of E. Noether [15], according to which the laws of conservation of momentum and its momentum are a consequence of the homogeneity and isotropy of space. However, we should not forget that these properties of space do not at all mean that the distribution of mass filling this space is uniform. It is known that the density of matter in the space of the universe ranges from 10^{-31} g cm^{-3} in space free from celestial bodies to 10^{18} g cm^{-3} in celestial bodies such as "white dwarfs". Therefore, by general relativity, the properties of space (its curvature and the associated energy-momentum tensor) depend on the distribution of matter in it. Consequently, in real outer space, where the density of matter differs by tens of orders of magnitude, there can be no talk of homogeneity of space.

The above does not apply to the law of conservation of energy, which, by Noether's theorem, follows from the homogeneity of time and therefore has no direct relation to the homogeneity of space. This makes the law of conservation of energy the only law of nature that has no restrictions.

IV. The Principle of Mutual Conversion of Impulses of Translational, Rotational, and Oscillatory Motion

Let us now show that the laws of conservation of any energy carriers, including momentum and momentum, must give way to the principle of their interconversion. It is known that the velocity vector υ can be decomposed into translational w and rotational ω components:

$$\upsilon = w + R\times\omega, \qquad (12)$$

where R is the instantaneous radius of their rotation.

So, the impulse $J=P=M\upsilon$ includes, along with the translational $J^w = Mw$, the rotational part $J^\omega = MR\times\omega$, called angular momentum. Therefore, the law of conservation of momentum ($dP/dt = 0$ at $F = 0$) refers to the sum of the impulses $P_i^w P_i^\omega$ and P_i^ω, i.e., it does not exclude the possibility of mutual transformation of the local momentum and its momentum. For the same reasons, the law of conservation of angular momentum loses its independent status.

The number of processes of inter conversion of impulses cardinally expands when considering the oscillatory motion of energy carriers. The simplest of these processes is wave formation caused by the transfer of a certain amount Θ' of the energy carrier Θ (in this case, mass M) from a position with a radius vector r' to a position r'', i.e. its displacement by a half-wavelength $\lambda/2$ (Figure 2), This reciprocating displacement of the energy carrier Θ by a distance Δr occurs twice during the oscillation period τ, the reciprocal of its frequency ν, and proceeds with an average speed $c_i = \overline{\upsilon_i} = 2|\Delta r|/\tau = \rho\nu$, equal to the product of its length λ and frequency ν, i.e. the speed of wave propagation c in a given medium. The kinetic energy density of these waves is decided by the well-known expression $\rho_\nu = \rho_i c^2/2$. If we take $|\Delta r|$ for the amplitude A_ν of a longitudinal wave with frequency ν, then we directly come to the well-known expression for the energy density of a traveling wave [21]:

$$\rho_\nu = \rho_i A^2 \nu^2/2. \qquad (13)$$

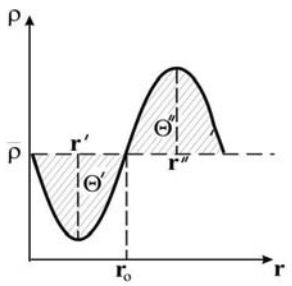

Fig. 2: Wave formation

In accordance with (13), the momentum density of oscillatory motion is determined by the value $j_i^\nu = \rho_i c$. Taking this into account, the momentum density of the i-th energy carrier $j_i = \rho_i \upsilon_i$ already includes three components: translational $j_a^w = \rho_i w_i$, rotational $j_i = \rho_i R_i \times \omega_i$ and oscillatory $j_i^\nu = \rho_i c$. Then

$$dU/dt = \Sigma_i \int x_i (j_a^w + j_i^\omega + j_i^\nu) dV = 0, \qquad (14)$$

According to this expression, when $x_i \neq 0$ the sum of all i-the energy carriers of a heterogeneous system vanishes, but not each of them individually. This implies the possibility of mutual transformation of not only different forms of energy, but also impulses of the same mechanical form, including impulses of translational, rotational, and oscillatory mechanical motion.

V. Transformation of Vibrational Impulse as the basis of the Processes of the Evolution of the Universe

If the fate is that at least 95% of the matter of the Universe is "hidden mass" (non-baryonic matter), which does not participate in any interactions other than gravitational (and therefore is unobservable), then the beginning of the process of its evolution should be associated with it. which leads to the formation of all forms of baryonic matter in the Universe (elementary particles and atoms, molecules and gas-dust clouds, small and large celestial bodies, stars, and galaxies). The process of formation of baryonic matter begins with the appearance of self-oscillations in any part of non-baryonic matter, caused by the instability of the inhomogeneous distribution of its density in the space of the Universe. This process of excitation of vibrations is accompanied by the internal work $dW_\nu = \overline{\upsilon_i}\, d(M_o \overline{\upsilon_i})$ performed on this part of M_o by the hidden mass and the acquisition of vibrational energy by it

$$U^k = W_\nu = \int c dM_{\text{ш}} c = M_o c^2, \qquad (15)$$

decided by the average speed of this movement $\overline{\upsilon_i} = c$. In the absence of dispersion of the speed of light in the

cosmic environment (i.e., with c = const), this energy $U^k$is proportional to the mass M_o involved in the oscillatory process, which served as the basis for the conclusion of the SRT about their equivalence. Meanwhile, this proportionality was set up long before the advent of STR (N. Umov, 1873; J. Thomson, 1881; O. Heaviside, 1990) [22] and expressed the energy that baryonic matter buysas a result of the "condensation" of the ether. Part of this energy $\rho_v=\rho_o c^2/2$ is spent on radiation, the other – on the formation of new structural elements of matter. This is how nuclear, atomic, chemical, thermal, electrical, magnetic, and other forms of internal energy of condensed matter arise successively. Each of these forms is distinguished by the structural features of their material carrier Θ_i, its quantity M_i and the impulse of internal movement $P_i= M_i\upsilon_i$. This sequence of energy conversion processes is confirmed by the fact that the speed of light propagation in baryonic matter decreases (it has a refractive index $n_i = c/c_i>1$), as well as the direct detection of the so-called "baryon acoustic oscillations of the primary plasma of the Universe" [23]. Thus, without the interconversion of impulses and the presence of sources for all forms of energy, the evolution of the Universe would be impossible.

It is easy to verify that these oscillations propagate in outer space in the form of matter density waves by representing the total derivative of the wave energy density $\rho\nu$ as the sum of the convective $(\mathbf{c}\cdot\nabla)\rho_v$ and local $+(\partial\rho_v/\partial t)_\mathbf{r}$ components:

$$d\rho_v/dt=(\mathbf{c}\cdot\nabla)\rho_v+(\partial\rho_v/\partial t)_\mathbf{r}. \qquad (16)$$

It is easy to give this expression the form of a wave equation in its so-called "single wave" approximation:

$$\partial\rho_v/\partial t + c\,(\partial\rho_v/\partial r) = d\rho_v/dt, \qquad (17)$$

in which the term $d\rho\nu/dt$ characterizes the wave attenuation rate. This equation describes a density wave traveling in one direction (away from the source). It is usually called "kinematic" (in contrast to the "dynamic" second order equation, which describes two waves diverging in opposite directions.

Using expression (17), it is easy to imagine the convective part (16) as the product of the driving force of radiative energy exchange $\mathbf{x}_v = -\nabla\psi_v$ by the radiant energy flux density $j_v=\rho_o A_v\nu\mathbf{c}$:

$$(\mathbf{c}\cdot\nabla)\rho_v=x_v\cdot j_v. \qquad (18)$$

It follows that radiant energy exchange obeys the same transfer laws as the processes of thermal conductivity, electrical conductivity, diffusion, etc.:

$$j_v= L_v x_v, \qquad (19)$$

where $\psi_v= A_v\nu$ is the wave potential, which we call amplitude-frequency [24]; L_v is the coefficient of "radiation conductivity" of the medium, like the coefficients of its thermal conductivity, electrical conductivity, diffusion, etc.

According to this expression, a flow of vibrational (radiant) energy occurs when the amplitude or frequency of natural oscillations of baryonic matter becomes less than the corresponding parameters in the source. Since $c_i<c$, such conditions really exist, which decides the ongoing process of its condensation of nonbaryonic matter and its transformation into baryonic matter. The new structural elements of baryonic matter formed in this process have a natural oscillation frequency that is different from the background one, which makes the baryonic matter visible (observable).

An imbalance between absorbed and emitted energy, along with the accretion and ongoing compaction of baryonic matter, leads to concentration of energy in it, heating, synthesis of increasingly "heavy" and complex chemical elements, up to the occurrence of thermonuclear reactions in it and the transformation of planets into stars. All these processes would be impossible in the absence of the transformation of the oscillatory impulse into a rotational and translational one. It is the emergence of new degrees of freedom that leads to an increase in internal pressure and the emergence of a singularity (a state in which known physical laws become invalid). This leads to explosions of so-called "supernovae," the dispersion of matter and its "rupture") with the repetition of the showed "synthesis-decay" cycle in another region of the unlimited space of the Universe. This ensures its permanent development, bypassing the state of equilibrium [25].

VI. Experimental Confirmation of the Possibility of Interconversion of Impulses

The possibility of mutual conversion of impulses of translational and rotational mechanical motion was experimentally proven by the American self-taught N. Dean back in 1956 in his lift, which he directly called "a device for converting a rotational motion impulse into a translational one" [26]. During testing, his car developed a vertical thrust of 2400 kg with a 150 hp engine. With.

This was followed by a public demonstration in 1974 of the effect of the emergence of "gyroscopic thrust" by E. Laithwaite [27]. In his experiments, a spinning gyroscope weighing 10 kg was suspended from one end of the rotor to a vertical string and, when released, began to move in a spiral, causing the suspension to deviate from the vertical.

A similar phenomenon was seen during demonstrations of "Tolchin's cart" (1976), which he called "inerzoid" [7], as well as in its numerous

replications. This is, in particular, the "4-D gyroscope" of the Russian G. Shipov [9], manufactured at the Research Institute of Space Systems [28]. During testing, this version of the inerzoid, called by journalists a "gravity trap," developed a thrust of 1–3 g with dimensions of 200x82x120 mm, weight of 1.7 kg and power consumption of 6–8 W. The device was installed on the Yubileiny satellite, launched in 2008. into the space. However, at the insistence of the Russian Academy of Sciences, it was never tested due to fears that "an experiment in space with the inclusion of a new engine would damage the prestige of Russia due to the "contradiction of the principle of operation of the engine with the fundamental laws of mechanics" [29].

Meanwhile, such converters of rotational motion impulse into translational motion are known not only for mechanical systems. In 2003, British engineer Roger Scheuer introduced the world to a propulsion system called "EmDrive". In the closed conical resonator of this device, a rotating electromagnetic field was created by a conventional magnetron, which during tests in 2006 created a small thrust of 16 millinewtons [30]. Research in this direction received government support, and in August 2013, a message appeared on the official NASA website about evaluating a model of the "corrective" space engine "Cannae Drive" by the American inventor Guido Fett [31]. For eight days, a group of researchers from the Johnson Space Center in Houston (USA) evaluated this engine in various modes and became convinced of its ability to create a thrust of 30-50 millinewtons [32].

A little earlier (in 2009, 2014), in the private Russian campaign "Kvanton", the engine of the Russian V.S. Leonov was evaluated, which he called "quantum" [33]. His device, with a mass of 54 kg and an electrical power consumption of 1 kW, created a vertical thrust impulse of more than 100 N/kW during testing and ensured its vertical take-off along guides with an acceleration of 10...12 g, which is more than 100 times higher than the best liquid-propelled ones. rocket engines.

In 2009–2010, a Chinese research group from Northwestern Polytechnical University, Xi'an, China, led by Prof. Yang Juan built an analogue of the "EmDrive" and confirmed that the engine thrust reached 720 millinewton [34]. In 2016, this engine was evaluated in space on one of the satellites and proved that its thrust is quite enough to correct its orbit.

Despite all this, most physicists still exclude the possibility of creating such installations, since they violate the "laws" of Newtonian mechanics. This gives the analysis of the epistemological reasons given in this article for such a persistent misconception an enduring significance.

VII. Conclusion

As shown above, the laws of evolution, understood as the development of a system, its complication, the acquisition of new properties and forms of motion, etc., conflict with the laws of their conservation, which exclude the emergence of sources in the material carriers of these forms of motion. This incompatibility served as the basis for a more careful study of the origin of conservation laws, which revealed their complete inconsistency. This is especially obvious in relation to momentum, which, with the advent of vector algebra, gave way to the concept of momentum and momentum as measures of ordered translational and rotational motion. Under these conditions, the law of conservation of scalar momentum in any system, put forward by Descartes as the first fundamental law of nature, acquired a different meaning, which does not contradict the principle of conservation of energy in isolated systems only if energy is understood as a quantitative measure of all forms of motion (both observable and hidden). However, modern ideas about energy are very ambiguous and far from this due to the assumption of the existence of purely potential fields [35]. This law also lost force in Newtonian mechanics, since it was limited to closed systems and, in essence, postulated the law of conservation of momentum Mυ by the very definition of force. This deprived the basis for classifying this law as the basic principles of natural science. As for the law of conservation of momentum of internal motion, in closed systems it is always equal to zero, so the very formulation of the problem of its constancy is meaningless. Moreover, external forces in mechanics refer to sources of impulse, which removes the question of the conservation of mechanical impulse and its moment.

A deductive approach to the problem of conservation (from the general to the particular) and the use of strict criteria for the conservation of any field value reveal that the law of conservation of momentum of any energy carrier must give way to the principle of mutual conversion of impulses of internal translational, rotational and oscillatory motion in any polyvariant system. From this principle it follows that the impulse belongs to the emergent properties of the system, allowing the possibility of both its emergence or disappearance, and mutual transformation, like various forms of energy.

The justification of this principle proposed in the article, based on the law of conservation of energy, and its experimental confirmation given in it give it the status of a law of nature and opens up prospects for creating on this basis new devices that carry out movement due to the transformation of the impulse of various forms of energy [36].

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The Nature of Supermassive Black Holes in the Early Universe and the Birth of Baryonic Matter

By Stanislav Konstantinov

Herzen State Pedagogical University

Abstract- The article states that with the help of the James Webb Space Telescope, it was possible to detect in the early Universe in the galaxy A bell 2744 a supermassive black hole (BH) with a mass of $\backsim 10^8$ M⊖, producing powerful radiation during the accretion of gas. It is assumed that to explain such a massive black hole at such an early age of the Universe ($\backsim$500 mil.) years, it will be necessary to introduce dark matter since the BH of stellar origin would not have time to increase its mass to the indicated value. In the early stages of the Universe, only supermassive black holes formed by dark matter with the property of gravity were capable of becoming a baryonic matter factory.

Keywords: dark matter, baryonic matter, black hole, quasar, electron, positron, positronium.

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The Nature of Supermassive Black Holes in the Early Universe and the Birth of Baryonic Matter

Stanislav Konstantinov

Abstract- **The article states that with the help of the James Webb Space Telescope, it was possible to detect in the early Universe in the galaxy A bell 2744 a supermassive black hole (BH) with a mass of ∽10^8 Mʘ, producing powerful radiation during the accretion of gas. It is assumed that to explain such a massive black hole at such an early age of the Universe (∽500 mil.) years, it will be necessary to introduce dark matter since the BH of stellar origin would not have time to increase its mass to the indicated value. In the early stages of the Universe, only supermassive black holes formed by dark matter with the property of gravity were capable of becoming a baryonic matter factory.**

Keywords: dark matter, baryonic matter, black hole, quasar, electron, positron, positronium.

I. Introduction

Today, with the creation of the largest space telescope, the James Webb Space Telescope, astrophysicists have the opportunity to look into the depths of the Universe, 13 billion years old in the infrared, and there they did not see the expected picture of the Big Bang. In July 2022, a large group of astrophysicists published an article called "Panic!" [1]. The gravitational lens created by the galaxy cluster Abell 2744 at redshift z=0.308 allowed the telescope. J. Webb to observe 11 galaxies at redshifts z > 9, estimated by the photometric method [2]. The X-ray emission of one of these galaxies at z≈10.3 was then measured by the Chandra Space Observatory, and it was concluded that the galaxy contained a supermassive black hole (BH) with a mass of ∽10^8 Mʘ, producing powerful radiation during gas accretion [3]. The mass of such a black hole is comparable to the mass of all the stars in the galaxy, while in modern galaxies, the mass of the central black hole is ∽0.1% of the mass of the stars. In addition, it is difficult to explain the presence of such a massive black hole in that era when the Universe was ∽500 million years old. A black hole of stellar origin would not have time to increase its mass to the indicated value. In the new cosmology, a dark matter halo can act in the primary Universe as a reasonably dense object that can shrink (collapse) under the influence of gravitational forces into a black hole. The question arises whether astrophysical dark matter core–halo configurations can form at all and whether they remain stable on cosmological time scales. The authors of the article "On the formation and stability of fermion halos of dark matter in a cosmological framework" give an affirmative answer to this question [4]. Moreover, their results prove that a dark matter halo with a core–ho morphology is a very likely outcome during the nonlinear stages of black hole structure formation. Having become acquainted with the bipolar theory of gravity by Valery Etkin, one may wonder what will happen to the dimensions of the Schwarzschild sphere if gravitational forces are calculated not according to Newton's law, but according to the bipolar law of gravity (more substantial)? [5]. It is easy to calculate the Schwarzschild radius (gravitational radius) of any body within the framework of classical concepts. It is necessary to take the formula for calculating the second escape velocity:

$$v2 = \sqrt{(2GM/r)}, \qquad (1)$$

where v2 is the escape velocity. M is the mass. r is the radius. G is the gravitational constant. the proportionality coefficient established experimentally. Its meaning is constantly being clarified: it is now taken to be 6.67408 × 10^{-11} m^3 kg^{-1} s^{-2}. Let v=c. We make the necessary replacement in the equation and get: $r_g = 2GM/c^2$. where r_g is the gravitational radius. On the right side of the equation we have two constants - the gravitational constant and the speed of light. So the Schwarzschild radius is a quantity that depends only on the mass of the body and is directly proportional to it. To get some idea of the size of the Schwarzschild radius. we point out that for the Sun it should be slightly less than 3 km. That is. if the entire mass of the Sun is inside a sphere of such a radius. then the Sun will turn into a black hole. Since the Schwarzschild radius for the sun is 3 km. then for a supermassive black hole with a mass of a billion solar masses. the Schwarzschild radius will be about $3 \cdot 10^{12}$ km. The observed size of the massive accretion disk in galaxy III Zw 002. which is located at a distance of about 22 million light years from Earth. is about 52.4 light days or $150 \cdot 10^{11}$ km. Professor Valery Etkina proposed a new law of gravitational interaction of masses. which asserts the existence of forces of both attraction and repulsion depending on the sign of the density gradient of matter. [5]. He found the conditions under which the new law transforms into Newton's law of gravitation and showed the existence of "strong" gravity. many orders of magnitude greater than Newton's gravitational forces [5]. Using the principle of equivalence of mass and energy, which, when applied

Author: Department of Physical Electronics, Herzen State Pedagogical University, Saint Petersburg RSC "Energy", Russia.
e-mail: konstantinov.s.i@yandex.com

to any (baryonic and non-baryonic) continuous medium with mass M, has the form $U = Mc^2$ Professor Etkin, using the concept of energy density of the gravitational field $\rho g = dUg/dV = \rho c^2$ (J/m^3), where $\rho = dM/dV$ is the density of matter, obtained the potential of the gravitational field:

$$\psi g = dUg/dM = d\rho g/d\rho = cg^2, \qquad (2)$$

where $c = cg = const$, i.e., the square of the propagation velocity of perturbations in the gravitational field.

By analogy with the concept of the strength of the electric and magnetic fields, Etkin introduced the concept of the strength of the gravitational field $Xg = -\nabla\psi g$, then Xg is expressed in terms of the density gradient of the substance $\nabla\rho$ by a simple relation:

$$Xg = -cg^2\nabla\rho/\rho, \ (кг/м^2 \cdot с^2). \qquad (3)$$

Professor Valery Etkin called this expression the binary law of gravitational interaction, since, in accordance with it, gravitational forces can have a different sign depending on the sign of the density gradient Vp. Since $Xg = -\rho g$, then, in accordance with (3), the value of acceleration in the gravitational field g is proportional to the relative gradient $\nabla\rho/\rho$ of the matter density:

$$g = \psi g\nabla\rho/\rho, \ м\ с^{-2} \qquad (4)$$

Professor Etkin writes that, according to (3, 4), the acceleration g in a gravitational field is always codirectional with the gradient density of matter $\nabla\rho$ and therefore can have a different sign depending on the nature of the distribution of matter in a particular region of the Universe space. However, Etkin points out that his binary law of gravity differs in many respects from Newton's law. First of all, this law is applicable to continuous media in which it is impossible to distinguish "field-forming" or "test" bodies with masses M or m. This makes it indispensable for the "hidden" mass of the Universe ("dark" matter), since it does not require knowledge of its other parameters that cannot be measured by modern means. This gives the laws of gravitational interaction (3) and (4) a "paradigm" meaning, far beyond the scope of a simple generalization of Newton's law.

II. Quasars - Factories of Baryonic Matter in the Early Universe

In recent years, deep analogies with thermodynamics have been discovered in the physics of black holes. In September 2021, Professors Xavier Calmett and Folkert Kuipers from the Department of Physics and Astronomy at the University of Sussex published a report that the structure of black holes is more complex than previously thought, and quantum gravity can lead to pressure black holes on the quantum environment. Xavier Calmett said: "Our finding that Schwarzschild black holes have a pressure as well as a temperature is even more exciting given that it was a total surprise. Hawking's landmark intuition that black holes are not black but have a radiation spectrum similar to that of a black body makes black holes an ideal laboratory to investigate the interplay between quantum mechanics, gravity, and thermodynamics" [6]. A black hole, generally speaking, is characterized by several macro parameters: mass, electric charge and angular momentum. In the absence of the latter two, the area A of the black hole's event horizon and its entropy S are proportional to the square of the black hole's mass M. The formula for the entropy of a black hole, in this case, has the form:

$$S = \alpha M^2 kG/hc \qquad (5)$$

Where are the fundamental physical constants $G = GN$ involved; $c = cE$; $h = hP$; $k = kB$:

GN - Newtonian gravitational constant,

cE is the speed of light in Einstein's special theory of relativity,

hP is Planck's constant of quantum theory,

kB is the Boltzmann constant of thermodynamics.

One can check that they are dimensionally independent. This is precisely what Max Planck took advantage of, proposing to make them the basis of a natural system of physical units. Planck, at the turn of the nineteenth and twentieth centuries, together with the idea of quanta and Planck's constant, found universal (not dependent on our arbitrariness, but only on nature, more precisely, on GN; cE; hP; kB) Planck quantities (dimensions) of length, time, mass and temperature. What the so-obtained Planck scales are responsible for in nature is still unclear to physicists, but this become clearer as we move toward a unified field theory. Planck values are considered a fundamental scale, at which, for example, the concept of continuous space-time ceases to be applicable. It is also believed that the Planck units (Planck quantities) determine the limits of applicability of modern physical theories and, therefore, should play a significant role in their unification. However, today there is an obvious contradiction in Planck's theory related to the thermodynamics of black holes. How does the colossal energy $nh\nu$, where n can be a considerable number, go to one oscillator with a negligible average energy U? In addition, we add that the frequency ν in the radiation spectrum changes continuously from zero to infinity without any distinguished harmonics, and it becomes completely incomprehensible and illogical that a single oscillator should have a huge number of such frequencies in its stock. It turns out that in the visible

region of the spectrum, the oscillator can be excited to a colossal energy nhν, comparable to the energy of hard X-rays, still, at the same time, it can emit only a tiny piece of this energy hν, and the rest of the energy of the oscillator (n-1)hν is, as it were, "frozen " and cannot be realized in any form, at least in non-radiative processes. A similar paradox in Planck's quantum theory was also found in nanotechnology. On July 21, 2020, a scientific group from Peter the Great St. Petersburg Polytechnic University was able not only to detect, but also theoretically explain a previously unknown physical phenomenon, an increase in the amplitude of mechanical vibrations without any external influence [7]. Members of the scientific group V.A. Kuzkin and A.M. Krivtsov discovered a physical paradox, according to which the excitation of mechanical vibrations occurred due to internal thermal resources. This open physical phenomenon is called ballistic resonance (Figure 1) [7].

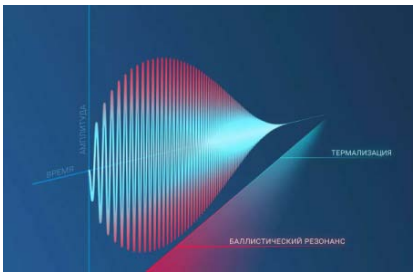

Figure 1: A new physical phenomenon - ballistic resonance

Here's what the authors of the discovery themselves write: "To understand the essence of the process, one can imagine the most ordinary swing. So it was generally accepted that without external influence, it is simply impossible to achieve oscillatory resonance. ... But the scientific group discovered a physical paradox, according to which the excitation of mechanical vibrations occurred due to internal thermal resources (that is, the swing swung by itself). The phenomenon of ballistic resonance lies in the fact that during the heat equalization process, mechanical vibrations arise in the crystal lattice of the material, the amplitude of which is raster over time" [7]. That is, if different subsystems of one system that move in resonance but with a phase shift are considered as swings and external influences, then it is possible to transfer energy from a subsystem oscillating with a lower amplitude (temperature) to a subsystem oscillating with a larger amplitude (temperature). But the growth does not occur indefinitely, but reaches a certain value and then gradually fades away, and the temperature equalizes along the entire crystal. In this case, the resonant frequencies do not have to coincide, but their diversity is sufficient. If, simultaneously, one learns to divert part of the energy from the subsystem that increases the amplitude of its oscillations, then this will be a perpetual motion machine of the second kind. It is well known that non-radiative energy transfer processes from one excited center to another with partial or complete dissipation of energy into the crystal lattice or with radiation of this energy are very well developed in a solid, especially in crystals. In addition, one can ask the question: what atom or molecule can be excited to a considerable energy nhν, and at the same time, they are preserved without being destroyed? Apparently, in Planck's theory, any reasonable physics ends, and abstract modeling begins, which has nothing to do with natural phenomena. This happened, in all likelihood, due to the fact that no one at the beginning of the 20th century proposed the present, i.e., solution of this problem free from any contradictions.

At the edge of a black hole, the physical vacuum is in a conditionally stressed state, resulting of which it is polarized in a quantum manner. Nothing of the kind follows from Einstein's General Theory of Relativity. Einstein's general relativity, in general, is incompatible with quantum concepts. Studying the behavior of quantum fields near a black hole, Stephen Hawking predicted that a black hole necessarily radiates particles into outer space and thereby loses mass [8]. This effect is called Hawking radiation (evaporation). Vacuum polarization occurs under the influence of monstrous gravitational and magnetic fields, as a result of which the formation of not only virtual but also real particle-antiparticle pairs is possible. According to Hawking, on the surface of the event horizon, the direction of expansion of the generated particles ceases to be random, i.e., it becomes polarized, namely, orthogonal to the surface of the black hole [8]. The existence of stable Hawking radiation - the process of emission of various particles by a black hole - was first proved by specialists from the Israel Institute of Technology [9]. A report of the production of a substance with properties identical to plasma in the vicinity of a black hole also appeared in a joint work of Russian, Japanese, and French researchers from the LaPlaz Institute, the National Research Nuclear University MEPhI, and the CELIA laboratory of the University of Bordeaux, published in 2020 [10]. Black hole accretion disks were obtained in laboratory conditions. This structure results from the fall of diffuse material with spinning momentum onto a massive central body (accretion) around neutron stars and black holes. Compression of matter, as well as the release of heat due to friction of differentially rotating layers, leads to heating of the accretion disk. Therefore, the accretion disk emits thermal electromagnetic and X-ray radiation. Experiments have shown that the technique developed by an international group makes it possible to create not only quasi-stationary magnetic fields of record magnitude, but also to simulate the state of plasma emerging in them with a high energy density of matter - 10^{18} particles per cm^3. The uniqueness of the experiment is that the parameters of the resulting

plasma do not need to be scaled; they correspond to the fundamental parameters of the plasma in the vicinity of the black hole of binary systems like Cygnus X-1 (Fig. 2) [10].

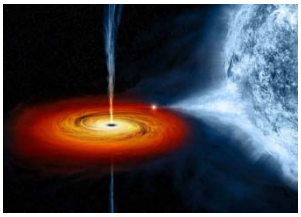

Figure 2: Black water Swan X-1

Later, researchers at the University of Manchester, led by Nobel Prize winner Andre Geim, discovered that inside graphene, it is possible to recreate conditions identical to those in which matter emerges from the vacuum in the vicinity of black holes and other space objects [11]. In laboratory experiments, they reproduced the Schwinger effect using very narrow strips of graphene. In this case, super-powerful electric or magnetic fields will act on the vacuum so that virtual particles and antiparticles forming dipole structures - positronium - will break apart and form very real positrons and electrons [11].

The experiment showed that the technique developed by the international group makes it possible to create quasi-stationary magnetic fields of record magnitude, and to simulate the state of the plasma arising in them with a high energy density of matter and electromagnetic energy. As a result, we get an electron-positron mixture near the black hole, consisting of approximately equal numbers of negative electrons and positive positrons. In a free state, electrons and positrons annihilate - this is an indisputable fact. However, in the accretion disk, electrons and positrons are not entirely free. They continue to rotate by inertia within the plasma disk at about the speed of light. And it is this speed, or rather the force of inertia, that keeps them from direct collisions and complete mutual destruction. At this stage, electrons and positrons form dipole structures - positroniums. Experimentally, such a pair was discovered in 1951 by the German physicist Martin Deutsch (Figure 3) and reliably established by Professor DB Cassidy and his assistant A. P. Mills, Jr. in 2007 [12].

Figure 3: Positronium atom

Positronium has stable, compact states with high binding energies, which can be interpreted as particles and unit cells of the quantum vacuum structure. Positronium has a mass of two electronic, and its energy in the ground state of E = 3727.77 63161411854 eV. The work of Academician of the Russian Academy of Sciences R.F. Avramenko shows that in the excited state, the vacuum has a lower energy than in the ground state [13]. Cassidy and Mills calculated that in their experiment, the density of positronium atoms was 10^{15} per cm^3. Calculations show that with an increase in this density by three orders of magnitude, these atoms at a temperature of 15 kelvin will merge into a single quantum system — Bose-Einstein condensate [12]. Under normal conditions, a vacuum quantum behaves like a quasiparticle in a condensed state. In a state of excitation, a vacuum quantum loses its original state and passes into a new one - into the state neutron n^0 (1840;1;0), which then transforms into three particles, proton p^0(1836;1;1), electron e^-(1;1; -1) and antineutrino γ^-(1;-1;0) [14]. During the birth of a neutron, several types of elementary particles are released. They form the corresponding radiation, by the combination of which one can detect the processes of production of the proton, deuterium, and tritium neutrons:

γ-quanta γ^-(0;1;0) and γ^+(0;1;0) – form γ-radiation;

neutrino ${}^{b}\gamma^-$(-1;-1;0) and γ^+(1;1;0) – neutrino radiation;

electrons and positrons ${}^{W}e^-$ (-1;-1;-1) and e^+(1;1;1) – forms β-radiation;

generated single neutrons n^0 (1840;1;0) give neutron radiation;

neutrons grouped in pairs form α-radiation [14].

It is in this interstellar medium that cold nuclear fusion occurs, allowing the creation of thermal background radiation from the Universe in the microwave range from 10 GHz to 33 GHz. When a vacuum is irradiated by external γ quanta, the vacuum must be transformed into a substance, in which case the above five types of radiation will be present, and high energy and temperature will also be released [14].

However, the massive appearance of neutrons on the outskirts of the plasma disk marks a fundamentally new stage in formation of mother in the infinite Universe, the evolution of which does not require a Big Bang and has no beginning and end. From this moment on, the conveyor for the production of chemical elements begins to operate. Experimental physics has reliably established that a free neutron decays into a proton and an electron in about 15 minutes. Thanks to this, the most common substance in the Universe is born - hydrogen. Hydrogen atoms gradually accumulate around the rotating disk of protoplasm and envelop it in a reasonably dense layer. At some point, the density of the hydrogen blanket reaches a critical value, and the free escape of neutrons from the plasma disk becomes difficult. The next cycle of synthesis of atoms of matter begins. This is the next chemical element of the periodic

table - helium. Such processes of wrapping a neutron centrifuge in a gas cushion are repeated for each new chemical element. The further we move along the periodic table, the denser the outer nucleon layer becomes, and the fewer atoms of a new substance are formed at the output. Therefore, in our Universe, hydrogen makes up 70% of the total mass of all chemical elements. The described process allows us to understand how the synthesis of all chemical components of the universe proceeds. This is not explosive thermonuclear fusion in the depths of several generations of stars still the careful assembly of atoms of chemical elements from elementary particles using a high-speed plasma centrifuge. This synthesis of bits of matter, unlike thermonuclear fusion, is a highly energy-consuming process. In our case, the source of energy is a black hole. To be completely precise, its mass is multiplied by the square of the speed of light. Despite the colossal amount of this energy, the synthesis of chemical elements must stop sooner or later. Later, astrophysicists found that there are galaxies are living with quasars, but they are cold, that is their reserves of cold gas are not depleted, and the birth of stars can continue (Fig. 4) [15].

Figure 4: Galaxy CQ4479 is capable of producing about 100 stars per year

Allison Kirkpatrick, an assistant professor at the University of Kansas at Lawrence, said: "Galaxy CQ4479 shows us that the existence of active black holes does not always stop the birth of stars." This statement contradicts modern scientific knowledge about such systems [15]. In addition to baryonic matter, astrophysicists have found that quasars of supermassive black holes in the centers of galaxies serve as the source of almost all neutrinos that reach Earth from space [16]. Neutrinos, which travel at very high speeds, are a good candidate for hot dark matter. In particular, they do not emit or absorb light - they appear "dark." It has long been assumed that neutrinos, which come in three different types, have no mass. However, experiments have shown that they can change (fluctuate) from one species to another. Importantly, scientists have shown that this change requires them to have mass - making them a legitimate candidate for hot dark matter. A few years ago, physicists at the Pierre Auger Observatory discovered the first hints that all these particles are of extragalactic origin. Three years ago, researchers from the Antarctic IceCube Neutrino Observatory found one of the possible sources of these neutrinos - the blazar TXS 0506+056. The blazar is located in the constellation Orion, the light from which takes about 4.33 billion years to reach Earth. The formation of superluminal neutrinos is associated with the collision of ultrahigh-energy protons with surrounding photons, in which neutrinos appear, and a proton disappears. Protons or heavier nuclei accelerated to ultra-high energy near the dark hole collide with atomic nuclei or low-energy photons. In this case, π- and K-mesons are formed, the decay of which produces high-energy cosmic neutrinos. It can be assumed that baryonic matter (proton) turned into a particle of hot dark matter (neutrino) with energy absorption. The process leading to the creation of gamma rays and neutrinos generated by the interaction of protons accelerated to ultra-high energies with matter is presented in (Fig. 7) [16].

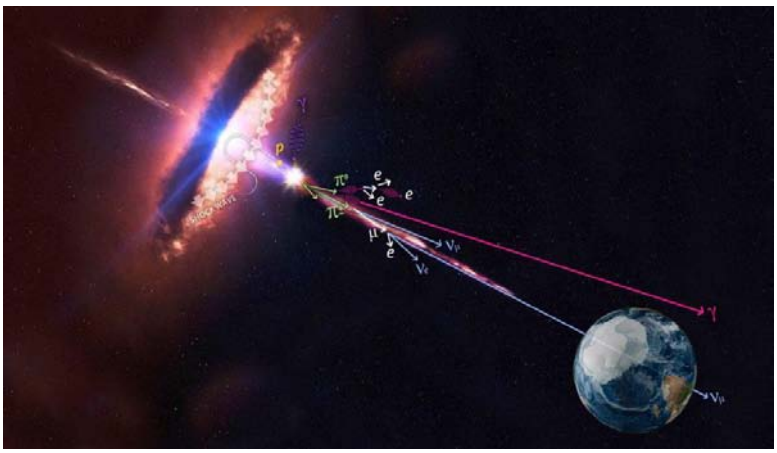

Figure 7: Artistic depiction of how blazar accelerates protons that generate pions, which in turn create neutrinos and gamma rays. Neutrinos are always the result of hadron reactions. Gamma rays can appear in both hadron and electromagnetic interactions

One of the possible reactions during the interaction of protons accelerated in the vicinity of a dark hole with matter is described by formula (6)

$$p + X \rightarrow \pi^0 + Y \rightarrow \gamma + \gamma + Y \quad (6)$$

Although neutrinos react very weakly with matter, the likelihood of a reaction increases with energy, which is why superluminal neutrinos have been detected with confidence by the IceCube Observatory.

III. Conclusion

Thus, new astronomical observations of recent years say with all certainty that black holes formed by both dark and baryonic matter in their development into quasars become not a gravedigger of baryonic matter, but a factory of baryonic matter for new galaxies not only in the early Universe, but and in our time.

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Alternatively, you can download our basic template from https://globaljournals.org/Template.zip

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Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

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The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

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It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

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The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Tips for Writing a Good Quality Science Frontier Research Paper

Techniques for writing a good quality Science Frontier Research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

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6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

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10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

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22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

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- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
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- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

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Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

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This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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