

GRAVITY AND ELECTROMAGNETIC FIELDS

THE SAME LAWS ON DIFFERENT LEVELS

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ABSTRACT

“To see a World in a Grain of Sand” - W.Blake

When we look for object description (one or two object maximum), for example as our planet, than the cinematic laws and equitation's are enough for that.

If we look for inner structure of this big objects we shall find that this objects are made from much smaller objects (particles) with same shape. When we exam them we shall find that cinematic equitation's are not enough. Now it must be used different laws, theories, equitation's and formulas as that from thermodynamics, statistic laws, lows of probability and so on. But if we exam only one or maximum two small particles than we shall find that the laws for their descriptions are the same as for the big objects, but with different constants.

So the big question is:

How much such levels are from our cosmos “up” and how much such levels are from our micro cosmos “down”?

Panoramic view of distant universe, with added hidden atomic like structures!

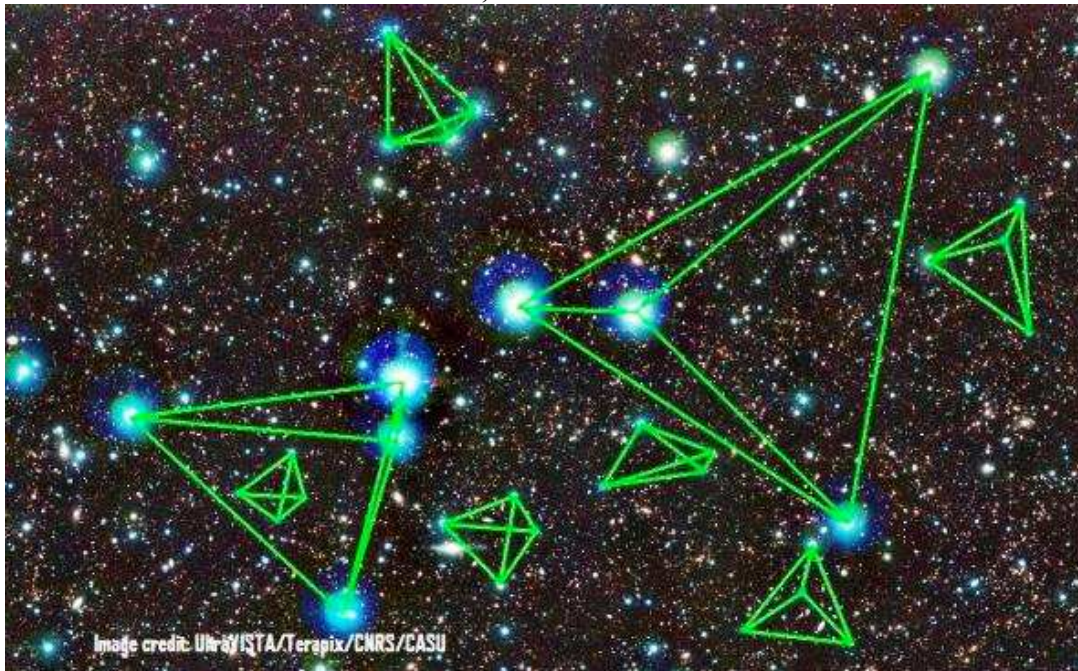


Image credit: UltraVISTA/Terapix/CNRS/CASU

The image, from the European Southern Observatory's (ESO) VISTA telescope

INTRODUCTION

Exploration of the structure of the matter and the fundamental structure of the universe, with his basic constituents and forces, with help of modern physical theories (field theories, quantum mechanics, theory of relativity, gauge theories, supersymmetric theories, supergravity theories, superstring theory and so on) are and were with purpose to explain and describe the reality.

Interpretation and understanding of experimental and observational data from physical processes and quantities is essential for every valid theory. But, always there is a possibility for different interpretation of same processes. For example, the physical nature and dimensionality of charge is not well understood or established in existing physics.

What is charge? What is volt? What is ohm? What is electric current? Do we really understand basis for electrical quantities and units.

To answer to this at first maybe is better to ask this question.

Is it possible to express electrical quantities only with coherent set of units that everybody are familiar, as metre, kilogram and second? This maybe will not simplify the theories and reduce the number of the units to the smallest number of basic units, but will help for better understanding of the basic principle in physical world.

This is no new question. It is well known that when dimension of any physical quantity is expressed only in terms of mass, length and time (MLT) quantities and with their units, than this system is named as absolute system. For example the CGS system (centimeter, gram, second) adopted in 1881 was so called absolute system.

So what really stand behind electrical units or is it possible to express formulas and equations without electrical units as ampere - A, volt - V, tesla - T, ohm - Ω and so on.

If such possibility exist then must also exist possibility to make connections and analogy between all fields, quantities and units which will led to the unifying of all forces in nature based on unified field characteristic.

UNIT ANALOGY

At first here will be present, as starting base point, the next unit analogy preposition for electromagnetic units with mechanical units or (MLT).

1. Coulomb: $[C] \equiv [kg]$
2. Ampere: $[A] \equiv kg f = [kg/s]$ or $[A] \equiv kg \omega = [kg/s]$
3. Volt: $[V] \equiv v^2 = [m^2/s^2]$
4. Veber: $[W_b] \equiv v R = [m^2/s]$
5. Tesla: $[T] \equiv f = [1/s]$ or $[T] \equiv \omega = [1/s]$
6. Farad: $[F] \equiv kg / v^2 = [kg s^2/m^2]$
7. Siemens: $[S] \equiv kg / v R = [kg s/m^2]$
8. Henry: $[H] \equiv R^2 / kg = [m^2/kg]$
9. Ohm; $[\Omega] \equiv v R / kg = [m^2/kg s]$
10. El.field strength $[V/m] \equiv g = v^2 / R = [m/s^2]$
11. Permittivity $\epsilon_0 = [F/m] = [kg s^2/m^2 m] = kg/v^2 R$
12. Permeability $\mu_0 = [H/m] = [m^2/kg m] = [m/kg] = R/kg$

Note: \equiv - identically equal to

R - radius (some times instead of R it must be used $O = 2\pi R$)

- the physical quantity sign for mass – m is given by [kg] because this sign is same with metre - [m]

So what are the electrical units instead of?

The simplest answer is that almost all electrical units are connected with physical quantities of the electron (here is not discuss the inner structure of the electron) .

If we replace in any electromagnetic equitation next derived quantities, always will be get the same result as we were working with electrical units.

1. Quantity of electricity [C] - Coulomb \equiv [kg]

One Coulomb is virtual particle with mass of $6.241509343 \cdot 10^{18}$ electrons, in [kg].

$$m_{cu} = 6.241509343 \cdot 10^{18} \cdot 9.10938291 \cdot 10^{-31} = 5.685629854 \cdot 10^{-12} \text{ [kg]} \text{ - coulomb mass } m_{cu}$$

The notion “virtual” mean that all electrical units are connected with the physical collective property of big number of electrons ($6.2415093433 \cdot 10^{18}$) which virtual act as one object.

dimensional check

present SI units for Coulomb = [As]

$$[A] \equiv \text{kgf} = [\text{kg}/\text{s}]$$

$$C = [\text{As}] = [\text{kgs}/\text{s}] = [\text{kg}]$$

2. Electric current [A] – Ampere \equiv [kg/s]

One Ampere is product of one Coulomb virtual particle mass [kg] and virtual electron circle frequency [1/s]

$$m_{\text{cu}} = 5.685629854 \cdot 10^{-12} \text{ [kg]}$$

$$f_T = 1 \text{ [1/s]}$$

$$1 \text{ A} = m_{\text{cu}} \cdot f_T = 5.685629854 \cdot 10^{-12} \cdot 1 = 5.685629854 \cdot 10^{-12} \text{ [kg/s]}$$

no check - basic SI unit

3. Electric potential [V] – Volt \equiv $v^2 = [\text{m}^2/\text{s}^2]$

One Volt is squared electron virtual velocity $v_{\text{el}} = 4.193828904 \cdot 10^5 \text{ [m/s]}$

$$E = qU = [\text{CV}] = 1[\text{J}]$$

$$E = m_{\text{cu}} v_{\text{el}}^2 = 5.685629854 \cdot 10^{-12} \cdot (4.193828904 \cdot 10^5)^2 = 5.685629854 \cdot 10^{-12} \cdot 1.758820088 \cdot 10^{11} \\ = 1 \text{ [kg]} \cdot [\text{m}^2/\text{s}^2] = 1 \text{ [J]}$$

$$\text{one volt} = (4.193828904 \cdot 10^5)^2 = 1.758820088 \cdot 10^{11} \text{ [m}^2/\text{s}^2]$$

$$\text{two volts} = 2 \cdot 1.758820088 \cdot 10^{11} = (5.930969715 \cdot 10^5)^2 = 3.517640176 \cdot 10^{11} \text{ [m}^2/\text{s}^2]$$

So electron velocity in conductors when one volt is applied is cca 419 [km/s], while with two volts electron velocity is 593 [km/s]. This is not real linear electron velocity throw the conductor but electron helicoids velocity throw conductor, with step equal to the distance of the electrons coherence. Things that go linear throw conductor, with speed of the light, is the velocity of the interconnection of free electrons fields.

dimensional check

present SI units for volt = $[m^2kg/s^3A]$

$[A] \equiv kgf = [kg/s]$

$V = [m^2kg/s^3A] = [m^2kgs/s^3kg] = [m^2/s^2]$

Electromagnetic induction:

$U = B l v = 1.758820088 \cdot 10^{11} [1/s] \cdot 1[m] \cdot 1[m/s] = 1.758820088 \cdot 10^{11} [m^2/s^2]$

$v = \sqrt{U} = 4.193828904 \cdot 10^5 [m/s]$

Electromagnetic power:

$P = U \cdot I = 1 [V] \cdot 1 [A] = 1.758820088 \cdot 10^{11} [m^2/s^2] \cdot 5.685629854 \cdot 10^{-12} [kg/s] = 1[kgm^2/s^3]$
 $= 1 [W]$

4. Magnetic flux $[W_b]$ – Veber $\equiv v R = [m^2/s]$

One veber is product of electron virtual velocity $v_{el} = 4.193828904 \cdot 10^5 [m/s]$ and virtual electron radius $R = 2.3844558821 \cdot 10^{-6} [m]$

$1 W_b = v_{el} R = 4.193828904 \cdot 10^5 \cdot 2.3844558821 \cdot 10^{-6} = 1 [m^2/s]$

dimensional check

present SI units for veber = $[m^2kg/s^3A]$

$[A] \equiv kgf = [kg/s]$

$Wb = [m^2kg/s^2A] = [m^2kgs/s^2kg] = [m^2/s]$

The electromagnetic force:

$F = B l I = 1[T] \cdot 1 [m] \cdot 1 [A] = 1.758820088 \cdot 10^{11} [1/s] \cdot 1[m] \cdot 5.685629854 \cdot 10^{-12} [kg/s] = 1[kgm/s^2]$ or $1[N]$

5. Magnetic flux density [T] – Tesla $\equiv f = [1/s]$

One Tesla is ratio between virtual electron velocity and virtual electron circle or radius

$$f_T = v_{el}/O = 4.193828904 \cdot 10^5 / 2.3844558821 \cdot 10^{-6} = 1.758820088 \cdot 10^{11} \quad [1/s]$$

$$\text{One Tesla} = \text{electron virtual circle frequency } f_T = 1.758820088 \cdot 10^{11} \quad [1/s]$$

dimensional check

$$\text{present SI units for tesla} = [kg/s^2 A]$$

$$[A] \equiv kgf = [kg/s]$$

$$T = [kg/s^2 A] = [kg \text{ s}/s^2 kg] = [1/s]$$

6. Capacitance [F] – Farad $\equiv kg/v^2 = [kg \text{ s}^2/m^2]$

One Farad is ratio between Coulomb virtual particle mass and squared electron virtual velocity

$$m_{cu} / v_{el}^2 = 5.685629854 \cdot 10^{-12} / (4.193828904 \cdot 10^5)^2 = 3.2326386839 \cdot 10^{-23} \quad [kg \text{ s}^2/m^2]$$

dimensional check

$$\text{present SI units for farad} = [s^4 A^2 / m^2 kg]$$

$$[A] \equiv kgf = [kg/s]$$

$$F = [s^4 A^2 / m^2 kg] = [s^4 kg^2 / m^2 s^2 kg] = [kg \text{ s}^2 / m^2]$$

Permittivity ϵ_0

$$\epsilon_0 = 8.854187817 \cdot 10^{-12} \quad [F/m] = [kg \text{ s}^2 / m^2] / [m] = [kg \text{ s}^2 / m^2 m] = kg/v^2 R$$

7. Conductance [F] – Siemens $\equiv \text{kg} / \text{v R} = [\text{kg s} / \text{m}^2]$

One Siemens is ratio between Coulomb virtual particle mass and product of electron virtual velocity and electron virtual circle or radius

$$m_{\text{cu}} / v_{\text{el}} O = 5.685629854 \cdot 10^{-12} / 4.193828904 \cdot 10^5 \cdot 2.3844558821 \cdot 10^{-6} = 5.685629854 \cdot 10^{-12} \text{ [kg s/m}^2\text{]}$$

dimensional check

$$\text{present SI units for Siemens} = [\text{s}^3 \text{A}^2 / \text{m}^2 \text{kg}]$$

$$[\text{A}] \equiv \text{kgf} = [\text{kg/s}]$$

$$\text{F} = [\text{s}^3 \text{A}^2 / \text{m}^2 \text{kg}] = [\text{s}^3 \text{kg}^2 / \text{m}^2 \text{s}^2 \text{kg}] = [\text{kg s} / \text{m}^2]$$

8. Inductance [H] – Henry $\equiv \text{R}^2 / \text{kg} = [\text{m}^2 / \text{kg}]$

One Henry is ratio between squared electron virtual radius and Coulomb virtual particle mass

$$\text{R}^2 / m_{\text{cu}} = (2.3844558821 \cdot 10^{-6})^2 / 5.685629854 \cdot 10^{-12} = 1 \text{ [m}^2 / \text{kg]}$$

dimensional check

$$\text{present SI units for Siemens} = [\text{m}^2 \text{kg} / \text{s}^2 \text{A}^2]$$

$$[\text{A}] \equiv \text{kgf} = [\text{kg/s}]$$

$$\text{H} = [\text{m}^2 \text{kg} / \text{s}^2 \text{A}^2] = [\text{m}^2 \text{kg} \text{s}^2 / \text{s}^2 \text{kg}^2] = [\text{m}^2 / \text{kg}]$$

Permeability μ_0

$$\mu_0 = 1.2566370614 \cdot 10^{-6} \text{ [H/m]} = [\text{m}^2 / \text{kgm}] = [\text{m/kg}] = \text{R/kg}$$

The simple relation between magnetic field B [T] and magnetic field strength H [A/m]

$$\text{B} = \mu_0 \text{H}$$

$$\text{H} = [\text{A/m}] = [\text{kg/m s}]$$

$$\text{B} = \mu_0 \text{H} = [\text{m/kg}] \cdot [\text{kg/m s}] = [1/\text{s}]$$

Electric resistance [Ω] – ohm $\equiv v R / \text{kg} = [\text{m}^2/\text{kg s}]$

One ohm is ratio between electron virtual velocity and electron virtual radius with Coulomb virtual particle mass

$$vR / m_{cu} = 4.193828904 \cdot 10^5 \cdot 2.3844558821 \cdot 10^{-6} / 5.685629854 \cdot 10^{-12} = 1.758820088 \cdot 10^{11} \text{ [m}^2/\text{kg s]}$$

dimensional check

$$\text{present SI units for ohm} = [\text{m}^2 \text{kg} / \text{s}^3 \text{A}^2]$$

$$[\text{A}] \equiv \text{kgf} = [\text{kg}/\text{s}]$$

$$\Omega = [\text{m}^2 \text{kg} / \text{s}^3 \text{A}^2] = [\text{m}^2 \text{kgs}^2 / \text{s}^3 \text{kg}^2] = [\text{m}^2/\text{kg s}]$$

Ohms law:

$$U = I \cdot R = 1 [\text{A}] \cdot 1[\Omega] = 1 [\text{V}]$$

$$U = I \cdot R = 5.685629854 \cdot 10^{-12} [\text{kg}/\text{s}] \cdot 1.758820088 \cdot 10^{11} [\text{m}^2/\text{kgs}] = 1 [\text{m}^2/\text{s}^2]$$

Electromagnetic power:

$$P = R \cdot I^2 = 1 [\Omega] \cdot 1^2 [\text{A}^2] = 1 [\Omega] \cdot 1 [\text{A}^2] = 1.758820088 \cdot 10^{11} [\text{m}^2/\text{kg s}] \cdot 5.685629854 \cdot 10^{-12} [\text{kg}^2/\text{s}^2] = 1 [\text{kgm}^2/\text{s}^3] = 1 [\text{W}]$$

All units without [kg] are cinematic units as Volt, Veber and Tesla

FUNDAMENTAL FORCES

To find answer how the gravitational and electromagnetic fields and their units interconnected at first we must exam some basic criteria for four fundamental forces of the universe, and how they are related.

Matter is effected by forces or interactions. According present theories there are four fundamental forces in the Universe:

- gravitation (between particles with mass)
- electromagnetic (between particles with charge/magnetism)
- strong nuclear force (between nucleus particles)
- weak nuclear force (operates between neutrinos and electrons)

Today there are, so told valid theories, only for the first two fundamental forces, gravitational and electromagnetic.

This theories (mechanics, electricity and magnetism) are based on five base laws which are determined experimentally. For better understanding they are all expressed in their the most simplest general form. They are all also connected with their conservative field characteristic.

1. First law is given by Newton

$$F = M a = G m_1 m_2 / R^2$$

2. Second and third law are given by Coulomb and Ampere

$$F_e = q q' / 4\pi \epsilon_o R^2 = k_e q q' / R^2 - \text{by Coulomb}$$

$$F_m = m m' / 4\pi \mu_o R^2 = k_m m m' / R^2 - \text{by Coulomb (with Coulomb magnetic mass)}$$

or

$$F_m = k_m I_1 I_2 L / R - \text{by Ampere (with Ampere magnetic mass)}$$

4. Fourt law is given by Laplace

$$F = 2\pi q_m I / R$$

5. Fifth law is given by Maxwell's electromagnetic theory

$$\epsilon_o \mu_o c^2 = A^2$$

If we look carefully and make analyzes of all five base laws we shall find that all of them have root from one base law, which are also determined experimentally.

This law was for the first time introduced and published by Johannes Kepler (1571-1630) in 1619 as third law which state:

the square of the orbital period T is proportional to the cube on the mean distance

$$T^2 k = a^3$$

T – orbital period

a = R – main distance or radius

k – constant

This law at first was used, as base, by Newton for his theories, introducing mass concept and gravitational constant, and then by Gauss for his laws, known as Gauss laws. Next are the Coulomb's and the Ampere's laws for electrostatic and electromagnetic.

But what really stand behind this basic formula?

This formula use only two units – length and time. All movements and mechanics in Earth atmosphere is based on this law. There is no need for mass or charge. Velocity and distance is only values needed for all interplanetary flight missions. This constant is also known as the standard gravitational parameter.

$$k = a^3 / T^2$$

$$a = R \quad T = 1 / f \quad f = v / O = v / 2 \pi R$$

$$k = R^3 / T^2 = R^3 f^2 = R^3 v^2 / 4 \pi^2 R^2 = v^2 R / 4 \pi^2$$

$$k_1 = v^2 R = \omega^2 R^3 = \mu - \text{the standard gravitational parameter}$$

ω – circular velocity

How this law is connected with all known fields and objects? Is this law valid for all four forces.

To exam this at first it must be shown that electrical and magnetic laws can be represent also with MLT units, and than connect this law with rest all known forces.

MECHANICAL BASIC LAW – NEWTON'S LAW AND STRONG FORCES

$$F = M a$$

$$F = G m_1 m_2 / R^2$$

Isaac Newton composed and published his first edition *Principia Mathematica* in 1687 where he established his famous three laws of motion. He introduced many new states as Inertia, Force, Mass, Gravitational constant, acceleration, action, reaction and many others which were basic for most of classical mechanics. Newton showed that the motions of objects as planet Earth is governed by Kepler's law. But with his great intellect he projected new ideas as dividing constant k in Kepler's formula into two parts. First is the concept of mass, which value at first depends on the choice of basic unit for mass. The second part is also another constant named gravitational constant. So the force between two objects on mutual distance R is;

$$v^2 R = k = GM$$

$$v^2 R \cdot R/R = GM$$

$$v^2/R \cdot R^2 = GM \quad v^2/R = g \text{ acceleration}$$

$$g = GM / R^2$$

$$F = mg = GMm / R^2 \quad [\text{kg}] - \text{the force between two particles with mass } M \text{ and } m.$$

In his universal gravitational theory Newton proposed, the gravitational constant is universal and is valid for all universes and for all levels.

This Newton state must be taken with reserve and reinvestigated.

We know this constant, for sure, only for Earth and maybe for the Moon. For other planets and stars we know only their standard gravitational parameters including and our Sun. If this constant depends, for example, on object density than the mass value is different from today accepted planets or star mass values.

To show that such possibility exists at first we shall investigate the force in Hydrogen atom and then will be introduced new gravitational electromagnetic constant.

FORCE IN HYDROGEN ATOM

As is well known the force between electron and proton, in Hydrogen's atom (Bohr's model of atom), can be calculated with Coulomb's formula

$$F_{ep} = q_e \cdot q_p / 4\pi\epsilon_0 R^2 = e^2 / 4\pi\epsilon_0 R^2 \quad [\text{N}]$$

$$e = 1.602176565 \cdot 10^{-19} \quad [\text{C}] - \text{the charge of electron or proton}$$

$R = 5.2917721092 \cdot 10^{-11}$ [m] – electron's first radius round proton

$\epsilon_0 = 8.854187817 \cdot 10^{-12}$ [C/Vm] – permittivity or electromagnetic constant for vacuum

$$F_{ep} = (1.602176565 \cdot 10^{-19})^2 / 4\pi \cdot 8.854187817 \cdot 10^{-12} \cdot (5.2917721092 \cdot 10^{-11})^2 = 8.2387227831 \cdot 10^{-8}$$

$F = 8.2387227831 \cdot 10^{-8}$ [N] - force between proton and electron

GRAVITATIONAL ELECTROMAGNETIC CONSTANT G_{ep}

For the start, one interesting question, is it possible to get same force value using only mass of the electron and the proton.

Or maybe is better to reformulate the question like this:

Which value will get, here new presented gravitational electromagnetic constant G_{ep} , knowing force value $F = 8.2387227831 \cdot 10^{-8}$ [N], using only mass of the electron and the proton instead their charges?

$$F_{ep} = G_{ep} \cdot m_e \cdot m_p / R^2$$

$$G_{ep} = F_{ep} \cdot R^2 / m_e \cdot m_p = 8.2387227831 \cdot 10^{-8} \cdot (5.2917721092 \cdot 10^{-11})^2 / 9.10938291 \cdot 10^{-31} \cdot 1.672621777 \cdot 10^{-27} = 1.514172943 \cdot 10^{29}$$

$$\underline{G_{ep} = 1.5141728374 \cdot 10^{29} \text{ [Jm/kg}^2\text{]}}$$

The relation between this gravitational electromagnetic constant G_{ep} and gravitational constant G gave value:

$$k_{ep} = G_{ep} / G = 1.5141728374 \cdot 10^{29} / 6.673 \cdot 10^{-11} = 2.26881801 \cdot 10^{39}$$

$$k_{ep} = 2.26881801 \cdot 10^{39}$$

This value present the real relation between two of four basic or fundamental forces in the Universe - gravitational and electromagnetic forces.

But we have now new questions.

What is this constant?

How we can calculate electromagnetic forces without charges?

Is the charge only mathematical concept?

Why we have one constant with very small value for planets and stars (G) and another big constant for particles G_{ep} ?

Is it possible the galaxies have even smaller such constant value than G?

Is this gravitational electromagnetic constant valid and for protons, neutrons, or protons and neutrons?

Is the only criteria for such constants vacuum condition?

Do this constants depends also on object or particle size and their mass or density?

Is the particle or object inner structure and dynamics has effect on this constants?

Is there four constants for each fundamental force?

Even strange result we shall get, for the gravitational electromagnetic constant G_{ee} for electrons and G_{pp} for protons, if we calculate the repulsive force between two electrons or two protons. This force value, for both of them, in absolute value, is same as force between electron and proton, on same distance.

Electrons pair - pushing force, electron positron pair –pulling force:

The pushing or pulling force between them has same absolute value as force between electron and proton

$$F_{ee} = q_e \cdot q_e / 4 \pi \epsilon_0 \cdot R^2 = e^2 / 4 \pi \epsilon_0 \cdot R^2 \text{ [N]}$$

$$F = 8.2387227831 \cdot 10^{-8} \text{ [N]} \text{ - same as force between proton and electron}$$

$$F_{ee} = F_{ep} = G_{ee} \cdot m_e \cdot m_e / R^2$$

$$G_{ee} = F_{ep} \cdot R^2 / m_e \cdot m_e = 8.2387227831 \cdot 10^{-8} (5.2917721092 \cdot 10^{-11})^2 / 9.10938291 \cdot 10^{-31} \cdot 9.10938291 \cdot 10^{-31} = 2.7802525011 \cdot 10^{32}$$

$$\underline{G_{ee} = 2.7802525011 \cdot 10^{32} \text{ [Jm/kg}^2\text{]}}$$

Protons pair - pushing force, proton antiproton-pulling force:

The pushing or pulling force between them has same absolute value as force between electron and proton

$$F_{pp} = q_p \cdot q_p / 4 \cdot \pi \cdot \epsilon_0 \cdot R^2 = e^2 / 4 \cdot \pi \cdot \epsilon_0 \cdot R^2 \text{ [N]}$$

$$F = 8,238722053 \cdot 10^{-8} \text{ [N]} \text{ - same as force between proton and electron}$$

$$F_{pp} = F_{ep} = G_{pp} \cdot m_p \cdot m_p / R^2$$

$$G_{pp} = F_{ep} \cdot R^2 / m_p \cdot m_p = 8.2387227831 \cdot 10^{-8} (5.2917721092 \cdot 10^{-11})^2 / 1.672621777 \cdot 10^{-27} \cdot 1.672621777 \cdot 10^{-27} = 8.2464430137 \cdot 10^{25}$$

$$\underline{G_{pp} = 8.2464430137 \cdot 10^{25} \text{ [Jm/kg}^2\text{]}}$$

These values can be also get from formulas which use mass-charge conversion factor or constant for electron and for proton.

$$k_e = e / m_e = 1.602176565 \cdot 10^{-19} / 9.10938215 \cdot 10^{-31} = 1.758820088 \cdot 10^{11} \text{ [C/kg]}$$

$$k_p = e / m_p = 1.602176565 \cdot 10^{-19} / 1.672621777 \cdot 10^{-27} = 9.57883358 \cdot 10^7 \text{ [C/kg]}$$

$$G_{ee} = k_e k_e / 4 \cdot \pi \cdot \epsilon_0 = 2.7802525011 \cdot 10^{32} \text{ [Jm/kg}^2\text{]}$$

$$G_{ep} = k_e k_p / 4 \cdot \pi \cdot \epsilon_0 = 1.5141728374 \cdot 10^{29} \text{ [Jm/kg}^2\text{]}$$

$$G_{pp} = k_p k_p / 4 \cdot \pi \cdot \epsilon_0 = 8.2464430137 \cdot 10^{25} \text{ [Jm/kg}^2\text{]}$$

The relation between this gravitational electromagnetic constants G_{ee} and G_{pp} , and gravitational constant G gave value:

$$k_{ee} = G_{ee} / G = 2.7802525011 \cdot 10^{32} / 6.673 \ 84 \cdot 10^{-11} = 4.1658962 \cdot 10^{42}$$

$$k_{ee} = 4.1658962 \cdot 10^{42}$$

$$k_{pp} = G_{pp} / G = 8.2464430137 \cdot 10^{25} / 6.673 \ 84 \cdot 10^{-11} = 1.2356369 \cdot 10^{36}$$

$$k_{pp} = 1.2356369 \cdot 10^{36}$$

What does it mean at all?

If all this is somehow correct then, is there a possibility, also for every particle, to have his own constant!

Is it possible?

Are we all wrong with gravitational constant value as value for all universe and for all levels.

Are these constants also valid and for protons and neutrons?

Here is one possible solution for strong force value (expressed through binding energy).

THE STRONG FORCE

proton – proton binding energy

To check this we can try, for example, to find the binding energy between two protons on distance, $R = 1.0 \cdot 10^{-15}$ [m]

The binding energy is:

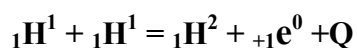
$$E_{pp} = G_{pp} \cdot m_p \cdot m_p / R_{pp}$$

$R_{pp} = 1.0 \cdot 10^{-15}$ [m] – present accepted value for distance between proton and proton

$$E_{pp} = G_{pp} \cdot m_p \cdot m_p / R_{pp} = 2.3070774 \cdot 10^{-13} \text{ [J]}$$

$$E_{pp} = 2.27 \cdot 10^{-13} / 1.602176565 \cdot 10^{-19} = 1.439964485 \text{ [MeV]}$$

This value can be checked, for example, with fusion process between two Hydrogen nuclei.



${}_1\text{H}^1$ - Hydrogen nucleus

${}_1\text{H}^2$ - Hydrogen molecule

${}_{+1}\text{e}^0$ - positron

Q - released energy

$$2 \cdot {}_1\text{H}^1 = 2 \cdot 1.0081451 \text{ amu} = 2.0162902 \text{ amu}$$

$${}_1\text{H}^2 = 2.0147425 \text{ amu}$$

$$2 \cdot {}_1\text{H}^1 - {}_1\text{H}^2 = 0.0015477$$

$$1 \text{ amu} = 931.444061 \text{ [Mev]} - \text{atomic mass constant}$$

$$0.0015477 \cdot 931.16 = 1.441 \text{ [Mev]}$$

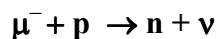
$Q = 1.441 \text{ [Mev]}$ – similar value as binding energy between two protons calculated with new gravitational electromagnetic constant for protons G_{pp} .

note: the positron energy is not taken in account.

proton – neutron binding energy (in Deuteron Nucleus)

Neutron is a particle with complex inner structure.

In muon absorption process from protons the next actual scheme is valid



So we can propose, somehow, that the neutron is composed from muon and proton.

$$G_n = k_\mu \cdot k_p / 4\pi\epsilon_0$$

$$k_\mu = e / m_\mu = 1.602176565 \cdot 10^{-19} / 1.883531475 \cdot 10^{-28} = 8.5062372796 \cdot 10^8 \text{ [C/kg]}$$

$$G_n = k_\mu \cdot k_p / 4\pi\epsilon_0 = 7.323042 \cdot 10^{26} \text{ [Jm/kg}^2\text{]}$$

For proton - neutron this field constant is:

$$G_{pn} = \sqrt{G_{pp} \cdot G_n} = \sqrt{(8.2464430137 \cdot 10^{25}) \cdot (7.323042 \cdot 10^{26})} = 2.4574183 \cdot 10^{26} \text{ [Jm/kg}^2\text{]}$$

$$E_{pn} = G_{pn} \cdot m_p \cdot m_n / R_{pn}$$

$R_{pn} = 1.9 \cdot 10^{-15} \text{ [m]}$ - estimated value for distance between proton and neutron in Deuteron

$$E_{pn} = G_{pn} \cdot m_p \cdot m_n / R_{pn} = 3.623424433 \cdot 10^{-13} \text{ [J]}$$

$$E_{pn} = 3.623424433 \cdot 10^{-13} / 1.602176565 \cdot 10^{-19} = 2.261563745 \text{ [Mev]}$$

$$E_{pn} = 2.261563745 \text{ [Mev]} \text{ (the actual value } E_{pn} = 2.224 \text{ [Mev])}$$

So these values are almost the same

ELECTROMAGNETIC BASIC LAWS

GAUSS'S LAW

The Gauss's law state:

The electric flux through any closed surface is proportional to enclosed charge.

$$\Psi = Q/4\pi \epsilon_0 \quad \Psi - \text{flux or radiance}$$

This law is same as Kepler law but here this law connect field round object as result of flux from particles in the object (charges), through object surface.

This Gauss equation can be written also as:

$$\Psi = Q/4\pi \epsilon_0 = V R = K S$$

Q - charge in [C]

V – voltage in [V]

R – radius or distance in [m]

K – electric field strength in [V/m]

S - surface of the object [m²]

According unit analogy proposition for electromagnetic units with mechanical units or (MLT) there are next equalities.

1. Coulomb: [C] ≡ [kg]
2. Volt: [V] ≡ v² = [m²/s²]
3. Electric field strength: [K] ≡ g [m/s²]
4. Gravity constant [G] ≡ 1/4π ε₀

so we shall get:

$$\Psi = V R = K S = Q/4\pi \epsilon_0 \quad \text{-Gauss's law}$$

$$\mu = v^2 R = g S = MG \quad \text{- Newton's law}$$

$$V R = K S = Q/4\pi \epsilon_0 = \Psi = v^2 R = g S = MG = \mu \quad \text{- standard gravitational parameter}$$

The Gauss's equation and Newton's equation are the same and have root from Kepler's third law.

What is difference between these two laws.

Gauss present with his formula new concepts. At first electric field is conservative and similar to gravitational field. Second, surface of the object as very important factor and third the the cause of the field is the electric charge flux. This is not case with Kepler's formula and also with similar Newton's formula. Flux is simple "the standard gravitational parameter" in Newton formula.

But the most important factor in Gauss's law or equitation is the third factor - the electric charge. In object there are two types of charges which can produce objects field. First is the free electric charge and second bound electric charge.

The bound electric charge exert his field flux only in presence of other objects fields round observed object. If we observe only one object this field is zero.

So what is free electric charge?

As is well known in nature there are so told two types of charges positive and negative charges.

But if we observe electric charges only like objects with mass such division is not possible.

So what is that that makes charges in objects so important and unique?

One possible solution: the strength of the electron field and the acceleration g_e .

So what is the acceleration that come from the electron?

To find this we must find the photons acceleration round electron.

$c = 299792458$ [m/s] – photon velocity

$R_{ph} = 2.8179403267 \cdot 10^{-15}$ [m] - preposition for photon radius round electron (the smaller or bigger radius will not change to much the order of the value of the electron acceleration)

$$g_{ph} = v^2/R = c^2/R_{ph} = (299792458)^2 / 2.8179403267 \cdot 10^{-15} = 3.1894046 \cdot 10^{31} \text{ [m/s}^2\text{]}$$

for proton this acceleration is much smaller

$$g_{el} = v^2/R = v_{el}^2/R_{el} = (2.187691264 \cdot 10^6)^2 / 5.2917721092 \cdot 10^{-11} = 9.0442161 \cdot 10^{22} \text{ [m/s}^2\text{]}$$

So this big photon acceleration come from matter or substance in the electron.

As we know acceleration on Earth surface is $g = 9.8$ [m/s²]

So can you imagine what acceleration is this or how strong is this electron field.

This enormous electron field acceleration act only when electron is not bound with proton and is free.

So free electron is like quasar in particles zoo. His enormous field density make this particle carrier of almost all known phenomena like , electricity, magnetism, light and so on.

This enormous acceleration is also responsible that we term the particle electron as charged particle.

Only 598 tons of free protons on Earth surface and 326 kg of free electrons on Moon surface are enough to simulate the the same gravitational force between Earth and the Moon. That is $3.6 \cdot 10^{32}$ electrons and $3.6 \cdot 10^{32}$ protons, which is 0.1 Coulomb of free protons per squared meters on Earth surface or $7.0 \cdot 10^{17}$ free protons/m².

So this field density strength is flux that come from inner low level structure of the matter or the substance in the electron. So this low level particles, what ever they are, as part of the field, must be also free particles and also they must have a spin. They are not the virtual photons.

This spin is responsible for so told negative or positive charged particles.

But what is with protons an rest so told charged particles.

If look carefully for all known charged particles (without quarks?) they all have minimum sing plus or sign minus one charge. What doe's it mean? That mean that all charged particles (all with different masses), we like it or not, contain some how, one or more free electrons fields or accelerations.

So all negative particles have minimum plus one free electron's field.

All positive particles have minimum minus one free electron's field.

The last is similar to hole concept.

So one possible solution for this is that proton is particle with hole of one electron field.

This is based on fact that electron and proton have same flux.

for proton – $\Psi_p = v_e^2 R_e = (2.187691264 \cdot 10^6)^2 \cdot 5.2917721092 \cdot 10^{-11} = 253.2638462 \text{ [m}^3/\text{s}^2]$

for electron – $\Psi_e = c^2 R_{ph} = (2.99792458 \cdot 10^8)^2 \cdot 2.8179403267 \cdot 10^{-15} = 253.2638462 \text{ [m}^3/\text{s}^2]$

THE REST ELECTROMAGNETIC BASIC LAWS

Similar result can be find and for equitation's by Coulomb, Ampere and Laplace.

COULOMB'S LAW

$$F_e = q q' / 4\pi \epsilon_o R^2 = k_e q q' / R^2$$

This Coulomb's equitation can be express with MLT units using mass-charge conversion factor or constant for electron and for proton.

$$k_e = e / m_e = 1.602176565 \cdot 10^{-19} / 9.10938291 \cdot 10^{-31} = 1.758820088 \cdot 10^{11} \text{ [C/kg]}$$

$$k_p = e / m_p = 1.602176565 \cdot 10^{-19} / 1.672621777 \cdot 10^{-27} = 9.57883358 \cdot 10^7 \text{ [C/kg]}$$

$$F_e = q q' / 4\pi \epsilon_o R^2 = k_e m_e k_p m_p / 4\pi \epsilon R^2 = (k_e k_p / 4\pi \epsilon_o) m_e m_p / R^2 = G_{ep} m_e m_p / R^2$$

$$G_{ep} = k_e k_p / 4\pi \epsilon_o = 1.5141728374 \cdot 10^{29} \text{ [Jm/kg}^2\text{]}$$

AMPERE'S LAW

$$F_m = k_m I_1 I_2 L / 2\pi R - \text{by Ampere (with Ampere magnetic mass)}$$

The Ampere NIST definition

The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to 2×10^{-7} newton per meter of length.

$$F_m = k_m I_1 I_2 L / 2\pi R$$

$$k_m = \mu_{0G} = 4\pi R_e / m_e = 4\pi \cdot 2.8179403267 \cdot 10^{-15} / 9.10938291 \cdot 10^{-31} = 3.887341532 \cdot 10^{16} \text{ [m/kg]}$$

$$L = 1 \text{ [m]}$$

$$R = 1 \text{ [m]}$$

$$I_1 = I_2 = 5.685629854 \cdot 10^{-12} \text{ [kg/s]}$$

$$F_m = \mu_{0G} I_1 I_2 L / 2\pi R = 3.887341532 \cdot 10^{16} \text{ [m/kg]} \cdot 5.685629854 \cdot 10^{-12} \text{ [kg/s]} \cdot 5.685629854 \cdot 10^{-12} \text{ [kg/s]} \cdot 1 \text{ [m]} / 2\pi \cdot 1 \text{ [m]}$$

$$F_m = 2 \cdot 10^{-7} \text{ [kgm/s}^2\text{]} = 2 \cdot 10^{-7} \text{ [N]}$$

LAPLACE'S LAW

The force which act on magnetic mass q_m in center of circular loop, from current I on distance R in loop, is given by equitation

$$F_m = 2\pi q_m I / R$$

q_m – magnetic mass in [W_b]

I – current in [A]

R – radius in [m]

$$F_m = 2\pi q_m I / R = [W_b] [A]/[m] = [m^2/s][kg/s] / [m] = [kgm/s^2] = [N]$$

MAXWELL'S electromagnetic theory

But the most interesting basic law is the last of five basic law which was given by Maxwell's electromagnetic theory

$$\epsilon_0 \mu_0 c^2 = A^2$$

Last equation is base for building absolute systems of units.

Depending of A there was four absolute systems of units

System	ϵ_0	μ_0	A	relations
Electrostatic System CGS	1	$1/c^2$	1	$\mu_0 c^2 = 1$
Electromagnetic System CGS	$1/c^2$	1	1	$\epsilon_0 c^2 = 1$
Gauss System CGS	1	1	c	$c = A$
Georgi MKS System (with rationalization)	$10^7 / 4\pi c^2$	$4\pi/10^7$	1	$\epsilon_0 \mu_0 c^2 = 1$

The last MKS system is base for the International System of Units (SI)

Now the question is, can we connect this formula, at first, with gravitational field and all other known fields, or with another words, what is the real nature of the constant A?

$$\Psi = V R = K S = Q/4\pi \epsilon_0 \text{ -Gauss's law}$$

$$\mu = v^2 R = g S = MG \text{ - Newton's law}$$

$$v^2 R/M = G$$

$$v^2 = G M/R = (v^2 R/M) \cdot (M/R) = X \cdot Y$$

$$X = v^2 R/M$$

$$Y = M/R$$

$$v^2 = c^2 / A^2$$

$$c^2 / A^2 = X \cdot Y$$

$$c^2 / X \cdot Y = A^2$$

$$A^2 = c^2 / X \cdot Y$$

$$A = \sqrt{c^2 / X \cdot Y} \text{ formula for field system checking}$$

Now we shall exam next known systems with this formula for A value:

1. electron – photon system

$$m_e = 9,10938291 \cdot 10^{-31} \text{ [kg] - mass of the electron}$$

$$R_{ph} = 2.8179403267 \cdot 10^{-15} \text{ [m] - photon radius round electron (this radius is usually taken as electron surface radius???)}$$

$$c = 2.99792458 \cdot 10^8 \text{ [m/s] – photon velocity}$$

$$X = v^2 R/M = c^2 R_{ph} / m_e = 2.7802525011 \cdot 10^{32} \text{ [Jm/kg] – electrons gravitational electromagnetic constant } G_{ee}$$

$Y = M/R = m_e / R_{ph} = 3.232638684 \cdot 10^{-16}$ [kg/m] - electrons gravitational magnetic constant

$$A = \sqrt{(c^2 / X \cdot Y)} = \sqrt{1} = 1$$

$$A = 1$$

This is the Maxwell's electromagnetic equitation

$$\epsilon_0 \mu_0 c^2 = A^2$$

$$A = 1$$

$$\epsilon_0 = k_e k_e / 4\pi X = 1.758820088 \cdot 10^{11} \cdot 1.758820088 \cdot 10^{11} / 4\pi 2.7802525011 \cdot 10^{32} = 8.854187817 \cdot 10^{-12}$$

$$\mu_0 = 4\pi / A^2 k_e k_e Y = 1.2566370614 \cdot 10^{-6}$$

2. proton – electron system

$$m_p = 1.672621777 \cdot 10^{-27}$$
 [kg] - mass of the proton

$$R_e = 5.2917721092 \cdot 10^{-11}$$
 [m] – electron radius round proton

$$c = 2.9979 2458 \cdot 10^8$$
 [m/s] – photon velocity

$$v_e = 2.187691264 \cdot 10^6$$
 [m/s] – electron velocity

$$X = v^2 R/M = v_e^2 R_e / m_p = 1.5141728374 \cdot 10^{29}$$
 [Jm/kg] – electron-proton gravitational electromagnetic constant G_{ep}

$$Y = M/R = m_p / R_e = 3.160797069 \cdot 10^{-17}$$
 [kg/m] - electrons gravitational magnetic constant

$$A = \sqrt{(c^2 / X \cdot Y)} = \sqrt{18778.86502} = 137.035999074$$

$$A = 137.035999074 = 1/\alpha$$
 - fine structure constant from Bohr's model of the atom

$$\epsilon_0 = k_e k_p / 4\pi X = 1.758820088 \cdot 10^{11} \cdot 9.57883358 \cdot 10^7 / 4\pi 1.5141728374 \cdot 10^{29} = 8.854187817 \cdot 10^{-12}$$
 [kg s²/m³]

$$\mu_0 = 4\pi / A^2 k_e k_p Y = 4\pi / 137.035999074^2 k_e k_p Y = 1.2566370614 \cdot 10^{-6}$$
 [m/kg]

3. Earth – Moon system

$m_{\text{earth}} = 5.9722 \cdot 10^{24}$ [kg] - mass of the Earth

$R_{\text{moon}} = 3.844 \cdot 10^8$ [m] – Moon radius round Earth

$c = 2.99792458 \cdot 10^8$ [m/s] – photon velocity

$v_{\text{moon}} = 1.022 \cdot 10^3$ [m/s] – Moon velocity roun Earth

$X = v^2 R/M = v_{\text{moon}}^2 R_{\text{moon}} / m_{\text{earth}} = 6.7228098 \cdot 10^{-11}$ [Jm/kg] – similar to Earth gravitational constant $G = 6.6742$ [m³/kgs²] but not the same

$Y = M/R = m_{\text{earth}} / R_{\text{moon}} = 1.553642 \cdot 10^{16}$ [kg/m] - Earth gravitational magnetic constant (new)

$A = \sqrt{(c^2 / X \cdot Y)} = \sqrt{8.604777 \cdot 10^{10}} = 2.93339 \cdot 10^5$

$A = 2.93339 \cdot 10^5$

$c/v_{\text{moon}} = 2.99792458 \cdot 10^8 / 1.022 \cdot 10^3 = 2.93339 \cdot 10^5 = A$ for Earth –Moon system

$A = 2.93339 \cdot 10^5$ for Earth –Moon system

4. Sun – Earth system

$m_{\text{sun}} = 1.98892 \cdot 10^{30}$ [kg] - mass of the Sun

This is the mass of the Sun based on Newton postulate that the Earth gravitational constant matter for all universe, including and our Sun. But there is no proof for such postulate. We know only the standard gravitational parameter for the Sun.

The real gravitational constant value for different objects must be determined with experiments, for example with next space missions, at first, the exact values for the gravitational constant for the Moon and next for the Mars. The value of this constant must be similar, but not the same, as that for the Earth because of their similar density or similar inner structure dynamics. But for the Sun it must be big difference.

The next calculations are only as probe, not as any proof.

$$R_{\text{earth}} = 1.49598261 \cdot 10^{11} \text{ [m]} - \text{Earth radius round Sun}$$

$$c = 2.99792458 \cdot 10^8 \text{ [m/s]} - \text{photon velocity}$$

$$v_{\text{earth}} = 2.9783 \cdot 10^4 \text{ [m/s]} - \text{Earth velocity round Sun}$$

$$X = v^2 R/M = v_{\text{earth}}^2 R_{\text{earth}} / m_{\text{sun}} = 6.6718475 \cdot 10^{-11} \text{ [Jm/kg]} - \text{Sun gravitational constant}$$

G ??? (m_{sun} is not known)

$$Y = M/R = m_{\text{sun}} / R_{\text{earth}} = 1.3295074 \cdot 10^{19} \text{ [kg/m]} - \text{Sun gravitational magnetic constant}$$

$$A = \sqrt{(c^2 / X \cdot Y)} = \sqrt{1.0132218 \cdot 10^8} = 1.0065892 \cdot 10^4$$

$$A = 1.0065892 \cdot 10^4$$

$$c / v_{\text{earth}} = 2.99792458 \cdot 10^8 / 2.9783 \cdot 10^4 = 1.0065892 \cdot 10^4$$

$$A = 1.0065892 \cdot 10^4$$

The mass of the steady - state universe, or maybe of a Grain of Sand on an known beach

$$v^2 R = GM$$

$$M = v^2 R / G$$

$G = 6.6742 \text{ [m}^3/\text{kg s}^2\text{]} - \text{gravitational constant - Newton's proposal that this constant is valid for all levels and for universe must be taken with reserve???$

$$R = v / \omega$$

$$v = c = 2.99792456 \cdot 10^8 \text{ [m/s]} \text{ speed of the light}$$

$$\omega = H_0 = 70.4 \text{ (km/s)/Mpc} = 2.28 \cdot 10^{-18} \text{ [1/s]} - \text{Hubble parameter or constant}$$

radius of the universe

$R = v/\omega = c/H_0 = 2.99792456 \cdot 10^8 / 2.28 \cdot 10^{-18} = 1.3148792 \cdot 10^{26}$ [m] - radius of the universe
or $R = 1.389 \cdot 10^{10}$ [light years]

age of the universe

$T = 1/\omega = 1/H_0 = 4.3859649 \cdot 10^{17}$ [s] or

$T = 1.3899266 \cdot 10^{10}$ [years], or 13.899266 [billion years] - time from big bang

present estimated value is 13.75 billion years from big bang

mass of the universe

$M = v^2 R / G = v^2 \cdot v / \omega G$

$M = c^3 / \omega G = c^3 / H_0 G = (2.99792458 \cdot 10^8)^3 / 2.28 \cdot 10^{-18} \cdot 6.6742 \cdot 10^{-11} = 1.75 \cdot 10^{53}$ [kg]

$M = 1.75 \cdot 10^{53}$ [kg]

CONCLUSION

Every object, particle, star or planet, in the universe, have it's own unique field which is extended in space round them. The strength of this field is defined with value of (k). (It's very strange that this constant has no proper name or unit). This field has unique characteristic. In every spherical point round object, on certain distance, this field has distinct value of circular velocity. Every pilot piece which have this circular velocity value, will stay in spherical area on same distance, round this object. If there are differences in velocities then the pilot particles with bigger velocity will be pushed from the object while pilot particles with smaller velocity will be pulled to the object.

So what is the most important here. It is space and motions. But there is no motion without objects or particles. According to this everything in the universe is made from matter or substance in motion. This also matter and for the objects or particles fields. There is nothing virtual in the fields. All fields are made from objects or particles with much smaller dimensions, from different level, then observed object.

All of this matter for all known and an known field levels and object, even they are interconnected in complex way.

Even each level differ in some quantities, the basis motions principles, for each levels, are the same.

“So nothing is so complex as it look like and nothing so simple as it look like, only matter the point of view”

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