CONNECTING FUNDAMENTAL CONSTANTS....

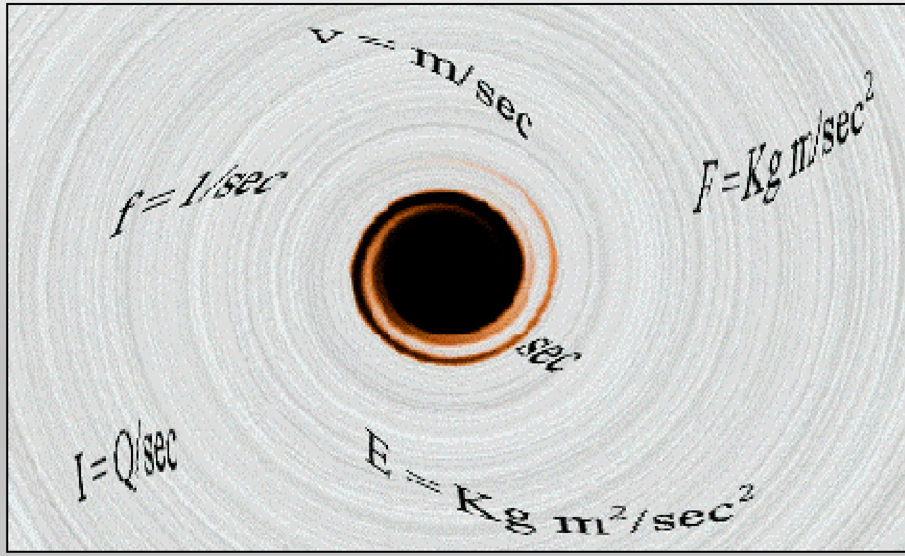
The gravitational to the electric force ratio in an electron is numerically close, by 0.23%, to Planck time, disregarding a $\pi\sqrt{2}$ factor.

$$\frac{F_g}{F_e} \approx t_p$$

Numbers are according to the MKSA system but its definition of electrical quantities do not allow an easy integration with quantum gravitation resulting in an apparent dimensional mismatch.

Actually there is no dimensional mismatch once the quantization of time and mass is introduced. This gives us the link connecting electric and gravitational quantities based on an underlying structure of a black hole electron.

Connecting Fundamental Constants



$$t_p = GM_0^2/GM^2$$

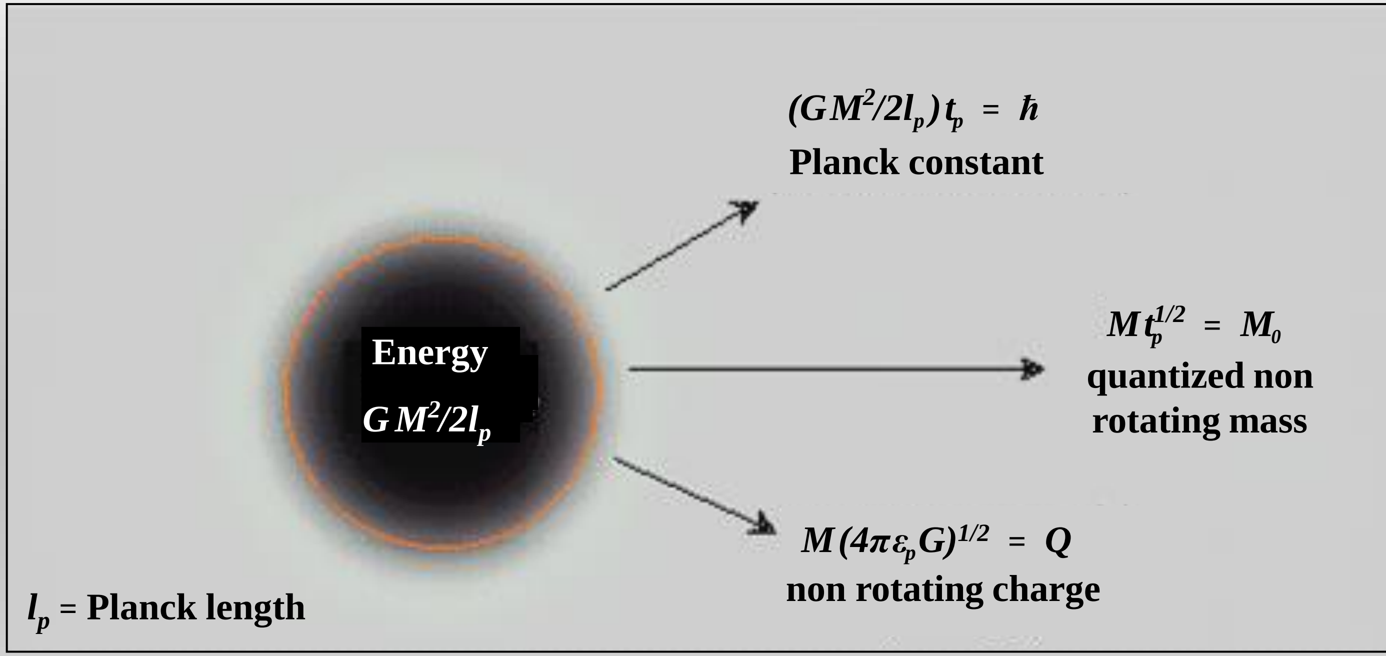
$$\varepsilon_p = (t_p/4\pi^2)^{1/4}$$

$$GM^2 = Q^2/4\pi\,\varepsilon_p$$

t_p = Planck time, M = Planck mass, $M_0 = M t_p^{1/2}$ quantized Planck mass, ε_p = Planck permittivity

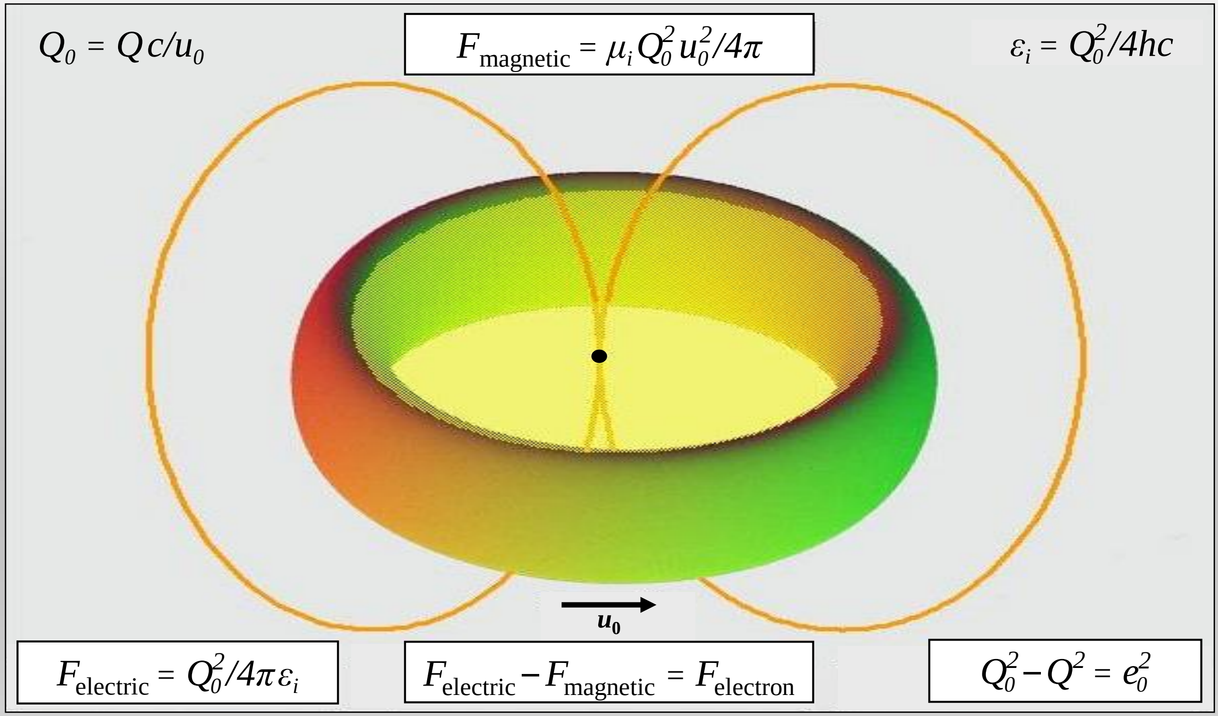
Time loses its meaning in a black hole. Past the event horizon the time dilation might "freeze" what we see. Outside the black hole, the quantized gravitational force GM_0^2 has an additional time dimension, the Planck time.

Origin of Electron



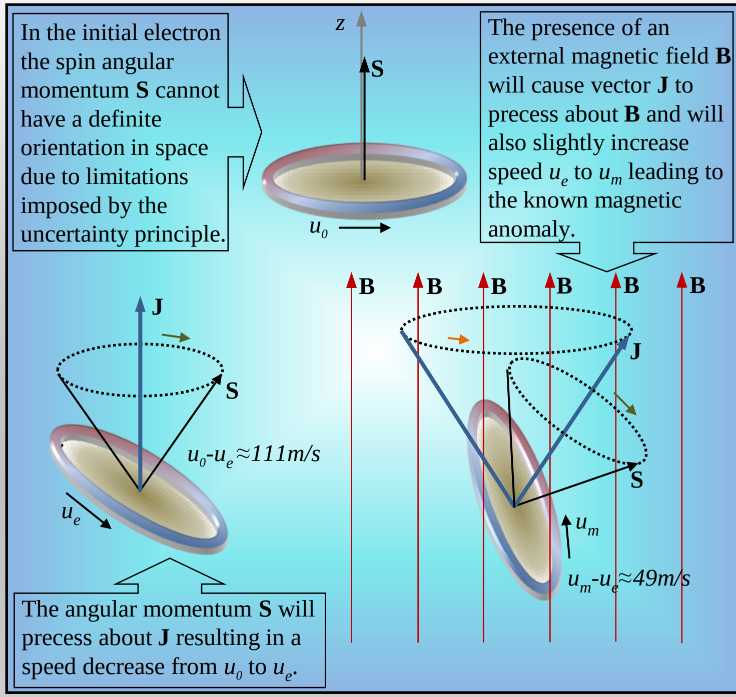
The energy of the Planck black hole is given by $GM^2/2l_p$, but the constrain of time t_p outside the black hole would give us something slightly different, the Planck constant and the quantized mass M_0

Rotation of Electron



A rotating charge will set up a magnetic field opposing its own rotation until a stability point is reached. The rotational speed u_0 is related to the initial fine structure constant $\alpha_0=2(1-u_0^2/c^2)$. α_0 would depend on some electrical properties of the particle and how charge Q compares with a ring of unitary charge Q_u and unitary time t_u so that $\alpha_0=(w_u/w_p)^{1/2}$ where $w_u=16\pi^4 Q_u^2/t_u$ and $w_p=Q^2/t_p$. The introduction of an exact quantity for the electron charge e requires a compensating factor e_t/e, with $e_t=(w_u\,t_p\,/a(2\text{-}a))^{1/2}$, to be applied to some equations.

Rotation Slowdown



Vacuum equation

$$\alpha^3 - 2\alpha^2 + w_u t_p / 2\varepsilon_0 (e_t/e)^2 hc \;=\; 0$$

Electron equation

$$\alpha^2 - 2\alpha + w_u t_p / e_t^2 \;=\; 0$$

Fine structure of magnetic moment

$$\alpha_m \;=\; \alpha / 1.000089187709953$$

Rotational speed

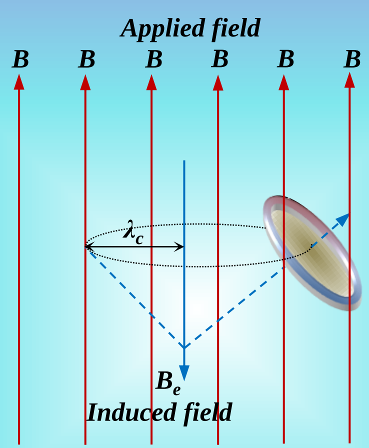
$$u_m \;=\; c(1 - \alpha_m/2)^{1/2}$$

Magnetic moment anomaly

$$a_e \;=\; (\alpha/\alpha_m)^{13}((2-\alpha)/(2-\alpha_m))^{5/4} - 1$$

A complete agreement with known values is achieved by lowering the rotational speed from u_0 to u_e. The precession of spin angular momentum S has the effect of lowering speed u_0 with a corresponding decrease of the charge from e_0 to e_t and an increase of the fine structure from α_0 to α.The presence of an external magnetic field B increases speed u_e to u_m and is responsible for the magnetic moment anomaly.

Magnetic Anomaly with Known Constants



$B_e/B = \alpha/2\pi$

$\delta_\alpha = (1+\alpha/2\pi-(\alpha/2\pi)^2+\delta_p)^{1/13}$

$\delta_p = 1.893x10^{-11}$ would include very marginal influence from other physics affecting the Larmor frequency f_e

Magnetic field ratio

$$B_e/B = \mu_0 f_e e/2\lambda_c = \alpha/2\pi$$

Interaction between main and induced field

$$(\alpha/2\pi)(1-\alpha/2\pi)+\delta_p = (\alpha/\alpha_m)^{13}-1$$

Supposed frequency sensitivity to other factors

$$\delta_p = 1.893x10^{-11}$$

α variation due to magnetic interaction

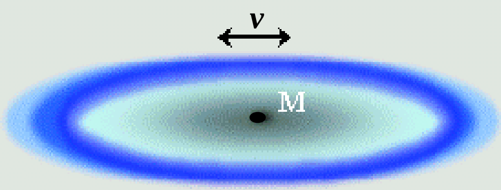
$$\delta_\alpha = \alpha/\alpha_m = (1+\alpha/2\pi-(\alpha/2\pi)^2+\delta_p)^{1/13}$$

Magnetic moment anomaly

$$a_e = \delta_\alpha^{13}((2-\alpha)/(2-\alpha/\delta_\alpha))^{5/4}-1$$

The magnetic field ratio generated by an electron rotating with the Larmor frequency $f_e=e/2\pi m_e$ on a radius λ_c=Compton wavelength, is always $\alpha/2\pi$. Interaction between applied and induced field is then related to the variation of the fine structure constant thus taking care of magnetic electron parameters. A residual discrepancy δ_p is due to other minor factors and can be safely ignored except for the calculation of anomaly a_e.

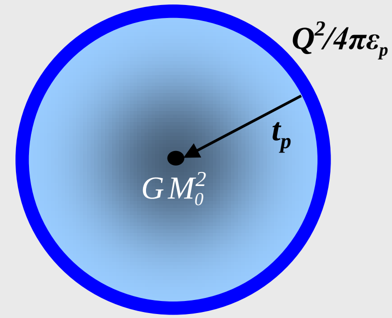
Planck Permittivity and Electron Force



$$M_0 = M t_p^{1/2}$$

$$M_0 v^2 = h/2\pi$$

$$M_0 c^2 = 2\pi M v^2$$



$$GM_0^2 = \pi\varepsilon_p^3 Q^2 \Longrightarrow Gm_e^2 \approx \pi\varepsilon_0^3 e^2$$

Non rotating

$$GM_0^2/GM^2 = 4\pi^2(v/c)^4 = t_p$$

v/c = **Planck Permittivity** ε_p

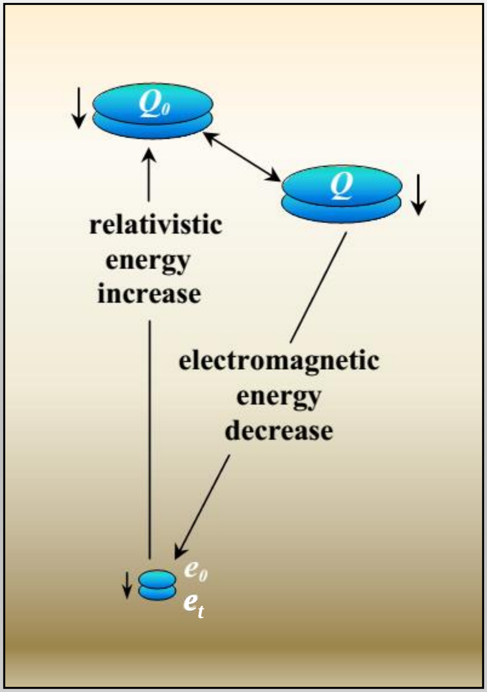
Rotating

$$Gm_e^2 = \pi\varepsilon_0^3 e^2 C$$

$$C = (e_t/e)^8(\alpha/\alpha_0)^{32}(1-\alpha/2)^4((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/4} \approx 0.989$$

Mass M would not stand still but would move with speed v calculated by applying the uncertainty principle to mass M_0. This would show as the kinetic energy of mass M. Their gravitational ratio would contain a constant which is our Planck permittivity. Time t_p and permittivity ε_p are directly related thus originating a relationship linking the electric and gravitational force in an electron.

Electric and Gravitational Force



$$F_g/F_e = t_p(\alpha/\alpha_0)^{24}((1-\alpha/2)(2-\alpha)/(2-\alpha_0))^{3/4}$$

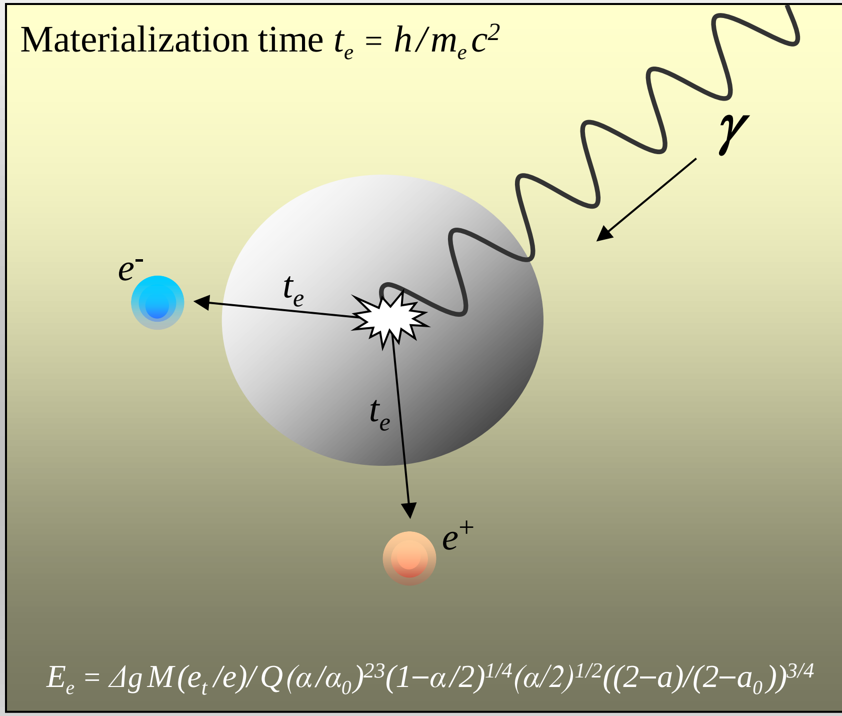
$$e_t = Q/(\alpha/\alpha_0)(2/\alpha-1)^{1/2} = (w_u t_p/\alpha(2-\alpha))^{1/2}$$

$$G = 8\hbar c^3(\alpha^2(2-\alpha)/\mu_0 w_u)^2$$

$$\varepsilon_0 = \varepsilon_p/(\alpha/\alpha_0)^2(1-\alpha/2)(e_t/e)^2$$

The small change of the rotational speed will lower the charge value. This change is written in terms of the fine structure constant variation thus giving the known permittivity and electron charge. The measurable ratio F_g/F_e is now calculated with precision once rotation and its variation is taken into account. Now it is possible to calculate G directly from other constants.

Electric Field from a Gravitational Variation



Electric force

$$F_e = GM^2\alpha/2$$

Gravitational field variation

$$\Delta g = Gm_e/t_e$$

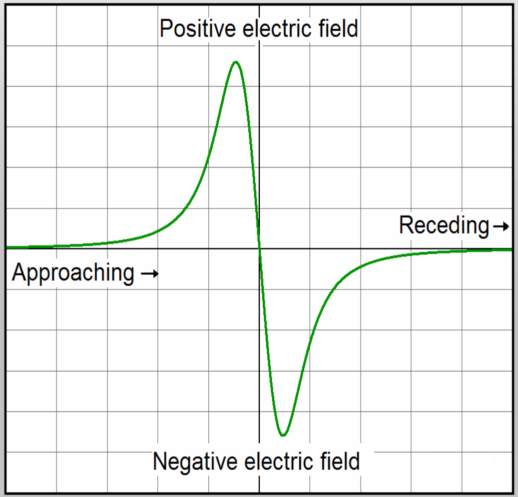
Electron electric field

$$E_e = M(\alpha G/8\pi\varepsilon_0)^{1/2}$$

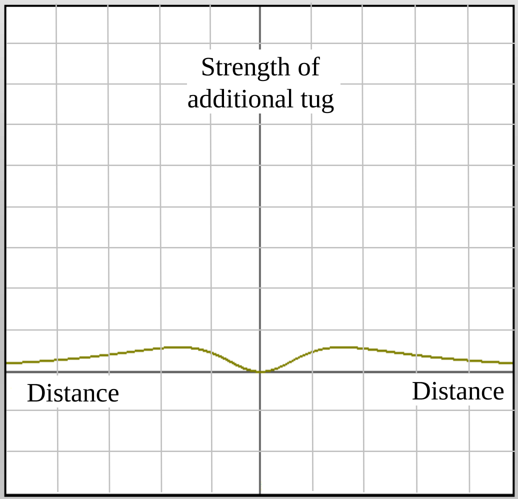
The electron force is equal to the gravitational force of the Planck mass provided we take into account its rotation represented by α. The mass variation in an electron, from zero to m_e, will generate the relevant electric field E_e without any knowledge of its charge. E_e includes a number of terms regarding its rotation and subsequent slowdown and it is also equal to $M(\alpha G/8\pi\varepsilon_0)^{1/2}$

Deviation from Newton's Law

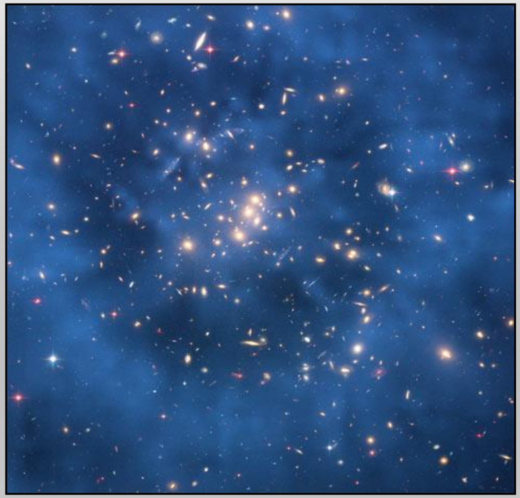
Electric field from a mass fly-by



Stronger at intermediate range

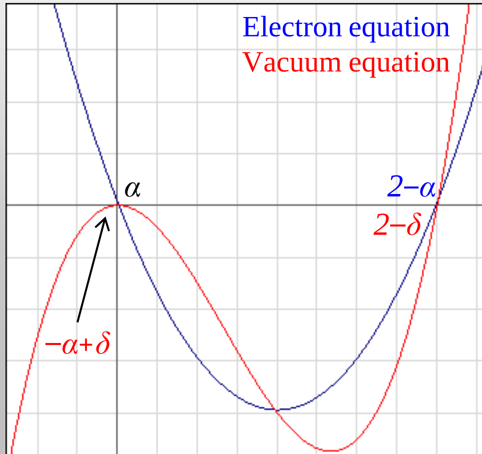


Galaxy cluster CL0024+1652



An extra tug would be generated whenever one mass moves with respect to another. The attractive force would slightly modify the classic law of gravitation with the peculiarity that it would be prominent only at a certain distance. Could the above galaxy cluster be an example of this additional pull rather then the work of dark matter? Measurements of the constant of gravitation *G* could be dependent also on the relative speed and not just their relative distance.

Negative and Magnetic Fine Structure



Fine structure	negative	standard	strong
Electron	no	α	$2-\alpha$
Vacuum	$-\alpha+\delta$	α	$2-\delta$
Magnetic	no	α_m	$2-\alpha_m$
Spin speed	$u > c$	$u < c$	$u << c$

$$\delta = 1+\alpha/2-(1+\alpha-(3/4)\alpha^2)^{1/2}$$

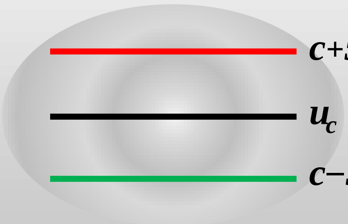
$$\alpha_m = \alpha/1.000089187709953$$

$$\alpha_n = -\alpha+\delta$$

The vacuum equation will intersect the abscissa in three places: α, $2-\delta$ and at a negative point given by $\alpha_n = -\alpha+\delta$. The negative value hints at the possibility of a speed faster than light by 0.18% and imaginary particles. The fine structure is decreased by a small amount, 89 ppm, enough to generate the magnetic anomaly and magnetic moment. All data from *c*, *h* and *G* only. All numerical results within one standard deviation, except for *G*, with h = $6.62607015\text{x}10^{-34}$ and G = $6.6729196876\text{x}10^{-11}$

Superluminal Speed and Imaginary Particles

Speed levels



$c{+}5.44\text{x}10^5 = u_s$

u_c = *mean speed* $\approx c$

$c{-}5.47\text{x}10^5 = u_e$

$$u_s = c(1-\alpha_n/2)^{1/2}$$

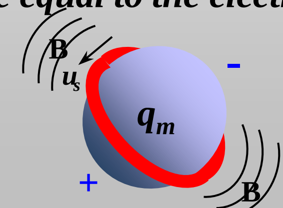
$$u_e = c(1-\alpha/2)^{1/2}$$

Quartic mean $u_c = (u_s^4/2+u_e^4/2)^{1/4}$

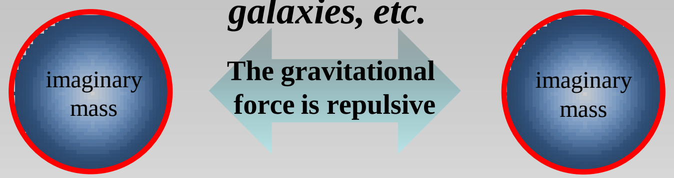
$$u_c \approx c$$

Imaginary particle generated by α_n

Rotation at speed u_s is so fast that the magnetic force prevails over the electric force and the particle is now showing a net magnetic charge $q_m = c\,\tilde{e}$ where $\tilde{e}$ is the selectron charge with an absolute value equal to the electron charge.



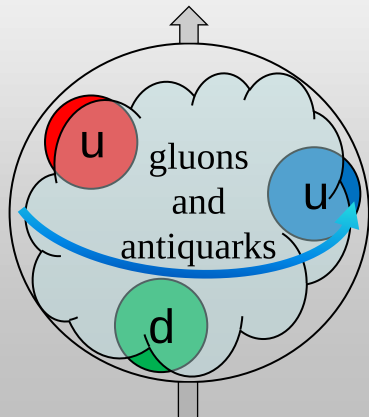
Gravitational forces are repulsive and masses will not coalesce to form stars, planets, galaxies, etc.



A four dimension spacetime would be required for a speed > c. The mean speed u_c between the superluminal speed u_s and u_e is then given by a quartic mean. It was expected $u_c = c$ but the result shows an unaccounted difference of 22ppt (parts per trillion). The superluminal speed would apply to imaginary particles that will not interact with real matter except for a direct collision.

Proton

Proton constituents



Mass - MeV

$$p = u/2\alpha + u/2\alpha + d/\alpha = (u+d)/\alpha$$

$$u = 2.168538\ MeV$$

$$d = 4.678364\ MeV$$

Known quark mass

$$u = 2.16^{+0.49}_{-0.26}\ MeV \quad d = 4.67^{+0.48}_{-0.17}\ MeV$$

confined fine structure

$$\alpha_c = 0.0555413$$

confined proton mass

$$p_c = (u+d)/\alpha_c$$

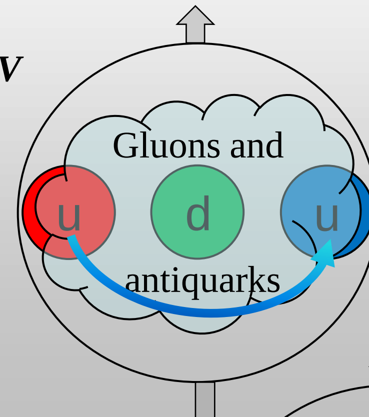
confined proton charge

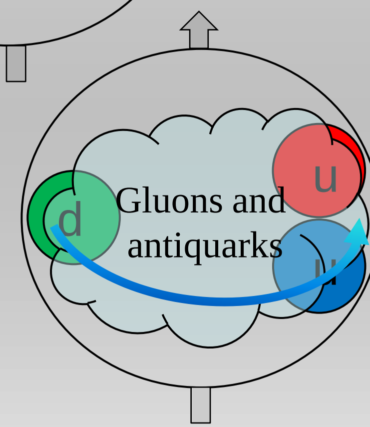
$$e_c = (w_u t_p / \alpha_c (2-\alpha_c))^{1/2}$$

proton magnetic moment

$$\mu_p = e_c \hbar c^2 / 2 e p_c$$

Alternative representations





Quarks interacting with gluons and antiquarks originate an effect similar to an "energy amplification" mediated by the fine structure constant α. Lattice in quantum chromodynamics is able to explain, to a large extent, the proton mass whereas the above empirical equations should be seen as shortcuts. The alternative representations should make it easier to calculate spin, excess antimatter from the d quark, magnetic properties and proton polarization.