Contents

THE DAON THEORY
Gravitation and Cosmology

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Abstract

The **Daon theory** is a new general theory of physics, it is a completely new way to approach physics and includes, in principle, all phenomena of nature.

The theory is presented in a series of closely related papers treating Electromagnetism, Atomic physics, Relativity, Particle physics, Gravitation and Cosmology. It is strongly recommended to read the presiding papers for a complete understanding of the following.

We start by examining the Universe, as seen through the Daon theory, which gives an explanation to the phenomenon of the accelerated expansion of the Universe (dark energy).

We explain the source of the neutral potential surrounding all masses. We there after examine the gravitation and show how to calculate the numerical value of Newton's constant (G). This leads to the explanation of the relatively fast rotation of certain galaxies (dark matter).

We thereafter present the variation of the main natural constants, relative to the Universe size and velocity of expansion, which results in the phenomenon of the red shift.

We examine the Black holes and the Cosmic Microwave Background Radiation

0.1 Introduction

The daon theory is constructed on the basis of one unique fundamental object **the Daon**, which is the ultimate constituent of all matter. It is a very small rotating sphere; its size is $r_{d_{fd}} = 4.5\ 10^{-19} m$ (if its medium interaction is zero), its effective velocity of rotation is c, while its associated "mass" is $m_d = 2.3\ 10^{-41} kg$ these three parameters are all fixed by experimental evidence or geometrical necessity[1].

The concept of the daons is essential to any understanding of nature, we therefore strongly recommend you to read, at least the introduction to, the Daon theory in [1].

Chapter 1

The Universe

The density of free daons can easily be calculated as,

$$D_d = \frac{1}{\frac{4\pi r_{d_{fd}}^3}{3}} \frac{\pi}{3\sqrt{2}} \simeq 1.45\ 10^{54}\ m^{-3} \tag{1.1}$$

The last term is the filling factor, while $r_{d_{fd}}$ is the radius of a free daon.

The value, obtained in equation (1.1), should be compared with the Universe corresponding number of daon associated with the normal mass,

$$D_m = 0.25 \frac{m_u}{m_{d_{fd}}} \simeq 9\ 10^{12}\ m^{-3} \tag{1.2}$$

0.25 is the number of nucleons in 1 cubic meter.

The Universe is dominated by free daons.

A Daon, without contact with its neighbours, expands rapidly. It is the interaction with its neighbours that keep the daon at a constant radius, in a static situation. This characteristic of the Daon explain therefore the behaviour of the Universe, if **The Universe is surrounded by an empty void** or more exact, a void which don't interact with the daons of our Universe. This hypothesis is necessary, since otherwise there is no logical explanation to the characteristics of the Universe, at least within the Daon theory.

The medium value of attraction/repulsion and contraction/expansion for free daons is zero, so the only possible medium action must happen at the surface of such a universe, since the only anisotropy is there. The surface daons are in contact with their neighbours inside the Universe but have no interacting zones outside the Universe. The radial action from a surface daon[1] is therefore:

$$a_u = 3\cos\phi \frac{3}{2}\frac{c^2}{r_{d_{fd}}} = 3\sqrt{\frac{3}{2}}\frac{c^2}{r_{d_{fd}}} \tag{1.3}$$

3 points of non-interaction multiplied with the mean radial direction $\cos\phi = \sqrt{\frac{2}{3}}$ multiplied with the action of a free daon, without interaction with other daons.

This will lead the surface daons to expand, which will push on their neighbouring daons making them expand et c., it follows that the Universe gets an action of expansion.

The daons, at the border, will stay in their position, since they have a tendency to become bigger and therefore leas strong, so that the interaction with the internal daons will attract them.

Notice that the border of the Universe acts as a perfect mirror; **nothing can escape from the Universe**.

1.1 The Hubble constant and the dark energy

From the above we obtain that the universe must have an expansion perpendicular to its surface, leading necessarily to a spherical geometry. All free daons, within such a Universe, must tend to obtain the same size, this is the case, since the action of a daon is inverse proportional to its radius according to equation (1.3), a smaller daon has a stronger action then a bigger one. This means that, within a free daon Universe, the smaller daons must become bigger and the bigger daons must become smaller, due to the interaction between daons of different size, tending to obtain the same size.

$$r_d = \sqrt{r_d^- r_d^+} \tag{1.4}$$

r_d^- and r_d^+ are respectively the smaller and bigger daons.

The Universe must be isotropic today, since the velocity of expansion is close to constant. All daons therefore keep their position relative to the surrounding daons, besides an irregular "Brownian" motion due to the interaction between neighbours. But, since the Universe expands, this means that *all daons expands, in the same way as the Universe itself* (we suppose that the number of daons within the Universe remains constant).

We can express the total number of daons in the Universe (N_{du}), in the following manner.

$$N_{du} = \frac{R_u^3}{r_{d_{fd}}^3} \frac{\pi}{3\sqrt{2}} \tag{1.5}$$

R_u is the radius of the Universe.

The number of free daons on the border of the Universe (N_b) is,

$$N_b = \frac{4\pi R_u^2}{\pi r_{d_{fd}}^2} \frac{\pi}{2\sqrt{3}} \tag{1.6}$$

where the last term is the filling factor for closed packed identical spheres on a plane surface.

The Universe must have a radial equilibrium. It follows that the radial action of the free daons, at the border, give the accelerated expansion of the Universe.

The radial acceleration of expansion of the Universe is then, combining equations (1.3),(1.5) and (1.6),

$$a_U = \frac{a_u N_b}{N_{du}} = 18\frac{c^2}{R_u} \tag{1.7}$$

This is the dark energy effect giving the accelerated expansion of the Universe.

The velocity of expansion, at a distance **r** relative to the center of the Universe, can be written

$$v = V_u \frac{r}{R_u} \tag{1.8}$$

V_u is the velocity of the Universe border.

This means that the Hubble parameter (H) can be written

$$H = \frac{\delta v}{\delta r} = \frac{V_u}{R_u} \tag{1.9}$$

i.e., *the Hubble parameter, in an isotropic universe, is the ratio between the* **velocity** *of expansion at the radius r of a sphere, relative to its center.* The Hubble parameter is therefore not constant in time, even if, in this moment, it must be close to constant all over the Universe (H_0).

The velocity of expansion of the Universe border, relative to its center, can very well be above the velocity of light, since the limiting velocity (c) is a local limit, giving the maximum relative velocity between an object and its surrounding free daons[3].

If we now assume that the number of daons within the Universe is constant (N_{du}) and we apply this to the expansion of the Universe, it's realized that the free daon size is growing with time and must be directly proportional to the size of the Universe. We can then write the velocity of expansion for a free daon v_{fd_e} as,

$$v_{fd_e} = \frac{V_u}{R_u} r_{d_{fd}} = H r_{d_{fd}} \tag{1.10}$$

1.2 Mass

The discussion above leads us to the following question; what is the correlation between a particles mass and the free daons size? This question was examined, using the particle simulation program PART[4]. First we have to understand which mass we are looking after, the mass of an electron[1] is obtained as follows,

$$m = m_d \frac{\pi}{\sqrt{2}} \int_0^\infty \frac{r^2}{r_d^3} O\ O dr \tag{1.11}$$

i.e., the total number of daons in a volume, multiplied by the order O (the strength of interaction). This must again be multiplied with the Order, which gives the sliding motion, between shells of the daons and the particle in motion. In this way we obtain the part of the ordered daons that are following the particle, giving it its mass.

We obtain the following law for the **rest** mass of any particle, using the code PART[4].

$$m = K_p r_{d_{fd}} \tag{1.12}$$

where K_p is a constant, different for each particle, while $r_{d_{fd}}$ is the free daon radius.

We have therefore that *the total effective action of contraction K_p, within a particle, is constant and independent from the size of the free daons.* It also means that the mass of all particles is directly proportional to the free daon size, i.e. *the mass of each particle must grow directly proportional to the free daon size, and therefore with the Universe expansion. Which means that around each particle must exist a flux of free daons, accumulating on, and therefore increasing, its mass.*

The volume of a daon can be written [1],

$$r_d^3 = r_{d_{fd}}^3 (1 - O) \tag{1.13}$$

As was already indicated above, **there is another mass around each particle** since also the ordered daons which are **not** following a particle, is a mass and a very big one. The total mass associated with an electron, is

$$m = m_d \int_0^R 4\pi r^2 \frac{O}{\pi r_d^2} \frac{\pi}{2\sqrt{3}} \frac{dr}{\sqrt{\frac{8}{3}} r_d} \simeq m_d \frac{\pi}{1.15\sqrt{2}} \frac{r_{e\infty}^2}{r_{d_{fd}}^3} R \tag{1.14}$$

m_d is a daons corresponding mass, while the order is $O = \frac{r_e^2}{r_e^2 + r^2}$[1]. r_∞ is the electrons reference radius when $r >> r_e$, while $\sqrt{\frac{8}{3}} r_d$ is the distance between two neighbouring daon shells, around the electron.

This means that an isolated charge is associated to an almost infinite mass! It simply demonstrates that the radial force equilibrium is maintained at any distance from the charge.

The order O is directly proportional to the electrical field (as was demonstrated with the Coulomb's law[1]), so at a distance where the electric field goes to zero ($E \sim \frac{1}{r^2}$) there is no order, i.e., the matter disappears. But, the radial equilibrium around any particle must always be maintained, i.e., independent from the order! What happens is that *the electric field is responsible for the equilibrium until an opposite charge reduce the field to zero. The electric field is then replaced by a corresponding deficit of daon size*, which replace the missing field, so that the equilibrium of force around any particle is maintained.

This means that *the expansion of the Universe creates a flux of free daons towards all particles*, needed to maintain their radial equilibrium. The variation of the missing volume in time gives the needed flux of free daons, to fill up the empty volume produced by the increase of the free daon size. We can then write the number of free daons passing a sphere, with radius R around a mass M, as

$$N_s = \frac{v_{fd} 4\pi R^2}{\frac{4\pi}{3} r_{d_{fd}}^3} \frac{\pi}{3\sqrt{2}} = v_{fd} \frac{R^2}{r_{d_{fd}}^3} \frac{\pi}{\sqrt{2}} \tag{1.15}$$

We can also write, for any particle, using equations (1.10)-(1.14), that the velocity of the free daon flux at a radius R is

$$N_s = \frac{M}{m_e} \frac{\delta}{\delta t} \left(\int_0^R \frac{4\pi r^2}{\pi r_d^2} O \frac{\pi}{2\sqrt{3}} \frac{dr}{\sqrt{\frac{8}{3}} r_d} \right) = \frac{M}{m_e} R \frac{r_{e\infty}^2}{r_{d_{fd}}^3} \frac{\pi}{3\sqrt{2}} H \tag{1.16}$$

$\frac{M}{m_e}$ is a number independent from time, it's therefore sufficient to examine the electron, if we apply equation (1.12).

We can now combine equations (1.15) and (1.16), giving

$$v_{fd} = H \frac{M}{m_e} \frac{r_{e\infty}^2}{3R} \tag{1.17}$$

note the dependence $\frac{1}{R}$, which means that such a daon flux is felt throughout the Universe! (We get a free daon velocity, at the earth surface of around $2\ 10^{-21} \frac{m}{s}$).

1.3 The reference system

The equilibrium of all charge, within the earth, must produce a collective radial action reducing the size of the surrounding free daons. We can think of this as a neutral potential, which becomes the reference system we used in [3], without explaining the source of the system. We start by calculating all the charged within the earth,

$$N_c = 16\ \frac{M}{m_u} \simeq 6\ 10^{52} \tag{1.18}$$

M is the earth mass while m_u is the nucleon mass unit. 16 is the number of charges associated with a nucleon[4]. A proton and an electron together count as a neutron.

If you calculate the corresponding total Order of the daons, at the surface of the earth, you get

$$O_t = N_c \frac{r_{e\infty}^2}{R^2} \simeq 2.1\ 10^9 \tag{1.19}$$

R is the earth radius.

This is so big that the free daons around the earth must follow the earth in its path.

This means that the earth (and any other major body in the Universe) is surrounded with a neutral potential, which is a frame of reference for every action.

A daon starts to move freely when the order O is smaller than 0.5. It follows that the extension of the neutral potential (within which the daons follow the earth) is around 200 000 R!?

If we now calculate the necessary reduction of size, of the free daons surrounding the earth, to compensate for this order, we get, with the help of equation (1.19),

$$O_{fd} = \frac{O_t}{\frac{4R^2}{r_{dfd}^2} \frac{\pi}{2\sqrt{3}}} \simeq 3\ 10^{-42} \tag{1.20}$$

i.e., the corresponding reduction of the surrounding daons size (using equation (1.13)), is extremely small.

Chapter 2

Gravitation

An object can not move if all its surrounding free daons have identical characteristics, it follows that it is the variation of the free daon characteristics around an object that causes the gravitational force.

Let us start by looking at the variation of the free daons size, around a neutral particle. The radial equilibrium of all the charges, contained within the particle, must continue also outside it, i.e. where the order (electric field) is zero. It means that the free daons, surrounding a neutral particle, have a size growing with their distance from the particle. We might think of this as a neutral potential.

A free daon flux around a particle gives as result a supplementary inclination of its ordered daons, so that a particle's rotation, velocity and radial equilibrium is perfectly matched, like if the particle obtained an added velocity. But, this situation was already examined[1], where we found that this situation do not give any added action, so; from where is the gravitational force coming?

2.1 The phenomenon of gravitation

If the gravitational action was due to the speed of the free daons then this would mean an inversion of the effect, if the velocity of a particle was higher then the velocity of the surrounding free daon flux. If you calculate the velocity of the free daon flux you will find that it is very low, i.e., the velocity of the free daon flux itself gives no action. But, there is a secondary action due to the geometry of the source of the free daon flux. If we use, for example a spherical mass as source, the concentric geometry force the daons to compress, in the azimuthal sense. This will give a reduction of the free daons size, directly proportional to the velocity of the flux, which leads to a deformation of all daons. This must lead to a force proportional to the deformation and therefore to the velocity of the free daon flux! This is exactly what we are looking for, since this gives an acceleration independent from the mass of the object and its velocity.

We start by calculating how much a daon is compressed, outside a sphere of mass **M**. We obtain the compression of a daon as

$$\begin{aligned} r_{d_c} &= r_{d_{fd}} \frac{1}{4\pi} \int_0^{\pi} \int_0^{2\pi} (1 - \frac{v_{fd}}{c} \sin^2\theta + \frac{v_{fd}}{c} \cos^2\theta) \sin\theta \; d\phi \; d\theta) \\ &= r_{d_{df}} (1 - \frac{v_{fd}}{3c}) \end{aligned} \tag{2.1}$$

θ is the angle between the daon's radius and the source radius. The second term (within the parenthesis) is the azimuthal **compression** while the third term is the radial **expansion**.

We can now write the gravitational force, as the sum of the action between daons throughout the mass m, with the help of equation (1.17), due to the deformed daons created by the source mass M at a distance R:

$$\begin{aligned} F_G &= m_d \frac{m}{m_e} \int_0^{\infty} \frac{A + -A-}{\sqrt{\frac{8}{3}} r_d} dr \\ &= 3.94\ 10^7 H \frac{Mm}{R^2} \end{aligned} \tag{2.2}$$

$$A = \int_0^{\pi} \int_0^{2\pi} \frac{r^2}{\pi r_d^2} \frac{\pi}{2\sqrt{3}} \; O^2 a_c \cos\theta \sin\theta \; d\phi \; d\theta = \frac{r_e^2}{r_{d_{fd}}^3} \sqrt{2}\pi \frac{Hc}{18} \frac{M}{m_e} \frac{r_{e\infty}^2}{R_0^2} \; rO$$

We use here the program EP[1] to find the maximum value of A. $\frac{r^2}{r_d^2}$ is independent from the compression since both r_d and r are compressed in the same way.

The action on a daon, in the radial direction (eq. 1.2 and [1]), is

$$a_c = 3\sqrt{\frac{2}{3}}\ \frac{3}{2}\ \frac{c^2}{r_{d_c}}$$

while the electron mass[1], can be written

$$m_e \sim m_d \frac{r^3_{e\infty}}{r^3_{d_{fd}}}$$

and the radius becomes

$$R = R_0 + r\cos\theta$$

Comparing this with Isaac Newton's classical formula

$$F = G\frac{mM}{R^2}$$

we obtain,

$$G = 1.636\ 10^{-46}\frac{Hc}{m_e r_{e\infty}} = 6.67\ 10^{-11}\frac{m^3}{s^2 kg} \tag{2.3}$$

Where the following values are used $H = 1.69\ 10^{-18}s^{-1}$ $(h = 0.52)$ and $r_{e\infty} = 1.23\ 10^{-15}m$[1]. The accuracy of G gives the accuracy of H .

2.2 The "dark matter" phenomenon

A galaxy having a flat geometry, will have a flux of free daons much stronger in the plan and much weaker on its flat sides, leading to a difference in the compression of the free daons. This must modify the gravitational force, felt around such a galaxy, i.e., the geometry of the source of gravitation leads to a strong variation of the gravitational constant (G). It follows that the gravitational force will be stronger on the galaxy border and weaker above its plan, relative to a spherical source.

A program of simulation should be developed to study this and other associated phenomena.

2.3 The photon and the neutrino within a gravitational field

The photon, as well as, the neutrino have no accumulation of mass[4] and have therefore no free daon flux associated with them, i.e., **they are not sources of gravitation**. But, since they have a radial equilibrium they do feel the gravitational attraction.

The specific characteristics of these two objects are such that they have no centrifugal force[4], i.e., when they are deviated by an external force they have no action, perpendicular to the velocity vector, resisting the deviation, which means that they deviate two times more than a normal particle.

Chapter 3

Cosmology

We will here take a look at the main phenomena associated with the characteristics of the Universe.

3.1 The development in time

We start with examining the variation of some basic constants, relative to the size and velocity of expansion of the Universe. First the real constants, which are independent from the expansion of the Universe (and anything else),

- **c** the effective rotational velocity of the daon, directly proportional to the velocity of light.
- The "mass" of a daon m_d is just a system constant corresponding to unity, the daon has no mass.
- The charge of a particles is the resulting sum of the number of radial equilibrium, with daons directed inwards minus those directed outwards, within a particle.
- The number of daons within the Universe.
- The total action of any particle, can be written $\frac{m}{r_{d_{fd}}} = K_p$, where K_p is constant but different for every type of particle[3]. Notice that K_p varies with the particles local velocity (relativity to the surrounding free daons).

- The fine structure constant, is the square of the ratio between the transverse and the parallel velocity of any charged particle([2] and [3]).

The "constants" which are varying with the size of the Universe R_U (or more correctly, with the size of the free daons $r_{d_{fd}}$).

- The mass of particles in general (see eq. (1.12))

$$M = K_p r_{d_{fd}} \sim R_U \tag{3.1}$$

- The electron's reference radius, using equations (1.11) and (3.1),

$$m_e \sim \frac{r_{e\infty}^3}{r_{d_{fd}}^3} \Rightarrow r_{e\infty} \sim R_U^{\frac{4}{3}} \tag{3.2}$$

- The Coulomb constant, we obtain from [1] as

$$\frac{e^2}{4\pi\epsilon_0} = m_d \sqrt{2}\pi \frac{r_{e\infty}^4}{r_{d_{fd}}^3} c^2 \sim R_U^{\frac{7}{3}} \tag{3.3}$$

- The Planck constant, using equation (3.3)

$$h = \frac{e^2}{4\pi\epsilon_0 v_0} \sim R_U^{\frac{7}{3}} \tag{3.4}$$

- The wave length of the associated wave, using equation (3.4)

$$\lambda = \frac{h}{mv} \sim R_U^{\frac{4}{3}} \tag{3.5}$$

  Notice that also the size of the atoms, molecules and therefore all matter in general, follow the same law[2]!

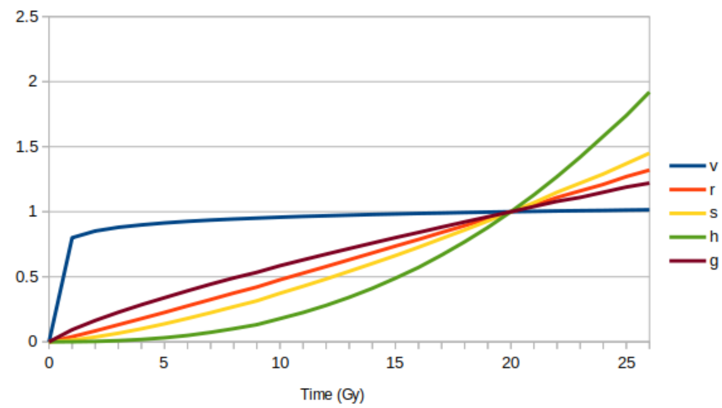

Figure 3.1: Graph showing the variation in time of some parameters (normalized relative to todays value). v is the velocity of the Universe border. r is proportional to the mass in general and to the radius of the Universe. s corresponds to variation of time and length in general (like the associated wavelength and the distance between major bodies). h is the variation of the Planck constant, while g is the gravitational constants variation with time.

- The Hubble constant

$$H = \frac{V_U}{R_U} \tag{3.6}$$

- The gravitational constant of Newton, using equation (2.2),

$$G \sim V_U(\frac{R}{R_U})^{\frac{2}{3}} \tag{3.7}$$

A simple 1-dimensional program called COSMOS was developed to take a closer look into a "free daon Universe" characteristics in time. The data from the oldest discovered galaxies, together with the calculated Hubble parameter, give approximately the size and expansion of the Universe.

The velocity of expansion at the Universe border should be around 18c, corresponding to a radius of around 320 Gly. For the minimum radial size of the Universe, when the velocity of the border goes to zero, we obtain around 0.04 Gly. The time passed, from minimum to actual size, is about 20 Gy, while the time passed from zero velocity to c should be around 0.003 Gy and the time up to 10c would be 0.04 Gy. This means that the Universe had a very strong accelerated expansion shortly after its minimum size, reaching close to its actual velocity, within a relatively short period of time.

We can make reasonable calculations during the period of almost constant expansion velocity, while things becomes more difficult at the minimum and maximum size, due to the fast variation of acceleration or the enormous distances.

The free daons can't be stopped by gravitation, if there is no coupling towards the internal masses. The influence of the neutral potential, on a free daon, must therefore be taken into account. We obtain the sum of the Order, using equation (1.19), of the totality of the Universe charges as

$$O_U = \Sigma_i O_i = 16\frac{M}{m_u}\frac{r_\infty^2}{R_U^2}(\frac{R_U}{R_0})^{\frac{8}{3}} = 2.4\ 10^{-29}(R_0 R_U^2)^{\frac{1}{3}} \tag{3.8}$$

$$M = 0.04\rho_c\frac{4\pi}{3}R_U^3$$

R_U is the radius of the Universe when the force of expansion is equal to the force of gravitation. ρ_c the critical cosmological density, while M is the total mass of the Universe and R_0 is the actual radius of the Universe.

The Universal velocity of expansion can then by written

$$V = \int_0^t 18\frac{c^2}{R_U}(1 - O_U)dt \tag{3.9}$$

If we try to estimate the time of a complete oscillation, we can start by calculating the radius of the Universe, when the gravitational force is equal to the force of expansion, we get, using equation (3.8),

$$O_U = 1 \Rightarrow R_U \simeq \frac{8\ 10^{42}}{\sqrt{R_0}} \tag{3.10}$$

If we go forward in time, the growing mass will increase the relative importance of the gravitational force leading to a deceleration down to zero. The enormous distances will give high importance to the delayed effects of actions from far away distances, so that increasing of the gravitational force, will continue long after the Universe expansion has been halted. The Universe will therefore start to contract. It seems that we are just within one of an infinite number of oscillations of the Universe! It will be necessary to develop a complete simulation program, to get a better understanding of such a scenario.

It should be noted that the size, but not the mass, of the neutrino and the photon grows proportionally with the free daon size.

3.2 Subjective time

What is time? We suggest that it is the duration of a biological process, associated with the perception of our brain. Such a process is directly connected with the time necessary for the interaction between atoms. We can therefore define time as the duration of an electron making a complete oscillation of its associated wave, within an atom[2]. Time is then, if we use equation (3.5),

$$t = \frac{\lambda}{v} \sim t_0(\frac{R}{R_o})^{\frac{4}{3}} \tag{3.11}$$

i.e. the time is slowing down with the size of the Universe. But, since the size of all matter increase with the same factor (eq.3.5), the velocity is independent from the expansion of the Universe.

The wavelength of the associated wave becomes longer with the expansion of the Universe (see eq.(3.5)). This means that also the atoms, molecules and matter in general will increase their size, in the same way (see figure 3.1 (r)).

This means that the warmest state of the Universe (Big Bang) happens at the maximum size of the universe and the coldest state you will find at the minimum size of the Universe!

It is in fact misleading to consider the Universe expansion connected to its speed of expansion, it is more correct to see the size of the Universe relative to our own size and time! In this case the Universe is getting smaller with time, since we are getting bigger faster then the Universe expansion (as everything within the Universe consisting of matter) and the time is slowing down, in the same proportion!

When the Universe reaches its maximum size (around $100R_0$), in around 700 Giga years, it will appear as if the time, from minimum size until then, was around 6 Giga years old, i.e. much young then the time we think today. In the same way, if we look backwards in time, when the Universe was 50 times smaller then today, we obtain that for them the time from minimum size until then should be around 70 Giga years!

When we are looking further and further away, going back in time, the galaxies will be smaller and smaller, with relatively more space between them. In the same way, some Giga years from now, another civilized animal, able to study the sky, will find the space smaller then today, he will see the stars stronger and bigger then today.

Note that, when the Universe is in a period of contraction, the Gravitational force is inverted, i.e., the stars will evaporate and disappear when the expansion stops. Contraction of the Universe is due to gravitation from far away delayed signals, while the local gravitation will be inverted once the Universe starts to contract.

This means that there is no live possible during the whole period of contraction.

3.3 Red shift

The red shift is a phenomenon of reduced energy of photons coming from far away cosmic sources. It is possible to see sharp line-spectra from very far away galaxies, which means that the photons have had no diffusion during the travel, i.e., no energy quanta has left such photons. But, why is then the photon wavelength shifted versus the red side of the color spectrum. The accepted theory says that the expansion of the Universe increase the wave length of the photons associated waves, but, the Daon theory can not accept such a proposal since such a lengthening can work only on an EM-wave, which in the introduction of the Daon Theory[1] was distinguished from the photon. Also, why should a photon, which is an absolutely stable energy package, be sensible for any very slow modification of it's surrounding space?

As was already explained above, the mass of all particles is increasing with the Universe expansion, we therefore get, if we use equation (3.4), that the energy of a photon, emitted by an atom, in a jump between two energy levels, becomes

$$E = \Delta jh\nu = \Delta jmvc \sim R_U \tag{3.12}$$

This means that the energy of a photon, emitted from an atom, is directly proportional to the atom's mass and must therefore increase with the expansion of the Universe.

We start from a photon emitted by an atom, in a galaxy at a distance r relative to us. The energy of this photon can be written

$$E = h\frac{v}{\lambda} \tag{3.13}$$

The energy of this photon must always be constant, we therefore get

$$E = h(\frac{R_0}{R})^{\frac{7}{3}} \frac{v}{\lambda(\frac{R}{R_0})^{\frac{7}{3}}} \tag{3.14}$$

The big R is the Universe radius while the index *0* indicates the current values.

i.e., the Plank's "constant" increase, with the expansion of the Universe, leading to a corresponding increase of the wavelength. The resulting wavelength of the photon becomes,

$$\lambda = \lambda_0 \frac{R_0}{R} \tag{3.15}$$

which is what we perceive as a red shift.

3.4 Angular diameter distance calculation of the Hubble parameter

The velocity of expansion, at the position of emission, is therefore

$$\frac{(c-v)t}{ct} = \frac{R}{R_0} \Rightarrow v = c(1 - \frac{1}{1+z}) \tag{3.16}$$

The size of an object is reduced with $(\frac{R}{R_0})^{\frac{4}{3}}$ but during the time period, before detection of the involved photons, the Universe expansion will increased the distance between the photons, so that the image of an object gets bigger with a factor$(\frac{R}{R_0})$. The distance to the emitter can therefore be calculated in the "normal" way, but a modification must be add, as follow

$$r = \frac{ds}{\theta}(\frac{R}{R_0})^{\frac{1}{3}} \tag{3.17}$$

ds is the size of the object, seen in the telescope, while θ is the corresponding angle.

After the indicated corrections the Hubble parameter can be expressed, as usual

$$H = \frac{v}{r} \tag{3.18}$$

The result should be smaller than the usually calculated value.

Also the "standard candles" must be reconsidered, since also the stars internal equilibrium must vary with the expansion of the Universe.

3.5 Black hole

It is possible, within a star, that the gravitational and kinetic energy of an atom become higher then the binding energy of its electrons, leading to a breakdown of the atoms into a compressed plasma like state (neutron stars). The density can then vary depending on the gravitational force but can be as big as $1\ 10^{18}\ \frac{kg}{m^3}$ (which corresponds to the internal density of the proton). A test was made, using PART[4], to see if even stronger compressed material can exist, but it seems that, if you try to compress further, the density starts to reduce!?

A Black hole must start to grow, if it reach the limit of "degenerate" mater, since this limit will keep the enclosed matter at a constant number of particles , i.e., it has no place for more particles. The attracted particles will therefore accumulate outside this limit, making the Black hole grow.

If we use equation (1.17) we can calculate the minimum radius and mass necessary for the creation of a Black Hole. We just postulate that the radial velocity of the free daons should be equal to the signal velocity c.

$$c = H\frac{M_{bh}}{m_e}\frac{r_{e\infty}^2}{3R_{bh}} \Rightarrow R_{bh} \geq 0.65\ 10^4 m \tag{3.19}$$

We get also

$$M_{bh} \geq 10^3 0 kg \simeq 5000 \qquad \text{solar masses} \tag{3.20}$$

this is also the upper limit for a neutron star.

3.6 The Cosmic Microwave Background Radiation

We gave in [4] a lower limit of the photon energy to be around 0.25 meV. This is the smallest photon consisting of around 25 effective daons, which corresponds to a temperature of around 2.5 Kelvin.

How come that this lowest photon energy corresponds to the energy of the Cosmic Microwave Background Radiation? A possible answer is that this lowest energy photon have a non zero possibility to be created directly by the free daons!

Chapter 4

Conclusion

The Universe was examined and found to be a sphere of daons in expansion, with a velocity at its border of around 18c. The action of the border daons are responsible for an action of expansion, giving the explanation to the "dark energy" phenomenon.

The Hubble constant is the ratio between the velocity of the universe border and its radius.

The expansion, of the Universe, produce an increase of the number of daons in all masses. The accumulation of free daons towards all lumps of matter produce a compression of the free daons around a spherical source mass, leading to an explanation of the gravitational force. The constant of Newton was calculated showing the importance of the geometrical form of the source of gravitation, giving an explanation to the "dark matter" phenomenon.

We also examined the variation, relative to the size and the velocity of expansion of the Universe, of the main physical constants. We found that a better view of the Universe is obtained if a subjective approach is made.

The red shift was explained as due to the accumulation of mass onto any particle which result in a photon energy growing proportional with to size of the Universe. We also made some suggestions concerning Black holes and CMBR.

We have shown, in the five papers presenting the Daon Theory, that starting from general considerations, a new theory of physics can be developed. This simple and effective theory gives a detailed explanation to all natural phenomena, as far as can be understood by the author.

The Daon Theory is a candidate for the Theory of Everything.

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