Contents

THE DAON THEORY
Particles

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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, Particle physics, Relativity, Gravitation and Cosmology. They should be red in this order for a complete understanding.

The numerical value of the main natural constants and parameters are calculated, while the explanation for the various natural phenomena are simple and logical. All the results from this theory agree, as far as we know, with experimental data.

The 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. The daon's size, velocity of rotation and associated "mass" are all fixed by experimental evidence or geometrical necessity[1].

In this document we present the photon and the neutrino, as seen from the perspective of the Daon Theory. We thereafter examine the muon, the π^0, the π^+, the proton and the neutron, with the help of a code of simulation. The particles are presented in a very detailed manner since any value of interest can be obtained from any of the constituents of the examined particles.

0.1 Introduction

The analysis of the electron/positron[1] has given a better understanding of concepts such as mass-energy, charge-potential and force-field. We can now use this knowledge to obtain an understanding of how the particles are constructed. We will start with the most simple constructions which are the particles constructed directly by the daons.

Chapter 1

The first level particles

The stability of all daon structures is ensured by the attraction between daons, which means that the daons must be placed with their axis quasi-parallel to each other according to[1].

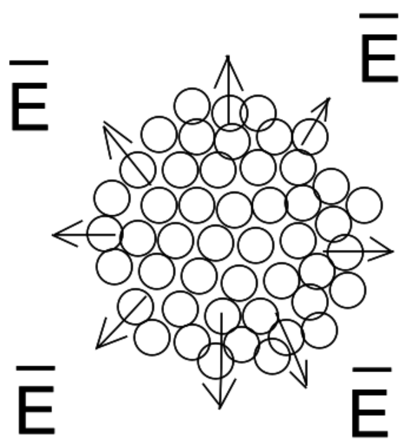

Figure 1.1: Schematic view of the electron

1.1 The electron/positron

The spherical structure of the electron/positron, where the axis of the daons all point radially outwards/inwards, is presented in figure (1.1).

The concentric geometry forces a radial equilibrium into this structure which, was demonstrated in[1] and, leads to the electron's specific characteristics.

1.2 The photon

The photon is supposed to have something to do with the electromagnetic wave. The mysterious photon has very strange characteristics, since it moves only with the speed of light, it has some energy but no mass and it has some wavelike behaviour. If we use some logic, and look at this object through the eyes of the daon theory, we can remove the mysteries and obtain a particle with much simpler and clearer characteristics. We start by making some hypothesis:

- The photon has energy so it must contain something, i.e. it must have a mass.
- Its mass do *not* depend on velocity.
- A photon is created with 0 or low velocity, its characteristics must therefore be such as to give it a strong acceleration, until it reaches its final speed, in an asymptotic manner.

A photon's structure must be very simple and made up by daons (in the same way as the electron) such a structure must then be one where daons are aligned, relative to the medium direction of their rotational axis, i.e. the daons are lined up parallel with each other. You can imagine a spherical lump of daons kept together by the interaction between daons having quasi parallel rotational axis. Such a lump of daons should take a spherical form, very similar to the electron, since the radial equilibrium must be maintained.

The parallel rotational axis are the source of an electric field, across the lump, while the interaction between the ordered daons and the free daons, perpendicular to the electric field, will give rise to a rotation of the lump[1]. This rotation produce a magnetic field perpendicular to the electrical one, as presented in figure (1.2). The velocity of rotation must increase until an equilibrium is reached, which happens when the following equation is valid throughout the photon,

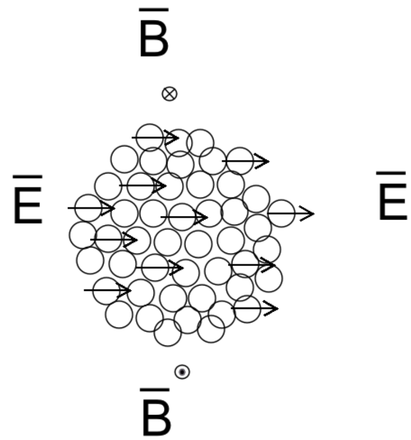

Figure 1.2: Schematic view of the photon

$$v_\phi = c\frac{r_{ph}^2}{r^2}\sin\theta \tag{1.1}$$

$\frac{r_{ph}^2}{r^2}$ is directly proportional to the force density of the photon, similar to the electron's force density. θ is the angle between the medium direction of the daons rotational axis (electric field vector) and the radius of the daon lump.

This means a particle with an electric field and a magnetic field circulating around the mean direction of the electrical field.

We now give a velocity $\vec{v}$ to the photon, much lower than the light speed, and examine the interaction between the free daons and the photon.

This daon lump must position itself so that the daons mean rotational axis is perpendicular to the velocity vector, since otherwise the interaction between daons[1], will reduce the velocity to zero.

Let us start with the rotation: The photon's velocity relative to the free daons produce a difference of force on the sides parallel to the velocity vector and perpendicular to the photon's symmetry axis. On one side the ordered daons push to increase the rotation; while on the opposite side the daons want to decrease to rotation, the result is that the rotation stays constant.

We have an action, on the sides perpendicular to the main velocity vector and to the electrical field, producing a repulsion on one side of the photon and an equally strong attraction on the opposite side, this force deviates the photon in the transverse sense. But, here we have a problem since the relative velocity, on the side "pushing" the photon, is above the light speed! Not only, also the "pushing" continues even at the speed of light, i.e., the transverse speed would exceed the light speed, which is impossible! The only possible solution out of this dilemma is that, when the relative speed between daons force the daon substances to be abnormal (the normal state is presented in the equations of interaction[1]), in the point of interaction, the result is that the daons shrink and therefore increase their attraction. The result would then be that this transverse action becomes an equally strong attraction on both side of the photon, i.e. *no resulting force*.

We now take a look at the sides perpendicular to the velocity vector and parallel to the rotational axis of the photon. Here there is a difference in velocity between the daon shells (closed surface with daons having the same order), which leads to an inclination of the daons, in the direction opposite to the velocity vector, since daons with stronger order has a higher velocity, relative to the free daons. It can be expressed as,

$$\sin\delta = \frac{v}{c}((\frac{r_{ph}^2}{r^2})^- - (\frac{r_{ph}^2}{r^2})^+)\cos\theta\sin\phi \tag{1.2}$$

This angle, between daons from neighbouring shells, results in a transverse force, directed perpendicular to the main velocity vector and the electrical field vector, it can be expressed as

$$F = m_d \int_0^\infty \int_0^\pi \int_0^{2\pi} A_{ph}\frac{1}{2}\sin\delta\sin\phi\ d\phi\sin\theta d\theta\frac{dr}{\Delta r} \tag{1.3}$$

$$A_{ph} = \frac{4\pi r^2}{\pi r_d^2}\frac{\pi}{2\sqrt{3}}\frac{r_{ph}^2}{r^2}3\sqrt{\frac{3}{2}}\pi\frac{c^2}{r_d}$$

A_{ph} is the force equilibrium around the photon. The factor $\frac{1}{2}$ is due to the direction of the force, which is parallel with the shell and not radial (see magnetism [1]).

This leads to a force pushing the photon in a direction perpendicular to the velocity vector and the electrical field.

The photon doesn't react immediately, which leads the daon to a secondary inclination, since the daons rotational axis must adapt itself to the surrounding forces. The supplementary angle, as presented in figure (1.3)), can be written

$$\sin\delta' = \frac{\Delta v_\perp}{c}\sin\theta\sin\phi = \frac{v}{c}((\frac{r_{ph}^2}{r^2})^- - (\frac{r_{ph}^2}{r^2})^+)\cos\theta\sin\phi \tag{1.4}$$

This gives then a component of the force *accelerating the photon in the direction of the photon's velocity vector.*

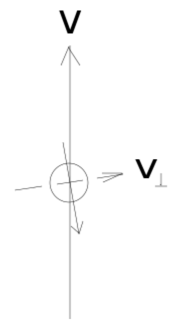

Figure 1.3: Schematic view of the daons inclination and the resulting force

The forces derived from equations (1.3) and (1.4), both depends on the relative velocity between the daon shells. So, if the photon starts to accelerate, under the action of these forces, the relative velocity between neighbouring shells must give a force in both directions, which means that the photon must increase its velocity in the longitudinal as well as the transverse sense, during the whole phase of acceleration.

The acceleration starts with a photon without transverse speed, which means that the whole transverse force will be bent (forced) in the forward direction, i.e. the photon gets a strong acceleration with a weaker transverse force. The acceleration becomes weaker, at higher speeds, while the transverse force gets stronger.

The photon feels the same "resulting electrical interaction" with its surrounding shells as the electron, which leads also the photon to start a spiralling trajectory. The rotational axis of the daons, associated with the photon, are directed away, from the mean velocity vector, when it makes a right handed spiral and towards, when it makes a left handed spiral.

As for the electron, the transverse force can be written,

$$F = m_d\frac{A_{ph}}{3}\frac{r_{ph}^2}{r^2}\frac{v_\perp}{c} = \frac{m_{ph}v_\perp^2}{\rho} \tag{1.5}$$

$v_\perp$ is the photon's transverse velocity.

The force density of the daons associated with the photon, far away from the photon's center, must be written, $\frac{r^2_{ph\infty}}{r^2}$, but, the disorder from the free daons is always the same, it's therefore necessary that the reference radius of the photon and the electron are identical, at a sufficient distance away from the center of the respective daon lumps. We obtain, passing to the corresponding classical expression,

$$\frac{e^2}{4\pi\epsilon_0 r^2}\frac{v_\perp}{c} = m_{ph} v_\perp^2 \rho \tag{1.6}$$

We now obtain the Louise de Broglie law, in the same way as for the electron, as

$$\frac{e^2}{4\pi\epsilon_0 c} = m_{ph} v_\perp \rho \qquad r_{ph} \tag{1.7}$$

$$\Rightarrow m_{ph} c\lambda = h \qquad \Rightarrow \qquad E_{ph} = h\frac{c}{\lambda} \tag{1.8}$$

The photon has therefore always the same effective size (identical to the electron), independent from its energy (mass). The electrical charge of the photon is then equally strong as the electron charge. We can here speak of the photon's corresponding "magnetic charge" $\frac{r^2_{ph\infty}}{r^2}$, which is equally strong as the electrical one.

This also means that the internal order of the photon is different for each photon since it depends on the number of effective daons the photon contains. The number of effective daons is not fixed, since the daons relative positions (geometry), is not fixed (like it is for the electron).

The photon do not have a relativistic mass, since its acceleration and final velocity is ensured by the interaction between its ordered daons and the free daons around it, and not from a rearrangement of the daons, i.e., *the photon's mass is independent from its velocity.*

We can speak of soft and hard photons, since the internal force density of a photon must be low, for a photon with low energy (mass) and high for a high energy (mass) photon.

It should be added that an external perpendicular electric or a magnetic field will have no net effect on the photon, since the spiralling trajectory will make the photon turn, making the effect in one half period be completely cancel in the next half period. This means that *the photon can be deviated only by an EM-wave, having the same frequency as the photon.*

It should here be mentioned that the concept of anti-particles, which is evident for the $e^- - e^+$ scenario, does not apply to the photon. The photon is a unique particle and has no anti-particle.

A daon is associated with a mass (a system constant), which means that we can estimate the smallest possible mass for a photon, by the minimum number of daons needed, to around $10^{-8}eV$, corresponding to around 25 effective daon masses.

1.2.1 Young's double slit experiment

When a photon passes through a slit, its EM-field is cut away. The photon must therefore re-order its daons, to obtain a radial equilibrium of force, when exiting from the slit. The photon therefore loose some mass-energy, during the passage of the slit.

Now, what happens in the second slit? Well, according to the Daon theory, a part of the EM-field from the photon must pass through the second slit. This is ordered daons which, when exiting from the slit, must produce an EM-wave, having the same frequency of oscillation as the source photon.

We have then, on the exit side of the double slit, a photon interacting with an EM-wave, having the same frequency. If the wave is strong enough (distance between the slits sufficiently short), an interference pattern will arise.

1.2.2 Entanglement

One of the obstacles for the development of a new model of physics is the experiments on the action between photon pairs. According to quantum mechanics a pair of photons emitted from a common source, at approximately the same time, will have a common sphere of "existence" so that when one is detected the sphere will immediately collapse and impose a polarization on the other photon opposite to the detected one (entanglement). Classical theories say that the two photons must be independent i.e. there should be no interaction between the two photons. What is examined is the probability of the two photons to have parallel polarization, measured with the help of coincidence measurements between polarisers (detectors). The measurements indicates a strong correlation between the two photons giving the quantum mechanic model as the correct one. Now, how are these results explained in the daon model?

First it should be recalled that the velocity of a photon must be measured relative to the surrounding free daons and not relative to the other photon. Secondary the photons starting from the source of creation do not travel with light speed but are first in a stage of acceleration, bringing them to their final velocity. This means that the photons *are* in contact with each other and that an interaction must take place, aligning their electromagnetic field. Their spiralling trajectories will therefore be opposite in direction. This also explain that the two photons must be produced within a short time interval, during which they have not yet reached their final speed.

The EM-wave is linearly polarised, but the photon has its electrical field rotating around its mean direction! In the various experiment concerning entanglement, linear polarisers are used! How is the photon interacting with linear polarisers? There is obviously a confusion between the EM-wave and the photon, since today it is believed that the EM-wave is made up by photons!

It is therefore necessary to have a clear idea of how the photon is passing a linear polariser (or some other device) before making any statement of entanglement!

An experimental evidence of entanglement is a demonstration that an action on one of the pair will produce a similar but opposite action on the other one. Such a demonstration has not been done, as far as known by the author.

1.2.3 Suggestion of Experiments

- Test if an electro-magnetic wave can be detected by a *photon* detector or if a photon can be detected by an *antenna*.

  If it's possible to construct a transmitter of EM-waves in the region of visible light, it would be possible to verify if the human eye can see an EM-wave or if it can only to see photons!

- Photons are supposed to be emitted from any high voltage equipment! But, there is now trace of any photons around such equipment, they should have been noticed since photons would disturb the electronic installations. So, why not try to detect such emissions, and develop some theory around it. A negative experiment could, in this case, be more interesting than a positive one!

- It might be possible to measure the time a photon needs, to travel from its place of creation until some form of detector (reaction), and compare this with the time it should take with a constant speed c. The photon's acceleration is very strong, so that the photon reach the light speed in a very short time (and distance).

1.3 The neutrino

The last possibility geometry for a stable daon ensemble is a torus, i.e. something looking like a snake biting its tail, where the body is made up by daons having the same medium direction of their rotational axis, as presented schematically in figure (1.4). As for the photon, the daons will interact with the free daons so that the torus will start to rotate, producing a magnetic field around the torus. This configuration has no electric field, since the geometry is closed on itself. This means that such a completely neutral particle will have a very small interaction with other particles, which leads us to believe that this configuration must be the neutrino.

The medium direction of the ordered daons (electrical field) could be directed to the right or to the left, relative to the torus axis. But, if the neutrino has a velocity $\vec{v}$, relative to the surrounding free daons, it must be oriented so that a flux of free daons (magnetic field) pass in the center of the torus, like a perfect magnetic dipole. The force between the ordered and disordered daons [1], impose the ordered daons to be directed in the left handed direction relative to the velocity vector. This then produce a magnetic flux of free daons having the same direction as the velocity vector, in the center of the torus, and the opposite direction outside of it.

The neutrino can not have a spiralling trajectory since its electric field (ordered daons) is closed on itself, it has therefore no associated wave. The medium direction of the daons must be perpendicular to the velocity vector since otherwise the interaction with the surrounding quasi-free daons will decelerate it [1]. It has no "engine" for acceleration, pushing it towards the limit of velocity, i.e., the neutrino must travel with the velocity it obtains

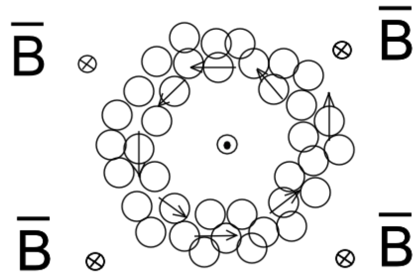

Figure 1.4: Schematic view of the neutrino

after reacting with other particles.

In a reaction producing a neutrino, the axis of the torus could be in any direction, but when its has obtained a velocity relative to the free daons, it will orient itself so that its symmetry axis is parallel with its velocity vector. There is no rotation, of the torus, around the velocity vector, since the interaction between daons stops it [1].

The neutrino, as the photon, is a unique particle and has no anti-particle. The smallest possible mass for a neutrino can be estimated, again through the minimum number of daons needed, to be around 5 times the value for the smallest photon (i.e. around 1.2 meV). The neutrino does **not** follow the law of Einstein ($m = m_0\gamma$). It can have any energy, like the photon, above its minimum value.

It should be added that a perpendicular electric field will produce a rotation of the neutrino around its velocity vector, but no deviation. This means that **the neutrino can not be deviated by an EM-field**.

It is likely that the size of the neutrino is important for the probability of a given interaction, i.e., a neutrino reacts, in a given reaction, within a certain mass-energy range. The different types of neutrinos, proposed in today's theories, must then be just neutrinos of different size and energy.

The size, of the photon and the neutrino, is decided by the number of daons they contain, due to their respective force equilibrium. The mass-energy of these particles are independent from their velocity.

The four daon configurations presented above are the first level of matter since the daon itself has no mass.

Chapter 2

The interaction, at close distances

It is known that the masses of all material bodies follow the Einstein's law of energy ($E = mc^2$): This was demonstrated to be the case for the electron/positron in[3]. The mass of the photon and the neutrino do not depend on velocity, which means that **the fundamental building blocks of particles must be electrons and positrons!**. The photon and the neutrino has no role to play in the construction of more elaborated particles.

It should be emphasized that the decay products from any particle, is always lower mass particles plus electrons/positrons, neutrinos and photons, i.e. when the decay chain has finished the left overs are always protons, electrons, positrons, neutrinos and photons.

The interaction between electrons/positrons, having a distance much bigger than the electron radius, was already examined[1], it is evident that the distances must be in the same order or less than the electron radius, to give a strong deformation, leading to a strong modification of their characteristics.

2.1 PART

A computer code, called **PART**, was developed, which simulates the interaction between electrons and positrons.

First of all we need a dedicated mesh, representing the electron and/or positron. To obtain this, we start with a sphere done by a regular mesh of 20 triangles. Each triangle is reduced to 6 new triangles, giving a total of

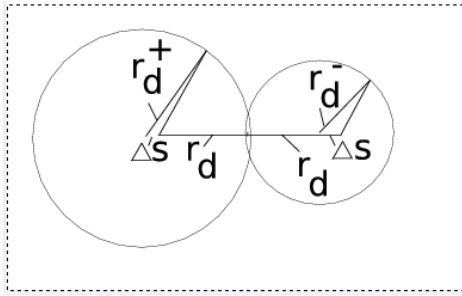

Figure 2.1: The deformation of interacting daons, having different radii.

120 quasi regular triangles representing a sphere. Then we produced many such spheres, with growing radii, so that a spherical mesh, filling up all the volume of interest, is produced. We then use lines, passing in the corners of each such triangle, so that a 3D mesh is achieved, which then was used in a numerical simulation.

The electric force lines are lines parallel to the medium direction of the daons axis, while equi-charge surfaces are perpendicular to the force lines. The equi-potential surfaces must be redefined under these conditions, due to the variation of the electron's reference radius r_e relative to the distance from the center of the electron, i.e., the charge is varying radially close to the electron/positron center.

The daons order, within an equi-charge shell varies, in the case of external interaction. This therefore modifies the interaction between the daons belonging to the same shell. The effective radius of interaction can be obtained, in the case of the interaction between two daons of different size, as presented schematically in figure (2.1),

$$r_d = \sqrt{r_d^+ r_d^-} \tag{2.1}$$

The plus means the bigger daon while the minus corresponds to the smaller one.

This means that the daon radius is the geometrical mean value of the neighbouring daons.
Δs is the displacement of the geometrical center of the respective sphere, due to the interaction.

What is important to realize is that the interaction between daons, within

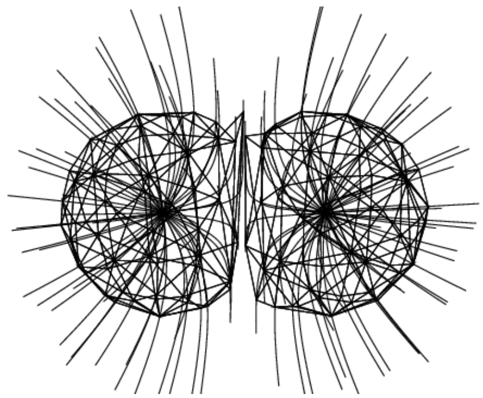

Figure 2.2: Two electrons

a closed surface, happens between daons of different sizes, which gives a stronger interaction, leading to a supplementary azimuthal action reducing the daon sizes. The radial equilibrium must therefore adapt to take into account this "compression". We can write the compression within an equi-charge surface as.

$$C_f = \frac{(\Pi_{i=1}^{n} \frac{1}{r_{d_i}})^{\frac{1}{n}}}{\frac{\Sigma_{i=1}^{n} \frac{1}{r_{d_i}}}{n}} \tag{2.2}$$

n is the number of daons within the equi-charge surface. The compression is rather small, but should be multiplied by the number of shells, which can be very high.

The code PART has no parameters, the user can only place the constituents in any position, thereafter PART calculate the fields, masses and the forces felt by each constituent, using the Daon-theory.

2.2 $e^- - e^-$

Let us start by examining the interaction $e^- - e^-$, at small distances. Part of the mesh can be seen in figure (2.2), where the lines parallel to the medium direction of the daons axis and one equi-charge surface are presented.

The force and mass variations, relative to the distance between them, are presented in figure (2.3), compared with the same value for the classical case. The theoretical values are cut when the distance between the electrons is shorter then the classical electron radius (their values have no sense thereafter). We start from a sufficiently large distance, to show that the classical and simulated values agree. The force, on an electron, is calculated as follows,

$$F = \int\int e \frac{r_e^2}{r_e^2 + C_f\ r^2} A \vec{r}_n \vec{T} dS \tag{2.3}$$

$$T = \Sigma \frac{r_e^2 \vec{r}}{C_f^2 r^3}$$

r_e is the radius of reference, as defined in[1]. C_f is the compression factor, while A is the area of the examined equi-charge surface. T is the total external action, acting on the examined area. The integral is made over the surface of maximal contribution, which is usually the area of interaction (i.e., the surface where the daons change belongings.

The values of the force is somewhat reduced, compared to classical values, at shorter distances. This is what could be expected from the fact that the charge is reduced with radius [1]). The mass is on the contrary growing faster than the classical values but the difference is not very big, this means that the compression, in this case, is rather weak.

The classical values are defined in Maxwell's equations as:

$$F_c = \frac{e^2}{4\pi\epsilon_0 r^2}$$

and:

$$m_c = m_e - \frac{e^2}{8\pi\epsilon_0 r c^2}$$

What the graph is actually showing is the force and mass of the constituents calculated at a given position (fixed in time).

2.3 $e^- - e^+$

In the same way, we obtain for $e^- - e^+$, that at shorter distances, the "electrical force" is reduced. This is due to the deformation but also to the reduction

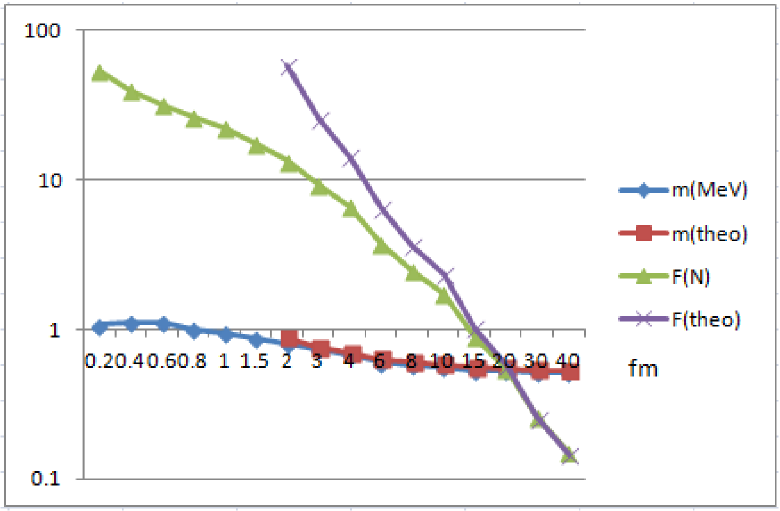

Figure 2.3: Mass and force variations relative to the minimum distance between two electrons

of the charge at shorter distances, as can be understood from figures (2.2) and (2.4).

The mass follow rather well the classical value until, at shorter distances, the deformation is sufficiently strong so that the contraction in the internal parts, reducing the size of the daons, increasing the necessary number of daons and therefore also the force and the mass. As you can see the mass and the force are growing to very high values, at around 0.5 fm.

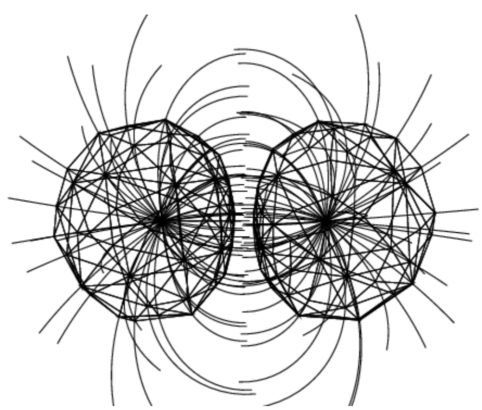

Figure 2.4: An electron and a positron

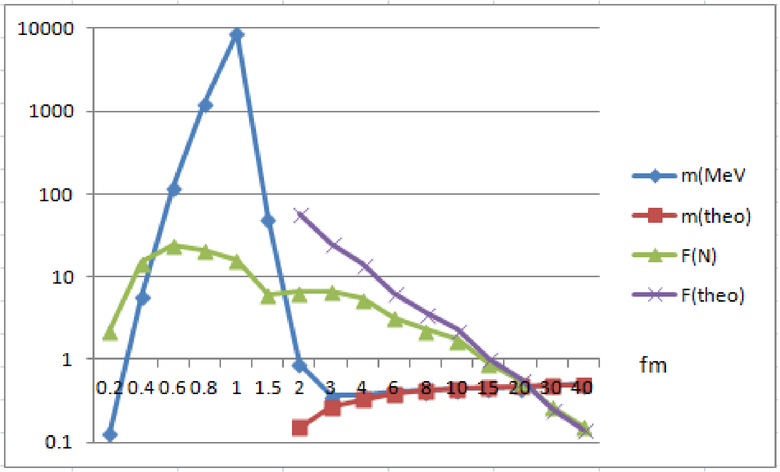

Figure 2.5: Mass and force variations relative to the minimum distance between an electron and a positron

A very interesting point, in this interaction, is the inversion of the force gradient leading to an inversion of the force, at a distance of around 0.25 fm, as presented in figure (2.5). This is due to the characteristics of the surface of interaction, which at this small distance obtain a smaller attraction and a stronger repulsion, since the the angle of interaction between daons smaller then 90 degrees, is obtained only for a small surface, as presented in figure (1.2), while the area of interaction, where you have repulsion (see Eq.(2.3)), is getting bigger and bigger.

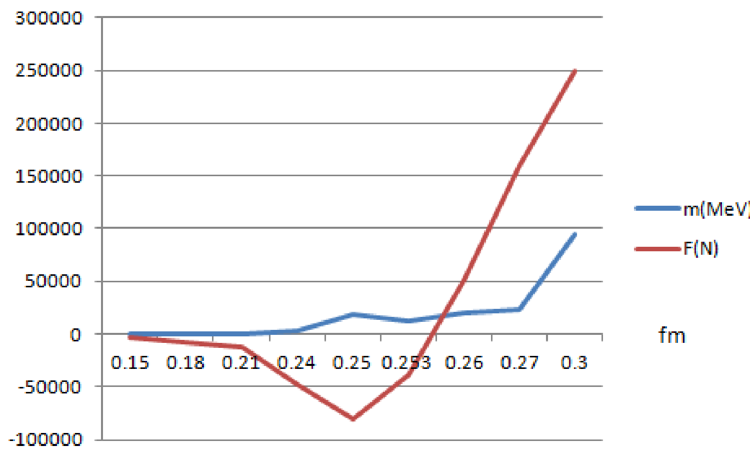

Figure 2.6: Mass and force variations relative to the minimum distance between an electron and a positron, in the region of strong variation.

2.4 Annihilation

The very strong inversion of the force, presented in figure (2.6), means that if, in an $e^- - e^+$ collision, the distance becomes smaller than 0.25 fm, their attraction will turn into a repulsion, especially in the external part of the interaction, which will lead to a separation of the daons, in the area of repulsion, pushing them away from the area of interaction. This is the scenario of annihilation.

After such a strong reaction you will have a geometry where the daons are separated into three regions: the two external ones, will be similar in number of daons and have their daons pointing in the same direction, while the central one will be smaller and point in the opposite direction. This, as we have learned above, means three quasi-photons, where two have the same size and direction and a third smaller one, in between, having the opposite direction. The scenario that follows could be several, depending on the energy and the impact parameter of the reaction:

- A simple photon seems highly unlikely (but possible in the presence of other particles or strong EM-fields), since the force of repulsion will separate the two external quasi-photons.
- Only two photons can be obtained if the third central quasi-photon is absorbed by the external bigger ones.

- Three photons is possible but the central resulting photon should then be smaller then the two external ones.
- Four or more photons (or other particles) is possible if there are sufficient energy or other particles or strong EM fields in the neighbourhood of the principal reaction.

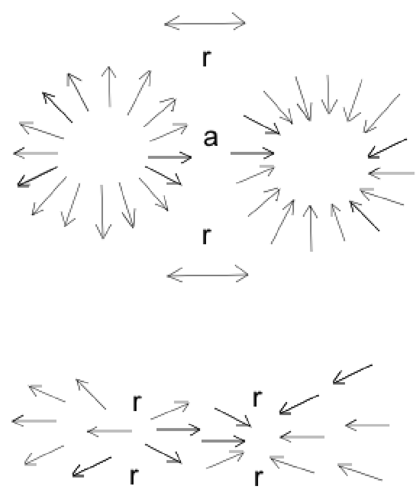

Figure 2.7: Scenario of annihilation: a = region of attraction, r = region of repulsion

Chapter 3

The Leptons

We have already given an extensive analysis of the electron and the positron, so we will here only examine the muon.

The constituents of the lighter particles should be visible in their decay modes. The muon decays, in fact, directly into electron/positron and photon/neutrinos, which demonstrate the simple construction of this particle. The most probable process looks like an annihilation between an electron and a positron. The neutrinos can not be detected, meaning that the decays below are an interpretation from experimental data of the electron distribution.

$$\mu^- \to e^- \nu_e \bar{\nu}_\mu \quad ; \quad e^- \nu_e \bar{\nu}_\mu \gamma \quad ; \quad e^- \nu_e \bar{\nu}_\mu e^+ e^-$$

This means that the μ^- should be constituted by the most simple structure, i.e. two electrons plus one positron. They must, for reasons of symmetry, be aligned with each other, as can be seen in figure (3.1.)

We can then try to give an interpretation of the muon decay, seen through the daon theory. As was already discussed above, the annihilation gives, as result, three quasi-photons lined up, with, in this case, the electron at one end. The quasi-photon closest to the electron will be absorbed by the electron, while the central quasi-photon will be pushed against the external quasi-photon. This means that the two remaining quasi-photons will be side by side but in opposite direction, which is an invitation to produce a neutrino, as can be understood from the discussion above.

The muon geometry is presented in figure (3.1); the force lines are cut

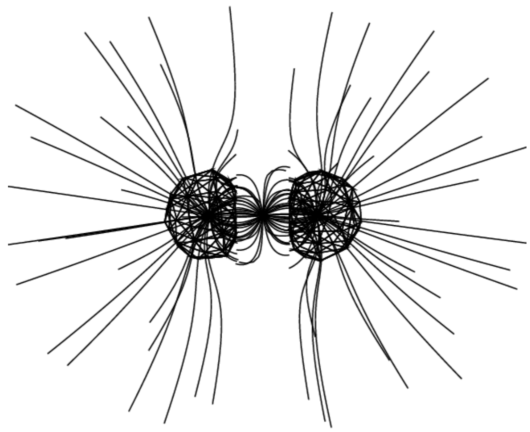

Figure 3.1: The muon geometry.

at $O = 0.2$, corresponds to the limit where the muon starts to behave like a "particle", while the equi-charge surface is at $O = 0.94$. The muon has a geometry of a sphere, at a relatively far of distance, becoming a superimposed double sphere, at shorter distance, until shortly before the indicated equi-charge surface, the central positron appears.

You can see, in figure (3.2), that the main mass, needed for equilibrium, is concentrated to the central positron (m^+). The two electrons are, from mass point of view, rather insignificant. Notice that at the point of interest, muon mass around (105 Mev), there is an inversion of the direction of the force.

You can see a maximum of the mass and the force when the distance between constituents is around 1 fermi. The correct mass of μ^- is obtained when the force is inverted from attraction to repulsion, which happens when the distance between the constituents is around 0.36 fm.

It should be said that the graphs of force and mass are static, i.e. this is not the real appearance from a scenario of particle creation. The creation is a dynamical process where the region, covered by the graphs, is very quickly passed (in a collision) the particles deform and want more mass (daons) leading to a strong attraction followed, after the passage of the barrier peak, of a repulsion or not at all passed (decay from heavier particle). The main interest of these graphs is to identify the position of maximum stability for the particles and characteristics around these points.

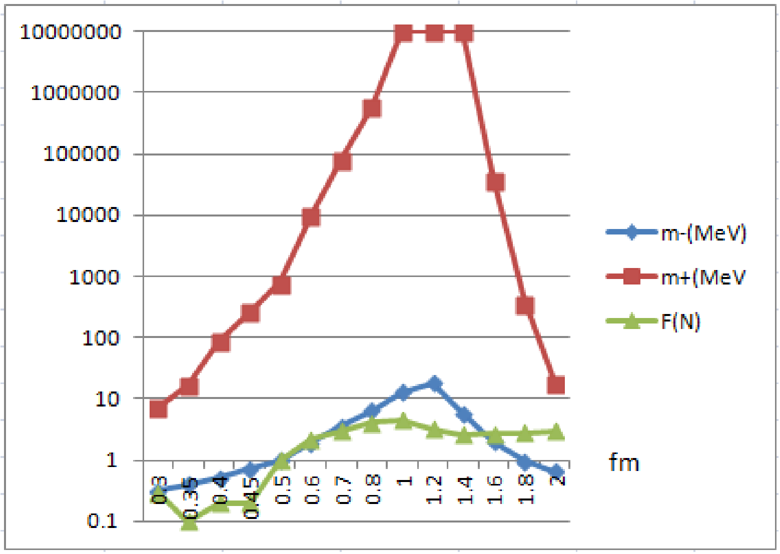

Figure 3.2: Mass and force variations of the muon, relative to the distance between constituents

The errors in the presented graphs are due essentially to the basic mesh, which is too sparse, in the azimuthal sense. The errors for the force and the mass is around 20 percent.

The field lines from a charge goes from a charge to the opposite charge, the "number of field lines" between two charges must be identical, even within a complex particle. So, to obtain the charge from any particle, you just sum up the 'number of field lines which are not occupied", giving an integer number of corresponding unit charges. It follows that the charge of any particle comes from the resulting number of radial equilibriums, i.e. the difference between the number of positrons (having their daons pointing inwards) minus the number of electrons (having their daons pointing outwards). The charge of a particle is well defined once the distance is much bigger than the reference radius of the particle ($r >> Zr_e$).

Chapter 4

The Mesons

There is, in principle, no real difference between Leptons and Mesons, in the daon theory. The only principle difference must be in the dynamic interaction with the surrounding free daons.

4.1 π^0

We will again start with the decay modes to get a better understanding:

$$\pi^0 \to 2\gamma \quad ; \quad e^-e^+\gamma \quad ; \quad e^+e^-e^+e^-$$

The very unstable π^0 decays, after one or two annihilations, into gammas and/or electrons/positrons and should therefore be constituted by two electrons and two positrons, which must, for reasons of symmetry, be positioned in a square, as can be seen in figure (4.1).

The equi-charge surface shown is the last individual one, at around $O = 0.4$.

Here, we come to a crucial point. If you take a closer look on this graph, you find that the point of stability, for the π^0, is on the outer part of the force and mass peak! This means that the constituents can leave the particle without added energy, since they don't need to pass the mass peak. In fact, in the decay modes, for the π^0, you'll find a mode of simple separation of the constituents. When the constituents start to be separated, they are strongly

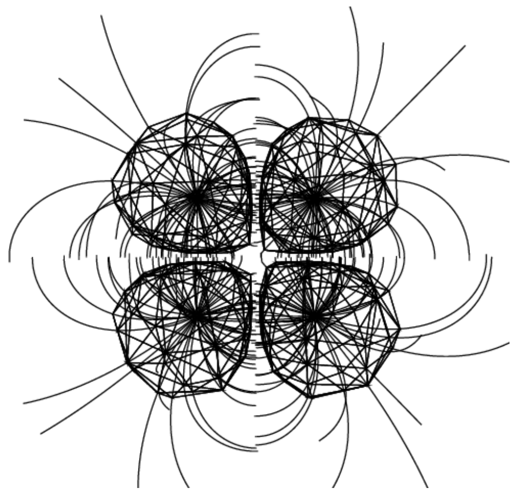

Figure 4.1: The π^0

attracted to the opposite charge partners, so that annihilation(s) are the usual decay mode.

The total mass (m_t) of π^0 is obtained when the force between its constituents goes to zero, at the minimum distance between constituents around 3.9 fm, as can be seen in figure (4.2).

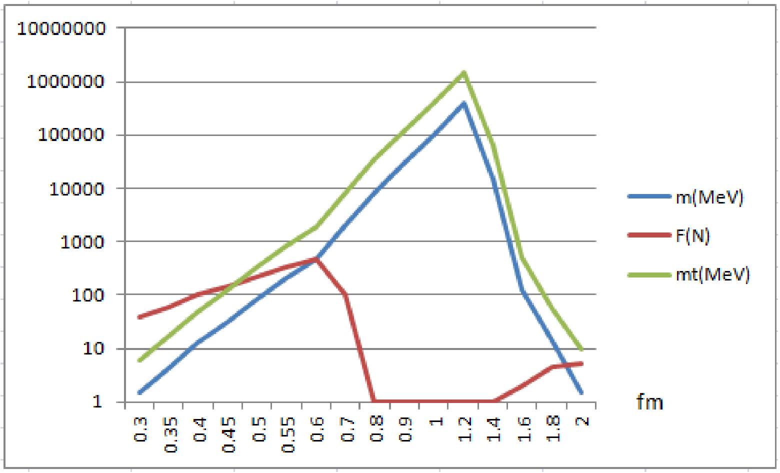

Figure 4.2: Individual and total Mass as well as the force variations between the constituents of π^0, relative to the minimum distance between constituents

4.2 π^-

It follows, from the previous section, that π^-, which preferably decays into a muon, should be constituted by three electrons and two positrons.

$$\pi^- \rightarrow \mu^- \nu_\mu \quad ; \quad \mu^- \nu_\mu \gamma \quad ; \quad e^- \nu_e$$

The e^- should be positioned in a regular triangle, while the e^+ should, for reasons of symmetry, be positioned face to face, on a line passing through the barycentre and perpendicular to the plane of the triangle, as shown in figure (4.3).

The π^- behaves in a similar way as the π^0, i.e., its point of stability is on the outside of the force-mass peak! Which must lead to a rather unstable particle, since no additional energy is needed to separate the particle into its constituents.

The force value is optimized so that the force acting on the positrons is approximately equal to the force acting on the electrons, The mass of the positrons are, at 1 fermi, so high that it was necessary to cut the values at 10 TeV.

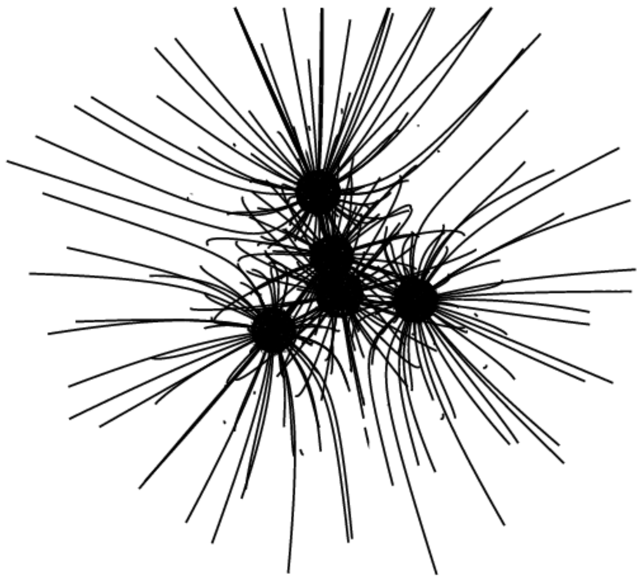

Figure 4.3: parts of the π^- mesh, showing the geometry of the constituents.

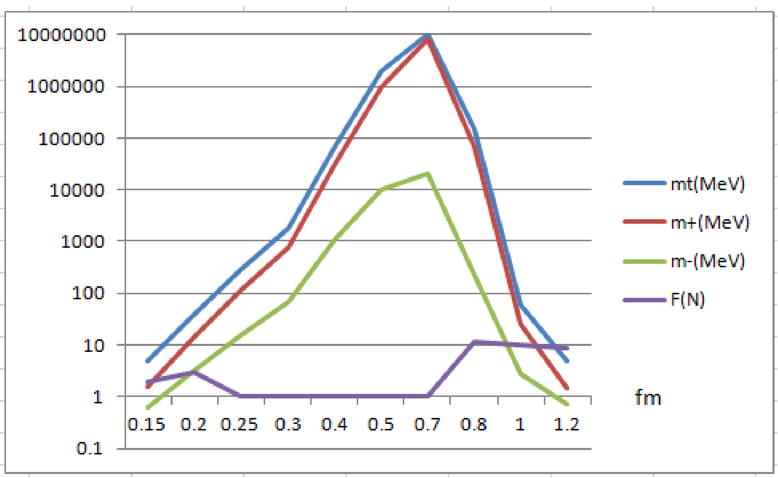

Figure 4.4: Mass of the individual constituents, total mass of the particle and mean force between the constituents of π^-, relative to the distance from a positron to the particle's barycentre

It should be said that, in the scenario of creation or decay of particles, the mass of the particles is not at all well defined, the mass of a created particle can very well be much lower or much higher than normal. If a particle obtain a too high mass it will, during a period of decay, close in on its final mass. It can happen that the particle has obtained a too low mass, which can happen for example in a high energy reaction, it will then absorb mass (ordered daons) from the surrounding fields or particles, until it has reached its final mass (it can of coarse during this period also become unstable and decay). This is a force of attraction, if it needs more daons and a force of repulsion, if it has too many.

We have the maximum values around 1 fermi. The relative distance between the e^- and e^+ is almost constant in the whole interval examined. The correct value of the π^- mass is obtained when the force goes to zero. The positrons have then a distance of 3.55 fm and the electrons 4.15 fm, from the barycentre of the triangle.

As for the π^0, the separation of the constituents will lead to annihilation(s), which is the reason that the π^- decay easily into μ^-.

The heavier mesons, like $\eta, K, \rho, \omega \ldots$, using the same reasoning, seems to be constituted by three or more pions! If this is so, then it would explain their short life times since, in this case, they must behave like π^0 and π^- , i.e. they must be "outside" the force-mass peak. They should therefore be loosely bound and rather unstable. Also their size should be rather big, their radii must be bigger than the π^0 radius.

Chapter 5

The Baryons

The baryons must necessarily be constituted by electrons and positrons, which gives the explanation for the very precise charge unity of the proton, in the same way as the lighter particles, so, why the strong difference, especially in stability?

5.1 The Proton

The only possible answer is that the proton has a special symmetry. The proton is also quite heavy, compared with the leptons and mesons. The number of constituents must also be higher, so we are looking after a structure of perfect symmetry with a relatively high number of participants, where half of them have a positive charge and the other half have the same but negative charge. This reasoning makes us think of a crystal of ions with similar characteristics, like CsCl for example. So from physical chemistry, we obtain that similar sized ions with charges $-+$ order themselves into cubes, placed parallel to each other, where the cube with $+$ charges is displaced relative to the one with - charges, so that the corner of a cube of $+$ charges is placed in the center of the cube of - charges. If we now apply this knowledge to the proton, we obtain that the necessary stability can only be obtained with the most simple structure, which is a complete cube of positrons with an electron in its center and six other electrons placed outside the center of the cubes faces. Such a symmetry has the electrons as well as the positrons in perfect symmetry between themselves, since the electrons form an octahedron, as proposed in figure (5.1).

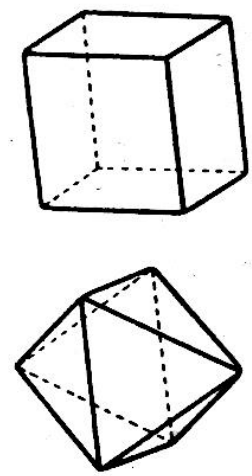

Figure 5.1: The geometry of the proton.

The proton looks like a single positive charge until, at $O \simeq 0.9$, appears the electrons in the collective equi-charge surface, as demonstrated in figure (5.2). The last individual closed surface is around $O = 0.98$. The individual constituents are difficult to extract since the positrons are placed rather deep within the proton and the electrons appear rather late and only in a short radial interval.

The total mass, as well as the electron mass, are so high that it was necessary to cut their values at 10 TeV. We have again the maximum values at around 1 fermi. The relative distance between the e^- and e^+ is almost constant in the whole interval examined. The proton mass is obtained when the force between constituents goes to zero (inversion), the electrons have then a distance, from the central electron, of 0.436 fm, while the respective distance for the positrons is 0.265 fm.

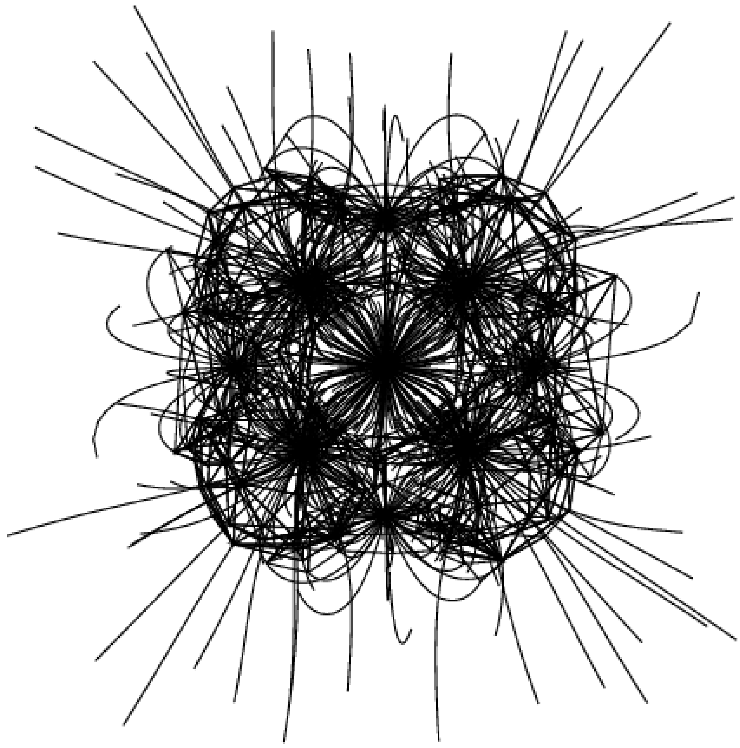

Figure 5.2: Part of the proton mesh.

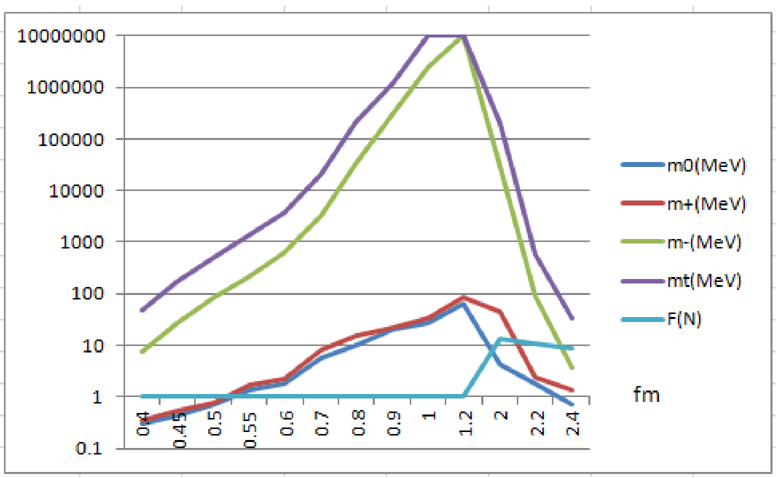

Figure 5.3: Mass and force variations of the proton constituents, relative to the distance between a positron and the central electron.

5.2 The Neutron

We now obtain the neutron by simply adding an electron. This causes some considerations:

- At this very short distances, the electron can not have any spin since the wavelength of the spin is much too long, i.e. the action from the proton on the electron is much stronger then the action producing the spin. This is the essential difference between an Hydrogen atom and the neutron.
- There is no place for the extra electron within the proton, which means that the electron has to be placed outside.
- The mass of the neutron is slightly higher than the proton, which means that the electron must be placed rather close to the proton, since the "normal classical" decrease of potential would give a reduction of the mass, for both the electron and the proton. The electron must therefore be placed sufficiently close to the proton so that the increase of mass, due to the deformation of the shells, will start to act, i.e., at the beginning of the barrier of growing mass, which means around 3-4 fm distance away.

The electron will move around the proton in a rather erratic motion, since the electro-magnetic interaction is very strong and depends on the relative position of the electron. It is impossible, in a static approach, to give details on the trajectory, the electron feels in medium an attraction, coming from the central positrons, but can locally feel an even stronger repulsion from the external electrons of the proton. Their are small "positive" Faraday's tubes, leading into the proton, so how come the electron stays outside? This is difficult to say, without a dynamic approach, but, it looks like the tubes are too small, so that the electron can not pass (see Fig. (5.1)).

CHECK A STATIC APPROACH AT A GIVEN AZIMUTHAL POSITION (F versus DISTANCE)!!!

We can make some comments for the neutron decay:

- This quasi-stable particle must have a unique way to decay. The most probable such mode is when the electron, in its erratic motion, reach

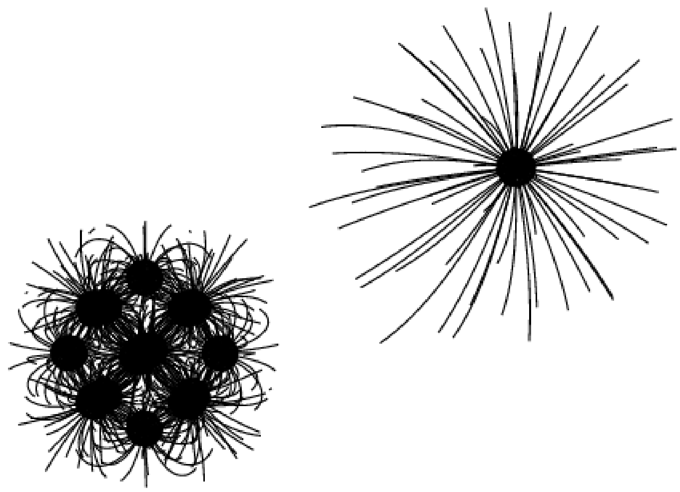

Figure 5.4: The geometry of the neutron.

close to the azimuthal position of an electron, which would give a sufficiently strong repulsion to expel the electron.

- The excess mass, after such an expulsion, is sufficient to create a neutrino and/or a photon. But, a closer look into such a reaction, leads to a necessarily detail analysis of the complete interaction. We are not, at the moment, ready to undertake such an analysis.

- An interesting experiment can here be suggested; A low energy positron beam on a target rich in neutrons, i.e.

  $$e^+ \; n \rightarrow p \; + \; N\gamma + \; \nu$$

  N is an integer number

  The analysis should show the annihilation of the e^+ and the e^- at the side of the proton. The energies would be different from a normal annihilation due to the asymmetry in the masses.

The heavier baryons, using the same reasoning as above, seems to be constituted by a basic proton with leptons and/or mesons attached!

We can here make a distinction between second and third level of particles, since it is important if the constituents of a particle, are inside or outside of

	e	muon	pi_0	pi_-	P	N
Me(MeV)	0.511	105.6	135	139.6	938.3	939.6
M(part)	0.51 (3)	105 (10)	110 (30)	150 (30)	1000 (200)	1000 (200)
Z	-1	-1	0	-1	1	0

Figure 5.5: The masses of the examined particles, compared with their corresponding experimental ones.

the force-mass barrier. We have so far only the muon and the proton in the second level category, all other particles can be placed in the third level.

In the table (5.5) is presented the mass and charge, for the examined particles, corresponding to the position, of the constituents, where the sum of the forces between the constituents goes to zero, giving the most stable particle.
The rather big errors are due to the mesh, being to sparse in the azimuthal sense.

Chapter 6

The nuclear force

The strong force comes from the compression of the daon, within closed equi-charge surfaces, of electrons and positrons under strong interaction. The compression starts to become important at very small distances, around some fermi, and reach its maximum at around 1 fermi. Let us first take a look at the stability of the particles.

6.1 Stability

No why are some particles more stable than others?

- The first level particles are all daon configurations creating their own stability. This means that normally they are completely stable, even if they can be absorbed or created by reactions with other particles.

- The second level particles are much more complex, they consist of electrons and positrons. The constituents of these particles are inside the barrier of the force-mass peak (at around 1 fm distances), giving them a high stability as explained below. They are, so far, only two, the muon and the proton.

  Let us imagine two constituents that, for some reason, get an action separating them from each other, this would lead to an increase of their masses, but, from where do they take there needed extra mass? There is only one possibility, they must try to extract extra daons from the surrounding, but since they both need extra daons they will pull on each others daons, this must lead to a force attracting them. The opposite will happen if they come closer to each other. This phenomena means a force, a mass variation effect, which maintain the equilibrium within these particles, giving a strong increase of their stability.

The μ^- has a simple effective symmetry, the two external electrons are repelling each other so that they can not come close together, if the central positron approach one of the electrons, the other one will follow, attracted by the positron. This make the internal forces relatively low, this plus the linearity of the geometry do not assure the stability but give a relatively long lifetime to this particle. It should also be noted that the μ^- **can not** simply separate its constituents, due to the force-mass barrier.

The proton is the most symmetric structure of all and therefore the most stable one. The proton is the most important particle for all construction of matter, it therefore deserves a special attention. We will examine the point of equilibrium:

At the point of stability for the proton, the distance between the positrons is 0.306 fm and the force of repulsion between two of them is here rather constant, around 20 N. The external electrons, which are at a distance of 0.436 fm from the central electron and 0.617 fm from their closest external electron, has a repulsion, between them, of around 15 N. Both this values are on the negative slope of the force as you can see in figure (2.3), which means that the closer they are the stronger is the repulsion.

The distance between the central electron and the positrons is 0.27 fm, the absolute value of the attractive force between them is around 20 N. The distance between a positron and its closest external electron is also 0.27 fm. This distance is on the middle of a positive slope of the force-mass graph, for electron-positron interaction, as can be seen in figure (2.5). The slope is extremely strong, bigger then $10^7 \frac{N}{fm}$, which means that if a positron moves towards a smaller radius, a very strong reduction of the attraction towards the central electron will result, as also an even stronger increase of the attraction towards the external electrons. The central electron can therefore not approach a positron because this would immediately be pulled away by the external electrons. In the case of an external electron moving to smaller radius, we have also a strong reduction of the attraction towards the internal positrons, but, also an increase of the repulsion from the central electron (see Fig. (2.3)), pushing it back. This can very well explain the absolute stability of the proton.

- We have already seen the neutron, π^0 and π^{-+} as representatives for the third level particles. The π^0 has a nice symmetry but there is no regulatory force to maintain it, i.e. when, an electron close in on a positron, the other electron will be more attracted towards the positron left over, i.e., it will close in on the other positron. This particle is also relatively loosely bound since it has rather big distances between the constituents so that its point of force equilibrium is on the "outside" of the mass peak at 1 fm, it is therefore relatively unstable. The decay mode which simply separates the constituents, is possible only outside the peak of the force-mass barrier.

  The π^- (π^+) has a more complex 3 dimensional symmetry, here the electrons are maintained in a triangular position, due to their repulsion from each other, while the positrons are repelled from each other through the center of the triangle. Now, if a positron close in on an electron, also this particle has no regulatory force to maintain it, i.e. the other positron will be repelled into the opposite direction i.e. it will close in on the other electrons. This particle has a more "developed" geometry but is still quite unstable, also its constituents are on the "wrong side" of the force-mass barrier.

  Similar arguments are valid for most of the other particles, the exception is the neutron which is very stable, this is due to the strong attraction between the electron and the proton and that the electron can not annihilate with a positron (which is inside the proton and therefore not accessible). The electron itself is a first level particle and therefore stable.

6.2 The strong force

We have seen that all particles have a very strong growth of their mass and force at a distance between their constituents of around 1 fm, imagine now another particle closing in at this distance, such a particle must deform so that its daons adapt their sizes to the surrounding daon size gradient. It

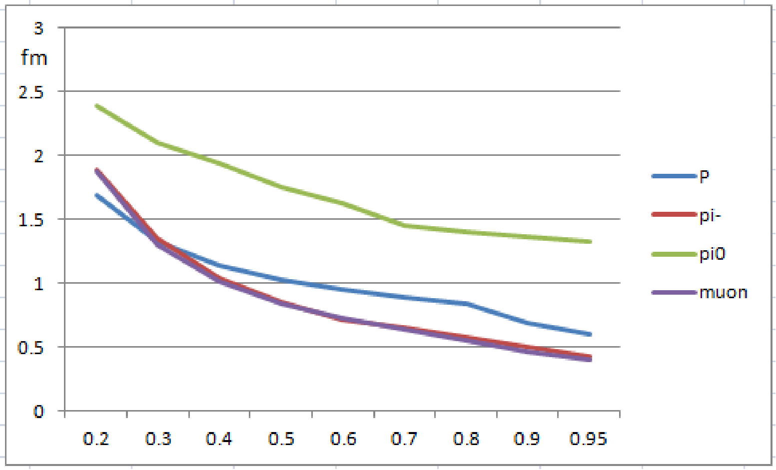

Figure 6.1: The variation of the minimum, maximum and medium values of the Order, on an equi-charge surface, relative to the radius of the proton

will reduce its size and it will need more mass (energy). It will therefore be attracted to the daons of the other particle, obtaining an acceleration.

This corresponds then to a "field" acting on any particle, independent of its charge. Such a field must depend on the surface density of the source particle's constituents, meaning that the force must be limited to a certain constant distance from the particles surface, (as can be seen in the force-mass peak at 1 fm, Fig.(6.1)). Particles consisting of only few constituents (electrons/positrons, muons, pions and lighter mesons) have a distance of action that depends on the constituents' relative position. Such a field does not exist for the photon and the neutrino, since these are stable independent on their mass (energy).

In figure (6.1) is shown how the order grows rapidly just below 1 fm, indicating a direct correlation between the order and the attraction between particles. This is the "nuclear force field", seen from the viewpoint of the daon theory. This field could be named energy-mass force field, since it is the need for more or less energy-mass, that provoke this action.

The stability of a nuclei can be understood, looking in a more detailed way on the interaction between protons; when two protons are close enough together, they will start to feel the interaction between the individual constituents, this will produce a certain geometrical interface where the attraction will be maximal and the repulsion minimal. An equilibrium must here exist between the electromagnetic repulsion, between the respective external electrons, as well as, between the dominant positive field from the internal positrons and the attractive energy-mass field (strong force). To this will be added the electrons medium field, the electrons should have their trajectories concentrated at the strongest points of attraction, which should be around the points of the proton interfaces, since there they are attracted by several protons at the same time.

6.3 The weak force

Photons and neutrinos are not influenced by the strong force (i.e. the mass exchange mechanism) but are influenced by the modified size of the free daons surrounding any particle. This means that they are bending their respective trajectory towards the source particle, this is the weak force! Electrons and positrons are strongly influenced by the weak force be cause of their low mass, all particles are influenced by the weak force.

The heavier bosons (W, Z and Higg's) have, in the daon theory, no specific role to play. Their specific characteristics indicates in any case some specific symmetries for these particles.

Quarks and gluons do not exist (within the daon theory)!

6.4 Time dilatation

we obtain

$$t = m_e \gamma \tag{6.1}$$

Chapter 7

Conclusion

We show, starting from general considerations, that a new theory of physics can be developed. The fundamental characteristics of the Daon show that particles should be some more or less complicated ensemble of daons, since the mass, according to the daon theory, is a daon ensemble kept together by their order.

We start by analysing the photon and the neutrino, which are the most simple daon structures, and thereafter gradually increase the complications. We show that the fundamental particles (electron, positron, photon and neutrino) can be built up by Daons, while more complex particles could be simple ensembles of electrons and positrons. The electrons and positrons obtain a strong deformation, when the distance of interaction becomes very short (some Fermi), increasing their mass and force.

A code called PART was developed, using individual meshes for each electron -positron, simulating any particle. The lightest particles of the various types of particles were presented in great details, showing the internal structure of the particles in general. The strong force and the weak force were explained, as well as, the stability of the proton and other particles.

We give an explanation to the mystery of mater and anti-mater. The unit charge of all particles is also explained since the charge of any particle is just the number of positron minus the number of electrons (charge = number of effective radial force equilibriums).

This simple and effective theory gives a detailed description of all particles, as far as can be understood by the author.

Acknowledgement

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