About the Gravitational Interaction of Photons

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Abstract

In the following article, the author theoretically proved that during a threshold frequency of electromagnetic radiation equal to Planck's frequency, this radiation, under the influence of the force of gravity between photons, will stop. The energy will transform itself into so-called 'dark energy'. This 'dark energy' affects gravity, yet it does not move or does not oscillate in the real sense of the term. Another observation regarding gravitational energy is that it is dependent upon the ratio of Planck's length and the distance between two interacting objects, as well as the ratio of the multiplied energies of two interacting particles to Planck's energy, which are a part of the constants of nature. Further results can be obtained through further theoretical and practical research.

Keywords: Absolute zero; Bound state; Dark energy; Electromagnetism; Frequency; Gravity; Kinetic energy; Oscillation; Photons; Planck's constants; Radiation

Introduction

The author has finished a technical university education with a Slovak equivalent of the Masters of Science or MSc. and has further educated himself in the fields of physics and mathematics throughout his life. Mathematical language used is only trivial in nature, as its transcription into vector and tensor script has been deemed unnecessary by the author in the early stages of research, yet it can be supplied if required. The author has discovered multiple irregularities within his studies of physics, which were often caused by not always accurate obtainment of results. The field of mathematics contains certain limits for the analytical calculation of functions of differential equations and while numerical methods can give us the expected values, the analytical descriptions of functions are not known in their full range of values. These numerical methods fail especially in borderline conditions, which is exactly what the author focuses on. Hence, the priority is not to define borderline conditions and then use numerical methods to solve the course of values of functions in particular intervals, but to correctly identify these boundaries and then use the force of numerical solutions. Furthermore, while it is not yet possible to prove the practical implications of this theory, it is useful to have a theoretical basis which would motivate us towards such

improvements in technology, rather than slow this progress, unlike the current theories of Special and General Relativity Theories.

The author believes that the main objective of physics is discussion, which is currently not maintained in the field of Einstein's physics, which can be taken quite dogmatically. The base of Einstein's Special and General Relativity Theories present a barrier to the evolution of physics and the author would like to disturb these stereotypes and offer his own critical opinion. Throughout this article the only idea in accordance to Einstein's theory is that the speed of light is equal to the speed of photons (particles with zero rest mass). For particles that do not have zero rest mass the limitation of maximum speed is in accordance to quantum-mechanical constants. The author wants to suggest that the main disproportions are only apparent when mass is included in the formulas, which is not necessary when dealing with photons, as their resting mass is equal to zero.

In the following article the author consciously prioritised the original Newtonian view on gravitation, over Einstein's General Relativity Theory and his geometrical interpretation of space-time curved by mass, in combination with the theory of quantum-mechanics.

Hypothesis

During the so-called threshold frequency of electromagnetic radiation, equal to Planck's frequency, will this radiation, under the influence of gravity between photons, stop and become 'dark energy'.

Practical Limitations

Energy equal to around 14, 000 GeV is currently used in existing accelerators, which is approximately 10^{-6} Joules and the energy required to prove the practical implications of this theory is 10^9 Joules, which represents energy 10^{15} times greater than what is possible in current accelerators.

According to the author, the practical proof could also be acquired through using the reverse order and that is to cool down the mass or photons, to the temperature of absolute zero, during which the photons exist in a bound state of gravitational and kinetic energy (they have the same size, they are just oriented in an opposite manner). Once the barrier of the temperature of absolute zero is overcome, this bound state will break and both energies are going to be separated from each other, which will cause an immediate rise of the temperature of photons to Planck's temperature equal to Tp=9, 455×10^{31} K. The author believes that absolute zero and the highest temperature within the limit of Planck's radiation frequency are equal. This means that there is a pulsation around these temperatures, pulsating from maximum temperature to minimal temperature and back. This is shown in FIG. 1.
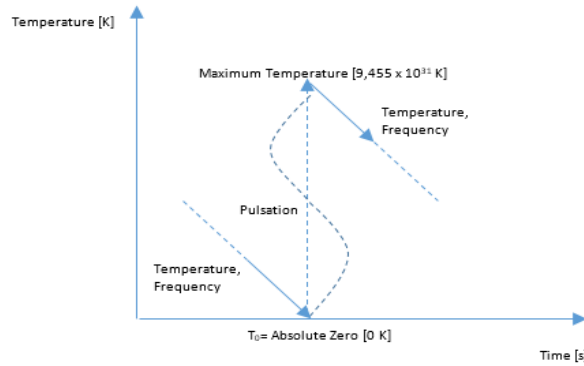
FIG. 1. **Diagram explaining the automatic rise of temperature from absolute zero to Plank's temperature.**

The author is unaware of any other methods of obtaining the above stated energy and in his opinion it can only be found in observations of space, such as evaporation or interaction of black holes [1-14].

Method

Take a ray, which is created by a flow of localized quantities of concentrated energy (photons). We are going to define the energy of these quanta within the range of corpuscular wave dualism using frequency f and Planck's constant h, also known as reduced Planck's constant $\hbar = h/2\pi$ and the circular frequency ω:

$$E = h f = h\omega \left[J \right]$$

The relationship between the frequency of the photon and its circular frequency is:

$$f = \frac{\omega}{2\pi} \left[s^{-1} \right]$$

We then define the quantity T=the duration of vibration of the photon:

$$T = \frac{1}{\omega} = \frac{1}{2\pi f} \left[s \right]$$

The wavelength of the photon λ is defined as:

$$\lambda = 2\pi cT = \frac{2\pi c}{\omega} \left[m \right]$$

The radius of the photon R is equal to the distance between photons and it is defined as:

$$R = cT = \frac{c}{\omega} = \frac{c}{2\pi f} \left[m \right]$$

We are assuming that the composition of the ray is made up of entities of equal frequency (monochromatic radiation), with the distance between them being equal to the radius of the photon R, as shown by FIG. 2.
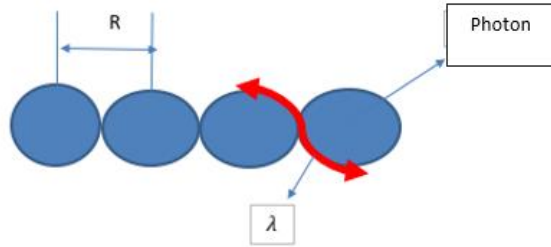
FIG. 2. **Diagram picturing photons of equal radius with the wavelength of a photon.**

We apply Newton's gravitational law in the following way: Gravitational force can be written in the following way:

$$F = k \frac{m_f m_f}{R^2}$$

Where:

m_f dynamic weight of the photon in kg (while the rest mass is equal to zero).

The coefficient of proportion κ will be identified using Planck's constants:

$$K = \frac{x_p c^4}{E_P} = (6,6742 \pm 0,0010) \times 10^{-11} m^3 kg^{-1} s^{-2}$$

Where:

X=1, 61624.10^{-35} m smallest also known as Planck's length

Tp=5, 391.10^{-44} s Planck's shortest time

Ep=1, 956.10^{9}J Planck's energy

C=2.998.10^8 m.s^{-1} the speed of light in a vacuum

h=6, 625.10^{-34} J.s Planck's constant

h=1, 055.10^{-34} J.s Reduced Planck's constant.

Then, gravitational force can be written as:

$$F = \frac{x_p c^4}{E_P} \frac{m_f m_f}{R^2} = \frac{x_p}{R^2} \frac{m_f c^2 m_f c^2}{E_p}$$

and gravitational energy can be written as:

$$E_g = F\,R = \frac{x_p}{R} \frac{m_f c^2 m_f c^2}{E_p}$$

where $m_f c^2 = E_f$ Einstein's kinetic energy of a photon.

While the following applies:

$$E_k = m_f c^2 = h\omega$$

and

$$R = \frac{c}{\omega}$$

then the gravitational energy of two photons can be written as:

$$E_g = \frac{x_p}{R} \frac{(h\omega)^2}{E_p} = \frac{x_p}{E_p} \frac{h^2\omega^2}{c} = \frac{E_k^2}{E_p} \frac{x_p}{R}$$

Therefore: $E_g E_p = E_k^2 \dfrac{x_p}{R}$

(This equation of gravitation is true in general for two particles with both zero resting mass and resting mass that does not equal to zero.)

We can define the relative decrease in the energy of the photon as a consequence of gravitation as a ratio of gravitational to kinetic energy:

$$\Delta = \frac{E_g}{E_k}$$

For example, for medium yellow radiation with the angular frequency $\omega = 5,2.10^{14}\, s^{-1}$ the kinetic energy is equal to:

$$\omega = 5,2.10^{14}\, s^{-1}$$

$$E_k = h\omega = 1,055 \times 10^{-34} \times 5,2 \times 10^{14} = 5,487 \times 10^{-20}\, J$$

and gravitational energy:

$$E_g = \frac{x_p}{E_p} \frac{h^2\omega^2}{c} = \frac{1,616 \times 10^{-35} \times \left(1,055 \times 10^{-34}\right)^2 \times \left(5,2 \times 10^{-14}\right)^3}{1,956 \times 10^9 \times 2,998 \times 10^8}$$

$$E_g = 4,311 \times 10^{-77}\, J$$

And lastly the relative decrease of the energy of the photon as a result of gravity:

$$\Delta = \frac{E_g}{E_k} = \frac{4,311 \times 10^{-77}}{5,487 \times 10^{-20}} = 7,856 \times 10^{-58}$$

If we set the gravitational energy to be equal to the kinetic energy of the photon $E_p = hf$, we will get the threshold value of the frequency, during which the gravitational pull of the photons will be equal to the kinetic energy of the photons and the flow of currents will calm down (stop):

$$E_P = E_g$$

Hence,

$$h\omega = \frac{x_p}{E_P} \frac{h^2 \omega^2}{c}$$

Hence, the threshold frequency $\omega_{\mathrm{marginal}}$

$$\omega_{\mathrm{marginal}} = \sqrt{\frac{cE_p}{x_p h}} = \sqrt{\frac{2,998 \times 10^8 \times 1,956 \times 10^9}{1,616 \times 10^{-35} \times 1,055 \times 10^{-34}}} = 1,855 \times 10^{43} s^{-1}$$

During the angular frequency of $1,855 \times 10^{43}$ s^{-1}, [which] is Planck's angular frequency ω_p the gravitational power of photons will outweigh the kinetic energy of photons and the flow of localised quant-energy will stop, hence the hypothesis that the photon flow will collapse into singularity emerges and the temperature of photons will be equal to Planck's temperature $T_p = 9,455 \times 10^{31} K = 0K$.

Maximum temperature will jump to the temperature of absolute zero, because the flow of photons will come to a stop.

It is questionable whether the photon called the 'black photon' will also have the properties of a graviton, as particles of gravitational interaction. The duration of its lifespan will be equal to Planck's time $t_p = 5,39 \times 10^{-44}$ s and the remaining parameters are given in the TABLES 1 to 3.

Even though we cannot measure the wave sources of such frequency and we also do not have the ability of constructing such a source, we can possibly gather such sources from the universe during extraordinary circumstances (such as during the gravitational impact of black holes etc.).

TABLE 1. **Table showing certain calculated quantities for various angular frequencies of radiation/photons.**

Name of quantity	Angular frequency of photon	Duration of oscillation	Radius of photon	Frequency of photon	Wavelength of photon
Formula	ω	$T=1/\omega$	$R=cT$	$f=\omega/2\pi$	$\lambda=2\pi R=2\pi cT=2\pi c/\omega$
Unit	s^{-1}=Hz	s	m	s^{-1}=Hz	m
Name of photon/number of colon	1	2	3	4	5
Biggest photon	1, 000E+00	1, 000E+00	2, 998E+08	1, 592E-01	1, 883E+09
Technical alternating currents	5, 000E+01	2, 000E-02	5, 996E+06	7, 962E+00	3, 765E+07
	1, 000E+02	1, 000E-02	2, 998E+06	1, 592E+01	1, 883E+07
	1, 000E+03	1, 000E-03	2, 998E+05	1, 592E+02	1, 883E+06
	1, 000E+04	1, 000E-04	2, 998E+04	1, 592E+03	1, 883E+05
Long waves	2, 000E+05	5, 000E-06	1, 499E+03	3, 185E+04	9, 413E+03
Medium waves	1, 000E+06	1, 000E-06	2, 998E+02	1, 592E+05	1, 883E+03
Very short waves	3, 000E+08	3, 333E-09	9, 993E-01	4, 777E+07	6, 276E+00
Microwaves	1, 000E+10	1, 000E-10	2, 998E-02	1, 592E+09	1, 883E-01
	2, 000E+10	5, 000E-11	1, 499E-02	3, 185E+09	9, 413E-02
	4, 000E+10	2, 500E-11	7, 495E-03	6, 369E+09	4, 707E-02
	8, 000E+10	1, 250E-11	3, 747E-03	1, 274E+10	2, 353E-02
	1, 600E+11	6, 250E-12	1, 874E-03	2, 548E+10	1, 177E-02
	3, 200E+11	3, 125E-12	9, 369E-04	5, 096E+10	5, 883E-03
	6, 400E+11	1, 563E-12	4, 684E-04	1, 019E+11	2, 942E-03
Infrared radiation	1, 280E+12	7, 813E-13	2, 342E-04	2, 038E+11	1, 471E-03
	2, 560E+12	3, 906E-13	1, 171E-04	4, 076E+11	7, 354E-04
	5, 120E+12	1, 953E-13	5, 855E-05	8, 153E+11	3, 677E-04
	1, 024E+13	9, 766E-14	2, 928E-05	1, 631E+12	1, 839E-04
	2, 048E+13	4, 883E-14	1, 464E-05	3, 261E+12	9, 193E-05
	4, 096E+13	2, 441E-14	7, 319E-06	6, 522E+12	4, 596E-05
	8, 192E+13	1, 221E-14	3, 660E-06	1, 304E+13	2, 298E-05
Visible radiation	3, 800E+14	2, 632E-15	7, 889E-07	6, 051E+13	4, 954E-06
Medium red radiation	4, 600E+14	2, 174E-15	6, 517E-07	7, 325E+13	4, 093E-06
Medium yellow radiation	5, 200E+14	1, 923E-15	5, 765E-07	8, 280E+13	3, 621E-06
Medium green radiation	5, 750E+14	1, 739E-15	5, 214E-07	9, 156E+13	3, 274E-06
Medium blue radiation	6, 700E+14	1, 493E-15	4, 475E-07	1, 067E+14	2, 810E-06
Medium violet radiation	7, 500E+14	1, 333E-15	3, 997E-07	1, 194E+14	2, 510E-06
	3, 300E+15	3, 030E-16	9, 085E-08	5, 255E+14	5, 705E-07
Ultraviolet radiation	1, 000E+16	1, 000E-16	2, 998E-08	1, 592E+15	1, 883E-07
	1, 000E+17	1, 000E-17	2, 998E-09	1, 592E+16	1, 883E-08
X-Rays	1, 000E+18	1, 000E-18	2, 998E-10	1, 592E+17	1, 883E-09
	1, 000E+19	1, 000E-19	2, 998E-11	1, 592E+18	1, 883E-10
Gamma radiation	7, 761E+20	1, 289E-21	3, 863E-13	1, 236E+20	2, 426E-12
	1, 000E+21	1, 000E-21	2, 998E-13	1, 592E+20	1, 883E-12
	1, 000E+22	1, 000E-22	2, 998E-14	1, 592E+21	1, 883E-13

	1, 000E+23	1, 000E-23	2, 998E-15	1, 592E+22	1, 883E-14
Cosmic radiation	1, 425E+24	7, 018E-25	2, 104E-16	2, 269E+23	1, 321E-15
	3, 097E+24	3, 228E-25	9, 679E-17	4, 932E+23	6, 078E-16
	3, 097E+24	3, 228E-25	9, 679E-17	4, 932E+23	6, 078E-16
	3, 512E+24	2, 848E-25	8, 537E-17	5, 592E+23	5, 361E-16
	3, 512E+25	2, 848E-26	8, 537E-18	5, 592E+24	5, 361E-17
	3, 512E+26	2, 848E-27	8, 537E-19	5, 592E+25	5, 361E-18
	3, 512E+27	2, 848E-28	8, 537E-20	5, 592E+26	5, 361E-19
	3, 512E+28	2, 848E-29	8, 537E-21	5, 592E+27	5, 361E-20
	3, 512E+29	2, 848E-30	8, 537E-22	5, 592E+28	5, 361E-21
	3, 512E+30	2, 848E-31	8, 537E-23	5, 592E+29	5, 361E-22
	3, 512E+31	2, 848E-32	8, 537E-24	5, 592E+30	5, 361E-23
	3, 512E+32	2, 848E-33	8, 537E-25	5, 592E+31	5, 361E-24
	1, 509E+33	6, 625E-34	1, 986E-25	2, 404E+32	1, 247E-24
	9, 479E+33	1, 055E-34	3, 163E-26	1, 509E+33	1, 986E-25
	1, 000E+34	1, 000E-34	2, 998E-26	1, 592E+33	1, 883E-25
	1, 000E+35	1, 000E-35	2, 998E-27	1, 592E+34	1, 883E-26
	1, 000E+36	1, 000E-36	2, 998E-28	1, 592E+35	1, 883E-27
	1, 000E+37	1, 000E-37	2, 998E-29	1, 592E+36	1, 883E-28
	1, 000E+38	1, 000E-38	2, 998E-30	1, 592E+37	1, 883E-29
	1, 000E+39	1, 000E-39	2, 998E-31	1, 592E+38	1, 883E-30
	1, 000E+40	1, 000E-40	2, 998E-32	1, 592E+39	1, 883E-31
	1, 000E+41	1, 000E-41	2, 998E-33	1, 592E+40	1, 883E-32
	1, 600E+42	6, 249E-43	1, 874E-34	2, 548E+41	1, 177E-33
Black photon	1, 855E+43	5, 391E-44	1, 616E-35	2, 954E+42	1, 015E-34

TABLE 2. **Table showing certain calculated quantities for various angular frequencies of radiation/photons.**

Name of quantity	Mass of photon	Momentum of the photon	Energy of photon	Gravitational energy of photon	Gravitational energy as a percentage of kinetic energy	Temperature of photon
Formula	$m=E/c^2$	$p=mc=h/l=hf/c$	$E=hf/q_e$	$Eg=\kappa m^2/R$	Eg/E	$t=E/k_B$
Unit	kg	kgms^{-1}	eV	J		st. K
Name of photon/number of column	7	8	9	10	11	12
Biggest photon	1.17E-48	3.52E-40	6.59E-13	3.07E-118	2.91E-84	7, 65E-12
Technical alternating currents	5.87E-47	1.76E-38	3.29E-11	3.83E-113	7.27E-81	3, 82E-10
	1.17E-46	3.52E-38	6.59E-11	3.07E-112	2.91E-80	7, 65E-10
	1.17E-45	3.52E-37	6.59E-10	3.07E-109	2.91E-78	7, 65E-09
	1.17E-44	3.52E-36	6.59E-09	3.07E-106	2.91E-76	7, 65E-08
Long waves	2.35E-43	7.04E-35	1.32E-07	2.45E-102	1.16E-73	1, 53E-06
Medium waves	1.17E-42	3.52E-34	6.59E-07	3.07E-100	2.91E-72	7, 65E-06
Very short waves	3.52E-40	1.06E-31	1.98E-04	8.28E-93	2.62E-67	2, 29E-03
Microwaves	1.17E-38	3.52E-30	6.59E-03	3.07E-88	2.91E-64	7, 65E-02
	2.35E-38	7.04E-30	1.32E-02	2.45E-87	1.16E-63	1, 53E-01
	4.70E-38	1.41E-29	2.63E-02	1.96E-86	4.65E-63	3, 06E-01
	9.39E-38	2.82E-29	5.27E-02	1.57E-85	1.86E-62	6, 12E-01
	1.88E-37	5.63E-29	1.05E-01	1.26E-84	7.44E-62	1, 22E+00
	3.76E-37	1.13E-28	2.11E-01	1.01E-83	2.98E-61	2, 45E+00
	7.51E-37	2.25E-28	4.22E-01	8.04E-83	1.19E-60	4, 89E+00

Infrared radiation	1.50E-36	4.51E-28	8.43E-01	6.43E-82	4.76E-60	9, 79E+00
	3.01E-36	9.01E-28	1.69E+00	5.14E-81	1.91E-59	1, 96E+01
	6.01E-36	1.80E-27	3.37E+00	4.12E-80	7.62E-59	3, 91E+01
	1.20E-35	3.60E-27	6.74E+00	3.29E-79	3.05E-58	7, 83E+01
	2.40E-35	7.21E-27	1.35E+01	2.63E-78	1.22E-57	1, 57E+02
	4.81E-35	1.44E-26	2.70E+01	2.11E-77	4.88E-57	3, 13E+02
	9.62E-35	2.88E-26	5.40E+01	1.69E-76	1.95E-56	6, 26E+02
Visible radiation	4.46E-34	1.34E-25	2.50E+02	1.68E-74	4.20E-55	2, 91E+03
Medium red radiation	5.40E-34	1.62E-25	3.03E+02	2.99E-74	6.15E-55	3, 52E+03
Medium yellow radiation	6.11E-34	1.83E-25	3.43E+02	4.31E-74	7.86E-55	3, 98E+03
Medium green radiation	6.75E-34	2.02E-25	3.79E+02	5.83E-74	9.61E-55	4, 40E+03
Medium blue radiation	7.87E-34	2.36E-25	4.41E+02	9.22E-74	1.31E-54	5, 12E+03
Medium violet radiation	8.81E-34	2.64E-25	4.94E+02	1.29E-73	1.64E-54	5, 73E+03
	3.87E-33	1.16E-24	2.17E+03	1.10E-71	3.17E-53	2, 52E+04
Ultraviolet radiation	1.17E-32	3.52E-24	6.59E+03	3.07E-70	2.91E-52	7, 65E+04
	1.17E-31	3.52E-23	6.59E+04	3.07E-67	2.91E-50	7, 65E+05
X-Rays	1.17E-30	3.52E-22	6.59E+05	3.07E-64	2.91E-48	7, 65E+06
	1.17E-29	3.52E-21	6.59E+06	3.07E-61	2.91E-46	7, 65E+07
Gamma radiation	9.11E-28	2.73E-19	5.11E+08	1.43E-55	1.75E-42	5, 93E+09
	1.17E-27	3.52E-19	6.59E+08	3.07E-55	2.91E-42	7, 65E+09
	1.17E-26	3.52E-18	6.59E+09	3.07E-52	2.91E-40	7, 65E+10
	1.17E-25	3.52E-17	6.59E+10	3.07E-49	2.91E-38	7, 65E+11
Cosmic radiation	1.67E-24	5.02E-16	9.39E+11	8.87E-46	5.90E-36	1, 09E+13
	3.64E-24	1.09E-15	2.04E+12	9.11E-45	2.79E-35	2, 37E+13
	3.64E-24	1.09E-15	2.04E+12	9.11E-45	2.79E-35	2, 37E+13
	4.12E-24	1.24E-15	2.31E+12	1.33E-44	3.58E-35	2, 68E+13
	4.12E-23	1.24E-14	2.31E+13	1.33E-41	3.58E-33	2, 68E+14

	4.12E-22	1.24E-13	2.31E+14	1.33E-38	3.58E-31	2, 68E+15
	4.12E-21	1.24E-12	2.31E+15	1.33E-35	3.58E-29	2, 68E+16
	4.12E-20	1.24E-11	2.31E+16	1.33E-32	3.58E-27	2, 68E+17
	4.12E-19	1.24E-10	2.31E+17	1.33E-29	3.58E-25	2, 68E+18
	4.12E-18	1.24E-09	2.31E+18	1.33E-26	3.58E-23	2, 68E+19
	4.12E-17	1.24E-08	2.31E+19	1.33E-23	3.58E-21	2, 68E+20
	4.12E-16	1.24E-07	2.31E+20	1.33E-20	3.58E-19	2, 68E+21
	1.77E-15	5.31E-07	9.94E+20	1.06E-18	6.62E-18	1, 15E+22
	1.11E-14	3.34E-06	6.24E+21	2.61E-16	2.61E-16	7, 25E+22
	1.17E-14	3.52E-06	6.59E+21	3.07E-16	2.91E-16	7, 65E+22
	1.17E-13	3.52E-05	6.59E+22	3.07E-13	2.91E-14	7, 65E+23
	1.17E-12	3.52E-04	6.59E+23	3.07E-10	2.91E-12	7, 65E+24
	1.17E-11	3.52E-03	6.59E+24	3.07E-07	2.91E-10	7, 65E+25
	1.17E-10	3.52E-02	6.59E+25	3.07E-04	2.91E-08	7, 65E+26
	1.17E-09	3.52E-01	6.59E+26	3.07E-01	2.91E-06	7, 65E+27
	1.17E-08	3.52E+00	6.59E+27	3.07E+02	2.91E-04	7, 65E+28
	1.17E-07	3.52E+01	6.59E+28	3.07E+05	2.91E-02	7, 65E+29
	1.88E-06	5.63E+02	1.05E+30	1.26E+09	7.44E+00	1, 22E+31
Black photon	2.18E-05	6.53E+03	1.22E+31	1.96E+12	1.00E+03	1, 42E+32

TABLE 3. **Table showing chosen Planck's quantities and its values and chosen values of certain constants.**

No.	Name of quantity	Lettering chosen to mark the quantity	Formula for calculation	Value of quantity	Unit for quantity
1	Speed of light	c	$c = \dfrac{x_p}{t_p}$	$2,998 \times 10^8$	ms^{-1}
2	Planck's constant	h		$6,625 \times 10^{-34}$	Js
3	Planck's smallest length	x_p		$1,616 \times 10^{-35}$	m
4	Planck's shortest time	t_p		$5,391 \times 10^{-44}$	s
5	Planck's area	s_p	$s_p = x_p{}^2$	$2,612 \times 10^{-70}$	m^2
6	Planck's angular frequency	ω_p	$\omega_p = \dfrac{1}{t_p}$	$1,855 \times 10^{43}$	s^{-1}
7	Planck's frequency	f_p	$f_p = \dfrac{\omega_p}{2\pi}$	$2,952 \times 10^{42}$	s^{-1}
8	Planck's energy	E_p	$E_p = hf_p$	$1,956 \times 10^9$	J
9	Planck's mass	m_p	$m_p = \dfrac{E_p}{c^2}$	$2,176 \times 10^{-8}$	kg
10	Planck's momentum	p_p	$Pp = m_p c$	$6,524$	$kg\,m\,s^{-1}$
11	Planck's volume	V_p	$v_p = x_p{}^3$	$4,220 \times 10^{-105}$	m^3
12	Planck's time-volume	VT_p	$vt_p = v_p c t_p$	$6,824 \times 10^{-140}$	m^4
13	Planck's density	ρ_p	$\rho_p = \dfrac{m_p}{v_p}$	$5,156 \times 10^{97}$	$kg\,m^{-3}$
14	Planck's acceleration (gravitation)	a_p	$a_p = \dfrac{c}{t_p}$	$5,562 \times 10^{51}$	ms^{-2}
15	Planck's force	F_p	$F_p = m_p a_p$	$1,210 \times 10^{44}$	N
16	Wavelength of Planck's radiation	λ_p	$\lambda_p = \dfrac{2\pi c}{\omega_p}$	$1,015 \times 10^{-34}$	m
17	Gravitational energy of Planck's photon	E_g	$E_g = \kappa \dfrac{m_p{}^2}{x_p} = E_p$	$1,956 \times 10^9$	J
18	Gravitational constant	κ	$\kappa \dfrac{x_p c^4}{E_p}$	$6,670 \times 10^{11}$	$\dfrac{Nm^2}{kg^2}$

Results and Discussion

The author has theoretically proven the afore mentioned hypothesis mostly using Newton's Law of Gravity for two physical bodies (photons): $E = k\dfrac{m^2}{R}$, expression of Newton's gravitational constant through Planck's constants $k = \dfrac{x_p c^4}{E_p}$ and modelling photons as particles (e.g. balls which move very close behind each other=localized energies of photons and hence their distance from the middle is equal to: $R = cT = \dfrac{R}{\omega}$) as well as electromagnetic waves, which is representative of the duality of particles and oscillation. The author used Einstein's law for calculating energy $E = mc^2$ and Planck's quantum-mechanical relationship for calculation of energy $E = hf$, which are equal to each other. From the afore mentioned laws, the author has deduced a formula for the calculation of threshold frequency $\omega_{threshold} = \sqrt{\dfrac{cE_p}{x_p h}}$, which the author has calculated to be on the level of Planck's frequency and hence voiced a hypothesis claiming the creation of 'dark energy' through the transformation of real energy, from electromagnetic oscillation, where during the appropriate frequency (Planck's), under the influence of gravitational effect of photons, will become immobile. When something becomes immobile, the temperature of the particles becomes equal to absolute zero. Hence the temperature $9,45.10^{31}\,K$ becomes 0 K.

It needs to be re-stated, that the results are only based upon theoretical research and it is necessary for them to be verified. However, if the theoretical basis of this research is at least confirmed it would provide motivation for the practical verification to be provided, as it would change our view on a part of physics, particularly in the field of threshold values.

Conclusion

The author found inconsistencies in Einstein's Special Relativity Theory, particularly regarding infinite values of mass, zero length (contraction of length) and frequency (dilatation of time), which more likely fulfill the quantum-mechanical limitations, such as Planck's mass, smallest length, largest frequency and other constants given in TABLES 2 and 3. The principle of superposition of individual particles, which mass is made up of, is applicable for the bonding of particle theories for micro and macro particles.

The Heisenberg's uncertainty principle can be solved in the same way, when we observe uncertainty and inability to observe certain parameters, in which the threshold values of Planck's constants are manifested. It is important to understand that the observation of real parameters can be done using real instruments, yet the properties of virtual parameters cannot be investigated in such a way, only their threshold expressions can be investigated. In order to be able to investigate the whole process, machines would have to be built which would be able to capture such values, which is motivational only after a thorough theoretical background is given. Hence first a motivational, theoretical background is obtained and then finances, which would be necessary for such research. Author's motivation is to aid the acquisition of such theoretical background and possibly start the work for obtaining such goals.

The given work on gravitational interaction of photons is just an introduction into the field of 'New Physics', which the author is currently working on. However, the results are adequate for the military industrial complex hence, the release of further theoretical research should be handled with care.

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