Unification of the electromagnetic force with quantum gravity

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Paper 1

Unification of the electromagnetic force with quantum gravity

Abstract

In this paper the graviton or the quantum of gravity has been identified as the Planck mass (Planck Mass $m_{pl} = 2.17651 \times 10^{-8} Kg$ Quantum of gravity, graviton particle or the God particle), Max Karl Ernst Ludwig Planck, FRS[2] (/plɑːŋk/;[1] 23 April 1858 – 4 October 1947) and hence the unification of the electromagnetic force with the quantum of gravity by definition of the Ampere, It is named after André-Marie Ampère [2] (1775–1836), $F = 2 \times 10^{-7} N$ and the theoretical values by calculation of the force of attraction or repulsion which acts between two 1 m wires placed in vacuum 1 m apart with negligible cross-sectional area each carrying 1 Coulomb of charge per second or $6.241 \times 10^{18} e^{s}$ at any point on the circuit has been calculated to be:

$$\underline{F = 1.973181 \times 10^{-7} N}$$

Furthermore the Bohr's theory of the Hydrogen atom Niels Bohr[3] in 1913, is explored and how the factor of $\frac{v^2}{c^2}$ plays part in the Ionisation of atoms w.r.t kinetic energy of the orbiting electrons in Hydrogen and Helium as well as other elements.

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Text

Definition of ampere's force law can be theoretically proven by using the universal gravitational law:

$F_g = \frac{G m_{pl}{}^2}{d^2}$ where m_{pl} is the Planck's mass $m_{pl} = 2.17651 \times 10^{-8} Kg$, d=1m

and each electron unleashes a quantum gravity particle which will interact with the other electron in the opposite wire.

The force will be negative (attraction) or positive (repulsion) if the currents are in the same direction or in the opposite direction due to the magnetic fields of the spins of the electrons as in fig 1 bellow and 2.

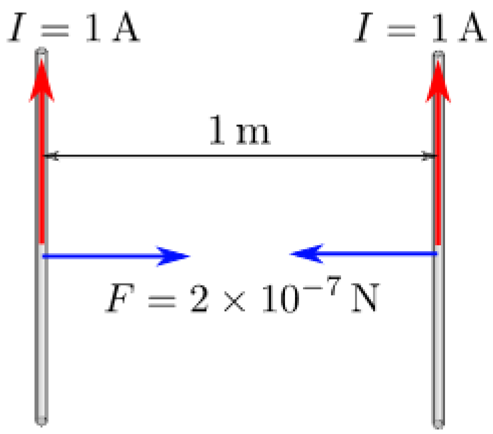

Fig 1

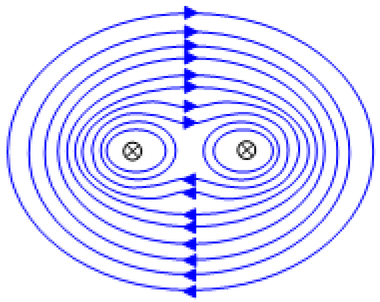

Figure 2(a)

Attraction

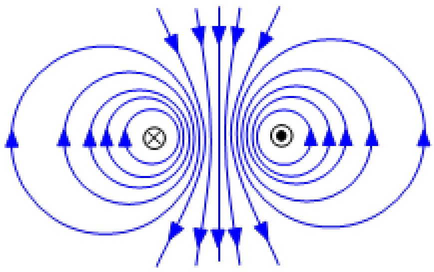

Figure 2(b)

Repulsion

Fig2 (a) and (b), when the both currents are in the same direction (same spin electrons) the magnetic field lines overlap and attract each other, whereas opposite direction current (opposite spin electrons) the force is repulsive as the field lines push one another.

By simple mathematics the theoretical value of the force will be:

$$N^o electrons = \frac{1}{1.60217662\times10^{-19}} = 6.2415091\times10^{18} electrons$$

$$F = \frac{Gm_{pl}^{\ 2}}{d^2}\times6.2415091\times10^{18}$$

$$F = \frac{6.67408\ \times\ 10^{-11}\times(2.17651\times10^{-8})^2}{1}\times6.241\times10^{18}$$

$$\underline{F = 1.973181\times10^{-7}\,N}$$

This would either be positive or negative depending on the directions of the spins of the electrons creating the magnetic fields and the experimental value $F = 2\times10^{-7}\,N$.

The magnetic force is felt only by a moving point charge. A stationary point charge experiences no magnetic force.

Bohr's theory of the Hydrogen atom

Hydrogen atom and molecule

H_2 , H and H_2^+

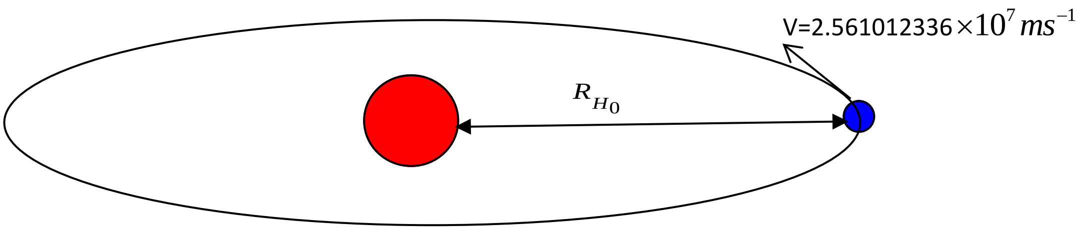

Fig 3 – Hydrogen atom Fig 3 hydrogen atom

$R_{H_0} = a_0$ Bohr's radius

$$a_0 = 5.2917721067(12)\times10^{-11}\ \mathrm{m}$$

The forces that are acting in the hydrogen atom are the attraction force of quantum gravity (Planck's mass) and the centrifugal force of the orbiting electron as follows:

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$$F_{CF} = \frac{m_e V^2}{R_{H_0}} \quad \text{and} \quad F_g = \frac{G m_{pl}^2}{d^2}$$

V is the orbiting velocity of the electron.

Therefore $V = \sqrt{\dfrac{G m_{pl}^2}{m_e R_{H_0}}}$ and $\underline{V = 2.561012336 \times 10^7 \, ms^{-1}}$

With this velocity the centrifugal and quantum gravity attraction are equal and opposite as below.

$F_{CF} = \dfrac{m_e V^2}{R_{H_0}}$ Hence $\underline{F_{CF} = 1.129044857 \times 10^{-5} N}$

$F_g = \dfrac{G m_{pl}^2}{d^2}$ Hence $\underline{F_g = 1.129044857 \times 10^{-5} N}$

(Planck Mass $m_{pl} = 2.1765113 \times 10^{-8} Kg$)

By using the force acting between the charge particles (electron and proton), only in the stationary conditions not in motion.

$F_{elec} = \dfrac{e^2}{4\pi\varepsilon_0 d^2}$ $\quad d = R_{H_0} = a_0 = 5.2917721067 \times 10^{-11}$

$$\underline{F_{elec} = 8.238723367 \times 10^{-8}} \text{ N}$$

Hence the ratio of the two forces will give:

$$\underline{\frac{F_g}{F_{elec}} = 137.0412389}$$

Hence Fine structure constant $\underline{\alpha = 7.297073554 \times 10^{-3}}$

The constant can be also represented by the ratio of the velocity of the orbiting electron and the speed of light squared:

From $\alpha = \dfrac{V^2}{C^2}$ $\quad \underline{\alpha = 7.297436857 \times 10^{-3}}$

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$$\frac{1}{\alpha} = 137.0344163$$

This constant can be better defined as in the ionisation of the hydrogen below.

Ionisation energy of Hydrogen atom

Kinetic energy of the electron in the orbit is

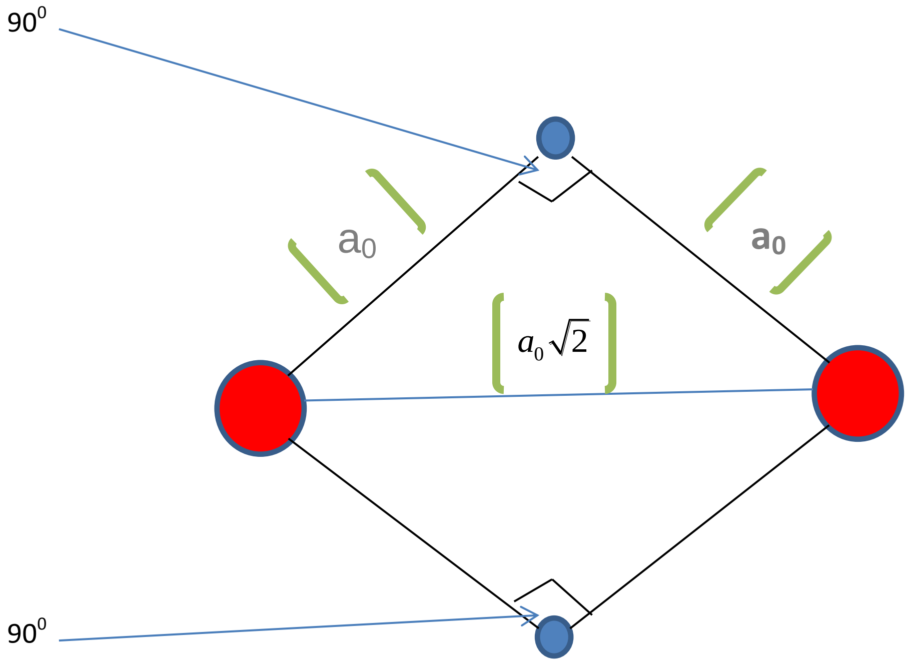
$$KE = \frac{1}{2} m_e v^2 \qquad \underline{KE = 2.987324041 \times 10^{-16}\, j}$$

The ionisation energy would be

$$KE \times \frac{v^2}{c^2} \qquad \underline{E = 2.179980856 \times 10^{-18}\, j = 13.60637041 eV}$$

The reason for this factor of $\frac{V^2}{C^2}$ is that a photon of light arriving in the electron orbit has the speed C and therefore the acceleration toward the centre would be $a = \frac{C^2}{R}$ as the acceleration of the electron toward the centre is $a = \frac{V^2}{R}$, therefore a photon of light arriving in the orbit with the speed of light needs less energy of the order of $\frac{V^2}{C^2}$ ratio to replace the electron that has a velocity of about $\frac{1}{12}$ of the speed of light.

Hydrogen molecule H_2



$$d_{H-H} = a_0\sqrt{2}$$

Fig 4 hydrogen molecule

$$d_{H-H} = 7.483695882 \times 10^{-11}\,\text{m}$$

In the hydrogen molecule the electrons of the opposite spin have right angle with the two protons and the bond distance can be simply calculated using right angle triangle formulae and under extreme pressure two bond distances can be observed one shorter and one longer than the $a_0\sqrt{2}$ due to pressure causing squashing either from the two electron sides (longer bond distance) or the two proton sides (shorter bond distance) forming cigar or sardine shapes.

Di-hydrogen cation H_2^+

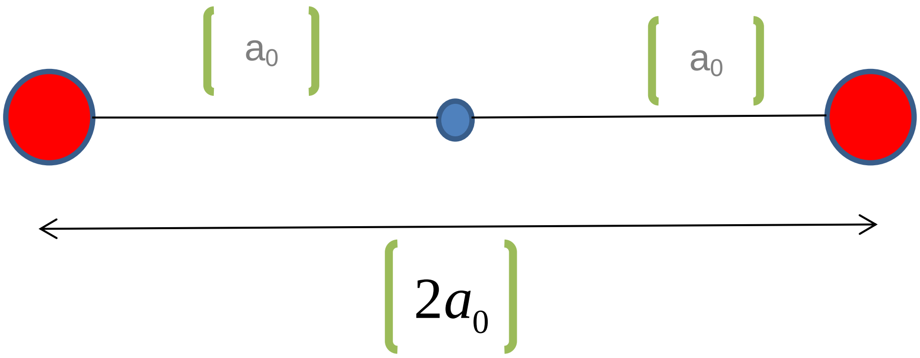


Fig 5 di-hydrogen cation

$$d_{H_2^+} = 2a_0$$

$$d_{H_2^+} = 1.058354421 \times 10^{-10}\, m$$

In the di-hydrogen cation the electron is in the middle of the two protons and the bond distance is double the Bohr's radius.

First and second ionisation of the Helium

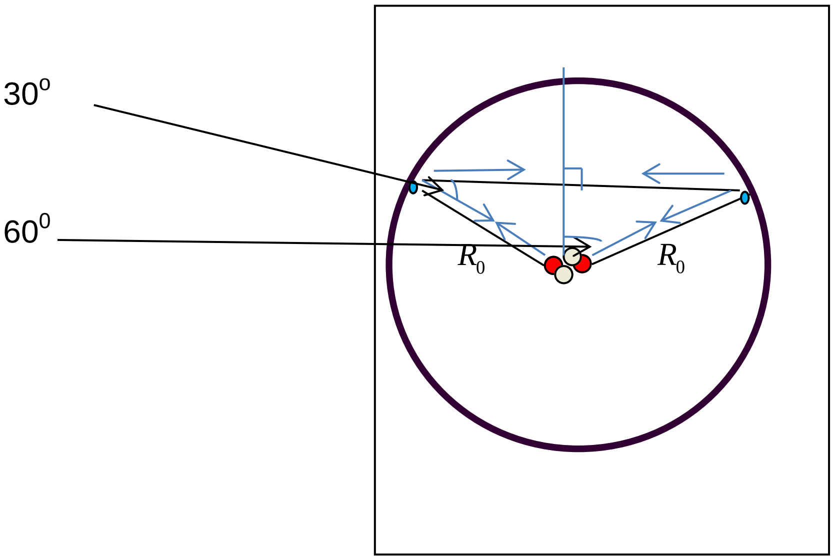


Fig 6 helium atom

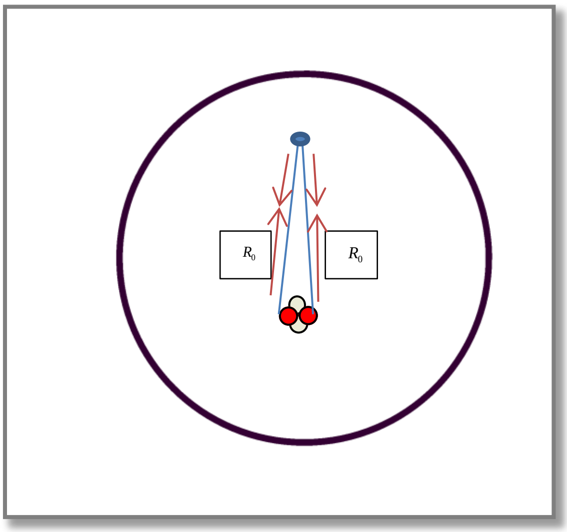


Fig 7 He^+

In the above fig 6 and fig 7 the electronic structure of helium, the forces acting by graviton are shown by arrows.

Calculations of the first and second ionisation energy of helium

The distance between electrons in the He is d and R_o is the radius of the orbits different in both He and He^+ .

With similar calculation we can obtain the followings:

$$For \rightarrow He$$
$$R_o = 5.0736485 \times 10^{-11} m$$
$$d = 8.787817 \times 10^{-11} m$$
$$V = 2.9693o8 \times 10^{7} ms^{-1}$$
$$\frac{v^2}{c^2} = 9.8097419 \times 10^{-3}$$
$$KE = 4.015779674 \times 10^{-16} j$$
$$KE \times \frac{v^2}{c^2} = 3.93937622 \times 10^{-18} j = 24.58765 eV$$
$$For \rightarrow He^{+}$$
$$V = 3.62168927 \times 10^{7} ms^{-1}$$
$$R_o = 5.292917541 \times 10^{-11} m$$
$$\frac{v^2}{c^2} = 1.4593833 \times 10^{-2}$$
$$KE = 5.974226351 \times 10^{-16} j = 3728.818829 eV$$
$$KE \times \frac{v^2}{c^2} = 54.41775998 eV$$

Therefore 1st ionisation energy = 24.58765 eV

And 2nd ionisation energy = 54.41775998 eV .

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Table 1 below shows some of the allowed orbitals of the hydrogen atom, these allowed orbitals are entirely due to the synchronisation of the rotation of the fields of electron and proton nucleus that must be in phase with one another at specific frequencies.

Table 1

Shell number	**Radius of the e^s allowed orbits**	**Orbital velocity of the e^s in ms⁻¹**	$\frac{v^2}{c^2}$	**Kinetic energy of the orbiting e^s in Jules**	**Ionisation energy** $KE \times \frac{v^2}{c^2}$ **In eV**
Ground state	a_0	$2.561012336 \times 10^{7}$	$7.297436857 \times 10^{-3}$	$2.987324041 \times 10^{-16}$	13.60637
n_1	$2\ a_0$	1.81028×10^{7}	$3.646186196 \times 10^{-3}$	$5.442394015 \times 10^{-16}$	3.39687
n_2	$3\ a_0$	1.47865×10^{7}	$2.432642829 \times 10^{-3}$	$9.958424706 \times 10^{-17}$	1.51202
n_3	$4\ a_0$	1.28006×10^{7}	$1.823093098 \times 10^{-3}$	$7.463132312 \times 10^{-17}$	0.84922
n_4	$5\ a_0$	1.145079×10^{7}	1.458874×10^{-3}	$5.97214199 \times 10^{-17}$	0.54380
n_5	$6\ a_0$	1.04556×10^{7}	1.21632×10^{-3}	$4.979213053 \times 10^{-17}$	0.37801
n_6	$7\ a_0$				
n_7	$8\ a_0$				
etc	---				

In the above table a_0 is the Bohr's radius of the hydrogen atom.

Table 2 shows the ratios of the ionisation of consecutive allowed orbitals.

Table 2

$\frac{n_5}{n_4}$	$\frac{n_4}{n_3}$	$\frac{n_3}{n_2}$	$\frac{n_2}{n_1}$	$\frac{n_1}{n_0}$	∞
$\frac{6}{7}$	$\frac{7}{9}$	$\frac{9}{12}=\frac{3}{4}$	$\frac{12}{18}=\frac{2}{3}$	$\frac{18}{36}=\frac{1}{2}$	1

In the above table the ionisation energy ratios of the consecutive

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Forces of nature and there relation to quantum gravity

1) **Gravititational force**

The gravitational force is given by equation - $F_g = \frac{\hbar c}{d^2}$ **(I)**

In terms of quantum gravity using Planck's mass force is given by $F_g = \frac{Gm_{pl}^2}{d^2}$ **(II)** by using $m_{pl} = \sqrt{\frac{\hbar c}{G}} \rightarrow m_{pl}^2 = \frac{\hbar c}{G}$ **(III)** and substituting in equation **(II)** the equation **(I)** can be obtained.

$$F_g = \frac{G\frac{\hbar c}{G}}{d^2} \rightarrow F_g = \frac{\hbar c}{d^2}$$

- and at femtometer distance($10^{-15}m$) $F_g = 31615.7N$

2) **Electromagnetic force**
3) **Weak nuclear force**

As in the atomic hydrogen case.

The weak nuclear force constant $\alpha = \frac{e^2 c\mu_0}{2h}$ **(I)**

by using quantum gravity $\alpha = \frac{e^2}{4\pi\varepsilon_0 Gm_{pl}^2}$ **(II)**

By replacing $m_{pl}^2 = \frac{\hbar c}{G}$ and $\varepsilon_0 = \frac{1}{\mu_0 c^2}$ in equation **(II)** the equation **(I)** can be obtained as follows:

$$\alpha = \frac{e^2}{4\pi\varepsilon_0 Gm_{pl}^2} = \frac{e^2}{4\pi\frac{1}{\mu_0 c^2}G\frac{\hbar c}{G}} = \frac{e^2\mu_0 c}{4\pi\hbar} = \frac{e^2\mu_0 c}{4\pi\frac{h}{2\pi}} \rightarrow \alpha = \frac{e^2 c\mu_0}{2h}$$

Therefore the same constant $\alpha = \frac{e^2 c\mu_0}{2h} = \frac{1}{137.0412389}$

4) **Strong nuclear force**

Is given by $\alpha_G = \frac{Gm_p^2}{\hbar c}$ where $m_p = mass$ of proton

The strong force can be presented by $\alpha_G = \left(\frac{m_p}{m_{pl}}\right)^2$ and by substituting

$m_{pl} = \sqrt{\frac{\hbar c}{G}} \rightarrow m_{pl}^2 = \frac{\hbar c}{G}$ in the above equation the same result will be achieved

$$\alpha_G = \left(\frac{m_p}{m_{pl}}\right)^2 \rightarrow \alpha_G = \frac{m_p^2}{\hbar c / G} \rightarrow \alpha_G = \frac{Gm_p^2}{\hbar c}$$

Therefore $\underline{\alpha_G = \frac{Gm_p^2}{\hbar c} = \left(\frac{m_p}{m_{pl}}\right)^2 = 5.905626404 \times 10^{-39}}$

Conclusion

The father of the quantum physics Max Planck is also the father of the quantum gravity.

Planck's particle is the fundamental constituent of the Universe and plays the most important part in physics, astronomy, cosmology and the Grand Unified Theory.

In the next three papers by the same authors other important rules of the Planck's particle from the Big-Bang to Hubble constant and nature of light will be incorporated into some of the unresolved problems in theoretical physic and cosmology.

References

1) https://en.wikipedia.org/wiki/Max_Planck [Accessed 7 August 2016].
2) https://en.wikipedia.org/wiki/Ampere [Accessed 7 August 2016].
3) https://en.wikipedia.org/wiki/Bohr_model [Accessed 7 August 2016].