A sketch for a shared model for photons and quarks

And an extension of the electo-magnetic force to include the strong force and gravity

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August 31, 2016

[1]Many thanks to Elizabeth and Sam for their endless efforts and support

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Abstract

By extending magnetism and defining rules for massless charged particles in a circular movement above the speed of light c, it is possible to replace a photon with two opposing charged particles, that rotate around a central point, which moves with c. This does not violate the Einstein limit on the transfer of information speed, because it is a circular movement.

By using the same extension to magnetism it is possible to replace a quark with two opposing charged particles, of which one is stationary and the other one is circling with a speed above c. The hyper-c magnetism is only visible to particles that circulate around the same axis and in the same direction. So the force field has a narrow angular restriction. By positioning the quarks along the same axis, it is possible to build stable structures as protons and neutrons, and to connect them seamless together along the same axis.

Using these structures and this hyper-c magnetic field it is possible to connect and explain a number of different phenomena like: gravity, repulsion of an electron close to a nucleus, bending of electrons in a double slit experiment, without using interference, the same for neutrons, protons and photons, bending of photons due to gravity and a stable structure for nuclea.

And it is possible to make one prediction: gravity is directional and this might help explain a part of the missing dark matter and dark energy.

Chapter 1

Introduction

1.1 Coupling between light and matter

Before we go any further, we need to take a new look at the interaction between light and matter. How does mass influence light? When does it couple?

First example: if light travels from one star to another one, where does it move fastest? In the middle, when it is most far away from all masses, it will travel with the highest speed.

Second example: a satellite circles the sun and is opposite the earth, so the radio waves have to pass along the sun, the radio waves, which are also photons, take longer to reach the earth. So again the mass influences the speed of the photons, it takes longer to travel the same distance. In both cases the photons couple to the masses of the protons and neutrons in the sun or star and move slower. The official name is: Shapiro time delay.

Shapiro (1964):

> "Because, according to the general theory, the speed of a light wave depends on the strength of the gravitational potential along its path, these time delays should thereby be increased by almost $2 \cdot 10^{-4} s$, when the radar pulses pass near the sun. Such a change, equivalent to 60 km in distance, could now be measured over the required path length to within about 5 to 10% with presently obtainable equipment."

Third example: if light is send through a long optical fiber, which is laid out in a big loop (kilometers), somewhere on the earth, the rotation of the earth can be measured. The light, which travels along with the rotation of the earth, is a little bit shifted in color. While the light, which travels in the counter direction, is shifted in the opposite way. So what happens is , first the photons couple to the the mass of the earth and so are slowed down, but that influences light moving in both directions equally. So how can the light know, it is rotating with respect to the rest of the universe. The photos couple to the rest of all matter around, not only the earth, which is closest by, but also to all other matter.

A fourth example: light diverging, when it passes through a single slit. The photons pass through the slit and couple to the protons and neutrons in the material besides the slit. The coupling exerts a force and bends the photon. Can this be the same coupling mechanism as the light, which is bended when passing along a heavy celestial object?

In this approach we change perspective instead of the Einsteinian space time fabric, we keep time and space constant on a grid and assume a coupling between photons and matter like protons and neutrons. At the same time this coupling influences the speed of the photons and it can bend their path. An essential part is, that the photons move slower without losing energy, just like photons moving through glass. In glass light moves slower, but if it gets out of the glass, we do not assume that it gains an energy boost.

Chapter 2

Photons Short

A short introduction of the model for photons without details or applications, so that we can continue on to apply the same model to quarks and build nuclea. Which is much more essential. Later on we continue with the photon and how it interacts in more detail.

A long time ago I was trying to to make a model of a photon, that somehow would be more easy to imagine and visualize, and which would allow for the possibility to interact with other particles in a more defined manner. This had to be reached by being more explicit about the photon.

Much advance in physics has been made by assuming and discovering a smaller level and every time one goes from one level to a smaller one, more things can be explained in better details. The atoms which make up the molecules. The electrons and protons, which give rise to a charged particle, if there is a surplus of one kind. In general one can state that even a neutral particle can have charges as long as they are equal.

A photon must generate a field according to Maxwell, which has two components, an electrical and a magnetic field, which are both perpendicular to each other and are perpendicular to the direction in which the photon moves. Both the electrical and the magnetic field oscillate in a sinusoidal manner.

So my thinking was: can a photon be replaced by two massless point charges, which have opposite charge and rotate around the central imaginary point in the middle? The central point in the middle goes forward with the speed of light c, and the massless point charges rotate around this moving central point with a frequency that corresponds with their wavelength c.q. energy. So it is an electrical dipole rotating around the central point, which moves with c. The question is what will a stationary, non rotating, observer see from these rotating dipoles. As the speed of the whole photon is c, one of the massless point charges [1] will be moving with a speed above c and the other one with a speed under c. Here we need to expand electromagnetism to include massless charges moving above the speed of light c. And this only in the exclusive case of rotation.

A global inspection of the Maxwell equations (with one half closed eye) makes one guess, that the speed of light is the limit, the absolute horizon for interaction between two particles.

And we have to notice that as our small point charges are subparticles of massless photons, our point charges are even more massless.

First we take a look at the electric field. Let us assume that the part of the electric field, which is moving with a speed above c, has to be ignored. In the case of the rotating dipole one charged particle will be moving above c and thus be invisible and the other one will be moving under c and be visible. The border between visible and invisible part of the electric field lays exactly in the middle at the central point which moves with c. We now need to further define the movement of the massless dipole. If you follow the movement of a bicycle wheel over a road and you concentrate on one point fixed to the rim, for example the valve, you will notice that the valve moves with twice the speed of the bike when it is at the top of the wheel and that its speed is zero when it touches the ground (otherwise the wheel would slip). This bike wheel movement is beneficial to our model of the photon, which we want to build, because it lets one of the massless charges, stop its motion with regard to the non moving world. This short stop in motion allows for time to interact with particles that do not move. And this short stop in motion coincides with maximum field strength.

One can ask: why do those two particles stay together? Why do they stay connected? (Of course, we know: the static electric Coulomb force.) But it is better to move into the perspective of the photon and position oneself on top of one of the massless charged particles. If you look to the center, you see at the other side another particle, which is stationary, while the rest of the world is moving with variable speeds some parts move above c and hence are invisible. So the solid rock in your existence is that massless particle at the other side. While between the center and your self is an area and stage, where some times appear other charged particles, they move to the center line, slow down, stop for an unendless short time, accelerate and move of the stage. That is the big picture.

[1] to be called ornac hereafter

So we have a photon, which consists of two charged massless particles, who both rotate around a moving center. And there is a certain area, let's call it the **sub-c stage**, where interaction with slower moving particles is possible.

2.1 Cycloid movement

We have to dive deeper into the cycloid movement and see what happens where for our use case.

For brevity and easier reference let's give a name to our *"massless charged particle, much less than half a photon"*: **ornac**.

And as they are always together in a pair of opposing charges, we also have an **ornac-pair**. Which can be shortened to **o-pair** with the **o** indicating the rotating movement.

2.1.1 Single sub-particle cycloid

The figure 2.1 on the following page shows the idea of cycloid movement for one ornac, a massless charged particle, of a photon. The colors indicate the progress of time. At the top of the arch the color is red and this is the position with the highest speed. The speed is 100% forward, because the velocity vectors of the rotational movement and the the forward movement point in the same direction. So that makes a forward speed of $2c$.

At the bottom, where the color is turquoise blue, the speed is zero for a very short moment. It is the moment the valve of your bike wheel touches the ground. The velocity vectors point in opposing dirctions and cancel.

Figure 2.2 on page 7 shows the same, but now with a wheel. And with smaller dots to indicate the position and maybe one can see the speed a little bit better.

Figure 2.3 on page 7 shows the same picture, but now with a continiously red charge. The green area indicates the region with a speed below c, where the outside world becomes visible to the photon, the sub-c stage. And where the photon becomes visible for the non-rotating world.

2.1.2 Duo ornac sub-particle cycloid

A photon should consist of two opposing charges. Here both are sketched in their cycloid movement in figure 2.4 on page 7: blue for a positive charge and red for the negative one.

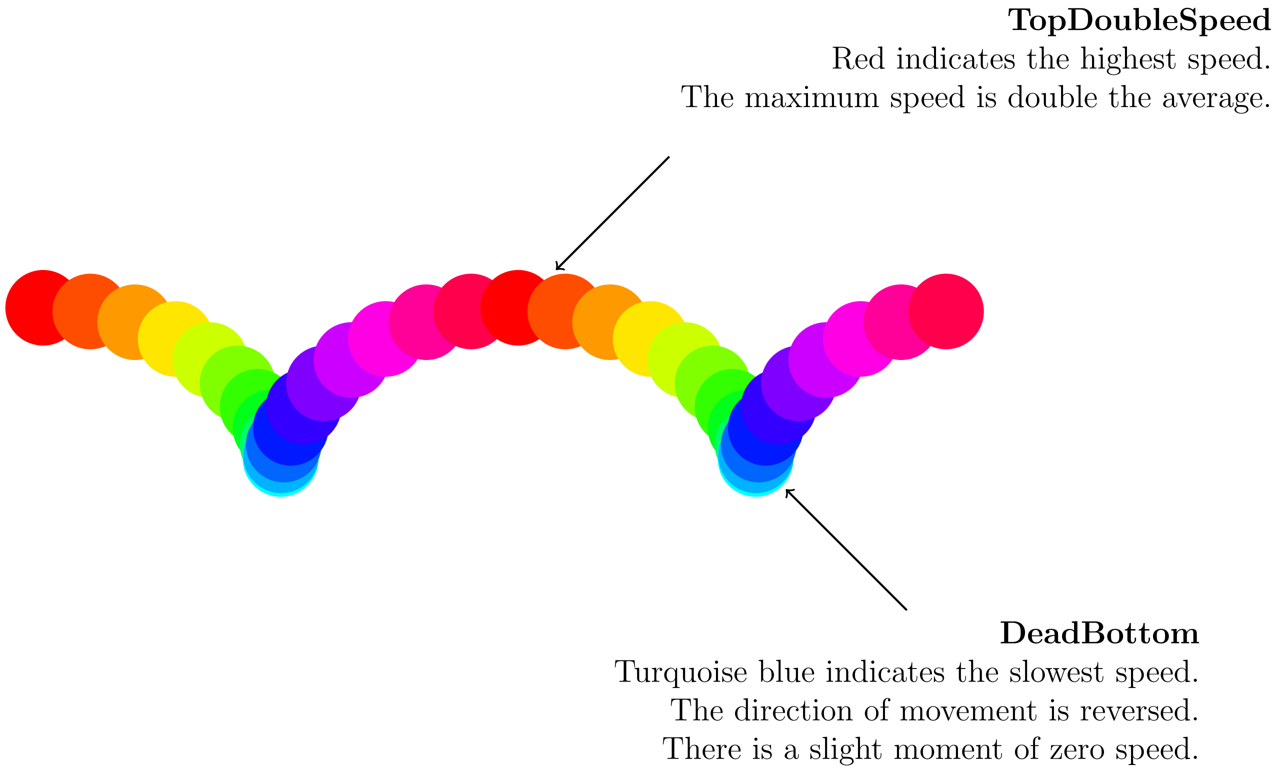


Figure 2.1: A single photon sub-particle, ornac, going through cycloid cycle in colors

Thier paths seen over two wavelengths looks quite symmetrical almost like an architectural design with arches dating back to gothic times. It is a bit difficult to visualize, where they will be in reference to each other. But if one is on top, the other is at the bottom. If one is in the middle, the other is also in the middle, but one quater wavelength behind.

The second figure 2.5 on page 8 adds the green area, where the electric field becomes temporarily visible due to the fact, that the speed is now clearly under c. By turn the red and blue charge become visible alternatingly causing an electic field, which modulates like a sinusoid.

An indication of the speeds can one get by looking at the distances between the dots. They are spaced at equal time lapse.

2.1.3 Photon details of positions

Here the photon is sketched frozen in one position to illustrate details of the velocity vectors and how they add up.

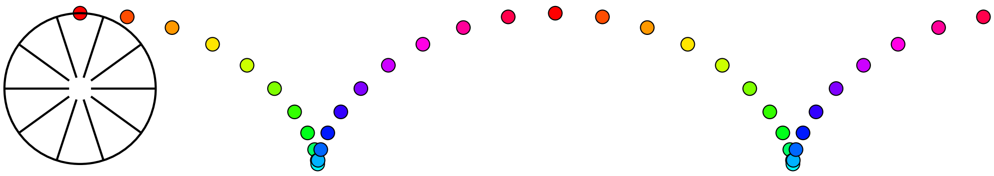


Figure 2.2: Cycloid cycle in colors single ornac of a photon with wheel

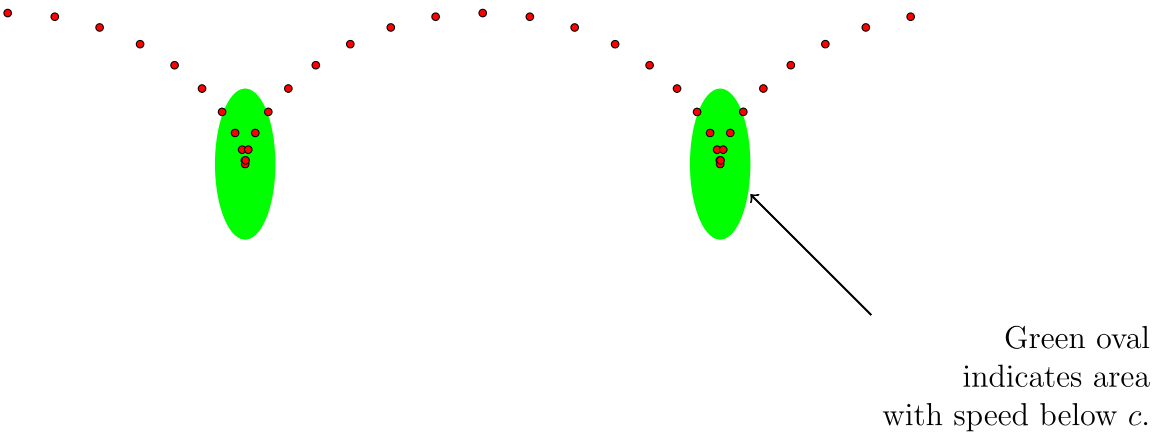


Figure 2.3: Single ornac of a photon going through two cycloid cycle in red with green oval to indicate the under c area

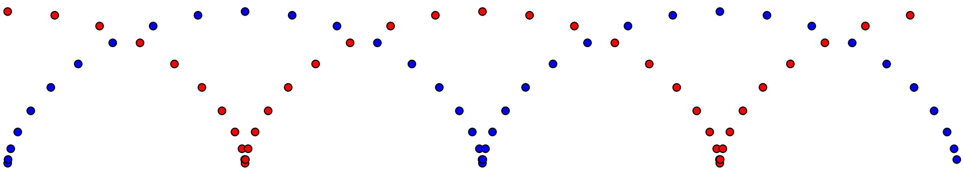


Figure 2.4: Two ornac of a photon going through two cycloid cycle in red and blue

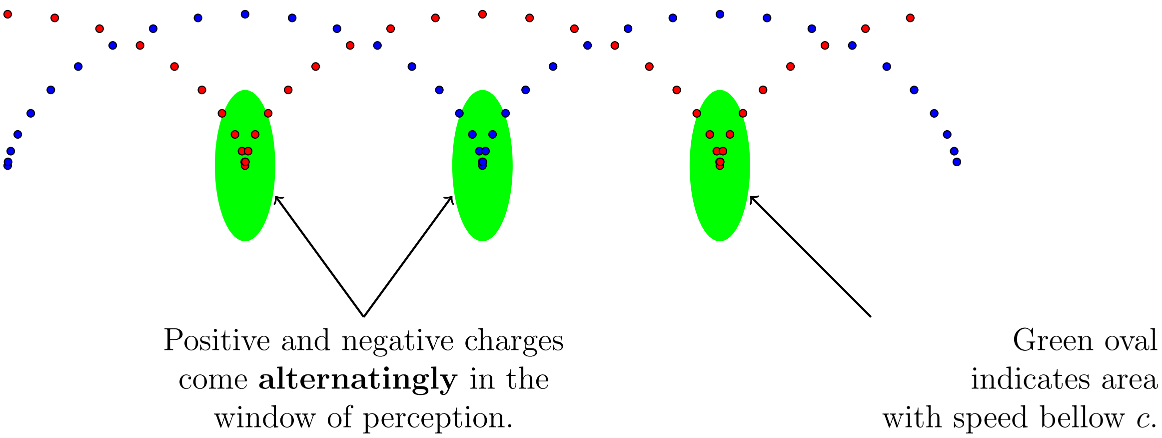


Figure 2.5: Two ornac of a photon going through two cycloid cycle in red and blue with green oval to indicate the under c area

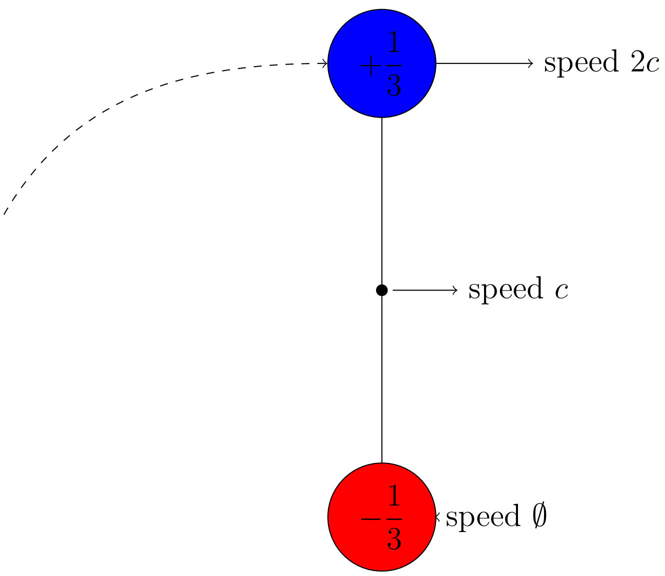


Figure 2.6: Photon vertical with speed vectors

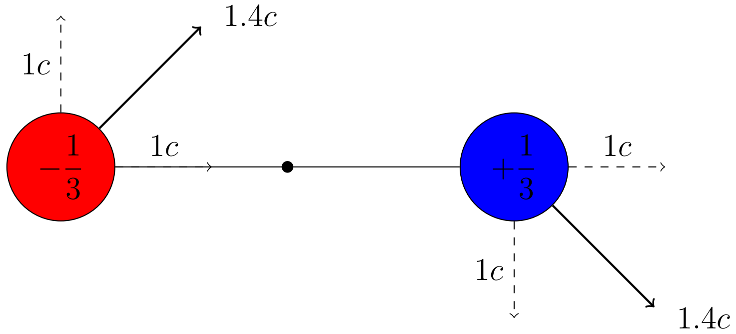


Figure 2.7: Photon horizontal with speed vectors

The first position is the vertical one as figure 2.6 on the previous page shows. This one is the most important as here one of the charges, ornacs, has a zero speed and has a visible electric field. While at the same time the other charge, ornac, at the top has a high speed, which creates the magnetic field.

In the horizontal position both ornacs move with a speed above c and are hence invisible. Figure 2.7 shows their vectors.

In the diagonal attidude the lower ornac is just under the speed of c and just visible. So the visibility starts at about an eights wavelength before DeadBottom and continues for about a quater of a wavelength. Figure 2.8 on the next page shows the addition of their vectors.

To be exacty the speed drops below c at 60 degrees before DeadBottom.

The magnetic field generated in the vertical position is shown in figure 2.9 on the following page. The ornacs are the blue and red circles on top and the bottom. The blue one on top has double the speed of light c and generates the magnetic fields. The red one is at DeadBottom and does not move.

For illustrative purpose the circle parts are drawn. They show how a part of the magnetic field can be generated.

According to Ampere: the magnetic dipole moment m caused by a current loop is:

$$m = I \cdot A$$

Where I is the current and A is the area.

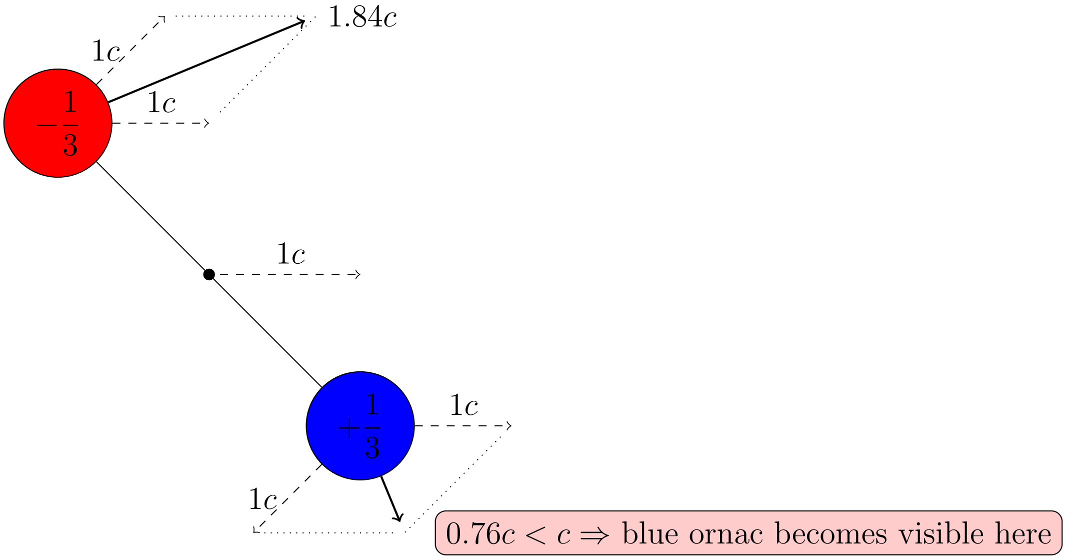


Figure 2.8: Photon diagonal with speed vectors

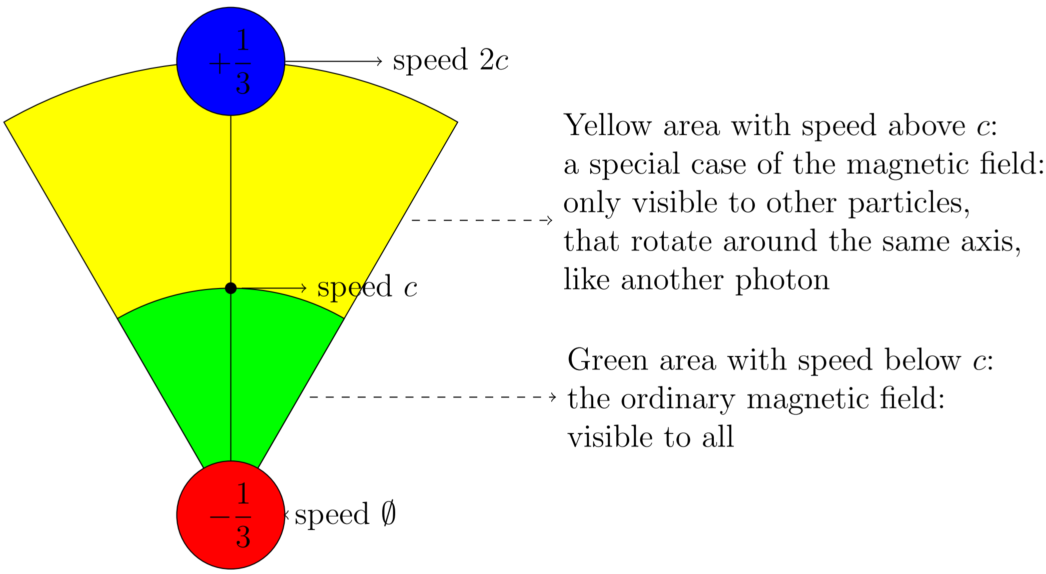


Figure 2.9: Photon vertical with green and yellow area for sub and hyper c indication speed

Let's apply this most simple equation to our rotating ornac-pair and find what the appropriate area is. The ordinairy magnetic field is generated by that part of the area in which the rotary speed is under c. Here that is the green circle pie.

The larger part of the area is the yellow circle pie. This is part of the hyper-c magnetic field and only visible to particles, which rotate around the same axis. In this case that could be for example other photons, with the same wavelength and phase.

The size of the circle pies is arbitrary, but the ratio of the yellow to green pie shows, that the coupling to equal photons is, here, four times as large as expected from the ordinary magnetic field only.

2.2 Different photon models

2.2.1 Maxwell photon

The Maxwell model is based on the electro magnetic waves, which propagate with the speed of c. It condenses all the current knowledge of that age about electicity and magnetism in one laws. It does not include particles, but certainly is the starting point. And all later photon models should converge to that in the case of a large number of synchronized photons.

2.2.2 Einstein photon

The Einstein photon is the beginning of the quantized phyiscs. It is the explanation of the light induced emmission of electrons. The photon has a defined energy (can it kick an electon out of this material?), which is coupled to the wavelength and the momentum. It is the first evidence that the electro magnetic waves consists of well defined packages. We can not include the work of Max Planck on blackbody radiation as evidence, because there it were assumed to be hypothetical packages only usefull as a mathematical thrick.

2.2.3 Dirac photon

Dirac in his PhD thesis builds on the matrix mechanics of on

2.2.4 Feinman photon

Chapter 3

Quarks and mass

The next question is whether the same system can be used for building matter? Ordinary matter consisting of quarks, which themselves are then made up of charged sub-particles rotating partially above the speed of light? The same way we have build up photons out of charged sub-particles, which rotate partially above c. It is certainly possible.

Quarks are light particles, which for example give charge to protons and neutrons and are strongly bound by a force, conveniently called the strong force. The quarks themselves are light only representing about 1% of the mass of nucleons. The mass of protons and neutrons results from the strong bond between them, which stores 99% of the energy and mass of the nuclea.

Let's assume that the quark can be build up of one non moving charge, that is fixed in the middle and one opposed charge, which is circling the stationary one. If the circling charge is moving with a speed above c, that charge and the part of the magnetic field above c, will be invisible to the rest of the world, which is not rotating around the same axis.

We have to inspect in more detail, the way in which the hyper-c magnetic field works for rotating charges. First let's take a look at a simple situation: we want to know what happens to a test charge or observer, which is not on the axis of rotation of the charged particle pair. Figure shows the idea. Because the observer is off axis, it only sees the non rotating charge in the middle and only that part of the magnetic field, which is under the speed of light c. The second case: we have two charged particle pairs and these pairs both rotate around the same axis, in the same direction and with the same angular speed. Of each pair the rotating charge generates a magnetic field, because they both are perfectly aligned and have the same angular speed, their magnetic fields couple full, as well the part under c as the part above c. If we add an observer, who is located off axis, he will see: both non rotating charges and their magnetic fields under c , but he will be amazed by the large force between them, because the hyper-c magnetic field is beyond his horizon of perception. The third case: the same particle pairs as before, on the same axis, but now one rotating in the other direction. As the rotation is opposing they only see each others normal magnetic field and not the hyper-c field. So while being on the same axis is satisfied, it is also crucial to rotate in the same direction. The fourth case: two particle pairs rotating around the same axis, in the same angular direction, but with a different angular speed. They both see each others normal magnetic field. The hyper-c magnetic field is more complicated. It is clear that they see each others hyper-c field partially, but not completely as their angular speeds do not match perfectly. Let us assume that coupling between the particle pairs is mutually equal. So if one of the pairs sees 70% of the others field, it is visa versa. As we have now clarified the basics of the coupling and limitations of the hyper-c magnetic field, we can use this to build more or less stable matter. The massless charged rotating particle pairs can be connected together with a force, which is much stronger than the magnetic force alone, as long as we make sure that the particle pairs rotate along the same axis and in the same direction. For brevity we introduce the name "ornac pair" to designate the massless charged rotating particle pair, in which one of the charges rotates with a speed above c and hence allows for coupling to the hyper-c magnetic field. Looking to the quark model for matter shows that it makes most sense to assume a charge of $+-\frac{1}{3}$ electron for the charged massless particle and to use some times two of them.

3.0.5 Build protons and neutrons

First try: let's build proton. Figure shows the idea: two ornac pairs with a stationary charge of +2/3 at the top and bottom and one ornac pair with a stationary charge of -1/3 in the middle. All ornac pairs rotate around the same axis and in the same direction. An observer, who is off axis, only sees the non-rotating parts of the ornac pairs as the total charge of one and the magnetic field of the rotating ornac parts as far as it is under c, which gives rise to the magnetic dipole moment of the proton. At this stage calculations still make no sense, so considerations is the only way to go. Now let's ignore the stationary charges and move to the perspective of the top and bottom ornac pairs: they are both on the same axis and rotate with the same speed and in the same direction, so they both see each others full hyper-c magnetic fields. As they also have the same charge, this force is pulling them together. As the hyper-c field is a magnetic field, it has a force field, which keeps their axi aligned. Just like the ordinary permanent magnets, with which you can play. So we now have the strange situation, that two positively charged quarks or ornac pairs with a stationary positive charge attract each other. Now let's look at the ornac pair in the middle: it has a negative stationary charge and a positive rotating charge, its axis is aligned and it is rotating in the same direction with a different angular speed. The ornac pair in the middle has an opposed charge configuration to the ones on top and bottom, so its magnetic and hyper-c magnetic field is in the opposing direction, it is pushing the top and bottom ornac pairs away, up and down. As the angular speed of the middle ornac pair is different from that of the top and bottom one, their hyper-c fields only couple partially. So the repulsive force of the middle ornac pair towards the top and bottom one is not the same as when their angular speeds would be equal. If the middle ornac pair would have been taken away, the top and bottom ornac pair would crash unbraked together.

Second try: let's build a neutron. A neutron can be built up in the same way. Figure shows the idea. Again all ornac pairs are aligned along the same axis and rotate in the same direction. The top and bottom ornac pairs attract each other through the hyper-c field, which surpasses the coulomb repulsion of their stationary charges. The magnetic character of the hyper-c field connects and stabalizes their axi. In the middle is an ornac pair with a stationary charge of +2/3, so the off-axis observer sees a total charge of zero.

3.0.6 Build longer quark-ornac sticks

Third try: connect a proton to a neutron to build Deuterium. It is easy to connect a proton and a neutron, if their axi of rotation and their direction of rotation are aligned. Figure shows the idea. The three ornac pairs with a stationary charge of +2/3 connect together and form an angular stabile stick, which is stiff and will not easily bend. The ornac pairs are connected through the hyper-c field and will keep a straight angle to the axis of rotation. The other three ornac pairs with a stationary charge of -1/3 have a different angular speed and form a different, equally well connected stick. The positively charged stick and the negative stick attract each other following the coulomb force, each one fitting tight between each other. Both ornac sticks can make a small angle with each other. The border between the proton and neutron blurs.

Fourth try: make an ornac stick of three nuclides and build tritium and helium-3. The same way can be used to connect a third nucleide to the deuterium as shown in figure. Helium-3 and tritium are quite similar and have about the same nuclear magnetic moment. This gives the first hint that sub-c field of the ornac pairs has to be equal for the 2/3 e charged pair and for the 1/3 e one. Helium 3 is a good absorber and detector for neutrons. From the figure it is visible, that a neutron would easily dock at the top or bottom of the helium-3 stick, if the ornac axis of the neutron is aligned to the ornac axis of the helium-3. Another point is that helium-3 does not become helium-4, when it absorbs a neutron. Instead it decays into tritium and a proton. So if a neutron docks to the top of a helium-3 stick, at the bottom the lowwest three ornac pairs detatch as a proton. This is the first pointer that helium-4 should be built in a different way.

3.0.7 Connect two quark-ornac sticks

Fifth try: let's build helium-4. Helium-4 can be built by connecting a deuterium to another deuterium stick. While it might be tempting to align their ornac axi and extend the chain as we have done before, here we have to try a different road and connect them as a cross as shown in figure. If we hold both of them apart and then move the sticks together, we have to overcome the coulomb force as both the particles have a charge of +1. In the end as both sticks are close together, so that their distance is less than the distance between two ornac pairs, the middle stationary charge of +2/3 e of one stick, will be close to a -1/3 e stationary charge of the other stick and this will pull the two sticks together and form the cross. At the same time the coulomb force, that was first pushing the sticks away, will now be centered in the middle of the cross and no longer push the sticks away from each other, but elongate them. The hyper-c force along their ornac axi stays the same, but the charge that is pushing out has almost doubled. Nuclear fusion happens at high temperatures and pressure, besides having a speed the particles are also rotating, so the chances of hitting each other in the middle are small. For lower temperatures the reaction between tritium and deuterium is faster, because tritium has double the number of docking places and those are at a third of the sticks length.

Sixth try: build lithium-6. If lithium-6 is bombarded with neutrons of sufficient energy it falls apart into tritium and helium-3, so it is built up off two sticks perfectly connected in the middle. Lithium-7 on the other hand is built up out of one tritium and two deuterium sticks. The difference in neutron absorption rate could be explained by the fact, that tritium can not accept a neutron as it already has a neutron on both ends of its stick and and that the deuterium sticks have an open position at one end and are partially shielded by the tritium stick.

3.1 Matching the spin numbers and the nuclear magnetic moments

At this moment we have a few examples of nuclear structures and we can try to work out, how the nuclear structure connects to the spin numbers and how the different levels of the nuclear magnetic momentum can be build up. As helium-4 has a zero magnetic field and we suppose that it is built up of two ornac sticks with each three +2/3 ornac pairs and three -1/3 ornac pairs, we have to conclude that the sub-c magnetic field of both kinds of ornac pairs have to be equal to cancel out. The formula for the magnetic moment of a current loop is: $m = I.A$ In which I is the electric current, A is the area and m is the magnetic moment. This can be written as: $m = 1/2q.r.v$ for a charge q, circling with radius r and speed v.

In our case we have two charges and we are interested in the sub-c magnetic field, so the speeds are equal to c. The magnetic moments of the +2/3 ornac pair and the -1/3 ornac pair are equal if the radius of the sub-c magnetic field of the -1/3 ornac pair is double that of the +2/3 ornac pair. m2/3 = m-1/3 r2/3 = r-1/3 r-1/3 = 2 r2/3

So we know that the angular velocity of the 2/3 ornac pair is double that of the -1/3 pair and that the sub-c surface of -1/3 ornac pair is four times that of the 2/3 pair. If we first take the one dimensional particles together with an odd number of ornac pairs, like proton, neutron, tritium and helium-3, they all have spin 1/2 and a nuclear magnetic moment of comparable size. If you look at the stick like structure and the rotation in the same direction along the same axis, it makes one think of the simple clean magnetic field of a solenoid. But here the situation is different, because opposing charges are rotating in the same direction. It is more like a couple of permanent bar magnets, with each one hold so that the north poles are directed against each other, with a lot of field lines pushing out between the ornac pairs. How can spin 1 look like? Spin 1 has three possibilities: zero magnetic moment, a magnetic moment aligned with the field or one aligned agianst the field. Lithium-6 is the simplest example. It consists of two sticks, with a magnetic moment : a tritium stick and a helium-3 stick connected in the middle. Without an external magnetic field it forms a cross to evenly divide the charge over the available space. Let's assume that when the external magnetic fiel is switched on, one of the axis of the cross is aligned with the field as shown in the figure. The tritium stick is aligned along the magnetic field lines and the helium-3 stick is perpendicular to the tritium and to the magnetic field, so the external field will exert a torc force, which aligns the helium-3 with the external field and the tritium. So we get a magnetic moment aligned with the external field. Figure b sketches the situation, when the tritium stick is aligned against the field, the torc again aligns the helium-3 with field and the magnetic moments of the tritium and helium-3 cancel and we get a total magnetic moment of zero.

Some nuclei have spin 3/2, which means they can have a big magnetic moment, a smaller magnetic moment, aligned or anti-aligned, but never zero. Lithium-9 is an unstable isotope, which consists of three tritium sticks. Without an external magnetic field it is supposed to form a 3d cross. Suppose that one of the tritium sticks is already aligned to the external magnetic field. The other two tritium sticks will be perpendicular to the magnetic field and experience a torque force, which will tend to align them as shown in the figure and in that way create a magnet consisting of three aligned tritium sticks. In the other situation one of the tritium sticks is aligned against the magnetic field and will not experience a torque force. The other two tritium sticks will align with the field. So two tritium sticks cancel each others field and only one tritium stick is left over to contribute to the magnetic moment of the nucleus. It should be noted that due to the fact that all the tritium sticks are positively charged, they will push each other away and hence are not all perfectly aligned.

In these simple nuclei it is easy for the sticks to move to other positions unhindered by other sticks which might interfere. It is not always that effortless. For example the decay of widely used in Mosebauer spectroscopy Deuterium is a bit different story, actually it is the cliff hanger and for a long time has been a show stopper. Deuterium consists of a single stick both ends have have opposing charges rotating in the same direction. So the top has a north pole pointing upward and the bottom has also a north pole pointing downward. In between there are five alternating leaking magnetic fields, which will result in a south pole in the middle. So deuterium can have two orientations to the external filed, which result in a zero torque force and zero magnetic moment and representing spin 0, as shown in the figure. In the first case both the north poles are aligned to the field lines and in the second one the south pole. If deuterium is diagonal aligned there will be a magnetic moment.

As we now have a more clear picture of the magnetic field. It is time to go back to Helium-4. It consists of two deuterium sticks and they both have poles at their ends, two north or two south poles. For helium-4 to exhibit a zero nuclear magnetic moment, it is better if it has two the deuterium sticks which rotate in the same direction so that they both have south poles or north poles. Four equal poles lead to an octopole, which has a low magnetic handle. Heavier nuclei: C-12 and up As a star has produced enough helium, helium burning will start.

As we now have the helium-4 disk build up of two deuterium sticks with the same magnetic poles and know how we have to interpret the hints from the quantum spin number, we can try to build Carbon-12 and further. C-12 is build up by fusing three helium disks. They can be aligned along the x, y and z-planes. The deviation of the angle between te two deuterium sticks of 90 degrees within the helium disk will provide some space in the sphere. The helium disks should all have the same magnetic poles. The total magnetic moment will be very evenly distributed along all the sticks and low to the outside world. So C-12 is build up of six ornac sticks protruding out in all the directions of a sphere. To bring the helium disks together one needs to overcome the Coulomb repulsion of the positive charges. While bringing the disks together the ornac sticks elongate and hence store the energy. When the helium disks are centered around the origin, there is no longer a force pushing them away from each other, there is only the positve charge that is pushing all equal charges outward, but now it is balanced around the origin. Some how the positve charged ornac pairs in the center will move closer to the negative ones.

C-13 can be made by adding one neutron to one of the six ornac sticks of C-12. So C-13 consists of five deuterium sticks and one tritum stick. It clearly has one magnet: the tritium stick and spin 1/2. If C-13 absorbs another neutron, it has two tritium sticks and four deuterium sticks. If the tritium sticks are perpendicular to each other, it has two magnets perpendicular and a spin 1. C-14 decays to N-14: at the end of one of the tritium sticks one of the -1/3 ornac pairs decays into a +2/3 ornac pair.

3.2 The wiggle angle

In the model for proton and neutron we have two equal ornac-pairs, who couple fully and attractive, so their ornac-axis are locked and can not easily be turned to another angle, just like two bar magnets that are clicked onto each other. However the ornac-pair in the middle is different: it has an opposing charge. This means that just like in a magnet it is pushing away the top and bottom ones and the axis is not coupled to another ornac-pair. The restraining force, that the middle ornac-pair will not move to the left or right in our picture, has to come from the Coulomb force of the non-rotating charges of the top and bottom ornac-pairs. The restraining force, that the middle ornac-paid will not tilt in our picture, has to come from the Coulomb force of the rotating charges of the top and bottom ornac-pairs. While those charges are not completely visible to the middle ornac-pair, due to the difference in angular speed, they still provide the stabilizing force to the middle ornac-pair. The middle ornac-pair hence can wiggle a bit with its axis. And it is this wiggling with its ornac-axis, which makes that its axis scans a wider volume around the narrower axis of the top and bottom ornac-pair and so the middle ornac-pair has a greater chance of coupling to an outside ornac-axis.

3.2.1 Limit of the wiggle angle

If the middle ornac-pair wiggles too much, the neutron or proton gets destabilized. The middle ornac-axis does not align enough with the axis of the top to bottom and so can not provide the pushing force to keep them apart. The top and bottom ornac-pairs start accelerating to each other and if the middle pair is not quickly realigned, will collide. So a decay mechanism for a neutron would be that the middle ornac-pair wiggles too much, is too late back, the top and bottom ornac-pairs collide and form a new combination of ornac-pairs.

3.2.2 The wiggling angle and chance of coupling to an outside particle

So if we draw a cross section of the sphere surrounding the proton, we have a narrow angle of the top and bottom ornac-pair and a wider angle of the more freely moving middle ornac-pair. If a neutron is in the proximity and rotates, the chances that both of their middle ornac-pairs axis cross and couple is greatest and so the chance on a repulsive coupling is greatest and the neutron will get a little push to start moving away.

While the chance that the middle ornac-pair of one of them will cross with the top to bottom axis of the other is smaller, it will happen and then the coupling is attractive and stronger and so the neuron and the proton will start moving together. The attractive coupling is also stronger, on one hand the ornac-pairs have the same angular speed and couple maximal, in this case four times as strong and and on the other hand this is a coupling between two ornac-pairs and one so the hyper-magnetic coupling is double.

The chance of a coupling is proportional to the solid angle. As the wiggling angle is larger than the hyper-c angle of the top bottom axis, this mechanism of coupling plays a large role. It only plays a role, when there is a certain distance.

3.2.3 What interactions does the wiggle angle influence

The wiggle angle influences a number of interactions : the approach of a neutron to a nucleus and it might trigger decays.

3.3 3-Helium to tritium cyclus

As described before a 3-Helium stick is eager to absorb a neutron at the top end. At the moment it accepts the neutron at the top, it does not form 4-Helium, which is stable, but it releases a proton at the bottom and becomes tritium. It is a bit like the pendulum with four balls, if you let one ball hit the three balls, only the last ball starts moving.

Tritium is unstable and decays into 3-Helium. How does that look like in the ornac-stick model? The $-\frac{1}{3}$ ornac-pair at the top of the tritium sick has to move to the bottom and change into a $+\frac{2}{3}$ ornac-pair. Then it will be exactly 3-Helium at the same location. While there are different ways for the top $-\frac{1}{3}$ ornac-pair to move to the bottom, for example a curved path outside the tritium stick, I have the feeling that a path through the central axis of the tritium stick is viable and necessary in other cases like neutron decay and the 14-N decay as presented below. The $-\frac{1}{3}$ ornac-pair at the top could walk down the tritium stick in a oscillatory movement. By tilting a little at the top, the axis of its hyper-c field would no longer match to that of the whole tritium stick and the repulsive hyper-c field from the second ornac-pair would vanish, the Coulomb force would pull it down inside the positive tritium.

The same cycle is repeated in other nuclea. If we take a look at 14-Nitrogen, we could suppose that it is build up of seven deuterium sticks, but that would make it too similar to 12-C, which is build up of six deuterium sticks and can not absorb a neutron. So 14-N is build up of four deuterium sticks and one tritium and one 3-Helium stick. The 3-Helium stick can absorb a neutron at the top end and releases a proton at the bottom, while forming tritium. So the 14-N becomes 14-C. 14-Carbon decays into 14-N with a half time of 5730 years closing the cycle. In the process of stellar nucleosynthesis 12-C is build up by the fusion of three 4-Helium nuclea. In analogy 14-C could be build up by the fusion of one 4-Helium and two 5-Helium nuclea, where the 5-He consists of one deuterium and one tritium stick.

3.4 Simple calculation of hyper-c in proton

With the ornac-pair model for a proton or neutron as described above, we can try to make a simple calculation of the hyper-c forces involved between the particles. As input we take the radius of the nucleus and its energy content or mass, then we calculate the forces between the ornac-pairs and the contained energy should match. As this is a first and crude approach, we neglect a number of things. We don't care about the energy contained within the quarks, we neglect the electric forces and we accept the uncertainty and model dependence of the radius. As stated before the force between two magnets or current loops falls off with $\frac{1}{r^2}$ with r being the distance between both magnets. This is very convenient as this means the magnetic field is comparable to the gravitational force and electric force at least when the magnets are on a single line and oriented to that line. It also is a conservative field. This formula only holds for distances where r is much larger than the size of the magnet or the current loop.

The proton is build up of two positive ornac-pairs and one negative one sandwiched in the middle, as in the figure. If we ignore the Coulomb force and only look at the hyper-c magnetic field, we see the middle one pushing the top one up away and the bottom one downward. On the other hand the top and bottom one are attracting each other. So the situation is a bit comparable to two springs being compressed by a thick elastic going from top to bottom. Energy is stored as well in the hyper-c field, which is compressed, like in the springs, as in the hyper-c field which holds them together, like the elongated elastic. Both contributions add to the total energy. And if we cut the elastic rope, all the energy stored in both the springs and the elastic rope will be released. As we assume a stable particle: all forces need to balance, a net force of zero on each sub-particle. The hyper-c forces act only in the direction of the ornac-axis. For reasons of symmetry the middle ornac-pair will experience an equal force pushing it down by the top ornac-pair and an equal force pushing it up by the down ornac-pair, so the net force on the middle ornac-pair is zero. Symmetry also makes the distance between the top and bottom equal.

From the ordinary magnetic field we know that the middle ornac-pair rotates with a lower speed, so its hyper-c field will also have a different angular speed and be only partial visible to the top and bottom ornac-pairs. Let's introduce a coupling factor, the hyper-c visibility factor, h_y , which makes it possible to do a calculation. The force, pushing the top ornac-pair up by the middle pair, has to equal the force, pulling it down to the bottom ornac-pair. As the distance to the the bottom is double the distance to the middle a factor 4 appears.

$$h_y \frac{{m_o}^2}{d^2} = \frac{{m_o}^2}{4d^2}$$

The hyper-c field between two $+\frac{2}{3}$ ornac-pairs needs to be equal to that between two $-\frac{1}{3}$ ornac-pairs, otherwise gravity and energy between neutrons and protons would never be equal. So their hyper-c magnetic moments must be close to equal and in this formula we have set these equal and squared m_o , the hyper-c magnetic ornac moment.

As the formula shows this is true for all d and for all m_o as long as the hyper-c visibility factor, h_y , is equal to $\frac{1}{4}$. This factor of four follows from the symmetry. During our inspection of sub-c magnetic field of the ornac-pairs we found that the $-\frac{1}{3}$ ornac-pairs have to rotate with halve the angular speed of the $+\frac{2}{3}$ ornac-pairs. So we can conclude that the coupling hyper-c visibility factor, h_y scales with the square of the angular speed.

The distance d is fixed by the size of the nucleide. So now we can look up the formula for the energy contained in the hyper-c magnetic field and make the distance and energy match, then we find the hyper-c magnetic ornac moment, m_o, for The energy of the nuclei is build up of three parts as demonstrated by the springs and elastic rope analogy: the attractive pull between bottom and top ornac-pair, $E_{TopBottom}$ and the two equal repulsive forces, $E_{TopMiddle}$.

$$E_{Total} = E_{TopBottom} + 2E_{TopMiddle}$$

Each energy component is characterized by a simple function of the distance between ornac-pairs, r and the magnitude of their hyper-c magnetic moment, m_o, and their coupling factor, h_y. Just like with gravity or electricity.

$$E(r) = h_y \frac{m_o^2}{r}$$

We can now build up the formula and plugin the numbers. First for the top bottom energy, the distance is $2d$ and the coupling factor is one.

$$E_{TopBottom} = \frac{m_o^2}{2d}$$

Secondly for the top middle energy, the distance is d and the coupling factor is $\frac{1}{4}$.

$$E_{TopMiddle} = \frac{1}{4}\frac{m_o^2}{d}$$

Put it all together in the formula above:

$$E_{Total} = \frac{m_o^2}{2d} + 2\frac{1}{4}\frac{m_o^2}{d} = \frac{m_o^2}{d}$$

The answer looks too clean to be reasonable, but this all results from the symmetry of the forces and positions.

If we look at the end result for the total energy contained in a particle, it increases as d becomes smaller and is proportional to $\frac{1}{d}$. This is comparable to a photon, where the energy of the photon is related the same way to its wavelength.

Chapter 4

Nuclear structure

4.1 Spin flipping and Mossbauer

In Mossbauer spectroscopy the nuclear decay of $Cobalt^{57}$ to Fe^{57} is often used: $Co^{57} \Rightarrow Fe^{57}$. A good introduction is by prof Guetlich Guetlich (2005).

Figure 4.1 shows the different energy levels and the energies of the emitted photons.

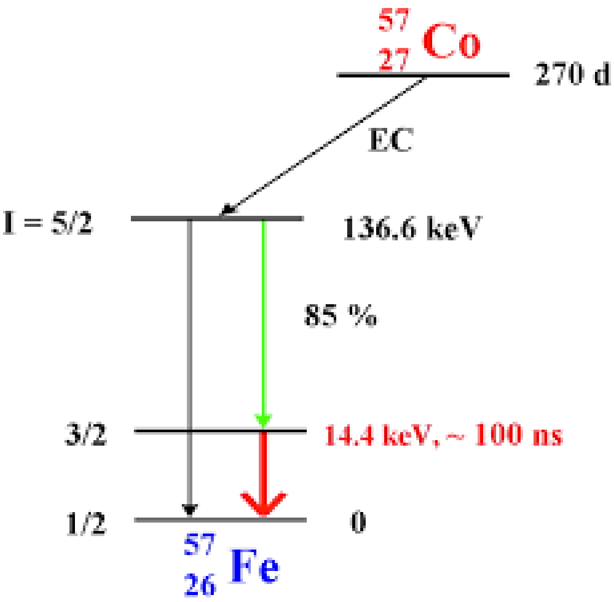
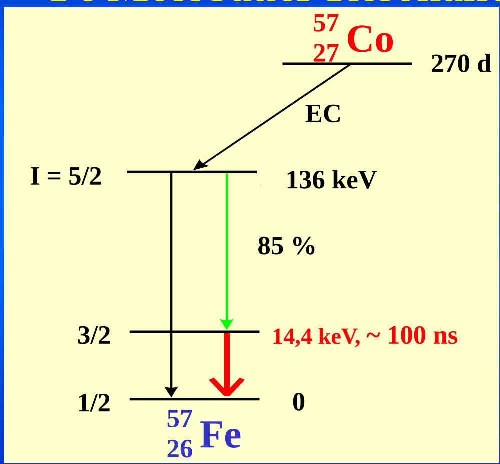
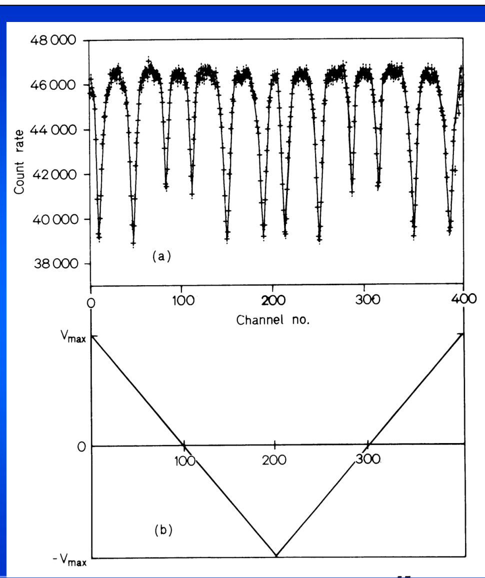


Figure 4.1: Nuclear decay scheme 57fe Mossbauer

Nuclear Decay Scheme for ^{57}Fe Mössbauer Resonance

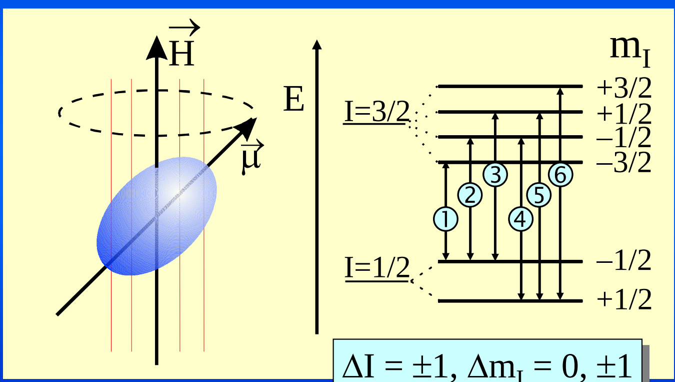




a) Mössbauer spectrum of metallic iron taken with a ^{57}Co/Rh source. The count rate is plotted as function of the channel number. The solid line drawn through the data points represents the least squares fit of the magnetic hyperfine pattern to the experimental data points

b) Velocity as a function of the channel number

Magnetic Dipole Interaction
Magnetic Splitting ΔE_M

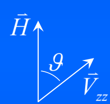


$\Delta I = \pm 1, \Delta m_I = 0, \pm 1$

The electric quadrupole interaction is usually much weaker than the magnetic dipole interaction, i.e. it can be treated as a perturbation of the magnetic dipole splitting:

$$\hat{H}_Q << \hat{H}_M$$

For ^{57}Fe and axial systems ($\eta = 0$):



$$\boxed{E_{M,Q}(I, m_I) = -g_N \beta_N H m_I + (-1)^{|m_I|+1/2}(eQV_{zz}/8)(3\cos^2\vartheta - 1)}$$

^{57}Co has a spin of $7/2$, so in our model it has at least 7 long ornac-sticks with three nucleids. These are oriented in about the same direction to create the magnetic moment. Co^{57} has 27 protons and 30 neutrons, so of the 7 long ornac-sticks three are from the surplus of neutrons, so thrice $1p + 2n$, these are Tritium sticks.

The other four are made up by a combination of twice $2p + 1n$ and twice $1p + 2n$. So a total of two Hetrium sticks and five Tritium sticks.

Co^{57} decays by electron capture: one of the Hetrium sticks captures the electron and transforms into a Tritium stick. The transform from hetrium to tritium lets the magnetic field flip in orientation. So Fe^{57} in its first state has a spin of $I = 5/2$.

So we can conclude that Fe^{57} has at least 7 long ornac-sticks of which one is a Hetrium stick. This decays quickly into Fe^{57} $3/2$. This happens by a rearrangment of the long ornac-sticks: one of them flips direction so it cancels the magnetic field of one other stick.

Another thing is that there is the same number of long ornac-sticks in Co^{57} and Fe^{57}. Both have 18 short ornac-sticks made of Deuterium sticks.

	Co^{57}	Fe^{57}
Deuterium	18	18
Tritium	5	6
Hetrium	2	1
Spin I	$7/2$	$1/2$
Magnetic Mo	4.7μ	0.09μ

Let's put it in a table and take a step back.
Why is the magnetic moment a factor 50 different,
while the spin is a factor 7?

If you would just look up Fe^{57} and found spin $I = 1/2$, we might just think:

Ok, there is spin $1/2$.
So, there is one stick with three nucleids.
And why is the magnetic moment so small.

But now we think:

OK, we know it started with seven long odd sticks.
All those fields cancel eachother almost,
When they are randomly aligned.
So we end up with a small net magnetic moment.

4.2 The Madame Wu experiment

$$^{60}_{27}Co \Rightarrow {}^{60}_{28}Ni + e + \nu + 2\gamma$$

Two gamma ray photons can mean two spin flips W Jinxong

In 1956 W Jinxong was inspired by her friends, theoretical physicists Tsung-Dao Lee and Chen-Ning Yang, to do an experiment to see, whether the β decay was sensitive to the direction of the magnetic field. She chose to use decay of Cobalt 60 to Nickel 60, where by one electron and two γ-rays are emitted. The neutrino is ignored.

The experiment has to be performed at low temperatures, otherwise the thermal motion disturbs the orientation of the spins of the nuclea. So a small layer of Cobalt 60 is coated onto a substrate and is cooled to 1.2 Kelvin. To reach the low temperatures needed, adiabatic demagnetization cooling is used to reach 0.003 Kelvin.

After the magnetic field is switched off, a small field is switched on to orient the spins of the atoms. Then the directions of the emitted electrons and the γ photons is measured. And indeed the electrons come out in a preferential direction. If the magnetic field points up the electrons go down and vice versa. Not all electrons but 60 percent.

So let's look how that works out in our picture. Firstly we know that the nucleus aligns along an ornac-stick with an odd number of nuclides, so let's assume three here.

Secondly if a β decay happens, it is an ornac-stick of the n-p-n type, which transforms to p-n-p. So let's align our n-p-n ornac-stick to the magnetic field and let the electron escape. Figure sketches the idea.

The magnetic field points up, we only draw one ornac-stick and ignore the other sticks, the electron will go down. The ornac stick has at each end an ornac-pair of which the positive $1/3$ ornac is stationary and visible, while the negative ornac rotates, which creates the magnetic and hyper magnetic fields. So according to the right hand rule this whole axis is turning around the left hand fist.

So let's assume the decay reaction starts at the bottom. So the bottom ornac-pair, with the positive $1/3$ ornac stationary decays. While we don't know the exact scenario, we start with an hypothetical one and later take a step back to evaluate how much sense it makes and possible improve it.

Here we go:

The bottom ornac-pair vibrates along the axis. It moves too much to the bottom and shoots up. It comes to close into the influence of the opposite charged ornac-pair above it. It decays into a lower energy $^2/_3$ ornac-pair, with a wider orbit. The difference in energy and angular momentum is released in an electron and neutrino of opposing angular momentum. The neutrino and electron are loosely coupled and move for a short distance together. The short lived constellation of electron and neutrino is usually called a W-boson. The electron-neutrino constellation moves downward. That is what is measured in the Madame Wu experiment.

This leaves some linear momentum for the newly formed $+^2/_3$ ornac-pair in the upward direction. So the newly formed $+^2/_3$ ornac-pair moves up. There is an attractive hyper-c force between equal particles. It propagate up the ornac-stick, until it reaches the top and becomes the new top of the stick. In the process the direction of ordinary magnetic field of the stick is reversed.

The electron-neutrino constellation moves further downward and falls apart leaving the trajectory of the electron in about the same direction.

So question in the end is, is the electron moving because of the magnetic field and its spin or is this due to the fact, that the magnetic field puts the atomic nucleus in a special orientation with regards to its magnetic ornac-axis and is decay taking place along that axis?

A further experiment could use Lithium 9, which decays to Beryllium 9. Lithium 9 is supposed to have three axis with each a n-p-n stick. This severely limits the number of directions in which an electron could be emitted. Or maybe a little bit more difficult, Tritium could be used, having only one axis even more strongly limited in its direction.

Goldhaber experiment

4.3 A neutron approaching a proton

How does the approach of a neutron to a proton look like? And why are there oscillations in the neutron absorption ratio depending on the speed of the neutron? Figure shows the graphic. Let's assume that the proton is stationary and that the neutron approaches. It would be easiest, if the sub-c magnetic field of both would align and so help guide the coupling, but they are opposing. This opposition of the magnetic fields is also quite necessary, because the magnetic field of deuterium is much smaller than that of a proton or a neutron apart, so adding them would go in the wrong direction, subtracting is better. If you look at figure of the end state, you see a deuterium stick, with all ornac-pairs rotating in the same direction. Three of them are positive and three negative, together the magnetic fields almost cancel.

So the neutron is approaching, while rotating. The rotational speed depends on the linear speed. So the sub-c magnetic fields alternate between attractive and repulsive for each rotation. The hyper-c magnetic fields can only couple during a short part of the rotation. If the middle ornac-pairs couple, due to the freedom of the wiggle angle, the force is repulsive, otherwise attractive. So we have a neutron approaching a proton and there are certain speeds at which there is a greater chance that they couple, due to these interactions.

A neutron approaching a 3-Helium stick: 3-He has a higher chance of absorbing a neutron than the proton as above. In the proton the middle ornac-pair can wiggle and so cause a repulsive force. In 3-He the ornac stick is longer and consists of 9 pairs: 5 positive pairs and 4 negative ones. So it are actually two sticks each coupled by their own hyper-c field, and kept together by the Coulomb force, so there is no way that the axis can wiggle. If the neutron passes by it can only couple attractive. There is no chance for a repulsive coupling and so the absorption ratio is greater.

A neutron approaching a deuterium stick: If we compare a deuterium stick with 3-He we notice that the neutron absorption for deuterium is low. So we can continue the reasoning from the 3-Helium stick, because deuterium consists of six ornac-pairs: 3 positive, 3 negative, so two sticks are formed, hold together by Coulomb force, so there is no wiggle angle and one would expect the neutron absorption to be higher than a proton, except that it had a single side to couple. It has a lower chance to couple, so we have a proton, if a neutron couples to its top side, it becomes deuterium, but then it is very difficult for another neutron to couple to its bottom side. So we can conclude that while the magnetic field helps to couple the neutron to the top side of a proton, it inhibits coupling to the bottom side.

4.4 Neutron capture, proton emission

http://periodictable.com/Properties/A/NeutronCrossSection.bt.log.html

Phosphorus-32 can be generated synthetically by irradiation of sulfur-32 with moderately fast neutrons as shown in this nuclear equation: 32 16S +

n 32 15P+ p

The sulfur-32 nucleus captures the neutron and emits a proton, reducing the atomic number by one while maintaining the mass number of 32.

https://en.m.wikipedia.org/wiki/Phosphorus-32

Elements sorted by neutron capture barn

http://environmentalchemistry.com/yogi/periodic/crosssection.html

Chapter 5

Halo nuclea

Some isotopes have an halo of one, two or four neutrons, which orbit an otherwise solid nucleus. Examples are helium-6 and -8 with 2 and 4 orbiting neutrons and lithium-11 with 2 orbiting neutrons and C-19 with one neutron. Figure sketches the situation for helium-6: in the middle is an helium-4 nucleus consisting of two deuterium sticks, above and under are positioned the neutrons. The neutrons rotate around their own centerpoint, while circling the helium-4. In figure a the ornac axi of both the neutrons and the ornac axis of the vertical deuterium stick are aligned for a short moment and their hyper-c fields will couple and generate a short impulse, which pulls both the neutrons towards the helium-4 nucleus. As the neutrons rotate further the hyper-c fields no longer overlap, they move in straight line forward, while rotating, till all the ornac axi are aligned again. It is clear that this can only happen, if all the rotations are well synchronized and the intermittent impulse provides just enough change to the course of the neutrons, that they maintain a stable orbit. This constellation is relative stable with a halftime of 800ms. Calculation for Lithium-11 A Binding energy i0.3Mev is measured. Suppose that this is the speed with which the neutron rotates around the neutron. Ekineteic = mv2 mneutron = m = 1.674 10-27 kg 0.3 MeV = 4.80E-14 Joule $v^2 =$

Chapter 6

Mesons and exotic hadrons

6.1 Mesons

Mesons are particles build up of two quarks. The charged ones have a longer lifetime and are thought to be bound by the strong force and the neutral ones are bound by their opposing Coulomb charges. Lets show the picture for the pions with the model of the ornac pairs. Figure sketches the idea for charged pions. Two ornac pairs are aligned along their axis of rotation and interact via the hyper-c field. Because they both have different angular speeds and radii, they do not see each others full hyper-c field, but only a fraction, if we take the same number as in the proton and neutron example above, it is something like 25% for the difference between an up and down quark ornac pair.

Mesons are particles made up of two quarks and they decay relative quickly compared to protons and neutrons. In the same family of mesons, there are ones that decay faster than others. The charged mesons are more stable. The neutral ones decay faster. Let's take a look at the pions π. The charged pion stays alive for 2.610^{-8} seconds, while the neutral one dies 10^8 times as quick in 8.410^{-17} seconds. What makes the difference? A pion is made up of two up down or its anti-quarks. ud , So in a charged pion there is for example one $\frac{+2}{3}$ ornac-pair and a $\frac{+1}{3}$ ornac-pair, if the pairs are oriented along a single axis and rotate in the same direction, the hyper-c force will be attractive. The hyper-fields will not completely couple as with equal ornac-pairs, while the angular speeds differ, so they only see a quarter of each others field. So the hyper-c field is attractive and the electric force is repulsive, but the electric force is much smaller, so another force like the centripetal force is needed to keep ornac-pairs in balance. The ornac-axis helps as a stabalizing factor. The neutral pion is build up of an quark and its anti-quark, for example a $\frac{+2}{3}$ and a $\frac{-2}{3}$ ornac-pair. If these ornac-pairs would rotate around the same axis in the same direction, the hyper-c force would be repulsive as the charges are opposed. So they are hold together by the electric force, while an orbiting movement provides the centripetal force and if at some moment the ornac-axis cross, then the neutral pion will disintegrate. The decay modes differ: the charged pion decays into a muon and a muon-neutrino, while the neutral pion falls down into two photons. This should be an excellent moment to calculate the conservation of ornac-momentum. ((So why is this charged pion constellation less stable than a proton? A proton consists of three ornac-pairs and if we take the top ornac-pair and look at the forces that push and pull it, we see that the pushing force and the pulling force originate from different points, respectively the middle and bottom ornac-pair. The force falls off with $\frac{1}{r^2}$, so only if the opposing forces originate from a different location, there will be a well defined minimum. This minimum gives a proton its stability. Here in the case of the charged pion, we have two opposing forces, but they both originate from the same location and both fall of with the same relation to distance $\frac{1}{r^2}$. So the minimum is less defined and is the result of the non-linearities.))

The mesons have a mass of $139.6 MeV/c^2$ and a mean lifetime of $2.6 \cdot 10^{-8} s$. They decay due to the weak interaction. The primary decay mode of a pion, with probability 0.999877, is a purely leptonic decay into an anti-muon and a muon neutrino:

$$\pi^+ \rightarrow \mu^+ + \nu$$
$$\pi^- \rightarrow \mu^- + \nu$$

Neutral pion decays The π^0 meson has a slightly smaller mass of 135.0 MeV/c2 and a much shorter mean lifetime of 8.41017 s. This pion decays in an electromagnetic force process. The main decay mode, with probability 0.98798, is into two photons (two gamma ray photons in this case):

$$\pi^0 \rightarrow 2\gamma$$

Chapter 7

Electron, muon, tau en neutrinos

The electron, muon and tau and their neutrinos can be build up in a similar way to the proton and neutron. the electron is build up of 3 ornac pairs orientated along a common axis. because the magnetic moment of the electron is much larger, the ornac pair has to rotate with a much lower speed, so that a larger area is below the speed of light. as the angular speed of the electrons ornac pairs is lower than that of protons ornac pairs, those different pairs do not couple strongly. Also the hyper-c field of the electron ornac-pair is lower, so the force between the electron ornac-pairs themselves is also smaller. And so the weight, mass and energy contained within the electron is lower.

The muon and tau particles are heavier and their magnetic moments are smaller. So the angular speed of their ornac-pairs will be higher. They fit nicely between electron and proton ornac-pairs. The following table puts them next to each other.

If a meson decays and falls apart to form an electron, a neutrino and an amount of energy in the shape of photos, we know that there were two quarks, consisting of two ornac-pairs, together they decay and form the new groups of ornac-pairs: 3 for the electron and 3 for the neutrino. Besides that charge, energy and spin need to be conserved, also the total angular momentum for all the ornac-pairs needs to be conserved.

7.1 Coupling between electrons and nuclea

A second problem that I hope to address is the following: if an electron is orbiting a nucleus, we know that that only can happen in certain orbits. The orbit, whether spherical or more complicated of shape, needs to be equal to an integer number of times the wavelength of the electron. The Schrdinger equation and related quantum mechanics makes it possible to calculate the orbits and interactions to great precision. But the big question remains, how does the electron know: "I have made one whole loop around the nucleus and now I am on the exact starting point again to make a second loop."

What is the locking mechanism? The electron is moving through a virtual empty space, far away from the nucleus and somehow it knows or feels that it is no good to make one loop around the nucleus in one-and-a-half wavelength, just unthinkable.

Most introductions into quantum mechanics start with a one dimensional quantum well. Here the mechanism is clear: we have the side walls of the well, which provide a physical boundary. If we study the sound produced by a guitar by listening only, we can conclude that the tones produced are quantized into twelve semi-tones. This is the correct answer, but not the complete physical explanation. You can not explain the tone forming of a guitar without talking about the frets, which limit the free part of the vibrating string. And for a flute or saxophone, you need to talk about the holes in the side, which define the length of the vibrating air. Otherwise you have discovered the phenomena and can use them in calculations and predictions, but there is more to discover.

7.2 De Broglie wavelength and cycloid rotation

De Broglie was the first one to bring the notion of wavelength back to particles, after Einstein had successfully connected the wavelength of light to the discrete photons. In its most simple form it states, that as the speed of a particle increases, its wavelength becomes smaller. How can the model of matter consisting of sticks of quarks be connected to wavelength? The stick of ornac pairs has a hyper-c field, which is angular confined and extends far, this provides an orientation in 3D space and a connecting force. As the particle rotates, while it is moving forward, the protruding hyper-c field will fix a wavelength, which can connect to other matter, at the moment that the hyper-c fields intersect. It is best compared to the rotating beam of a lighthouse: suppose two lighthouses are far apart, but it can happen that both beams meet and for a short period of time overlap, at that moment the hyper-c force will create its action. Interesting would be to have a mechanism, which would consistently accelerate the rotation of particles at the moment, in which they gain forward speed.

7.3 duplicate? Electron to proton neutron coupling

The electron consisting of three ornac-pairs as described above and in that way can couple via its hyper-c field to the ornac axis of the nucleus. The coupling is not as strong as a coupling between proton and neutron, because the ornac-pairs of the electron rotate with a much lower rotational speed.

Why is the force between the electron ornac-pairs and those of the nucleus repulsive? The fastest rotating ornac-pairs of the electron are the negative ones with a charge of $\frac{-2}{3}$, these fastest electron ornac-pairs couple best to the slowest rotating ornac-pairs of the nucleus, because then the angular speed difference is lowest and the hyper-c coupling the strongest, so they couple most to the slower moving $\frac{-1}{3}$ ornac-pairs of the nucleus.

Chapter 8

Feynman and the double slit

8.1 The electron double slit experiment

In the 1950-ties Richard Feynman proposed a double slit experiment with electrons to educate about the quantum nature of particles. The idea is as follows: to show that interference of the electrons only happens, if they have the possibility to travel through both slits at the same time, an additional barrier is added. This barrier has a square hole which is bigger than both slits and it can move from left to right, so that only the left slit is open, both slits are open or only the right slit is open. Interference is only expected if both slits are open.

Sixty years later Roger Bach et al 2013 New J. Phys. 15 033018 http://dx.doi.org/10.1088/1367-2630/15/3/033018 performed this experiment and as expected full interference shows up, if both slits are open. Figure sketches the setup and the result. More interesting is this image: the barrier is covering the right slit and leaves the left one open. An partial interference pattern is discernable: at the left side the electrons are deflected with a periodicity, at the right side it is more a continuous blob. What is happening? The electrons are only traveling through the left slit. We know what is happening, we have a hunch. The electrons are coming in with a fixed speed. When they pass through the slit, they experience a push to the left. It can be one, two or ten pushes, but it is always a multiple of the one unit push. What is creating this push? And why has it a fixed impulse? We have to start with a simpler situation. Figure sketches the idea: all the matter of the material between the two slits is concentrated in a very narrow line in the middle and the electrons only move exactly through the middle of the left slit. The electrons couple to the nuclea of the middle. The electrons rotate while moving forward. At the moment the axis of the electron is perpendicular to its direction of motion, it points in the direction of material of the middle. Its hyper-c field is narrow and if in the middle material one of the nuclea is at the right spot and one of its ornac-axis is completely aligned with the hyper-c field of the electron, then those two hyper-c fields will couple and create the unit push. As the electron makes a number of rotations, while moving past the concentrated material to the left, there are many chances to couple to a nucleus and so it can experience one or more pushes, but always a multiple of the same unit push. The push has a fixed size, because everything is fixed: the speed of the electron, the distance between the electron and the nucleus and hence the size of the force and, because of the DeBroglie wavelength,the duration of the force. And the impulse is the integral of force over time. The force between the electron and the nuclea is always repulsive, so the interference pattern only shows up on the left side. And the blob on the right side is due to continuous material to the left of the slit, which produces pushes of varying impulse, because the distance between the electron and the nucleus can have any size. The image as our simplified situation would create, is sketched in figure. Instead of the sinusoidal density fluctuations of the real world experiment, we get a number of sharp defined lines to the left and the blob at the right side. To recreate the real world experiment we can slowly broaden the range, in which the electrons move and broaden the concentration of the material. In that way we bring variation in the distance between the electron and the nuclea and hence the force will vary and our image will get blurred.

We have to add a detail to our image. If the beams of hyper-c force cross between the electron and the nucleus, it depends on the duration how large the change in impulse will be. So if the electron rotates clock wise, there will be a point to the right along its beam, where there is a temporary zero speed, because the rotational speed and the forward speed cancel. Let's call that the dead point. This dead point allows some time, so that the visual distinct unit push can show up. Because the electron not only couples to that one or five nuclea with a fixed unit push, it also couples to many other nuclea, but for a much shorter time, so they don't show up with a distinctive size. Let's try to calculate the distance of the dead point. The formula for the dead point radius is a combination of the one for the dead point for a rotating thing.

$$2\pi f r_{dead} = v$$

This formula relates the ratio $\frac{f}{v}$ to r_{dead}. The second formula relates f

and v to each other:

The formula for the wavelength is:

The sharp lines of our simplified situation do appear in the real world, if the matter of the nucleus is confined to well defined places. In crystal-spectrography electrons or x-ray photons are shot through the crystals and the deviation from their path is used to measure the distances between the nuclea. The radius of the nucleus is in femtometer scale $10^{-15}m$, while the atom has a radius in the angstrom scale $10^{-10}m$, so the point to which the electron couples is defined till 10^{-5}. On the other hand the position of the path of the electron is also constrained, if it moves too close to the nucleus, the chance of being randomly deflected by a bound electron increases enormously.

Let us try to get some more specific numbers. The electron has a wavelength of 60 nm, so it makes 16 rotations for every μm it moves forward. The metal, from which the double slit structure is made, is $50\mu m$ thick, so every electron has 800 chances to couple to an ornac-axis of a nucleus. If we again look at the image of the experiment of a and b,

The formula, which describes the distances between maxima and the central axis, is well known and is as follows:

$$\sin\theta_n = n\frac{\lambda}{d}$$

in which θ is the angle between the original trajectory of the electron and its new deviated path, n is any integer, which describes the number of the maximum, λ is the wavelength and d is distance between the two slits. In the formula the distance between the two slits d is used and we know the formula is right. But it is not a fundamental difference if we use half this distance d, namely the distance between the middle of the slit and the middle of the of the material in the middle.

If the deviation angle θ is small, $\sin\theta$ can be replaced by $\frac{y_n}{L}$, where y_n is the lateral displacement and L the distance between the slit and the projection screen:

$$y_n = n\frac{\lambda L}{d}$$

Or the angle by which the course of the electron is deviated for each individual impulse is:

$$\theta = \frac{\lambda}{d}$$

So we can calculate the individual impulse and try to make an educated guess about is duration and find the average size of the force pushing the electron away. (in which$n$ is any integer, λ is the wavelength, L is distance between slit and screen and d is distance between the two slits.)

What will happen to the angle of deflection, if we double the distance between the middle of the slit and the concentrated material? The distance between the electron and the nucleus doubles, so the force between them, during the moment they couple, becomes four times as weak. But because the distance is twice as large, the duration of the coupling is twice as long. So the impulse is twice as weak. Figure sketches the idea: two beams cross each other and if the distance between them doubles, the duration of the crossing doubles. It also shows the change in the shape of the impulse. Of course this agrees well with the formula for the bending of light and matter in the double slit and the grating. Now, what will happen, if we double the speed of the electron? Everything stays the same as in the simplified situation, except the speed. If the speed of the electron doubles, its momentum doubles,

(the impulse needs to quadruple to keep the same angle of deflection, because speed v appears squared in F= m v2 / r.) If the speed of the electron doubles, its wavelength halves, so the angular speed, with which it rotates, quadruples. This means that the dead point distance moves two times closer to the electron, hence the force between the ornac pairs in the electron and the nucleus quadruples.

8.2 Photons in the slit

The same experiment was first done with photons. So let's try that. The photons move through the middle of the slit. They are polarized. In this way they only can couple perpendicular to the material beside the slit. The photon consists of an ornac-pair, two opposing charges rotating around a central middle point. The middle point moves with the speed of light. So one of the charges moves above c in a curvatory trajectory and this creates both the ordinary magnetic field of the photon and the hyper-c field of the photon. This hyper-c field of the photon can couple to the hyper-c field of the quark ornac-pairs in the protons and neutrons of the nuclides besides the slit. So the same mechanism, which gives the electrons a unit kick, also gives the photons a unit kick. The electrons can only experience a repulsive force. but the photons can also be attracted, depending on whether a positive or negative ornac is above c. Also as the coupling is not really in the center, the photon will be a little twisted around its axis of motion. So the direction of its polarization will change a little. Of course the photon also has numerous chances to couple and hence can experience a number of pushes or pulls. Doubling the distance works in the same way as with the electron. So no need to go into that again. Doubling the energy or frequency of the photons, makes the ornac-pair rotate faster, creating a larger magnetic and hyper-c field, this larger hyper-c field will couple the photon stronger, so a higher frequency results in stronger bending. At this moment we can try to deduct, how the coupling between the ornac-pair of the photon and the ornac-pairs of the nuclea depend or alternatively how the distance between the photon ornac-pairs vary with frequency.

Chapter 9

Gravity

9.1 part one

The force of gravity can be build up by the same hyper-c magnetic field as the strong force. If two ornac-pairs are aligned along the same axis and rotate with the same angular speed, they will experience the same hyper-c force only dependent on the inverse square of the distance $\frac{1}{r^2}$. The fact, that the force of gravity is so much smaller, only comes from the limit of the angle of coupling between the both ornac-pairs. This angle is really small, so only one ornac-axis will couple between two distinct nuclea and if the nuclea are randomly oriented, this will not happen often. So the big difference between the strong force and gravity only has to do with narrow coupling angle of the hyper-c field.

Why is gravity always attractive? 99% of the observable mass is there in the shape of up and down quarks, which are ornac-pairs. The difference between them lays in the +2/3 or -1/3 charge and their difference in angular speed. This difference in angular speed, causes the different ornac-pairs to couple weaker in this case, four times weaker, to ornac-pairs of the other kind. So while opposing charges would create hyper-c fields, which push each other away, the fact that their angular speeds differ by a factor two, reduces the pushing forces by a factor four. So the net resulting force is pulling it together.

What will happen at the anti-hydrogen gravity experiment at CERN? In this case it are the same ornac-pairs rotating with the same angular speed, but as anti-matter their charges are exactly opposed and the hyper-c field will be fully coupled and pushing away the anti-matter.

9.2 part two

Directional gravity The ornac-pair model for matter and light has strong force which has a directional limitation, but the hyper-c magnetic field extends unlimited within its angle. So the gravity force between mass particles

The fact, that the gravitational force is created by the hyper-c field of ornac-pairs, means that gravity is a directional force. In ordinary daily life we do not notice this for a number of reasons. First of all we never touch a single atom. Secondly most atoms consist of more than one ornac axis. So only hydrogen with its single axis would be sensitive to this phenomenon and then best in its atomic form. So we have to move into astronomy to get to places where this might show up. In galaxies there are large clouds of hydrogen. Stars are born when these clouds contract enough to start ignition.

The mass of these clouds is considerable, up to 75% of the barionic mass of galaxies is estimated to be in this shape. So if the gravitational force of the hydrogen atoms has a directional component, and if this direction lays in the plane of the galactial disk, then the gravitational force exerted by the hydrogen clouds on the other objects in the galaxy is much larger. Suppose that the ornac-axis in the hydrogen rotate in the plane of the galaxy and so the hyper-c field swipes only in the galactic plane and never beams upward or downward, because the orientation of the ornac-axis is no longer randomly divided over a sphere, but limited to a narrow band, the gravitational pull increases with an order of magnitude. In a typical galaxy only about 4% of the mass is observed as stars (1%) and clouds (3%), the other 96% of matter is inferred by the curves the stars make around the center and the lack of matter to explain the observed curves. This is the origin for the quest to find the missing unobserved, hence dark matter. So if the hydrogen in the clouds is 30 times more oriented in the plane of the galaxy and of course in the right position, it could help explain the curves of the stars.

Further more one should consider the evolution of the gravitational force. First it is concentrated in a plane like in a galaxy or in a line like in a filament. Later on it gradually transforms. In a cloud it can be conceived, that the atoms keep a orientation, because the collisions between the atoms are not frequent, but if a cloud contracts and a star is formed, the hydrogen atoms collide much more frequently and the preferential orientation in the plane is lost. As the hydrogen is fused and burned into helium and heavier elements, the number of ornac-axis is increased and there is no more possibility for an increase of the gravitational force by orientation. To visualize what happens let's look at a filament and see how the gravity chances when in a certain region star formation take place. A filament has a typical thickness of one light year and is much longer, suppose that the hydrogen atoms are aligned.

If in a section stars form, the hydrogen will lose its orientation and burn. The ornac-axis lose their preferential orientation and the whole section will reduce its gravitational pull on the sections beside it to just a few percent. So the very process of star formation changes the directionality of gravity and slowly filaments and galactial clouds lose their preferential orientation and for the out side observer the gravity diminishes, things start to move away from each other. Maybe this evolutionary process might lead to cosmological expansion and be a source of the percieved dark energy.

Gravitational lensing is also influenced by a preferential gravitational orientation of hydrogen clouds inside lensing galaxies. In some galaxies the luminosity of the stars and hence its indicated mass will not agree with the observed bending of light passing through depending on the amount of hydrogen in oriented state. If light passes through a galaxy going through the disk perpendicular, the hydrogen clouds can have a gravitational preferential orientation, which increases the gravity. On the other hand, if the light is traveling parallel to the disk, they will be no noticeable influence of the hydrogen clouds.

As a separate thought: I remember having read sometime, that protons reaching the surface of the moon coming from the sun in 20% of the case do not experience gravity and bounce off in a straight line. It could be that their orientation is in a plane that does not cross the moon.

Chapter 10

Photons more detailed interactions

10.1 Laser confinement by photons

While usually the confinement of neutral atoms by laser beams is explained and depicted by beautiful graphs of the calculated undulating potential, here, I want to paint a different picture. Not pretty, just an empty space in the middle, where the atom can move freely to the left or right and at the sides an area, where there is a chance, that the photons interact with the atom and reverse its direction of motion. The figure below sketches the idea:

In his excellent presentation Prof at the be physics conference he treated it in such away, that it invited to think it over again. How and when do the photons couple to the electrons. His whole presentation drives home one point: the quantization of the different speeds of the atoms can only be a multiple of the change of momentum of the photon, when it reverses direction.

The yellow dot is the atom moving. And the area between the green lines is the place, where a photon can couple to the atom and reverse the motion. So the atom is locked between the green areas as long as there are enough photons are available to couple. The distance from two green lines tool the next two is half a wavelength.

At this moment the green box does not have a well defined size, just let's fix is size to 10% of the open space. So while moving over the open space, the atom spends 90% of its time moving freely in the direction of the green box.

When it finally arrives at the box, it continues moving forward at its slow speed, but here something changes, the photons start acting. The photons move very quickly, of course, in the time the slow atom moves through the box, the photons pass many open spaces and appear in many boxes. So the photon appears in many different boxes, while the atom stays almost motionless in its single box. In its time in the green box many different photons make their appearance and disappear in the rhythm of the well synchronised laser beam. They have a slightly different position. The size of the atom is much smaller than the wavelength of the photon, so the size of the green box is larger than the atom. The outer radius of the atom is made up by the electrons in the biggest orbit.

We know, that the photons, we use for building the laser trap, are detuned. They have a slightly lower energy than the photons, which can be absorbed by the atom and bring it's outer electron in a wider orbit, containing the difference in energy. The photons in the laser trap have a lower energy, they can not kick the electron into its higher orbit, but they can still couple to the outer electron, all be it for the short duration of half a wavelength. In this period of time the photon can make a 180 degree turn and reverse its direction of motion, while at the same moment transferring the same momentum to the atom and also reverse the direction of motion of the atom.

10.1.1 Quantized momentum transfer

How do we know that the photons transfer exactly this amount of momentum? As clearly explained by Prof , suppose,we have a small group of atoms caught in our laser trap. Then we switch off the laser beams and wait a short moment. We make a photo and measure, how the distinct sub groups have moved different distances. Now we can calculate the speeds of the different groups. And so know that they all move with a momentum, which is an integer times the momentum for speed reversal of the photon.

The question is, why does the photon make exactly a 180 degree turn and then it is free from the outer electron again? And in what relative position and speed need the photon and outer electron be, to allow this temporary coupling?

At this moment we only can speculate. We know that if we increase the number of photons, there is a greater chance for the atoms to reverse direction. We also know that when we lower the energy of the photons, there is a smaller chance that they couple to the atoms.

The dimensions are so small, that there is no hope to ever directly observe the mechanism. This does not mean that is useless to make a more detailed model. Even a wrong model will stimulate others to come with a better answer. (Just like Markov's calculation of chances was a direct reaction to)

10.1.2 A more detailed model of a photon

To make a more interesting model we need to define the photon in more detail. The photon has number of well defined properties: energy, momentum, wavelength, which are connected and measurable and has other properties, which are less defined like the electric and magnetic fieldthe duration of a single photon (10 wavelengths or 4 or half) and self interference of a single photon.

So to make for a more detailed mechanism I propose a model without any pretense. It is just a starting point and hope it will be improved. Let's start. I want to reconcile the Maxwellian view of an alternating electric and magnetic wave, with Einstein's view of a particle with a distinct momentum and wavelength and energy (which is all connected into one variable).

A photon has no net charge. So we start with a positive and negative point charge separated by a distance d. The net charge is zero. The average speed of charges is the same as the photon, the speed of light c. While moving forward this constellation rotates around the center point. See the figure below.

The red positive charge at the top moves fast towards the right, while going speedier and speedier down. The blue negative charge starts at zero speed and begins moving up, while slowly gaining speed to the right. After half a wavelength they reversed positions. And the cycle repeats. This movement is called a cycloid and is best compared to the wheel of a bicycle. The bicycle moves forward with a constant speed, but at the place where the tire of the wheel touches the ground, the speed of the wheel of zero, otherwise it would slip. This kind of movement is called cycloid. Let's follow the movement of the valve used to inflate the tire. We start at the ground the valve had zero speed, the wheel continues to rotate, so it moves up accelerating from zero, half way up at the height of the axis, it has the forward speed of the whole bike and the upward does from the rotating wheel, so the direction is 45 degree up and forward. The velocity is the square root of two times the speed of the bike. We go to the top position: the speed of the bike and speed of the wheel are parallel and in the same direction, so the valve has double the speed. So on average the valve has the speed of the bike, sometimes zero, sometimes double the speed.

We now translate the picture of the bicycle wheel to the rotating photon: we locate the positive charge at the valve and the negative charge at the opposite side of the wheel across the axis. The whole photon moves at the speed of c, so the positive charge sometimes moves with double the speed of c and sometimes it is at a stand still and before it is motionless it moves slowly. And it is this period of slow moving, which enables the photon to interact with slow moving matter like electrons.

For easier reference let's give the photons' subparticles, the positive and negative charge, a name "ornac". The name is chosen free after Tolkien's Lord of the Rings. And let's assume they are always created in pairs, so that never a net charge is created. We do not have any clue about the amount of charge they carry, but the smallest known charge is that of the quark, which is 1/3 of the electron charge. Let's assume the ornac pairs come with charges or and let's shorten ornac pair to o-pair and let the o stand symbol for the circular or cycloid movement, which they make. Another way to separate the parts of an o-pair, is that one of the o-pairs charges is always slow moving sub-c and hence visible and the other one of the pair is fast moving, hyper-c and invisible.

We have to examine this in more detail and add some rules. The first thing is, can anything move faster than the speed of light? It is the Einstein speed limit. Well, a photon is already special, in that it can move with speed c; a photon is a massless particle, so the subparticles of a photon have even less mass. If I have a photon with a structure and it rotates, while moving at speed c, it can not be else than that its parts must sometimes move above c and sometimes below c.

So how do we reconcile this with the Einstein speed limit? Firstly: this only holds for absolutely massless particles. Secondly: every particle that moves above the speed of light c, is invisible. This means, that the o-pair, which forms the photon, only one o charge is visible at the same moment. As we are only interested in rotating charges. Thirdly: the only part of the magnetic field, which is visible, is the part which moves under the speed of c. So while our photon rotates and moves forward, we see the fraction of the magnetic field as of the charge was moving over the line representing the speed limit c.

So what do we see of the photon? Alternating we see a positive or negative charge, which comes to a stand still. The slowing charge does not create much of a magnetic field, but the other charge, which then moves with double the speed of c, creates a magnetic field of which half the radius is visible. As the o-pair moves forward the charges chance roles and hence the magnetic field reverses. This starts to look like a propagating electromagnetic wave.

Let's try to connect to a stationary charge. Suppose it is located one wavelength away. Figure sketches the approach:

Green is the stationary charge

The red charge connects to the green stationary charge and can not move further, altering the movement of the blue charge.

The blue charge swings around the red and green charge. With about double the speed of c, it takes about half the time of a wavelength to finish the semi-circle.

Now the red charge disconnects from the green charge and the photon can continue its path.

Here the path of both the o-pair charges is sketched and one starts to think that the EM fields will cancel each other, but due to the time it takes to complete the semi-circle, which takes half a wavelength delay, they are actually in sync. This is an important result for all forms of reflection, in that it can explain the half wavelength time delay.

After one cycle the first slow o-charge reappears and can connect to the stationary charge. It is now fixed to a point in space and can not continue its cycloid movement. So the fast o-charge continues with the same speed 2c, but instead of its cycloid path it follows now a circle around the fixed point. It takes exactly half a wavelength to complete half the circle. As we try to rebuild a model of photon interacting with a laser trapped atom, it should get free after 180 degrees, so let this happen. And now we can look at the pattern of the reflection. The top half arcs are the paths of the approaching photon and the dotted lines are the leaving o-pair. You might think that the approaching and leaving path are out of phase, but this sketches their path and the 180 degree swing causes the half wavelength delay in time so they are in the same phase.

This reflection around the green dot is of course not a perfect model, because it does not propose a mechanism for release of the photon from the green dot. We can look back to the atom in the laser trap: firstly the photon does couple to a moving electron

There is this strange thing

Reflection off metal and different stuff

A warning you get when buying a polarizing filter is, that it won't work on metal surfaces, because they don't reflect light, while keeping the polarization. So there are two distinct ways of reflection: one which keeps the polarization, like water, glass etc and one which disturbs the polarization for metals. Let's start with the metal reflection. We assume that for the size and timescale of a photon, there will be a sea of charges (electrons or their lack of them) and they behave like a super conductor. As a small charge of one of the ornacs moves slightly above it, this will generate a magnetic field and the sea of charges will generate a magnetic field so that the slow ornac can not enter the super conductor and levitates above it. The fast ornac will swing around the fixated slow ornac. The slow ornac is only fixated in the plane of the metal surface and can freely move over it. So once the fast ornac is swung again out of the metal, the slow ornac is free again. To show the disturbance of this kind of reflection we need to look at a slanted approach of the photon.

Once the wavelength of the photon becomes too small, it is no longer reasonable to assume a sea of charge by the electrons and the high energy photos pass through in changed.

The reflection of dielectric material.

Here the polarization is kept and the reflection is less sure to happen like in glass, water. Suppose the slow ornac of the o-pair arrives just a little under the surface of the glass air interface, let's say 1/10 of a wavelength. The dielectric material will create a small polarization area in response, this area will stick to the surface, and the show ornac will hang under it. The fast ornac will swing around. In the slanted case it keeps it's orientation.

Directional photon emission in diamond ————————————————————————

The nitrogen vacancies in diamond are used in research The photons can only be emitted in four directions. This fact is used so that the sensors only need to catch photons from these known angles. But the question is of course, what is the mechanism. The energy of the future photon is still stored in the orbit of the electron. Figure f shows the idea, but then in 2D. The electron is some where moving along the ellipse and where would it release the photon, so that it can go in its predefined direction. Point A is not logical, neither point B, but one of the points T will do. It is the tangent line to the ellipse and parallel to the direction of the photon. While we can not speculate about the mechanism, why the electron releases the photon there, we know it happens there. Just like a ball which is thrown away, it keeps the direction, which it had just before the release.

When the elections, which emit the photons, form a part of the covalent bonds in the diamond grid structure, their orbits are locked in space to fixed angles. This only happens in crystals.

Proximity time ——————————

For the photon to couple to the electron circling around the nucleus, there needs to be time. The tone to be long enough and close enough to couple. The visible o part of the photon has a trajectory and the orbiting electron has its own trajectory they have to coincide in time and place for a connection to happen. Then the visible part of the photon is not fixed to a stationary position, but to the electron in its orbit. The o , which is at roughly double the speed of light c, starts to sling around the electron. As the electron has moved half is orbit and the photon has reversed is direction of movement, they decouple. That has to be when the photon starts to pull in a direction.

Reflection around a single charge ———————————————————
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10.2 Transparent medium

The movement of a photon through a transparent medium is governed by the electric permittivity of the material. Let's assume the following: the dimension of the atoms of which the material consists is much smaller than the wavelength of the photon. So that a single photon will cause a small displacement of the electrons of a number of atoms. The photon, as build up of the ornac pair moving forward while rotating, has a small and temporary electric field, this induces a small displacement of the electrons of the atoms around it, this small displacement of electrons is a current and will cause a small local magnetic field. This magnetic field will act on the magnetic axis of the photon and turn the photon a little around its axis of forward movement. In the next half of its wavelength, the electric field will change in direction and the induced magnetic field also, so the photon will be turned back a little by the same amount. As the ornac pairs don't move faster, but they have to cover a longer road, it takes a little bit longer to arrive.

When the photon exits the material and continues its travel through vacuum, it does not move faster, no energy is added, but it moves in a more straight line. No longer a wobbly line. Is there an advantage in using the ornac pair model? Yes, the trajectory of the ornac moving below the speed of light can be used to accurately model the response of the electrons.

Chapter 11

High energy physics

High energy physics is the field of research, where particles are accelerated until speeds close to the speed of light c and then collide. The first question is, how will the ornac-pair model of protons look like at those speeds.

If particles are accelerated, their energy content increases. If the distance between the ornac-pairs is reduced, the forces increase and the total stored energy increases. All fits well with formula . So there could be a mechanism, where the energy can be stored. A question would be why the ornac-pairs can come closer together? Is there a reduced coupling to other mass around?

Now we can have a model like this: the high speed particles are closer together and contain more energy by being compressed, just like a spring and if they now collide with other particles, all this energy is contained in a small space, the higher, the energy, the more it is concentrated in a compact space.

It sounds not like a big deal, just like the photons: the higher their energy, the smaller their wavelength becomes.

11.1 W-boson in neutron decay

In the decay process of a neutron a $-\frac{1}{3}$ ornac-pair decays into a $+\frac{2}{3}$ ornac-pair. In the process an electron is produced as is necessary to conserve charge and a neutrino is produced to conserve spin. In the character of conservative laws, here ornac angular momentum has to be conserved too.

The electron and the neutrino form together an intermediate particle, the W-boson. The W-boson travels a limited distance and falls apart into an electron and a neutrino. It is possible that the W-boson is a composite particle consisting of the electron and neutrino coupled together in a similar way to a deuterium stick, which is build up of an alternation of positive and negative ornac-pairs, which are held together by their hyper-c field. The great difference is of course in the size of the hyper-c field: for electrons and neutrinos it is much smaller than for nucleides, the force is too weak to hold them together in a stable configuration. The same constellation could hold for the tau and muon and its respective neutrinos.

The neutron consists of three ornac-pairs. The top $-\frac{1}{3}$ ornac-pair moves down below the middle $+\frac{2}{3}$ ornac-pair and there hits the bottom $-\frac{1}{3}$ ornac-pair. They can not annihilate like in a particle anti-particle collision and only emit energy in the shape of photons. If that would happen, charge would be lost. Instead the ornac-pairs collide and the middle stationary ornac, which provides the charges to the non-rotating world, is kicked out of its stationary position. Conservation of charge in this scenario means, that if an ornac moves out of its stationary center position, an ornac of the same charge must move into a stationary center. The resulting ornac-pairs can each have different angular speeds. The total angular momentum and energy of incoming and outgoing particles will be equal.

Figure X sketches the idea: three ornac pairs are together in a fixed, stable configuration. Then the middle ornac pair wobbles too far. The top and down ornac-pairs hit each other. One of the the stationary ornacs is kicked out of the center. To compensate for the charge and angular momentum, other ornac-pairs are created.

Chapter 12

Possible experiments

The structure of 3 He and 4 He should be sufficiently different to be detected in experiments. As measured by the charge radius is respectively and. 3 He consists of a single stick of 9 ornac-pairs and it has a large magnetic moment. if 3 He is placed in a strong magnetic field and all the nuclides are aligned with the field, one would expect to get a different result based on the orientation. The electrons which are fired on the sample will be deflected. Even the polarization of the electrons plays a role.

To execute the measurement one first switches on the magnetic field, waits till all the 3He nuclides are oriented with the field, then one switches off the magnetic field, fires the electrons to probe for the charge radius.

Another similar experiment could involve the absorption of neutrons by 3 He. The same magnetic field would influence the absorption depending on the polarization of the neutrons.

Chapter 13

Summary

By extending magnetism and defining rules for massless charged particles in a circular movement above the speed of light c, it is possible to replace a photon with two opposing charged particles, that rotate around a central point, which moves with c. This does not violate the Einstein limit on the transfer of information speed, because it is a circular movement.

By using the same extension to magnetism it is possible to replace a quark with two opposing charged particles, of which one is stationary and the other one is circling with a speed above c. The hyper-c magnetism is only visible to particles that circulate around the same axis and in the same direction. So the force field has a narrow angular restriction. By positioning the quarks along the same axis, it is possible to build stable structures as protons and neutrons, and to connect them seamless together along the same axis.

Using these structures and this hyper-c magnetic field it is possible to connect and explain a number of different phenomena like: gravity, repulsion of an electron close to a nucleus, bending of electrons in a double slit experiment, without using interference, the same for neutrons, protons and photons, bending of photons due to gravity and a stable structure for nuclea.

And it is possible to make one prediction: gravity is directional and this might help explain a part of the missing dark matter and dark energy.
sectionLamb shift and the muon proton radius
Recent experiments have measured the

Bibliography

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