Electric Field from Gravitational Variation

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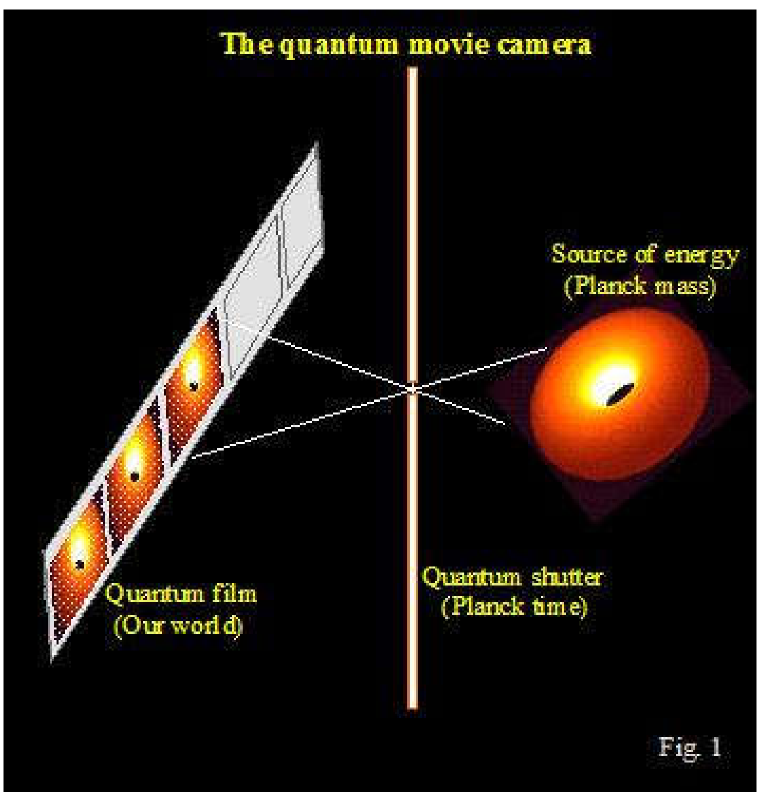
The quantization of the Planck mass seems to place a limit on the measurable energy or mass. In addition, rotation of this mass together with its electric and magnetic properties give us the link between gravity and electricity. The result is not just a unified field but rather a field we always experience in its duality: electric and gravitational. Now we could calculate the electric field generated by the variation of the gravitational field due to the electron materialization without the knowledge of its charge. An approaching mass is equivalent to a variation of its gravitational field, so the resulting electric field may influence the measured gravitational force. This means that even the measurement of the constant of gravitation could be influenced by moving masses.

Introduction

We often ponder with awe at the unusual magnitude of the Planck particle and associated time. Its mass, something like 10^{-8} Kg, is amazingly massive and its time in the region of 10^{-43} sec is quite short by any standard. Despite the unusual scale, what we would eventually detect is the electron mass and charge [1]. It is proposed to look differently at how the Planck particle is detected in our world. We could think of quantization as a very fast shutter of a quantum movie camera (Fig. 1). Here we have a source of energy, the Planck mass, which exists only for a very short time, the Planck time in fact, acting as a shutter. So fast is this shutters that only an infinitesimal portion of the energy is actually measured by our instruments, i.e. the energy impinging on a single frame. If we were part of quantum film and would be asked to



measure the energy falling on it we should say that there are so many joules *per frame* but in our real world we are unaware of the frames following one after the other and we would only say that we measure so many joules, foregoing the time dimension attached to it. It follows that what was originally a time dimension, the Planck time, becomes, in our experience, a dimensionless number. The ratio between the energy on the film and the source energy is seen, in our world, as a dimensionless number numerically equal to Planck time. We will call this dimensionless number the Planck ratio r_p. Strictly speaking it is advisable to use the Planck time instead of the Planck ratio if consistency of dimensions is to be preserved. On the other hand, all our current measurements ignore the fact that we live in a quantized world and the use of the Planck ratio would give us dimensions more in line with current knowledge albeit fundamentally flawed.

electron dimensional paradox

$$\frac{\textit{Gravitational energy}}{\textit{Electric energy}}$$ **Numerically very close to Planck time**

Normally we would have no choice but to consider it just a coincidence.

In a quantum world this is not a coincidence. A time dimension is present in the gravitational energy due to the quantization of the Planck mass $m_q=M(t_p\,\alpha/2)^{1/2}$ close to the electron mass if rotation, hence α, is accounted for. Now this value yields an exact Planck time.

$$\frac{G\,m_q^2}{(e^2/4\pi\,\varepsilon_0)} = \text{Planck time}$$

The electron is what we see

As we are unaware that we live in a quantum world, we would only experience the energy g_e falling on each single frame and this is the energy of the Planck particle e_p limited by Planck time t_p but it will appear to us simply as the ratio r_p, yet, a time dimension is actually present in both the left and right term and for a rotating particle we have:

$$t_p \;=\; g_e/e_p \;=\; (2/\alpha)m_q^2/M^2 \tag{1}$$

Where:

- t_p is the Planck time $t_p=(\pi\,h\,G/c^5)^{1/2}$
- $e_p=GM^2$ is the gravitational energy of Planck mass $M=h/t_p c^2$
- $g_e=Gm_q^2$ is the electron gravitational energy where $m_q=M(t_p\alpha/2)^{1/2}$ is the quantized Planck mass, 0.1% close to the actual electron mass, and α represents its rotation.

This is an approximation of a more complex equation. The fine structure constant α takes care of the rotational speed which, in turn, is the result of electromagnetic interaction. Finer adjustments would be made when the precession of the spin angular momentum is taken into account giving a final value in line with experimental results. Details about α and its relation with the rotational speed are given in the next section. In practice, when we measure the electron mass we are actually measuring the quantized Planck mass and as such we have the additional time dimension t_p when we consider its gravitational force

or energy. On the other hand, if we incorrectly disregard the possibility of a quantized Planck mass we end up with the dimensionless ratio r_p.
The electron and the Planck particle are the same particle [2] and, as a consequence, we would also expect to find some kind of relationship with the electron charge. The MKSA system does not recognize that mass or charge is the result of quantization so if we wish to see familiar numbers for the charge we have to introduce a unitary charge Q_u where its energy in the unitary time t_u is taken as a reference and the energy ratio between Q_u and e is, as in the case of the electron mass, equal to Planck time t_p because a time dimension is actually present in the definition we have given for the reference charge Q_u.
Even with the unitary charge Q_u we have to take care of a few additional factors: first of all we have to consider the shape of the particle. It is not a sphere, it is a ring, as this is the most accredited form for our black hole and possibly the electron [3,4] yielding a form factor equal to $4\pi^2$. The other parameter to consider is the rotational speed, hence the term $\alpha(2-\alpha)$, eventually we have:

$$t_p/c_f^2 \;=\; e_e/e_u \;=\; \alpha\,(2-\alpha)\,e^2/16\pi^4 \qquad (2)$$

Where:

- Energy $e_u=(4\pi^2 Q_u)^2/t_u\, 4\pi\varepsilon_0\alpha(2-\alpha)$ applied to a spinning toroid with unitary charge in the unitary time and where ε_0 is the vacuum permittivity.
- Energy $e_e=e^2/4\pi\varepsilon_0$ applicable to the electron charge.
- c_f is a compensating factor, explained later, equal to e_t/e where e_t is the charge theoretic value resulting from this study and e is the exact electron charge introduced in Codata 2018.

This is an exact equation from where the electron charge can be calculated without any prior knowledge of the vacuum permittivity or electron radius. Conversely, G can be calculated directly from basic quantities.

Fine structure constant and rotational speed

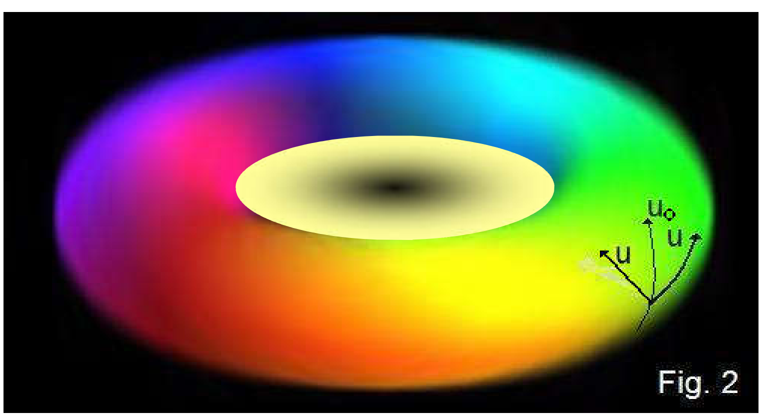


Fig. 2

Rotation of the electron ring model is normally taken for granted but there is no agreement on how fast the ring is rotating. The speed of light is often mentioned, useful to make calculations easy, but it does not take into account any relativistic effect. Another approach favored by Spaniol and Sutton [5] is to relate the fine structure constant to the rotational speed. We will follow this approach even if the final equation will be somewhat different.
In addition to its rotation with speed u, we consider that a point on the ring is also rotating around the torus itself with the same speed u (fig. 2 above). The result of these two

components is a point traveling around the ring at speed u_0 and describing a helix. We will define the initial fine structure constant α_0 as the factor accounting for speed u_0:

$$\alpha_0 = 2(1 - u_0^2/c^2) \tag{3}$$

This is really a relativistic factor and if we apply it to a toroid of unitary charge Q_u within unitary time t_u we have a constant $w_u = 16\pi^4 Q_u^2/t_u$, which appeared already in eq. 2, and a charge Q, the Planck charge, that would be the one seen through the quantum movie camera once the quantization due to the Planck time t_p is taken into account:

$$Q^2 = t_p w_u/\alpha_0^2 \tag{4}$$

In order to find α_0 we define Q as the charge giving the same force as Planck mass M:

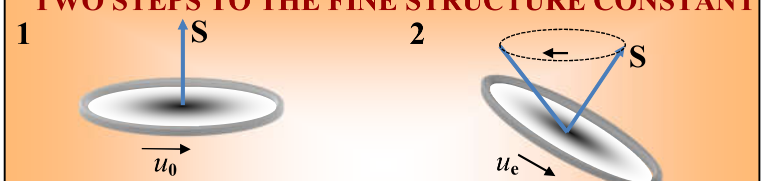
$$Q = M(4\pi\varepsilon_p G)^{1/2} \tag{5}$$

Where ε_p is the Planck permittivity [6] given by $(t_p/4\pi^2)^{1/4}$.
We are now in a position to find the initial fine structure α_0 and the relevant speed u_0. It is also possible to write α_0 in terms of fundamental constants only:

$$\alpha_0 = (4\pi^5/c^3)^{1/2}(2G/h)^{1/4}(c/\pi h G)^{1/16} \tag{6}$$

The above equation is dimensionally balanced because it includes the term $4\pi^2 = w_u^{1/2}$.

TWO STEPS TO THE FINE STRUCTURE CONSTANT



As a ratio we would see quantity Q^2/t_p as $1/\alpha_0^2$ larger than the reference unitary charge squared in the unitary time w_u=$16\pi^4 Q_u^2/t_u$

Precession of spin angular momentum S slightly decreases charge Q to Q_α =$Q\alpha_0/\alpha$ until the ratio $(Q_\alpha^2\alpha^2/t_p)$ is again w_u

Charge Q is a rotating charge and as such it will generate a magnetic force opposing its own electric force. The residual force will be smaller and electric in nature and it will appear to us as it were generated by a charge e_0 which we identify as the initial electron charge:

$$Q^2c^2/u_0^2 - Q^2 = e_0^2 \tag{7}$$

From where $e_0 = Q/(2/\alpha_0 - 1)^{1/2}$. This is the link we were looking for, relating e_0, Q and α_0 to fundamental quantum constants. The equation can be elaborated in many ways; we could, for example, substitute Q in eq. 7 with the term given in eq. 4, thus getting:

$$16\pi^4 t_p = \alpha_0(2 - \alpha_0)e_0^2 \tag{8}$$

Where $16\pi^4$ is actually constant w_u we have seen before. We note that the left term is a constant, this means that if we would change speed u_0 we would get a new set of values for the fine structure constant and the electron charge and there will be a given speed

$u_e < u_0$ generating exactly the known fine structure constant and the theoretic electron charge e_t. This theoretic electron charge is necessary because if we increase the calculation precision, we find that there is a very small difference between e_t and the exact electron charge e introduced by Codata 2018. We devise a compensating factor $c_f = e_t/e$ to take care of this difference which can be quantized as follows:

$$c_f \;=\; (w_u t_p / 2\pi\varepsilon_0 G(2-\alpha))^{1/2}/\alpha M \qquad (9)$$

Substituting the known values in eq. 8 we will have eq. 2 seen in the previous section. By rearranging its terms we would have what we call the *electron equation*:

$$\alpha^2 - 2\alpha + w_u t_p / e_t^2 \;=\; 0 \qquad (10)$$

As we know that $e^2 = 2\varepsilon_0 h c \alpha$ we could rewrite eq. 2 or 8 without the need to know the electron charge yielding an equation which allows us to calculate the known fine structure constant in terms of fundamental constants only. The result is a cubic equation presented here in its canonic form:

$$\alpha^3 - 2\alpha^2 + w_u t_p / 2\varepsilon_0 c_f^2 h c \;=\; 0 \qquad (11)$$

One of the solutions is the known fine structure constant. All solutions, one of them negative, would be pertinent to the properties of vacuum and we would refer to eq. 11 as the *vacuum equation*.

The quantum mass

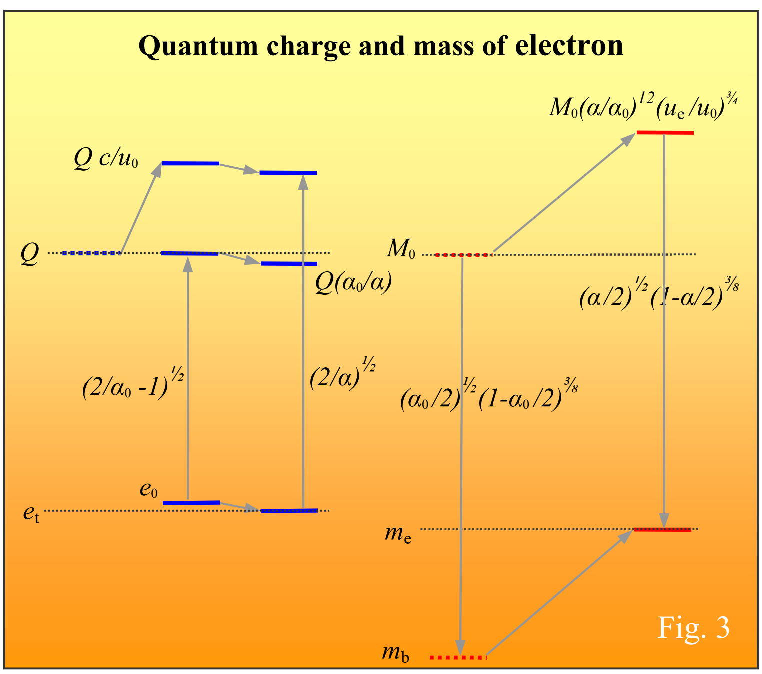


Fig. 3

The electron mass is obtained in a way similar to the electron charge (Fig. 3). First we find the quantized Planck mass, i.e. the mass that the Planck shutter will allow us to see. The energy falling on the quantum film is $GM^2 t_p$ but it will appear to us as originating from a mass $M_0 = M t_p^{1/2}$. This mass rotates with speed u_0 close to the speed of light, so there will be a certain electron mass m_b that will increase to M_0 once the relativistic factor is taken care of, together with an additional factor $(1-\alpha_0/2)^{1/8}$

which is the contraction of each of the 3 radii, the ring radius and the radii of its section, an ellipse, reflected as a corresponding variation of its mass:

$$m_{\mathrm{b}} \;=\; M_0\,(\alpha_0/2)^{1/2}(1-\alpha_0/2)^{3/8} \tag{12}$$

This is only the initial value for the electron mass. It is now possible to find a connection with the electron charge as they have a common origin in the Planck particle where M_0 and Q are related as follows:

$$M_0 \;=\; 8\,h^3/\pi\,Q^4 \tag{13}$$

By expanding eq. 12 and placing the electron mass m_{e} instead of m_{b} and α instead of α_0 we have an electron mass which is only 0.24% lower than the expected value:

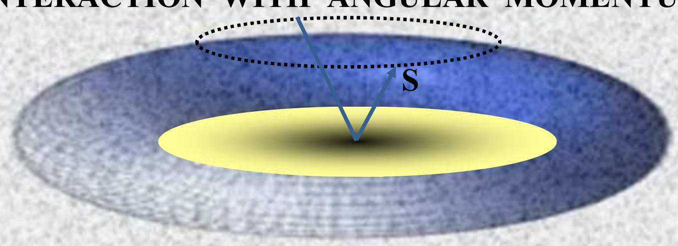
$$m_{\mathrm{e}} \;\approx\; M_0\,(\alpha/2)^{1/2}(1-\alpha/2)^{3/8} \tag{14}$$

From eq. 13 we see that the mass is in inverse proportion to the fourth power of the charge. From eq. 4 we see a direct relation between Q and the fine structure constant. This means that the additional variation α_0/α in the charge becomes $(\alpha_0/\alpha)^4$ in eq. 13 and becomes $(\alpha/\alpha_0)^{12}$ in the electron mass because of its 3 radii. Another factor is the variation of the rotational speed $(u_e/u_0)^{3/4}=((2-\alpha)/(2-\alpha_0))^{3/8}$ to be placed in the electron mass equation, shown below in term of M_0 and the theoretic electron charge e_{t}:

$$m_{\mathrm{e}} \;=\; M_0\,(\alpha/2)^{1/2}(\alpha/\alpha_0)^{12}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/8} \tag{15}$$

$$m_{\mathrm{e}} \;=\; (8\,h^3/\pi\,e_{\mathrm{t}}^4)(\alpha/2)^{1/2}(\alpha/\alpha_0)^{8}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/8}/(2/\alpha-1)^2 \tag{16}$$

INTERACTION WITH ANGULAR MOMENTUM



Rotating mass before slowdown:
$M_0\,(\alpha_0/2)^{1/2}(1-\alpha_0/2)^{3/8}$

Rotating mass after slowdown:
$M_0\,(\alpha/2)^{1/2}(\alpha/\alpha_0)^{12}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/8}$

The precession of spin angular momentum S slows down its rotation resulting in a slight mass increase due to $(\alpha/\alpha_0)^{12}$ and $((2-\alpha)/(2-\alpha_0))^{3/8}$

Other factors affecting the electron mass would be so small that are not considered at the moment. In order to reach these results we introduced some new hypothesis on the nature of the electron but the most important fact is that the charge and mass we measure is the result of rotation. The rotating charge is creating an opposite magnetic force and what we measure is the residual electric force. If we would speed up rotation we would measure an even lower electron charge. The same applies to the electron mass: to a faster rotation

corresponds a lower mass. We still have the relativistic mass increase but this is masked by the opposite magnetic force and the net result is a lower mass.
The electron will have an intrinsic magnetic moment which will interact with a magnetic field and thus changing, by a tiny amount, the fine structure constant. There is a “magnetic” fine structure [1] $\alpha_m=\alpha/1.000089187709953$ which will originate, among others, the magnetic moment anomaly $a_e=(\alpha/\alpha_m)^{13}((2-\alpha)/(2-\alpha_m))^{5/4}-1$.

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Origin of the electric field

With the elaboration of existing equations it is possible to relate directly the Planck mass with the electric force F_e applicable to the electron:

$$F_e \;=\; e^2/4\pi\,\varepsilon_0 \;=\; GM^2(\alpha/2) \qquad (17)$$

Eq. 17 is telling us that the electron force is equal to the gravitational force of the Planck mass, provided we take into account its rotation represented by α.
The consequence is that the electric force is really a gravitational force but with a fundamental difference: it is endowed with a polarity, positive or negative.

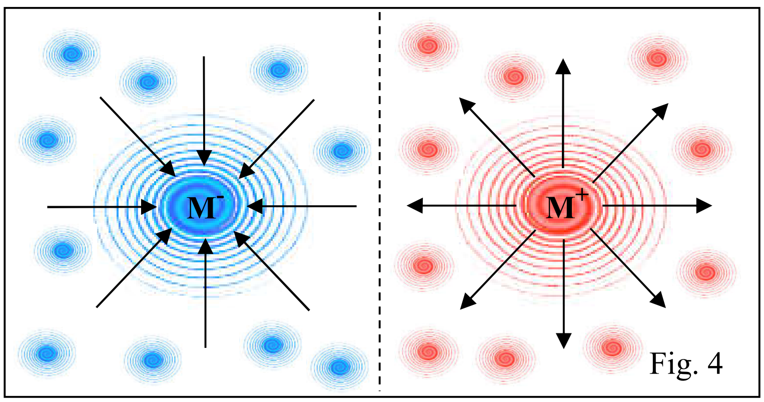


Fig. 4

We could possibly explain the existence of a polarity if we think that the Planck mass is a black hole trying to get bigger and bigger or smaller and smaller. This tendency would be felt as a polarity: a gravitational field changing over an extremely long time. Time loses its meaning in the vicinity of the black hole and the variation of the gravitation field would take place over a very long period of time, probably the age of the universe, and we would be left only with a polarity: negative or positive. The hypothetic “evaporation” of sub-atomic black holes would take place over an extremely long period of time and in our everyday experience we would see the Planck mass as a steady and ageless particle. It would be this “polarized gravity” that we would experience as the electric field, as shown in the graphical representation of fig. 4 and detected as electrons and positrons.
If this is the case we would expect to be able to calculate the known electric field $E_e = e/4\pi\varepsilon_0$ generated by an electron directly from the Planck data.
Similar to the electron charge to mass quotient $K_e = e/m_e$, we have a similar quotient K_p for the Planck particle:

$$K_p \;=\; Q/M \qquad (18)$$

The resulting electric field generated by the Planck mass is the electron electric field E_e, derived from eq. 17, provided we introduce the charge to mass quotient K_p and the compensating factor c_f:

$$E_e = GMc_f(\alpha/2)^{1/2}(\alpha/\alpha_0)(1-\alpha/2)^{1/2}/K_p \tag{19}$$

The same electric field is also given by $M(\alpha G/8\pi\varepsilon_0)^{1/2}$ showing, once more, how closely related are all fundamental constants. At this point it could be of interest to see that the ratio $(K_p/K_e)^2$ is the same as the ratio between the gravitational and electric force F_g/F_e in an electron provided that rotation and subsequent slowdown is taken into account:

$$F_g/F_e = (K_p/c_fK_e)^2(\alpha_0/\alpha)^2/(1-\alpha/2) \tag{20}$$

Of course, the important question is whether we could actually detect a generic electric field E generated by a gravitational field variation δg given over a period of time δt:

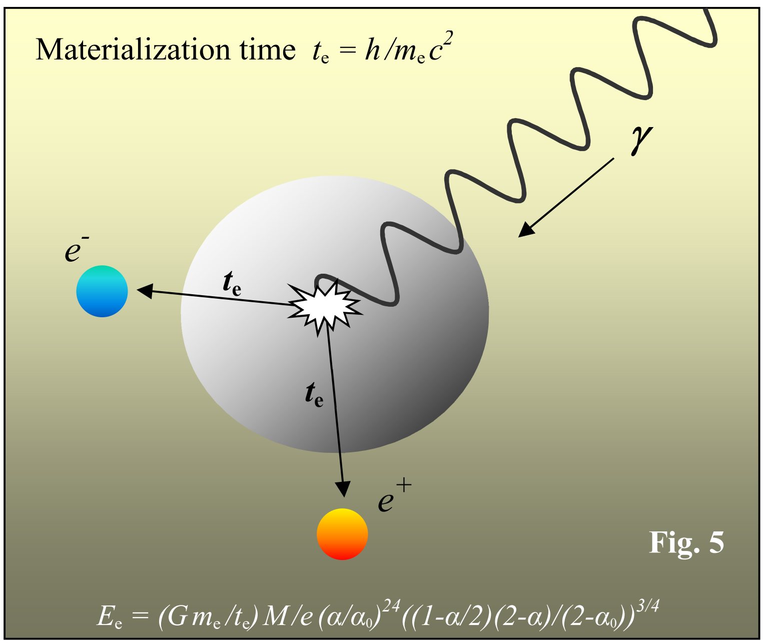


Fig. 5

$$E = \delta g/\delta t \tag{21}$$

We try first to see how the electric field of an electron can be calculated with the above equation as an alternative to eq. 19.

A gamma ray materializes in an electron-positron pair in certain circumstances: for example when it is close enough to a massive atomic particle (Fig. 5). In this case the electron mass would go from zero to m_e within time $t_e = h/m_ec^2$. The resulting variable gravitational field would be given by Gm_e/t_e. If we take into account the electron rotation, given by a series of terms involving α and α_0 and the Planck quotient K_p, we have our electric field E_e applicable to an electron without any knowledge of its electron charge, eq. 19.

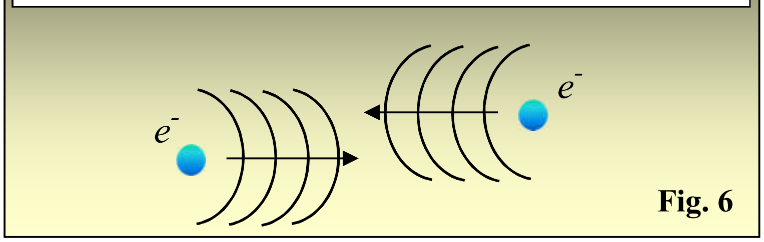
This equation is specifically applicable to an electron, a quantum rotating particle with all its collection of mathematical complications, but for the materialization of a generic mass m within time t, the rotational terms will not be present and eventually we would have a generic mass m generating an electric field E given by:

$$E = Gm/tK_p \tag{22}$$

As it would be quite hard to materialize a large mass, the alternative way to get a variable gravitational field is to change the distance from the mass to the detector point.

Measurement of such a field is going to be quite difficult because of the low electric field that would be generated. Maybe K_p is involved in sub-nuclear reactions only, such as pair production and quarks; on the other hand, if we would use the electron quotient K_e instead of K_p we would have the added problem of having to deal with an extremely low electric field, impossible to measure in practice.

A field of investigation could be the interaction between like particles: according to this theory the electron-electron close range interaction gives a slightly different result from a positron-positron interaction because there is an additional electric field for an approaching particle and an opposite additional electric field when the particles are receding. The interaction of such effect with the intrinsic charge of the particle would cause a slight difference of behaviour between particles. There would be a slight difference from the expected outcome because the electric field due to the gravitational field variation is added, or subtracted, when the two masses come closer and closer to each other, fig. 6. The electric field would reverse when one of the particles has gone past the other.



Besides their intrinsic electric field, the two electrons would experience an additional electric field due to variation of the gravitational field caused by the fast approaching masses.

Fig. 6

This effect will only be evident when at least one mass is involved: in other words, we could have interaction of a particle with a photon as in fig. 5 or between two masses as in fig. 6. The effect should be most evident at a relatively close range and at the highest speed, with the ideal case of an approaching speed equal to c as in fig. 5.

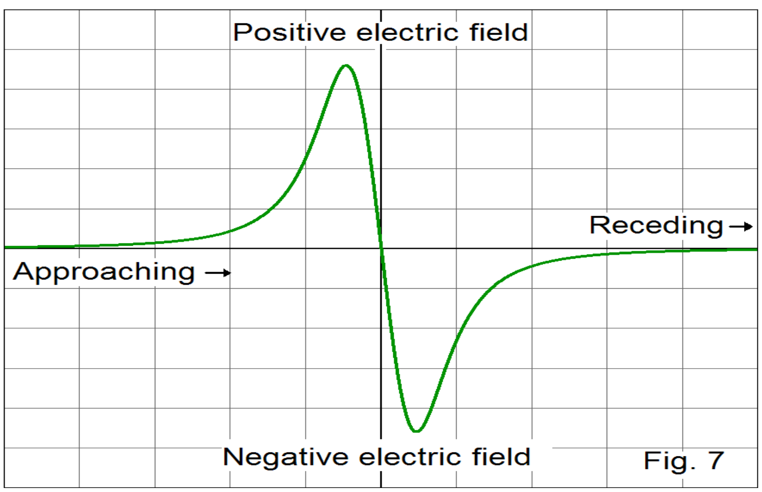


Fig. 7

In order to have a clear picture of the electric field created between two particles it was simulated the possible effect between two neutrons, fig. 7. In this case we would not worry about the intrinsic charge of the particles and the field experienced by the two neutrons would be the one shown in the drawing and it is the same as an induced voltage in a conductor when a magnet races past it. In our world it would show as a tiny anomaly in Newton's gravitational law and the ratio between the mass squared and the distance squared m^2/r^2 is no longer linear.

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Deviation from Newton's law

The example reported in the previous section applies equally well to gravitational masses which could be regarded as neutral bodies. If we consider a similar case as in fig. 6 where two masses go past each other, a fly-by, and we apply the known square law of gravitational attraction we have that the force between the two bodies follows the curve shown in fig. 8. This curve is slightly modified if we would account for the additional force induced by the variation of the gravitational field. This additional force is really the square of fig. 7 and is reported, properly scaled, in fig. 9. The sum of the two forces, blue line, and the original curve given by Newton's law are both shown in fig. 10.

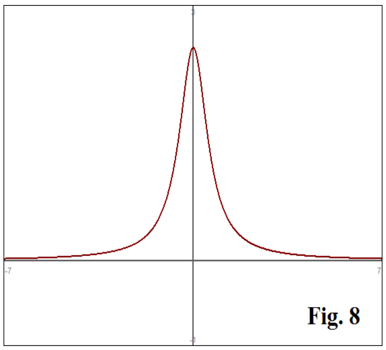

Fig. 8

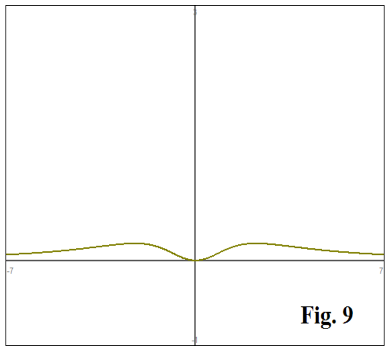

Fig. 9

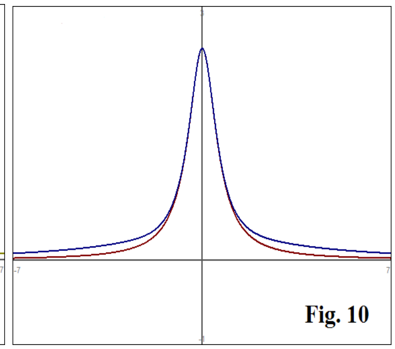

Fig. 10

In practice we have an extra tug which becomes prominent at an intermediate range: at close range or at extremely large range the additional force becomes very small and the classic square law of gravitation will be predominant. This is purely a qualitative analysis and no attempt has been made to actually calculate the effective strength of this additional force which depends on the mass and relative speed and distance of the bodies involved.
This effect could be felt even at galactic or intergalactic level: the additional pull would account for the observed extra gravitational force with no need to resort to dark matter.
An earlier attempt to explain some gravitational anomalies observed in galaxies was proposed by M. Milgrom in 1983 with the MOND (MOdified Newtonian Dynamics) theory. Here we have something acting at intermediate range, intermediate compared to the scale involved, be it atomic particles or large scale structures at cosmological level.
It appears that an additional mechanism is at work and one of the most important implications is in the measurement of the constant of gravitation *G*. We would not get the correct value if the moving masses generate a variable gravitational field. Since most of the experiments do actually employ moving masses in various configurations, we are bound to obtain incorrect and dissimilar results most of the time. Even if we would employ steady masses, the non-linearity of the m^2/r^2 ratio will eventually alter the measured gravitational constant. A promising approach to the measurement of *G* is through atom interferometry [7] which has given a value for *G* in line with this theory but still quite different from the latest Codata.

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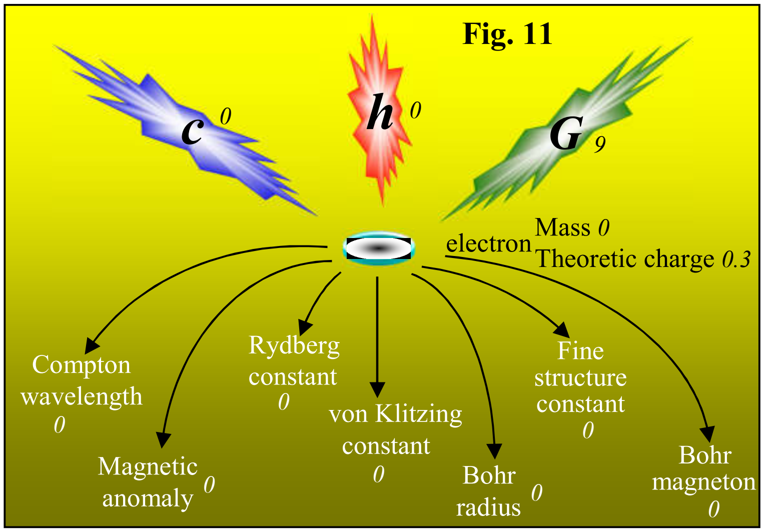
Conclusion

Anomalous gravitational effects and interaction of a gravitational field with a charge have been proposed in the past [8]. This paper seems to support the idea that a variable gravitational field generates an electric field and precise calculations are reported in the numeric table, next page. Three basic constants, *h*, *c* and *G,* notable for its large deviation, are sufficient to generate all basic quantum constants including the electron mass and charge, shown in fig. 11, with their standard deviation compared with the 2018 Codata listing [9, 10]. We have seen that there is also an electric field generated by the electron when its mass changes from zero to its current mass within a given time, typical of a pair production process.



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Related documents

1) D. Di Mario, (2003), *Magnetic anomaly in black hole electrons,* http://digilander.iol.it/bubblegate/magneticanomaly.pdf

2) D. Di Mario, (2003), *Reality of the Planck mass,* http://digilander.iol.it/bubblegate/planckmass.pdf

3) D. L. Bergman & J. P. Wesley, (1990), *Spinning charged ring model of electron yielding anomalous magnetic moment*, Galilean Electrodynamics, Vol. 2, 63-67.

4) M. Kanarev, *Model of the electron,* https://www.researchgate.net/publication/2932849_Model_of_the_Electron

5) C. Spaniol, and J.F. Sutton, (1992), *Classical electron mass and fields*, Part II, Physics Essay, vol. 5(3), p. 429-430

6) D. Di Mario, (2003), *Planck permittivity and electron force,* http://digilander.iol.it/bubblegate/planckpermittivity.pdf

7) G. Rosi, et al, (2014), *Precision measurement of the Newtonian gravitational constant using cold atoms,* http://arxiv.org/abs/1412.7954

8) L. I. Schiff, (1970), *Gravitation-induced electric field near a metal,* Phys. Rev. B1, 4649-4654. http://prola.aps.org/abstract/PRB/v1/i12/p4649_1

9) Internationally recommended values of the Fundamental Physical Constants (2018). Physics Laboratory of NIST, http://physics.nist.gov/cgi-bin/cuu/Category?view=pdf&All+values.x=80&All+values.y=11

10) Peter J Mohr, David B Newell, Barry N Taylor and Eite Tiesinga, 2018, *Data and analysis for the Codata 2017 adjustment...* https://www.researchgate.net/publication/320995786_Data_and_analysis_for_the_CODATA_2017_Special_Fundamental_Constants_Adjustment

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Numeric table

Basic data		
$c = 299792458$ $h = 6.62607015\text{x}10^{-34}$ $G = 6.6729196876\text{x}10^{-11}$		
Planck particle		
Planck time t_p	$(\pi h G/c^5)^{1/2}$	$2.39502\text{x}10^{-43}$
Planck mass M	$h/t_p c^2$	$3.0782613\text{x}10^{-8}$
Planck Permittivity ε_p	$(t_p/4\pi^2)^{1/4}$	$8.82546\text{x}10^{-12}$
Unitary charge squared in unitary time w_u	$16\pi^4 Q_u^2/t_u$	1558.5454565
Initial fine structure constant α_0	$(w_u t_p)^{1/2}/Q =$ $(2\pi^2/c)(\pi/c)^{1/2}(2G/h)^{1/4}(c/\pi hG)^{1/16}$	$7.295873082\text{x}10^{-3}$
Planck charge Q	$(4\varepsilon_p h c)^{1/2}$	$2.6481162\text{x}10^{-18}$
Quantized Planck mass M_0	$M t_p^{1/2}$	$1.5064685\text{x}10^{-29}$
Electron (Codata 2018 electron charge e=$1.602176634\text{x}10^{-19}$)		
Theoretic charge e_t	$(w_u t_p/\alpha(2-\alpha))^{1/2}$	$1.6021766364\text{x}10^{-19}$
Compensating factor $c_f = e_t/e$	$(w_u t_p/2\pi\varepsilon_0 G(2-\alpha))^{1/2}/\alpha M$	1.00000000150306
Fine structure constants *(vacuum equation)*	$\alpha^3 - 2\alpha^2 + w_u t_p/2\varepsilon_0 c_f^2 hc = 0$	$7.29735256929\text{x}10^{-3}$ 1.999973470767 $-7.270823337\text{x}10^{-3}$
Electric force F_e	$GM^2\alpha/2$	$2.307077552\text{x}10^{-28}$
Mass m_e	$M_0(\alpha/2)^{1/2}(\alpha/\alpha_0)^{12}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/4}$	$9.1093837015\text{x}10^{-31}$
Fine struct. of intrinsic magnetic moment α_m	$\alpha/1.000089187709953$	$7.2967017932\text{x}10^{-3}$
Magnetic moment anomaly a_e	$(\alpha/\alpha_m)^{13}((2-\alpha)/(2-\alpha_m))^{5/4} - 1$	0.00115965218128
Gravitational Force F_g	$GM_0^2(\alpha/2)(\alpha/\alpha_0)^{24}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/4}$	$5.5372469\text{x}10^{-71}$
Gravitation to electric force ratio F_g/F_e	$t_p(\alpha/\alpha_0)^{24}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/4}$ $= 2(m_e/M)^2/\alpha$	$2.400113\text{x}10^{-43}$
Electric field from a gravitational variation		
Materialization time t_e	$h/m_e c^2$	$8.0932998\text{x}10^{-21}$
Gravitational field variation Δ_g	$G m_e/t_e$	$7.51068117\text{x}10^{-21}$
Electric field $e/4\pi\varepsilon_0$	$\Delta_g M/e\,(\alpha/\alpha_0)^{24}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/4}$ $= M(\alpha G/8\pi\varepsilon_0)^{1/2}$	$1.439964548\text{x}10^{-9}$

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