The unification of the forces.

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Abstract

Background In previous papers it was set out that matter could be considered to be formed by gravitational pulsations in a six dimensional space with anisotropic curvature, since solutions to Einstein's field equations presented all of the characteristics of a particle then.

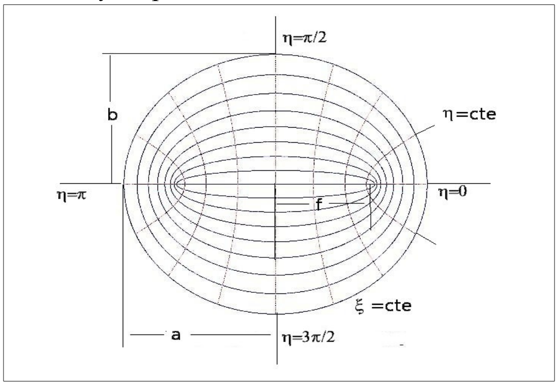
Results Four solutions to the gravitational wave equation have been found. These solutions can be assimilated to four neutrinos and complement to the previous solution identified with the electron. Since this set of solutions does not allow the existence of hadrons is postulated the existence of a central hole in the plane of the compacted dimensions. By assuming this postulate we can obtain complementary solutions formed by a surface wave plus any of the other five solutions. These solutions are called partons. Linear combinations of these solutions can explain the huge variety of known particles, allowing not only to identify their different charges, but also justify the existence of a multilinear system for hadron masses as advocated by Palazzi. The proposed system also predict the size and magnetic moment of mesons and baryons, and the internal distribution of charges. Regarding interactions, they occur via three non-linear mechanisms: by changing the refractive index, deforming and dragging on propagation medium (space-time). No other interaction is possible . The first two are the source of the gravitational interaction, the residual nuclear force and the London interaction, while the latest is the origin of interactions similar to the electromagnetic interaction. These interactions have been called electrostrong, electromagnetic and electroweak interaction. We can obtain mathematically these interactions from the probability density of the wavefunction or from the wavefunction gradient.

keywords: *Quantum Mechanics , Force Unification*

1.Background.

In previous papers [1,2] it was set out that matter could be considered to be formed by gravitational pulsations in a massless six dimensional space with anisotropic curvature , since solutions to Einstein's field equations presented all of the characteristics of a particle then.

Specifically a space formed by three extended spatial dimensions, two compacted spatial dimensions (which would form an ellipse of about 3 10^{-6} m with a relationship between major and minor semiaxes equal to 1.10576 / 0.8883) and one temporal dimension was explored. These dimensions can be described using an elliptic cylindrical coordinates system: the extended dimensions are described by Cartesian coordinates x, y, z and the plane of compacted dimensions is described by elliptical coordinates:



The curves with ξ = constant representing confocal ellipses, while the curves with η = constant are hyperbolas perpendicular to the ellipses. The dimension ξ is related to the inverse of the mass of elementary particles by the equation $\xi_0=\frac{\bar{h}}{2\, m_0\, c}$ and the dimension η is identified with the imaginary coordinate of the Minkonwnski's spacetime. It's remarkable that due to the above statement the concept of time, while still maintaining its dimensional nature, lose its geometric interpretation.

2. Gravitational wave equation.

Because of the difficulty to solve the Einstein field equations in these conditions the weak field approximation known as gravitomagnetism was used. The gravitomagnetic field is almost analogous to the electromagnetic field, except for two details, the first is that the gravitational field can not be negative and the second is that two parallel streams of mass repel each other rather than be attracted. In these conditions it is possible to obtain this wave equation:

$$\boxed{\vec{\nabla}^2 \vec{E}_g + k^2 \vec{E}g=0}$$

The first difference causes that if we observe two waves with the same frequency, the electromagnetic wave has a wavelength twice longer than the gravitomagnetic wave, therefore the wave number k should be defined as $\boxed{k=\frac{\pi}{\lambda}}$
Due to the spacetime topology gravitational waves can not move freely, but must conform to very strict boundary conditions. The most similar physical phenomenon is found in the transmission of electromagnetic waves through an elliptical wave guide, although in this case the confinement is due to the curvature of space and not to a metallic wall.

The six dimensional wave equation would be $(\nabla^2_{6D}+k^2)\cdot H=0$ .The Laplacian in elliptic-cylindrical coordinates is separable and is equal to $H(\xi,\eta,x,y,z)=D(\xi,\eta)\cdot F(x,y,z)$ and as is usual in the waveguide calculations we can decompose the wave number on 2 : $k^2=\beta^2+k_c^2$ where β is the "propagation constant" and k_c is the "cutoff wavenumber" and it represents the wavenumber at which a mode ceases to propagate through the guide.

$$\left.\begin{array}{l} \boxed{\dfrac{\nabla^2_{\xi,\eta} D(\xi,\eta)}{D(\xi,\eta)}+k_c^2=0} \\[2em] \boxed{\dfrac{\nabla^2_{3D} F(x,y,z)}{F(x,y,z)}+\beta^2=0} \end{array}\right\}$$

The first equation represents the problem in the compacted dimensions, while the second represent the problem in the extended dimensions. In [1] a solution to the first equation was developed and identified with the electron.

3. Solutions to the wave equation in the compacted dimensions.

In order to solve the equation $\frac{\nabla^2_{\xi,\eta} D(\xi,\eta)}{D(\xi,\eta)} + k_c^2 = 0$ is postulated that k_c is imaginary and equal to $k_c = \frac{m_0 c}{\hbar} i$.

The solution for the plane of the compacted dimensions is a stationary wave which is expressed through ½ order Mathieu functions and parameter $q = \frac{k_c^2 f^2}{4}$ where f is the focus of the ellipse formed by the compacted dimensions. Since the wavenumber is imaginary the parameter q is negative.

If we decompose D $D(\xi,\eta) = G(\xi) \cdot N(\eta)$ then solutions are known:

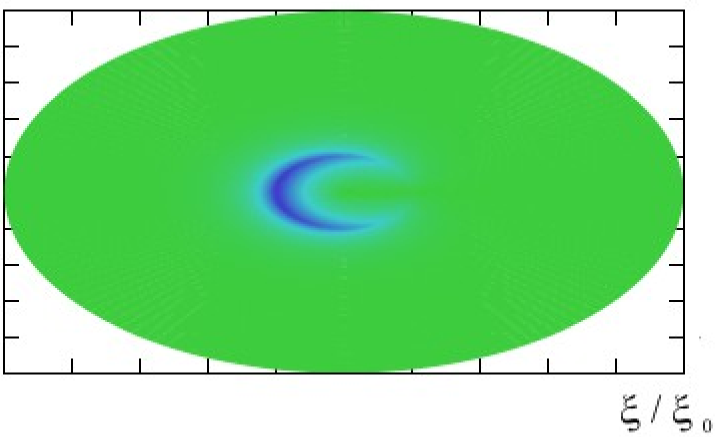
The angular solution N is expressed as the absolute value of the odd angular ½ order Mathieu function (also known as elliptical sine). The periodicity of this function is 4π, but how we choose the absolute value its periodicity is reduced to 2π.

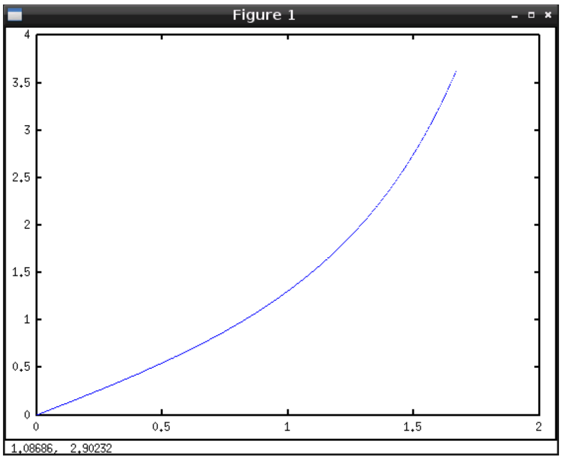
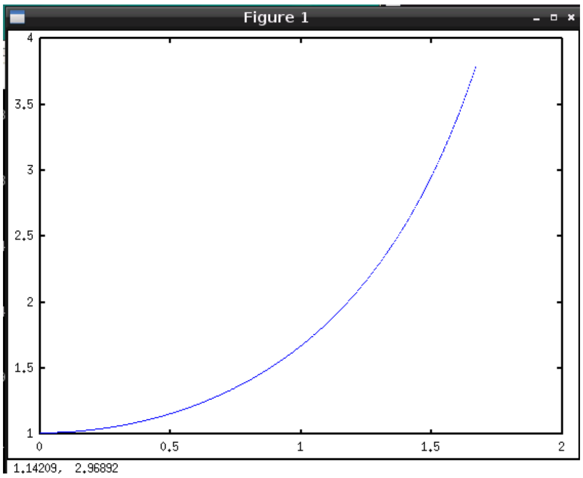
$$N(\eta) = \left| se_{\frac{1}{2}}(\eta, -q) \right|$$

Since q is negative radial solutions must be composed of linear combinations of radial evanescent Mathieu functions. These functions can be odd or even, and of first or second type.

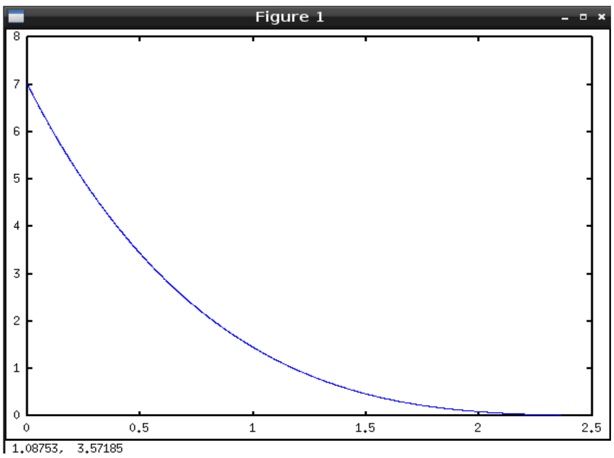
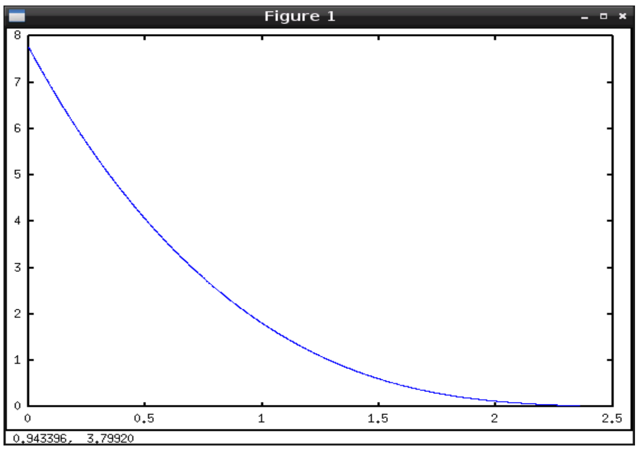
The computation of the Mathieu functions has been made numerically by a number of products of Bessel functions (McLachlan. Theory and applications of Mathieu functions). The algorithms have been implemented in Javascript and because of the high value of q a logarithmic number system is used in order to handle larger numbers than the 32-bit floating point system allows. Computer routines are available on request in the email of the first page.

On the next page are presented graphically the possible forms of these solutions.



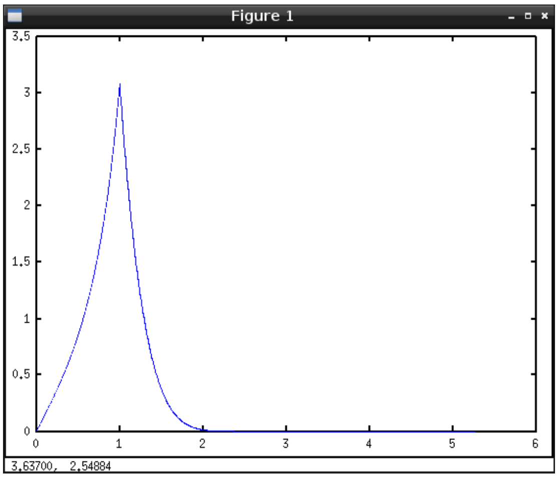
SOLUTIONS TYPE I	
Odd function first type order 1/2 $I_{o1/2}(2k_c\xi,-q)$	Even function first type order 1/2 $I_{e1/2}(2k_c\xi,-q)$
	

Notice that Ie (0,-q) is nonzero.

SOLUTIONS TYPE II	
Odd function second type order 1/2 $K_{o1/2}(2k_c\xi,-q)$	Even function second type order 1/2 $K_{e1/2}(2k_c\xi,-q)$
	

Apart from the above solutions it is possible to combine both in the coordinate $\xi_0 = \dfrac{\bar{h}}{2 m_0 c}$ in order to obtain the

SOLUTIONS TYPE III



If $0 < \xi < \xi_0$

$$G(\xi) = I_{o1/2}(2 k_c \xi, -q) = I_{o1/2}\left(\frac{\xi}{\xi_0}, -q\right)$$

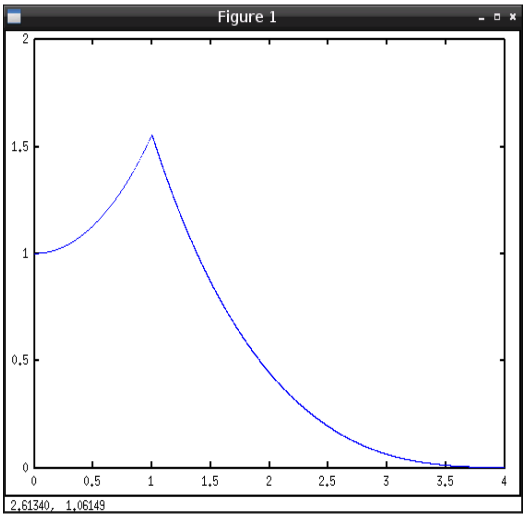
order ½ first type radial evanescent Mathieu function

If $\xi > \xi_0$

$$G(\xi) = K_{o1/2}(2 k_c \xi, -q) = K_{o1/2}\left(\frac{\xi}{\xi_0}, -q\right)$$

order ½ second type radial evanescent Mathieu function

ODD SOLUTION



If $0 < \xi < \xi_0$ $\quad G(\xi) = I_{e1/2}(2 k_c \xi, -q) = I_{e1/2}\left(\frac{\xi}{\xi_0}, -q\right)$

order ½ first type radial evanescent Mathieu function

If $\xi > \xi_0$

$$G(\xi) = K_{e1/2}(2 k_c \xi, -q) = K_{e1/2}\left(\frac{\xi}{\xi_0}, -q\right)$$

order ½ second type radial evanescent Mathieu function

EVEN SOLUTION

Since there are no walls but confinement of the wave is produced by the curvature of compacted dimensions the boundary condition is that the center of gravity of the square wave function must be in the coordinate $\xi_0 = \dfrac{\bar{h}}{2 m_0 c}$ in order to meet one of the fundamental postulates of the hypothesis. This implies that the product $2 k_c \xi_0$ would be equal to unity. The values that satisfy this condition are:

Tipo	**q**
Io	-0,0586
Ie	-0,0785
IoKo	-252,5
IoKo	-435
IoKo	-4,35 10 ^{9}

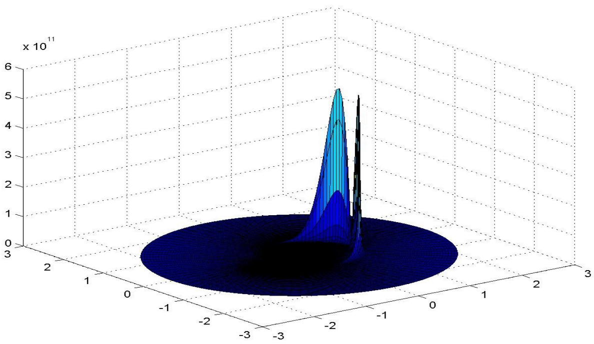


Illustration 1: Example of solution type IoKo for the compacted dimensions.

4. Stable Solutions. Neutrinos, electrons and partons.

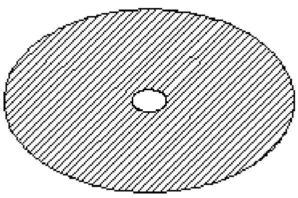
The tentative value for q in the electron case can be achieved using a tentative universe radius of $r_u=\sqrt{\frac{G}{2\pi}}=3{,}25\,10^{-6}$ [1], a semiaxes ratio of 1,10576/0,8883 and a wavenumber equal to $k_c=\frac{mc}{\hbar}=2{,}5896\,10^{12}$:

$q\approx\frac{k_c^2 f^2}{4}=\frac{(2{,}5892\,10^{12} i)^2\left[\sqrt{1{,}10576^2-0{,}8883^2}\cdot 3\,10^{-6}\right]^2}{4}=-5{,}8335\,10^{12}$ .If we assign the largest solution to the electron we can determine the masses of the remaining particles:

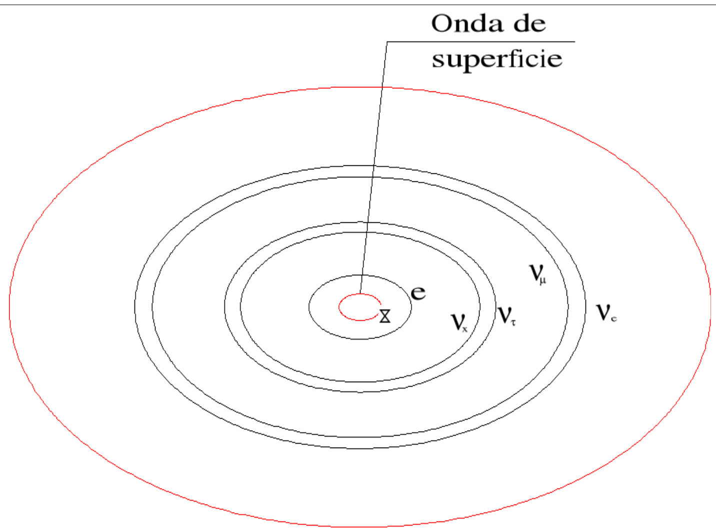
Particle	Type	q	m/me	estimated m
υ_e	Io	-0,0586	$3{,}67\ 10^{-6}$	18,75 eV
υ_μ	Ie	-0,0785	$4{,}24\ 10^{-6}$	21,66 eV
υ_τ	IoKo	-252,5	$2{,}41\ 10^{-4}$	1231,50 eV
υ_x?	IoKo	-435	$3{,}18\ 10^{-4}$	1624,97 eV
$e^{+,-}$	IoKo	$-4{,}35\ \ 10^{9}$	1	0,5109989 MeV

You can easily verify that these solutions justify the existence of the three known neutrinos, one more failing to confirm and electrons, however the existence of hadrons can not be justified. Therefore lacks a particle.

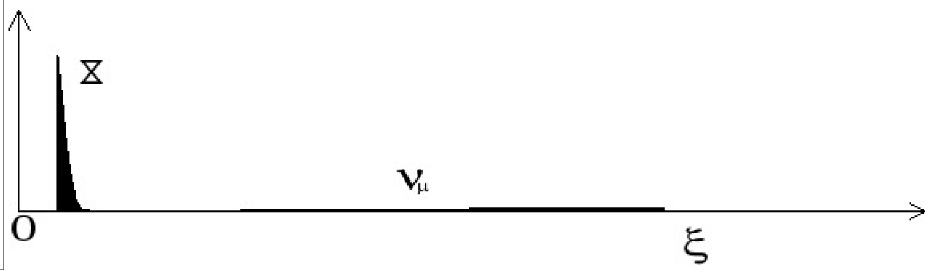
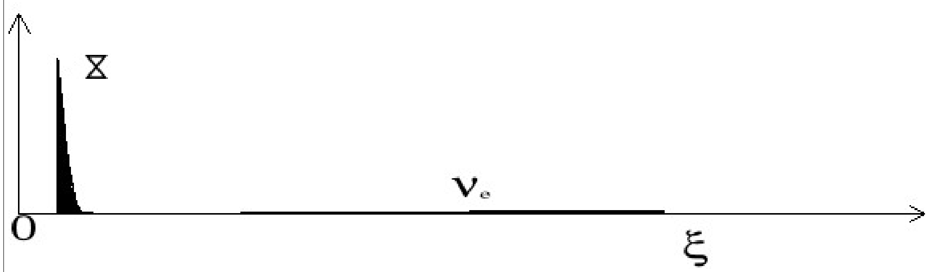
In order to allow the existence of hadrons is postulated that the universe has a central hole, so that the solutions of type II can exist as surface waves on the inner limit of the universe.



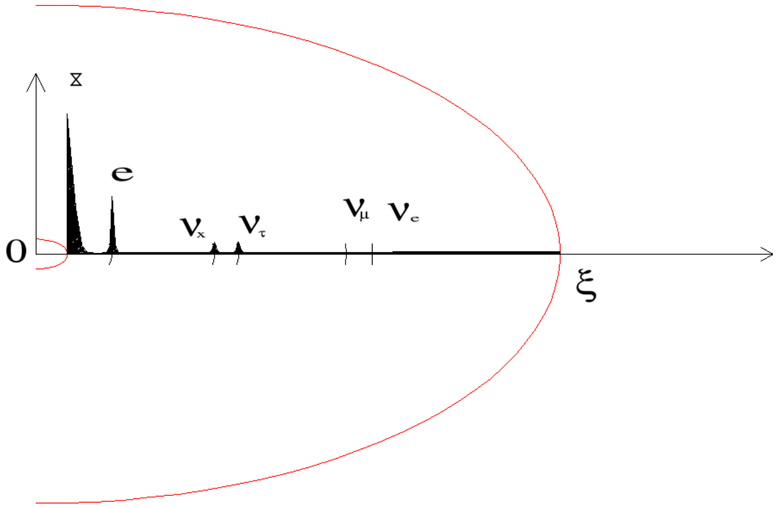
Appearance of the compacted dimensions. Note that this orbits are not real, but the ray approximation.



By themselves, type II solutions can not satisfy the boundary condition (the center of gravity of the square of the wave function must be in the coordinate $\xi_0 = \frac{\bar{h}}{2 m_0 c}$) and so they must appear in linear combination with some of the stable solutions.

SOLUTIONS TYPE IV. GLUTINOS ⧖	
⧖$_a$	
⧖$_b$	
⧖$_c$	
⧖$_d$	
⧖$_e$	

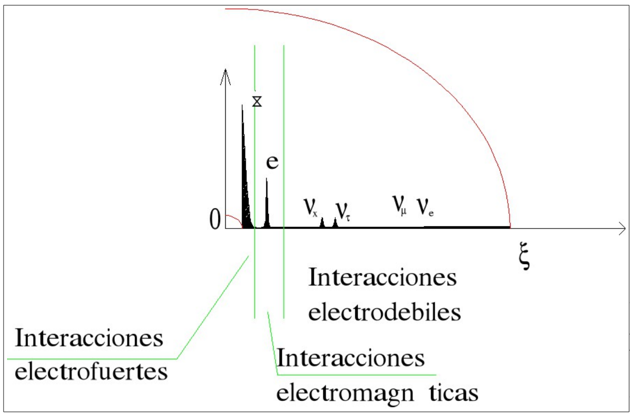
We have assigned Iberian alphabet letter ⧖ to surface waves type II, pronounced as ko, and the name parton. Since the mass of a linear combination should be placed between the mass of the constituent waves and due to the large mass difference between electrons and neutrinos it seems evident that partons can be classified in heavy partons ⧖$_a$ and light partons (⧖$_{b \to e}$).
Therefore, all particles should be obtained by linear combination of any of these solutions.



The wave coupling phenomenon helps explain the oscillation between neutrinos and even between different types of partons.

5. Interactions.

In a previous paper (Mechanisms of Interaction Between Gravitational Waves.) it was showed that standing waves that form the particles modify the propagation medium (spacetime) through three non-linear mechanisms: by changing the refractive index, deforming and dragging on propagation medium. No other interaction is possible. The first two mechanisms occur in the extended dimensions and would produce the force of gravity, while the latter mechanism occur in the compacted dimensions and would produce force between parallel streams of mass and therefore electrostrong, electromagnetic and electroweak forces.



Due to the shape of the radial wave functions it is easy to see that electronic and muon neutrinos interact weakly with the other pulsations, while partons, the other neutrinos and electrons interact only with themselves or with any linear combination containing them.

The relative intensity of these interactions can also be clearly observed.

Is important to stress that as partons can not exist separately, their different combinations will have one or more of the possible interactions.

For example ⧖$_a$ parton will be affected by gravity (changes the refractive index and deforms propagation medium) and by electromagnetic and electrostrong forces. This parton will interact weakly with electronic and muon neutrinos, since it drags the propagation medium not in the whole area of the compacted dimensions, but only in part of these. For the same reason this parton will not interact with the other two remaining neutrinos, except by gravity.

Analogously ⧖$_c$ parton will be affected by gravity (changes the refractive index and deforms propagation medium) and by electroweaks and electrostrong forces, but not by electromagnetic forces. This parton will interact weakly with electronic, muon and tau neutrinos.

In [1] it was determined that the ratio between the charge and the square of mass is constant and therefore we can determine the relative strength of interactions. $\frac{q_{glutino}}{m^2_{glutino}} = \frac{e}{m^2_e} = \frac{q_{\nu_x}}{m^2_{\nu_x}} = \frac{q_{\nu_\tau}}{m^2_{\nu_\tau}} = \frac{q_{\nu_\mu}}{m^2_{\nu_\mu}} = \frac{q_{\nu_e}}{m^2_{\nu_e}}$

We should speak of electroweak coulombs, electric coulombs or electrostrong coulombs.

Because of considerations that will be developed below in this paper is assigned a mass of 11.87 MeV/c^2 for light partons and 12.91 MeV/ c^2 for heavy partons.

Particle-pulsation	mass	Type of de interaction	Charge (In equivalent coulombs)	Equivalent fine-structure constant α'
υ_e	18,75 eV	ELECTROWEAK	2,157 10^{-28}	1,322 10^{-20}
υ_μ	21,66 eV	ELECTROWEAK	2,878 10^{-28}	2,354 10^{-20}
υ_τ	1231,50 eV	ELECTROWEAK	9,304 10^{-25}	2,46 10^{-13}
υ_x?	1624,97 eV	ELECTROWEAK	1,62 10^{-24}	7,459 10^{-13}
$e^{+,-}$	0,511MeV	ELECTROMAGNETIC	1,602 10^{-19}	1/137= 0,00729
⧖$^0{}_{light}$	11,87 MeV	ELECTROSTRONG	8,644 10^{-17}	2123,89
⧖$^{+,-}{}_{heavy}$	12,91 MeV	ELECTROSTRONG	1,022 10^{-16}	2971,909

6. Composite particles. Hadrons.

Since partons have very large electrostrong charges they may be able to form structures similar to the atoms, , but united by electrostrong charges instead of electrical charges. The relativistic gravitational wave equation for a potential that decreases with the inverse of the radius gave us the following energy levels:[1]

$$E=-mc^2\left[1\pm\sqrt{\frac{\alpha'^2}{n'^2+\alpha'^2}}\right]$$

with $\alpha'=\frac{q_1 q_2}{\hbar c 4\pi\varepsilon_0}$, m → reduced mass, $n'=n-\delta(l)$, $\delta(l)=l-l'$, and l= positive integer, and l' the solution to the following equation $l'^2+l'-\alpha'^2-l(l+1)=0$.

If l=0 (spheric orbitals) then $l'=\frac{-1\pm\sqrt{1+4\alpha'^2}}{2}$

As for partons α '>>>> 1 we can make the following approximation:

$l'\approx\frac{-1\pm 2\alpha'^2}{2}\approx\alpha'^2$, which gives us the following possible values for energy :

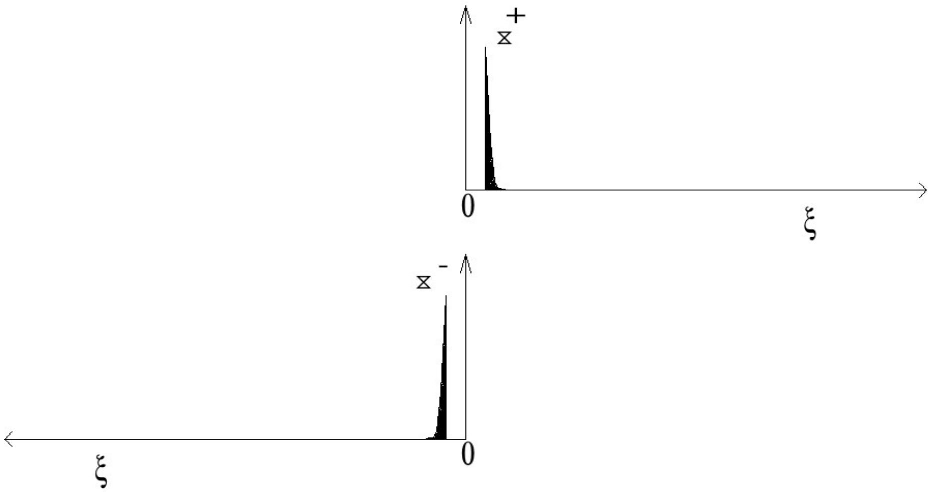
$$E=-mc^2\left[1\pm\sqrt{\frac{\alpha'^2}{\alpha'^2+\alpha'^2}}\right]=-mc^2\left[1\pm\sqrt{\frac{1}{2}}\right]$$, thus being:

$$E_{BINDING}=-0{,}2928\,mc^2 \quad \text{or} \quad E_{BINDING}=-1{,}7072\,mc^2$$

The first solution corresponded to the electronic orbitals, but if we observe the neutron decay the first solution would provide us a mass increment equal to $\Delta M=m(e)(1+0{,}2928)=0{,}66\,MeV$ and the second solution would provide us a mass increment equal to $\Delta M=m(e)(1+1{,}7072)=1{,}38\,MeV$,as experimental mass increment is 1.2933 MeV the second solution is chosen.

The above formula justifies a **linear masses system**. Already in 1952 Nambu had proposed that the masses of hadrons were quantized with a quantum of about 70 MeV, actually 35 MeV corresponding the even multiples with the baryons, while mesons are odd multiples.

POSITRONIUM type (MESONS) 2 equal waves Spin 0 (Notice that + and – are related to electrostrong charges.)



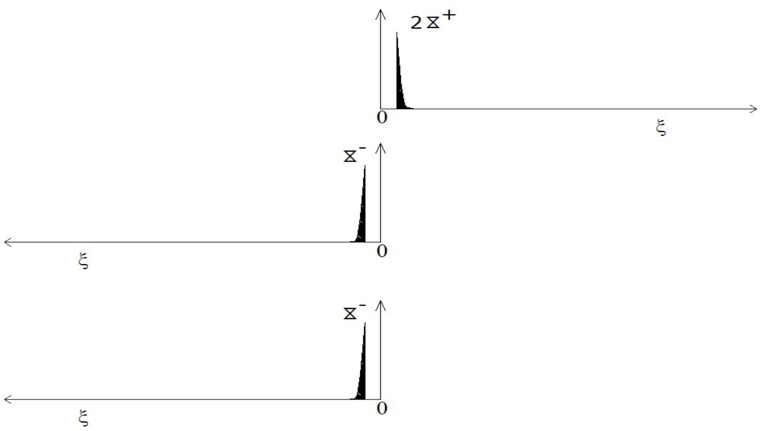
the reduced mass is equal to $m'=\frac{m^2}{2m}=\frac{m}{2}$ and therefore the binding energy is equal to

$E_{BINDING}=1{,}7072\,m'=1{,}7072\frac{m}{2}=0{,}8536m$ The total mass will be then $M=2m+0{,}8536\,m=2{,}8536m$.

From which we can approximate the mass of parton $m_{glutino}\approx\frac{35}{2{,}8536}=12{,}27\,MeV/c^2$

HELIUM Type. (BARYONS)3 waves spin ½

A.1 Number of partons divisible by 4.



The reduced mass is equal to $m' = \frac{2m \cdot m}{2m+m} = \frac{2}{3}m$ and therefore the attraction energy will be

$E_{Attraction} = 1{,}7073 \frac{2}{3} m$.

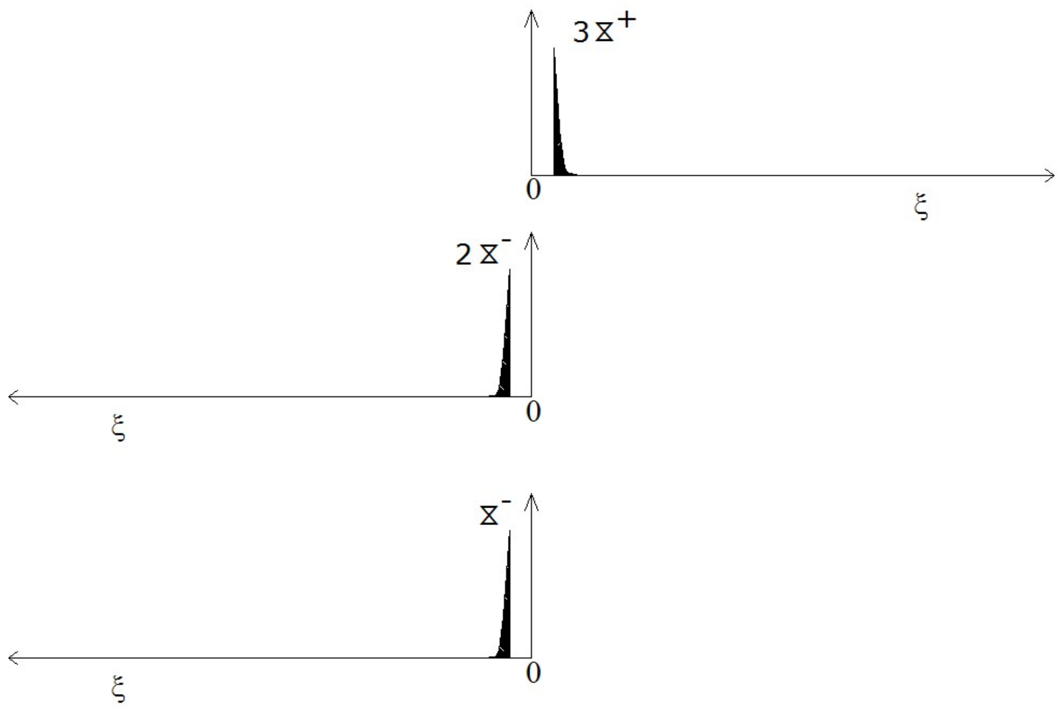
However the binding energy is reduced due to the repulsion between partons having the same electrostrong charge. This repulsion can be estimated as the equivalent mass of the two lightest partons multiplied by 1.7072, but considering that they are also fixed to the highest mass parton. That is, we will take as a basis the already reduced masses.

REPULSION= $1{,}7073 \cdot \left[\frac{2/3\, m \cdot 2/3\, m}{(2/3\, m + 2/3\, m)} \right] = 1{,}7073 \frac{m}{3}$

Therefore the binding energy will be: $E_{binding} = 2 \cdot ATTRACTION - REPULSION = 1{,}7073 \left(\frac{4}{3} m - \frac{1}{3} m \right) = 1{,}7073\, m$

That is, as in the positron type. Since the positron type is more symmetrical and simple (two waves against three) helio type should be heavily penalized. **This explains why the odd multiples of 35 MeV are preferably mesons.**

A.2 Number of partons not divisible by 4, but odds.



By following the same method of calculation:

$m'_1 = \frac{3m \cdot 2m}{3m + 2m} = \frac{6}{5} m$; $m'_2 = \frac{3m \cdot m}{3m + m} = \frac{3}{4} m$; Repulsión $m'_3 = \frac{6/5\, m \cdot 3/4\, m}{6/5\, m + 3/4\, m} = 0{,}46153\, m$

Therefore the total mass would be: $M = 3m + 2m + m + 1{,}7072 [6/5\, m + 3/4\, m - 0{,}46453\, m] = 8{,}5411\, m$

If a meson $M = 3m + 3m + 1{,}7072\,m/2 = 8{,}5608\,m$

The baryonic solutions is now lighest and thus prevails. **This explains why the even multiples of 35 MeV are preferably baryons.**

The lightest baryon would have a mass equal to $m_\mu = 8{,}5411 \cdot 12{,}27 = 104{,}79\,MeV$

This estimation is a 0,82 % lightest than muon experimental mass $m_\mu = 105{,}65\,MeV$

Previously we had postulated the existence of heavy and light partons, but there weren't any reference to the existence of a multilinear mass system for subatomic particles.

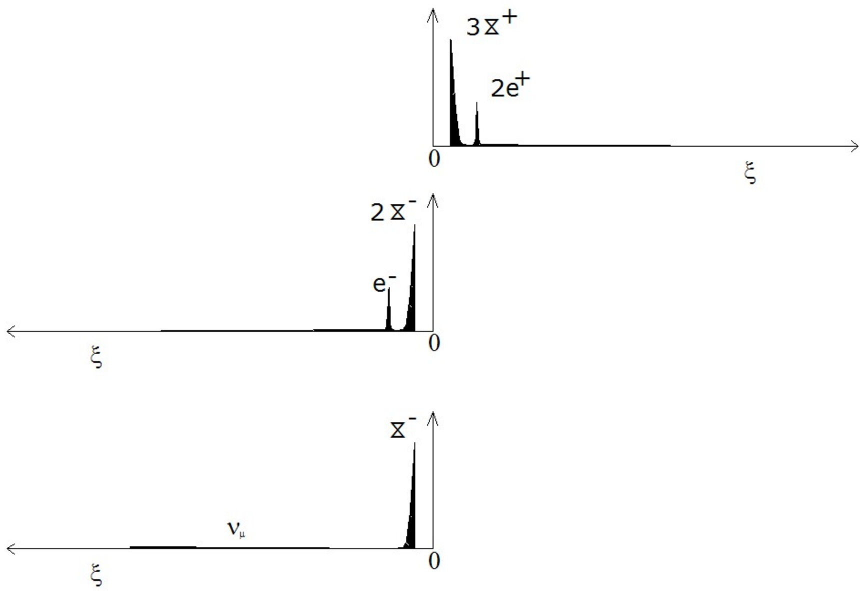
Due to the great job of Dr Palazzi it has been possible to overcome this difficulty. His articles have not received the deserved attention, but are fortunately available on his website www.particlez.org. Palazzi by applying appropriate statistical techniques is able to systematize the masses of virtually all mesons and baryons by a linear system based on two particles, an uncharged light particle (33.88 MeV/c^2) that we can identify with light partons and another slightly heavier electrically charged (36.84 MeV/c^2) that we can assimilate to the heavy parton.

Now we can know partons masses

$$m_{ligth\,glutine} \approx \frac{33{,}88}{2{,}8536} = 11{,}87\,MeV/c^2 \qquad m_{heavy\,glutine} \approx \frac{36{,}84}{2{,}8536} = 12{,}91\,MeV/c^2$$

We try to apply the above-mentioned to some of the simplest particles. In baryons the lowest electrostrong repulsion energy is achieved when distance between them is maximized, therefore the two smaller waves have to be as most unequal as possible. Electric charge will accumulate in the 2 inner waves because of electromagnetic charges of different signs tend to be as close as possible.

PROPOSAL FOR MUÓN



11,87+2*12,91=37,69 MeV

11,87 +12,91=24,78 MeV

11,87 MeV

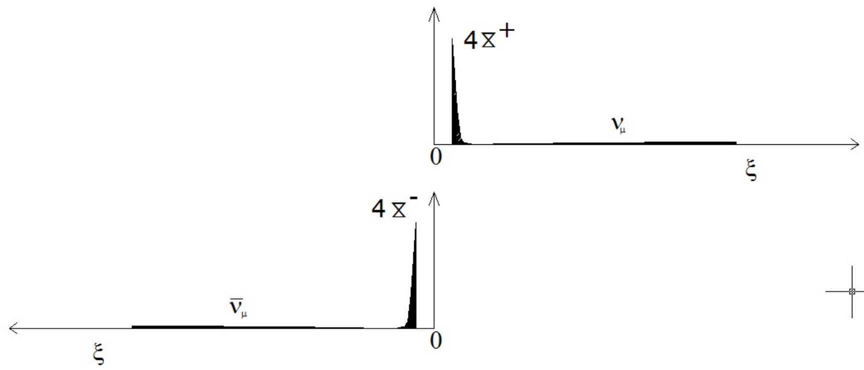
$$m'_1 = \frac{37{,}69 \cdot 24{,}78}{37{,}69 + 24{,}78} = 14{,}95\,MeV \qquad m'_2 = \frac{37{,}69 \cdot 11{,}87}{37{,}69 + 11{,}87} = 9{,}027\,MeV \qquad m'_{rep} = \frac{-14{,}95 \cdot 9{,}027}{14{,}95 + 9{,}027} = -5{,}6285\,MeV$$

Therefore:

$$m_{\mu}=37{,}69+24{,}78+11{,}87+1{,}7072\cdot(14{,}95+9{,}027-5{,}6285)=105{,}6641\,MeV$$

As the experimental mass of the muon is $m_{\mu}=105{,}6583\,MeV$ the error decreases to 0,006%.

PROPOSAL FOR π^0



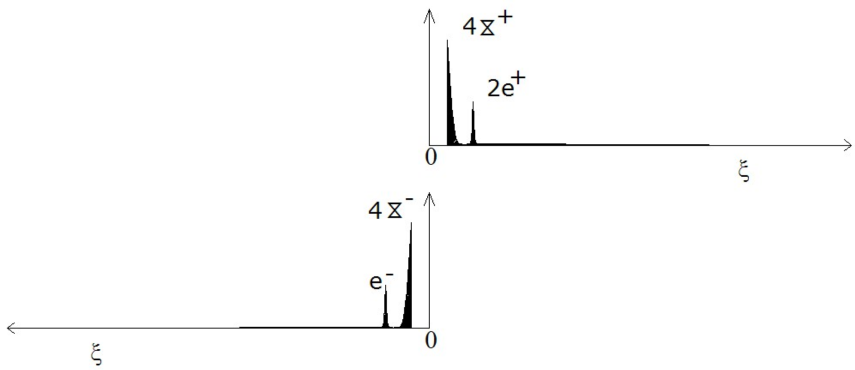
4*11,87=47,48 MeV

4*11,87=47,48 MeV

$$m'_1=\frac{47{,}48\cdot 47{,}48}{47{,}48+47{,}48}=23{,}74\,MeV \qquad m_{\pi^0}=47{,}48+47{,}48+1{,}7078\cdot 23{,}74=135{,}49\,MeV$$

As the experimental mass is: $m_{\pi^0}=135{,}0\,MeV$ the error is equal to 0,35%.

PROPOSAL FOR π^+



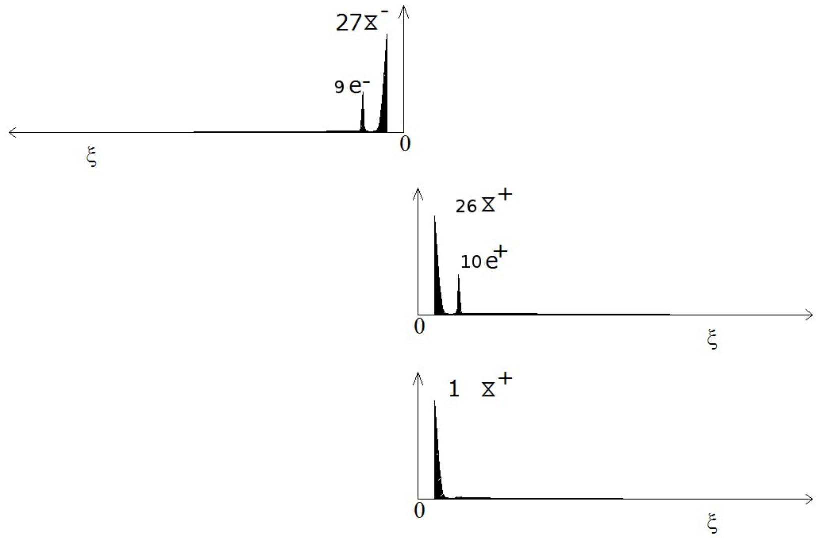
2*11,87+2*12,91=49,56 MeV

3*11,87+12,91= 48,52 MeV

$$m'_1=\frac{49{,}56\cdot 48{,}52}{49{,}56+48{,}52}=24{,}5172\,MeV \rightarrow m_{\pi^0}=49{,}56+48{,}52+1{,}7078\cdot 24{,}5172=139{,}93\,MeV$$

As the experimental mass is $m_{\pi}=139{,}57\,MeV$ the error is equal to 0,26%.

PROPOSAL FOR PROTON



329,85 MeV

319,02 MeV

11,87 MeV

$$m'_1=\frac{329{,}85\cdot 319{,}02}{329{,}85+319{,}02}=162{,}17\,MeV \qquad m'_2=\frac{329{,}85\cdot 11{,}87}{329{,}85+11{,}87}=11{,}46\,MeV$$

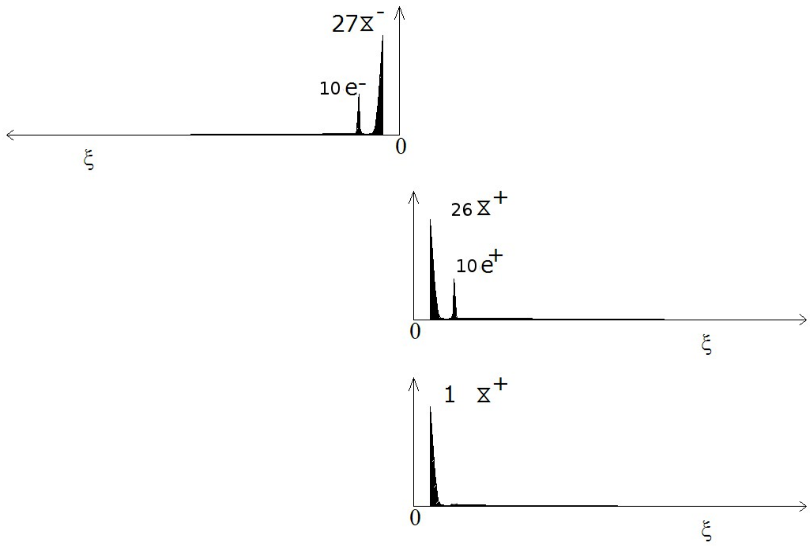
$$m'_{rep}=\frac{-162{,}17\cdot 11{,}46}{162{,}17+11{,}46}=-10{,}70\,MeV$$

Therefore:

$$m_{PROTON}=329{,}85+319{,}02+11{,}87-1{,}7072\cdot(162{,}17+11{,}46-10{,}70)=938{,}88\,MeV$$

As the experimental mass of the proton is: $m_{PROTON}=938{,}272\,MeV$ the error is equal to 0,07%.

PROPOSAL FOR NEUTRON



330,89 MeV

319,02 MeV

11,87 MeV

$$m'_1=\frac{330{,}89\cdot 319{,}02}{330{,}89+319{,}02}=162{,}42\,MeV \qquad m'_2=\frac{330{,}89\cdot 11{,}87}{330{,}89+11{,}87}=11{,}46\,MeV$$

$$m'_{rep}=\frac{-162{,}42\cdot 11{,}46}{162{,}42+11{,}46}=-10{,}70\,MeV$$

Therefore: $m_{NEUTRÓN}=330{,}89+319{,}02+11{,}87+1{,}7072\cdot(162{,}42+11{,}46-10{,}70)=940{,}35\,MeV$

As the experimental mass of the neutron is: $m_{NEUTRÓN}=939{,}56\,MeV$ the error is equal to 0,08%.

Of course there are another possibilities for proton, for example (27,+10;26,-9 ;1,0) instead of (27,-9;26,+10; 1,0) with a mass of 938,84 MeV and for neutron, for example (27,+10; 26,-10;1,0) instead of (27,-10 ;26,+10 ;1,0) with equal mass. In fact, as the two parton masses are of about 11-12 MeV we always can find a combination that agrees with the experimental mass of any particle, especially in great masses case. And in baryons case we have used a classical approximation to obtain repulsion energy, so it is inexact. Therefore we need another particle property in order to obtain the parton's structure of mesons and baryons. This property is the intrinsic magnetic moment.

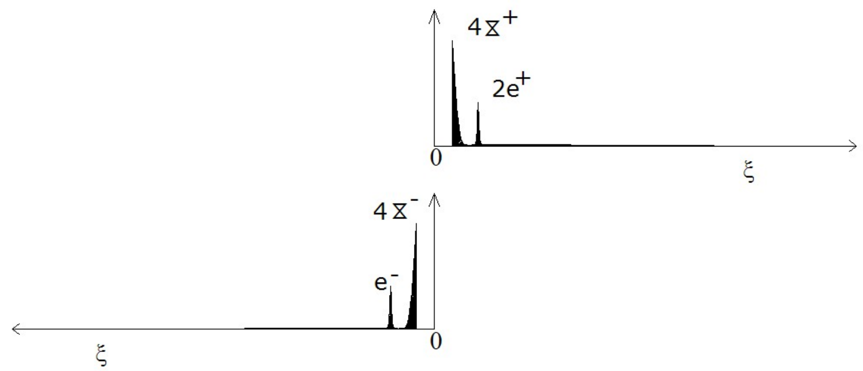
7. Magnetic moment.

It is possible to approximate the magnetic moment of a hadron by just sum the magnetics moment of every wave that conforms the hadrons. First we are going to try meson's case because it's simpler than baryon case.

7.1 π^0 CASE

Both waves are equal, so magnetic moment is equal to zero.

π^+ CASE



2*11,87+2*12,91=49,56 MeV

3*11,87+12,91= 48,52 MeV

$$m'_1=\frac{49{,}56\cdot 48{,}52}{49{,}56+48{,}52}=24{,}5172\,MeV \quad\rightarrow\quad m_{\pi^0}=49{,}56+48{,}52+1{,}7078\cdot 24{,}5172=139{,}93\,MeV$$

We can assign the binding energy in a proportional way, so we have two waves with this properties:

Wave 1: Mass 70.7172 MeV Charge 2e+

Wave 2: Mass 69.2127 MeV Charge e-

The magnetic moment will be :

$$\mu_1=\frac{2e\cdot\bar{h}}{2m_1}=\frac{2\cdot 1.602\,10^{-19}\cdot 1.054\,10^{-34}}{2\cdot 70.7172\cdot 1.78\,10^{-30}}=1.4743\,10^{-25} \qquad \mu_2=\frac{e\cdot\bar{h}}{2m_1}=\frac{1.602\,10^{-19}\cdot 1.054\,10^{-34}}{2\cdot 69.2127\cdot 1.78\,10^{-30}}=-7.5296\,10^{-26}$$

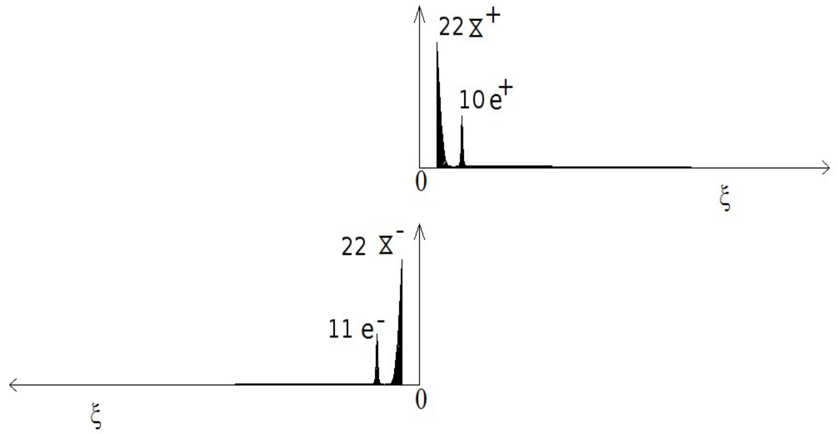
$\mu=\mu_1+\mu_2=1.4743\,10^{-25}-7.5296\,10^{-26}=7.21\,10^{-26}$ in SI units.

Since in the standard model a 0 spin particle can not have an intrinsic magnetic moment this could be a good test for “Matter as gravitational waves”. However, a more complex model with 4 unequal waves allow a zero magnetic moment.

7.2 ρ^+ CASE

According with Palazzi's multilinear system rho mesons are composed of an equal number of charged partons and uncharged partons, so it should be:

11*11,87+11*12,91=272,58 MeV



12*11,87+10*12,91= 271,54 MeV

$$m'_1=\frac{272{,}58\cdot 271{,}54}{272{,}58+271{,}54}=136{,}03\,MeV \quad\rightarrow\quad m_\rho=272{,}58+271{,}54+1{,}7078\cdot 136{,}03=776{,}34\,MeV$$

We can assign the binding energy in a proportional way, so we have two waves with this properties:

Wave 1: Mass 389,18 MeV Charge 11e-

Wave 2: Mass 387,16 MeV Charge 10e+

The magnetic moment will be:

$$\mu_1=\frac{11\,e\cdot\bar{h}}{2\,m_1}=\frac{2\cdot 1.602\,10^{-19}\cdot 1.054\,10^{-34}}{2\cdot 389{,}18\cdot 1.78\,10^{-30}}=-1.474\,10^{-25}$$

$$\mu_2=\frac{10\,e\cdot\bar{h}}{2\,m_2}=\frac{1.602\,10^{-19}\cdot 1.054\,10^{-34}}{2\cdot 387{,}16\cdot 1.78\,10^{-30}}=1{,}345610^{-25}$$

$$\mu_\rho=\mu_1+\mu_2=1{,}3453\,10^{-25}-1{,}474\,10^{-25}=-1{,}28\,10^{-26}$$ in SI units.

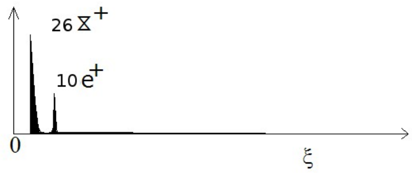
In [9] Garcia Gudiño and Toledo Sanchez obtain an experimental value of -1,29 10^{-26} in SI units.

At least in vectors meson “MASGW” obtain acceptable values.

Now, let's try baryons case.

7.3 PROTON CASE

329,85 MeV



319,02 MeV

11,87 MeV

$$m'_1 = \frac{329{,}85 \cdot 319{,}02}{329{,}85 + 319{,}02} = 162{,}17\, MeV \qquad m'_2 = \frac{329{,}85 \cdot 11{,}87}{329{,}85 + 11{,}87} = 11{,}46\, MeV$$

$$m'_{rep} = \frac{-162{,}17 \cdot 11{,}46}{162{,}17 + 11{,}46} = -10{,}70\, MeV$$

Therefore:

$$m_{PROTON} = 329{,}85 + 319{,}02 + 11{,}87 - 1{,}7072 \cdot (162{,}17 + 11{,}46 - 10{,}70) = 938{,}88\, MeV$$

We can assign the binding energy in a proportional way, so we have three waves with this properties:

Wave 1: Mass 427,57 MeV Charge 9e-

Wave 2: Mass 413,53 MeV Charge 10e+

Wave 3: Mass 15,39 MeV Charge 0 e.

The magnetic moment will be:

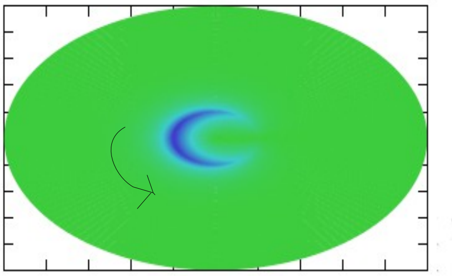
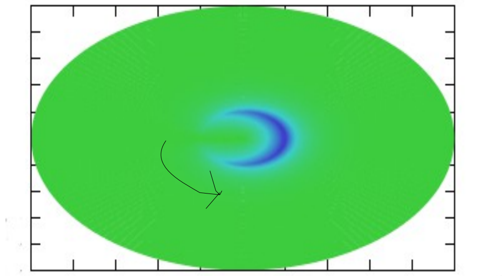
$$\mu_1 = \frac{9\, e \cdot \bar{h}}{2\, m_1} = \frac{9 \cdot 1.602\, 10^{-19} \cdot 1.054\, 10^{-34}}{2 \cdot 42.{,}57 \cdot 1.78\, 10^{-30}} = -9.989\, 10^{-26}$$

$$\mu_2 = \frac{10\, e \cdot \bar{h}}{2\, m_2} = \frac{10 \cdot 1.602\, 10^{-19} \cdot 1.054\, 10^{-34}}{2 \cdot 413.53 \cdot 1.78\, 10^{-30}} = 1.1476^{-25}$$

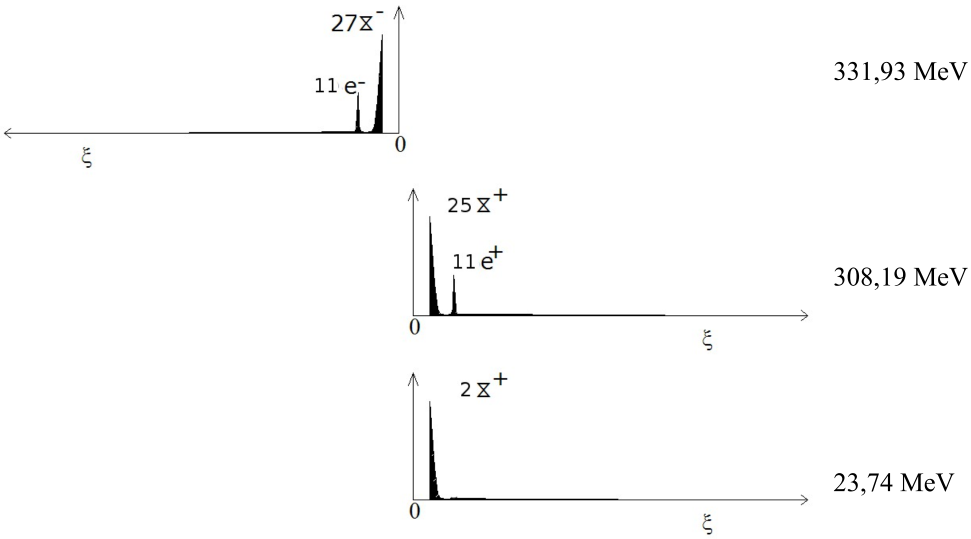
$\mu_\rho = \mu_1 + \mu_2 = -9.989\, 10^{-26} + 1.1476\, 10^{-25} = 1.49\, 10^{-26}$ in SI units. The experimental value is $1.41\ 10^{-26}$

7.4 NEUTRON CASE.

If we use the combination proposed in 6 for the neutron then we obtain a positive magnetic moment. This is not a problem, because in “matter as gravitational waves” spin is not a direction of rotation but is a phase difference. In fact and because of particles can have only two possible values of the magnetic moment (positive and negative) the sign does not matter. But in this case the total value is about a half of the experimental value.

 Compacted dimensions. Wave spin +1/2	 Compacted dimensions. Wave spin -1/2

However it is possible to find a combination that agrees with experimental mass and magnetic moment.



$$m'_1 = \frac{331.93 \cdot 308.19}{331.93 + 308.19} = 159.81\, MeV \qquad m'_2 = \frac{331.93 \cdot 23.74}{331.93 + 23.74} = 22.16\, MeV$$

$$m'_{rep} = \frac{-159.81 \cdot 22.16}{159.81 + 22.16} = -19.46\, MeV$$

Therefore: $m_{NEUTRÓN} = 331.93 + 308.19 + 22.16 + 1.7072 \cdot (159.81 + 22.16 - 19.46) = 941.28\, MeV$

We can assign the binding energy in a proportional way, so we have three waves with this properties:

Wave 1: Mass 429.76 MeV Charge 11e+

Wave 2: Mass 399.02 MeV Charge 11e-

Wave 3: Mass 30.74 MeV Charge 0 e.

The magnetic moment will be:

$$\mu_1=\frac{-11\, e\cdot\bar{h}}{2m_1}=\frac{11\cdot 1.602\,10^{-19}\cdot 1.054\,10^{-34}}{2\cdot 429.76\cdot 1.78\,10^{-30}}=-1.2148\,10^{-25}$$

$$\mu_2=\frac{11\, e\cdot\bar{h}}{2m_2}=\frac{10\cdot 1.602\,10^{-19}\cdot 1.054\,10^{-34}}{2\cdot 399.02\cdot 1.78\,10^{-30}}=1.3084^{-25}$$

$$\mu_\rho=\mu_1+\mu_2=-1.2148\,10^{-25}+1.3084\,10^{-25}=9.36\,10^{-27}$$ in SI units. The experimental value is -9.6 10^{-27}

This kind of calculations could be done for every particle in order to obtain the parton's composition, since usually there are just one combination that agree both with mass and magnetic moment experimental values.

8. Hadrons structure. Orbitals and charge distribution.

As it was shown in [1] the form of s orbital remains unchanged in the relativistic case, since the angular equation remains unaltered. Therefore hadrons will be composed of spherical shells. (at least in the bound state). For the non-relativistic case the radius a_0 (Bohr radius) is calculated by the following formula:

$a_0=\frac{\bar{h}}{mc\alpha}$ operating $a_0=\frac{\bar{h}}{mc\alpha}=\frac{\bar{h}}{mc\alpha}\frac{c}{c}\frac{\alpha}{\alpha}\frac{2}{2}$ and considering that the energy of the orbital is $E_0=\frac{mc^2\alpha^2}{2}$

we can write $a_0=\frac{\bar{h}c\alpha}{2E_0}=\frac{\bar{h}c}{2E_0/\alpha}$

If we extrapolate this relationship to the relativistic case we can write:

$$\frac{E_0}{\alpha}=\frac{-mc^2}{\alpha}\left[1\pm\sqrt{\frac{\alpha'^2}{n'^2+\alpha'^2}}\right]=-mc^2\left[\frac{1}{\alpha}\pm\sqrt{\frac{1}{\frac{n'^2}{\alpha'^2}+1}}\right]$$

As in the case of electrostrong forces α'>>>>1 and n' → α' we have:

$\frac{E_0}{\alpha}=-mc^2\sqrt{\frac{1}{2}}$ and therefore:

$$a_0=\frac{\bar{h}c}{2\sqrt{\frac{1}{2}}mc^2}=\frac{\bar{h}c}{\sqrt{2}mc^2}$$

However we have to consider two conditions:

- Must be used reduced mass.

- The particle mass has increased by the binding energy $m=m_0+1{,}7072\,m_0=2{,}7072\,m_0$

Thus:

$a_0=\frac{\bar{h}c}{3{,}8285(m'c^2 MeV)\cdot 1{,}602\,10^{-13}J/MeV}$ For the case of the proton it would be:

$$a_0=\frac{\bar{h}\,c}{3.8285(162.17+11.46-10.70)\cdot 1.602\,10^{-13}}=3.1522\,10^{-16}=0.31522\,fm$$

$$a_1=\frac{\hbar\,c}{3.8285(162.17-10.7/2)\cdot 1.602\,10^{-13}}=3.275\,10^{-16}=0.3275\,fm$$

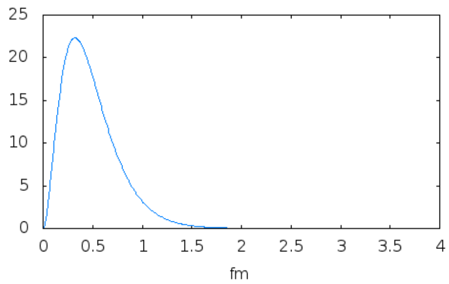
$$a_2=\frac{\hbar\,c}{3.8285(11.46-10.7/2)\cdot 1{,}602\,10^{-13}}=8.4099\,10^{-15}=8.4099\,fm$$

Now we have the wavefunction $\Psi_{1s}=\frac{1}{\sqrt{\pi}}\left(\frac{1}{a_0}\right)^{3/2}e^{-r/a_0}$,so we can plot probability density $4\pi r^2\Psi_{1s}^2=\frac{4\pi r^2}{\sqrt{\pi}}\left(\frac{1}{a_0}\right)^3 e^{-2r/a_0}$. We can normalize to a total area of 1, so we should plot $4r^2\left(\frac{1}{a_0}\right)^3 e^{-2r/a_0}$.

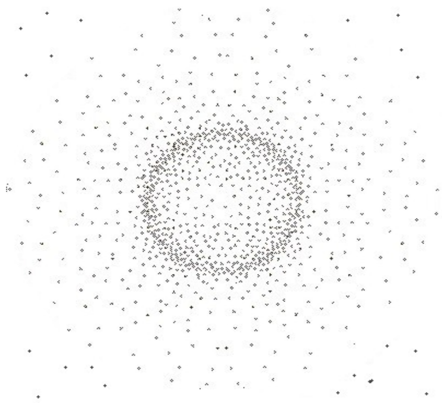
Now, we can plot the proton's three waves sum weighted according to their parton's masses.
Notice that the total area would be equal to 27 +26+1= 54. According to the hypothesis "matter as gravitational waves" this probability density is a **true density** (mass, charge, etc..) ,therefore we are able to study the internal structure of any hadron

.

$$\rho(r)_{mass}=4\left[27r^2\left(\frac{1}{0.31522}\right)^3 e^{-2r/0.31522}+26r^2\left(\frac{1}{0.3275}\right)^3 e^{-2r/0.3275}+1r^2\left(\frac{1}{8.4099}\right)^3 e^{-2r/8.4099}\right]$$



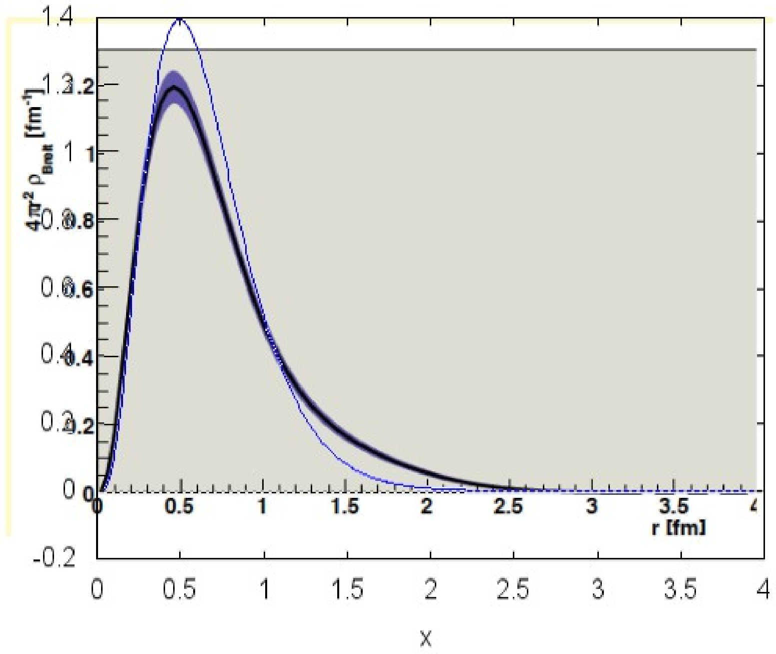
Radial mass distribution



Qualitative mass distribution (hollow sphere)

If we sum the 3 waves weighted according to their charges we can obtain the radial charge density of the proton.

$$\rho(r)_{charge}=4\left[-9r^2\left(\frac{1}{0.31522}\right)^3 e^{-2r/0.31522}+10r^2\left(\frac{1}{0.3275}\right)^3 e^{-2r/0.3275}\right]$$



We can plot and superimpose it to the positive charge distribution graph obtained in [4] .

If we notice that we are using a semiclassical approximation to obtain the binding energies the fit is very good.

For neutron case it would be:

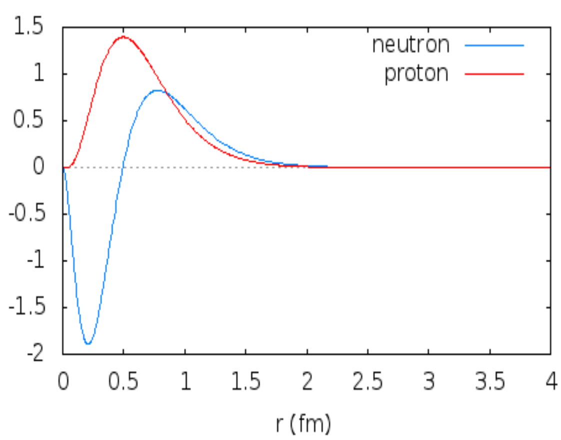
$a_0 = \frac{\bar{h}c}{3{,}8285(159.81+22.16-10.69)\cdot 1{,}602\,10^{-13}} = 3{,}1604\,10^{-16} = 0{,}31604\ fm$
$a_1 = \frac{\bar{h}c}{3{,}8285(159.81-22.16/2)\cdot 1{,}602\,10^{-13}} = 3.336\,10^{-16} = 0{,}3422\ fm$
$a_2 = \frac{\bar{h}c}{3{,}8285(22.16-19.46/2)\cdot 1{,}602\,10^{-13}} = 4.133\,10^{-16} = 4.133\ fm$

If we sum the 3 waves weighted according to their charges we can obtain the radial charge density of the neuton.

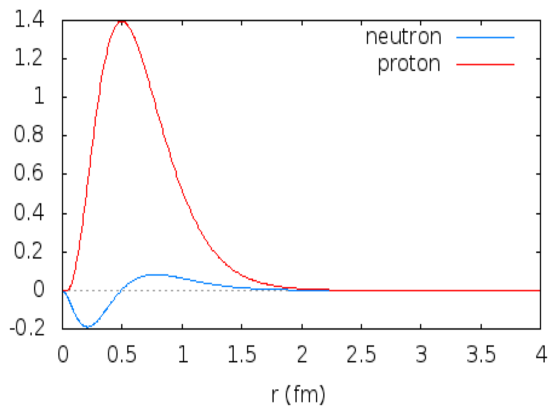
$$\rho(r)_{charge} = 4\left[-11\,r^2\left(\frac{1}{0.31604}\right)^3 e^{-2r/0.31604} + 11\,r^2\left(\frac{1}{0.3422}\right)^3 e^{-2r/0.3422}\right]$$

or normalized to a total area of 1 in order to compare with other papers.

$$\rho(r)_{charge} = 4\left[-1\,r^2\left(\frac{1}{0.31604}\right)^3 e^{-2r/0.31604} + 1\,r^2\left(\frac{1}{0.3422}\right)^3 e^{-2r/0.3422}\right]$$



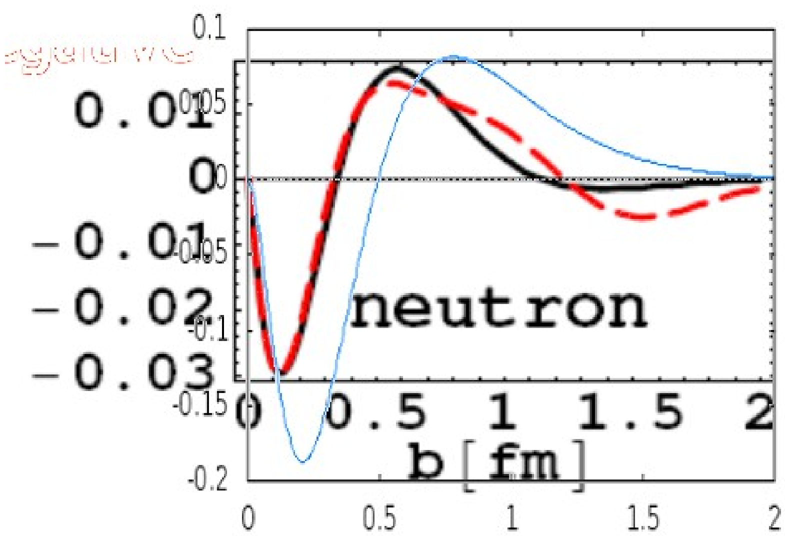
Charge density of neutron and proton



Charge density of neutron and proton

normalized to 1.

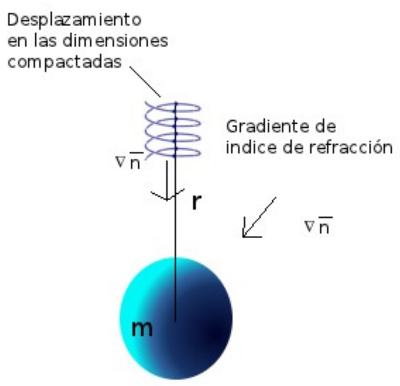
We can plot and superimpose it to the charge distribution graph obtained in [5] .



We can observe an acceptable degree of coincidence .

9.Van der Walls forces.

According to the hypothesis in [2] standing waves that conform the particles modified spacetime slowing the light that passes through them. Therefore, a probability density gradient should produce a refraction index gradient. As all particles keep closed trajectories in the plane of the compacted dimensions is deduced that apparent forces must occur in the direction of refraction index gradient and hence in the direction of mass gradient.



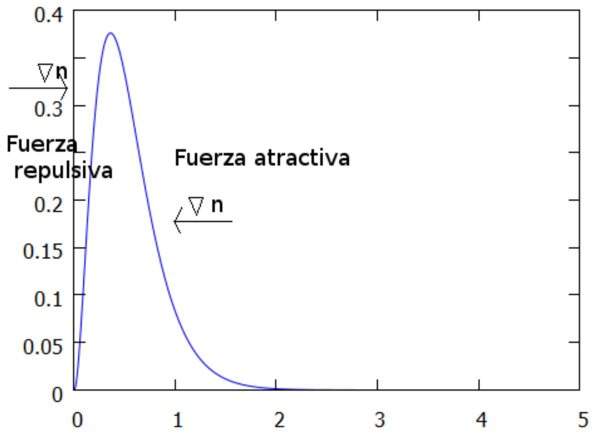
The acceleration caused by these gradient is given in [2] by the following relationship $\frac{d^2 r}{dt^2}=c^2\frac{\nabla n}{n}$ where n is the apparent refraction index.

In the case of gravitational attraction and due to gravitational time dilation it was shown [2] that apparent refractive index was equal to $n(r)=\left(1-\frac{Gm}{c^2 r}\right)^{-1/2}$, which easily allowed to obtain Newton's equation in the weak field approximation.

As distances are smaller than Universe radius in the compacted dimensions we should use $\frac{m}{G/\pi}$ instead $G\cdot m$ [1]

and as $1/r$ represented a linear density it can be replaced by $r^2\cdot\Psi^2$ hence we can write:

$$n(r)=\left(1-K\cdot r^2\Psi^2\right)^{-1/2} \quad \text{where} \quad K=\frac{1}{c^2}\cdot\frac{m}{G/\pi}$$



If we plot probability density function of an s orbital it is easy to see that it should cause a slight apparent refractive index gradient (electrons are very lightweight), which will cause a repulsive force from the center of the atom to the Bohr radius of the orbital and another attractive force from this distance that will decay rapidly.

These forces may be responsible for the London forces between neutral helium atoms and that in the present theory are attributed to the emergence of instantaneous dipoles, but that in "matter gravitational as waves" are caused by refractive index gradients due to probability density function gradients.

The acceleration is given by the equation $\frac{d^2 r}{dt^2}=c^2\frac{\nabla n}{n}$ [2] We can write then:

$$\frac{d^2 r}{dt^2}=\frac{1}{c^2}\frac{\nabla n}{n}=\frac{1}{c^2}\nabla\left(1-\frac{K}{r^2\Psi^2}\right)^{-1/2}\cdot\left(1-K\cdot r^2\Psi^2\right)^{-1/2}$$ and due to the spherical symmetry of the problem it becomes

$$\frac{d^2 r}{dt^2}=\frac{1}{c^2}\frac{d/dr\left(1-K\cdot r^2\Psi\right)^{-1/2}}{\left(1-K\cdot r^2\Psi\right)^{-1/2}}=\frac{1}{c^2}\frac{d/dr\left(1-K\cdot r^2 a_0^{-3}e^{-2r/a_0}\right)^{-1/2}}{\left(1-K\cdot r^2 a_0^{-3}e^{-2r/a_0}\right)^{-1/2}}=\frac{-K\,r(r-2a_0)}{a_0\left(a_0^3 e^{2r/a_0}-Kr^2\right)}$$ and as K<<<<1 then we can write

$$\frac{d^2 r}{dt^2}=\frac{1}{c^2}\frac{-K\,r(r-2a_0)}{a_0^4 e^{2r/a_0}}$$ The a0 parameter of the Helium atom can be achieved from:

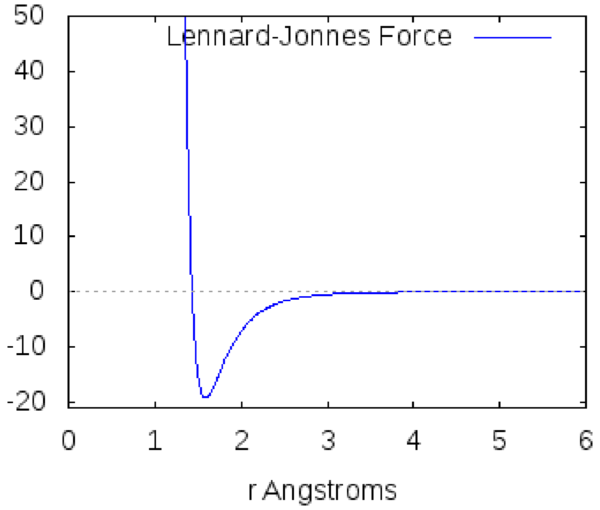
$$a_0=\frac{\bar{h}c\alpha'}{2E_0}$$ and considering that experimental binding energy of Helium is approximately 79 eV then:

$$a_0=\frac{\bar{h}c\alpha'}{2E_0}=\frac{\bar{h}c\frac{2e\cdot e}{\bar{h}c4\pi\varepsilon_0}}{2\frac{79}{2}1{,}602\,10^{-19}}=3{,}63\,10^{-11}m=0{,}36\,\mathring{A}\quad .$$

London interaction is usually modelled by Lennard-Jonnes potential: $\varphi=4\varepsilon_0\left[\left(\frac{\sigma}{r}\right)^{12}-\left(\frac{\sigma}{r}\right)^{6}\right]$.

He-He interaction parameter are σ=2,551 Angstroms and ε_0=10,22 K. As Lennard-Jonnes potential use the distance between two atoms we have to modify it in order to use the distance from one atom, therefore:

$\varphi=4\varepsilon_0\left[\left(\frac{\sigma}{2r}\right)^{12}-\left(\frac{\sigma}{2r}\right)^{6}\right]$ and the force by mass unit is given by $F=\frac{d\varphi}{dr}=\frac{48\varepsilon_0}{\sigma}\left[\left(\frac{\sigma}{2r}\right)^{13}-\left(\frac{\sigma}{2r}\right)^{7}\right]$



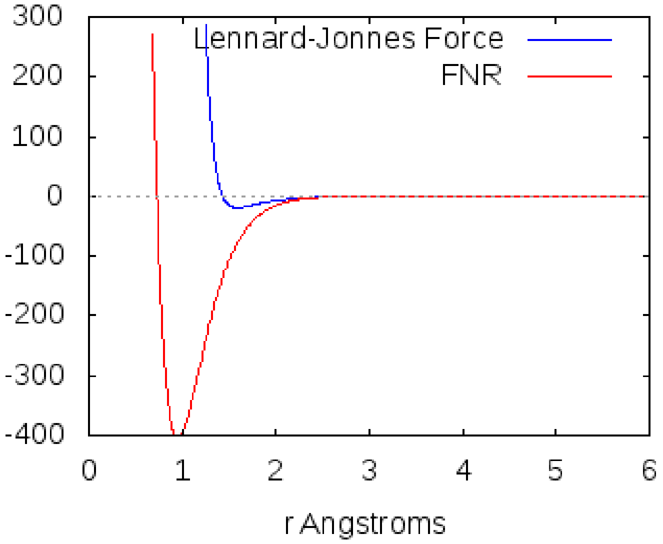
We have to use this units (Angstroms and Kelvin) due to numerical problems with the plotting software. Now we can plot London interaction force versus distance.

In Helium case $K=\frac{1}{c^2}\frac{2m_e}{G/\pi}$, and $a_0=0{,}36\,\check{A}$ so we can write

$$\frac{d^2r}{dt^2}=\frac{F}{m}=\frac{-2m_e}{G/\pi}\frac{r(r-2\cdot 0{,}36)}{0{,}36^4 e^{2r/0{,}36}}=\frac{-2\cdot 9.11\,10^{-31}}{6.67\,10^{-11}/\pi}\frac{r(r-2\cdot 0{,}36)}{0{,}36^4 e^{2r/0{,}36}\,1.38\,10^{-23}}=-6211\frac{r(r-2\cdot 0{,}36)}{0{,}36^4 e^{2r/0{,}36}}$$

Notice the use of Boltzman's constant in order to obtain corrects units. (Kelvin)

Now we can plot our tentative versus Lennard-Jonnes force.



But total interaction also depends on electromagnetic repulsion, we can obtain this repulsion from the quadratic wavefunction.

$$\varphi_e \propto \Psi^2 \rightarrow \varphi_e = K \frac{1}{0{,}36^3} e^{-2r/0{,}36}$$

First, one could think that the best way to model electromagnetic repulsion is through probability density of the wave-function,

$$\varphi_e \propto r^2 \Psi^2 \rightarrow \varphi_e = K\, r^2 \frac{1}{0{,}36^3} e^{-2r/0{,}36}$$

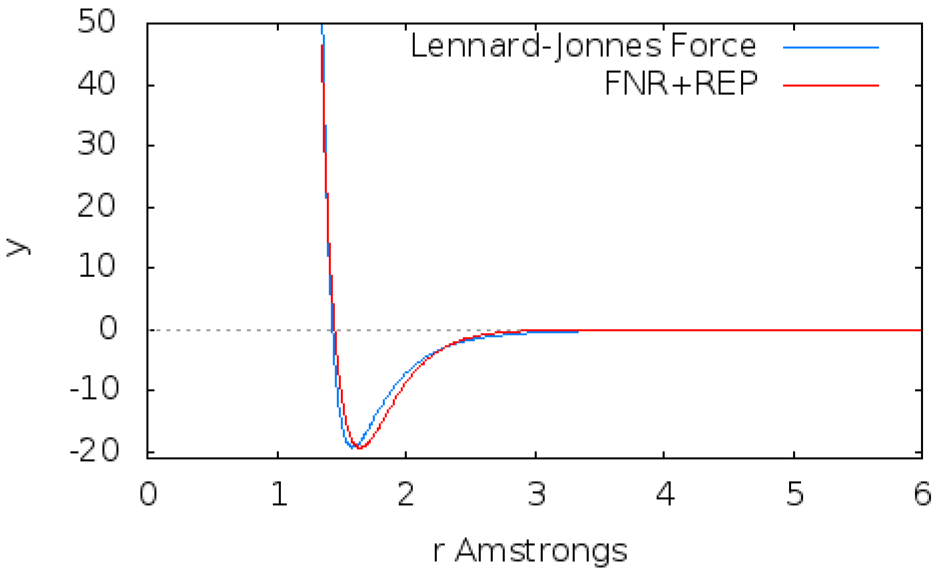
because it give us the charge density, but this is a three-dimensional interaction between two hollow spheres an if we notice that the intersection volume of two spheres of the same radius r0 is given by the relationship:

$$V = \frac{2\pi h^2}{3}(3r_0 - h) \quad ,$$

where h is the distance between centres, at least in a first approximation we should consider that electromagnetic repulsion is proportional to the quadratic wave-function.

Then force by mass unit should be: $F_e = \frac{d\varphi_e}{dr} = K \frac{2}{0{,}36^4} e^{-2r/0{,}36}$,so $\frac{d^2 r}{dt^2} = \frac{-2 m_e}{G/\pi} \frac{r(r-2\cdot 0{,}36)}{0{,}36^4 e^{2r/0{,}36}} + K \frac{2}{0{,}36^4} e^{-2r/0{,}36}$

by plotting with K=3250 we can observe a high degree of coincidence.

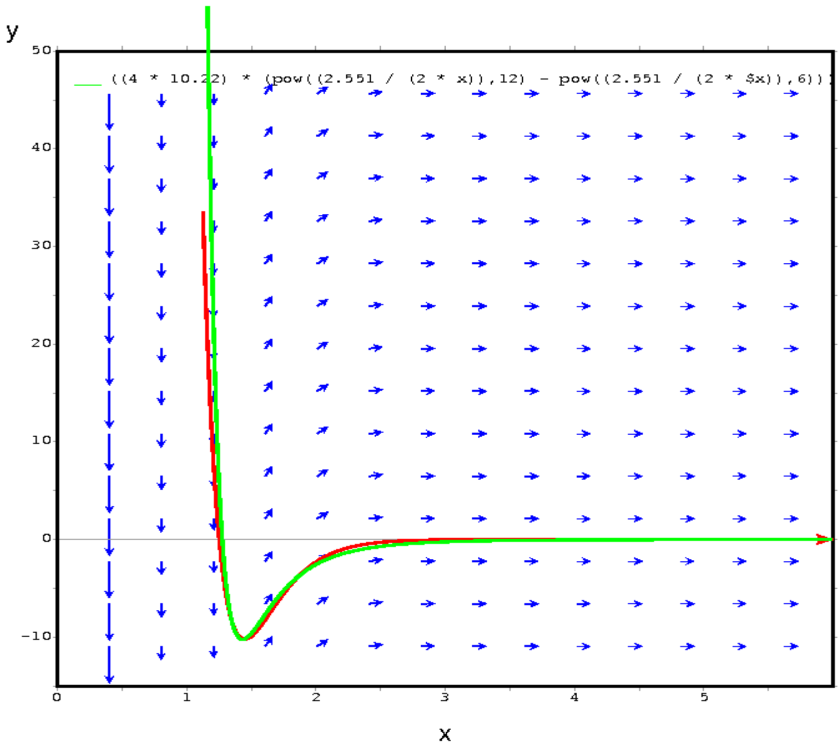


The need of K is due to the influence of nucleus positive charge in the electronic negative cloud.

We can get the potential from the differential equation

$$\varphi' = \frac{-2 m_e}{G/\pi} \frac{r(r-2\cdot 0{,}36)}{0{,}36^4 e^{2r/0{,}36}} + 3250 \frac{1}{0{,}36^4} e^{-2r/0{,}36}$$

This equation was solved numerically with plotdf function from wxmaxima: (boundary condition $\varphi(6)=0$) and it was plotted versus Lennard-Jonnes potential (green).



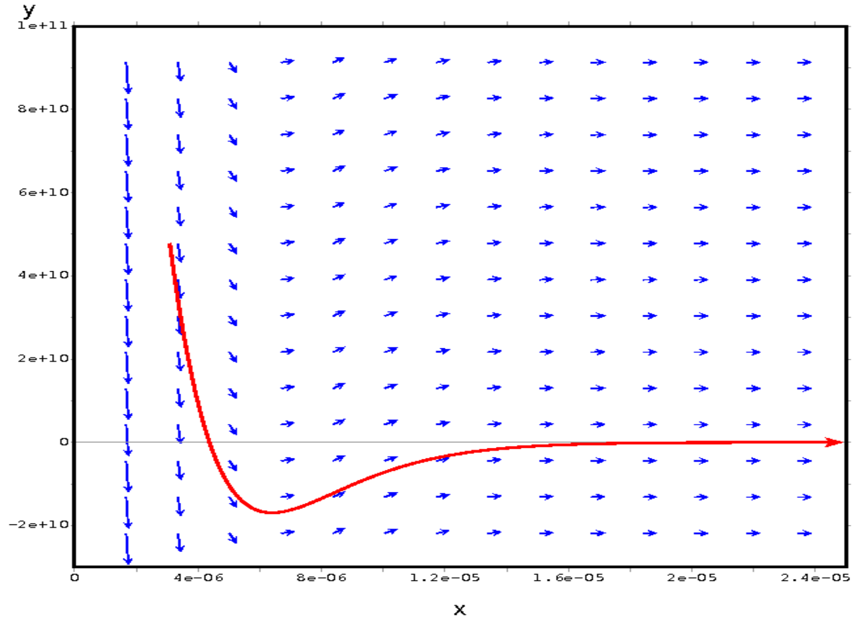
10 Residual nuclear force.

The residual strong interaction can be estimated by just use the result of adding the 3 waves that form the proton or neutron instead electronics orbitals. The mass is 634.9 greater than the mass of two electrons Helium orbital and the sum of the three waves

$$\Psi=27(3.1522\,10^{-6})^3 e^{-2r/3.1522\,10^{-6}}+26(3.275\,10^{-6})^3 e^{-2r/3.275\,10^{-6}}+1(8{,}4\,10^{-6})^3 e^{-2r/8.4\,10^{-6}}$$

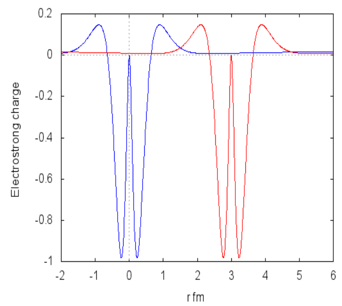
is approximated by $\Psi=53/54(3.2\,10^{-6})^3 e^{-2r/3.2\,10^{-6}}$ (r in Angstroms).

so we can get the potential from $\varphi'=\frac{53}{54}634.9\cdot 6211\frac{r(r-2\cdot 3.2\,10^{-6})}{(3.2\,10^{-6})^4 e^{2r/3.2\,10^{-6}}}$ and boundary condition $\varphi(6\,10^{-6})=0$

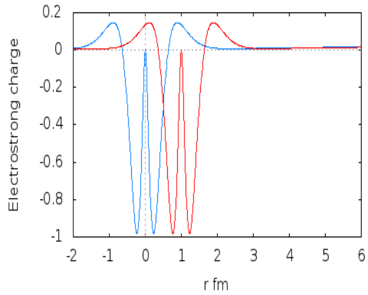


The minimum potential is about -2 10^{10} K = -1.722 MeV at r= 8 10^{-6} Angstroms. So we need another effect to explain the nucleon interactions. Again we can use electric-like forces, but due to the distances involves we should use electrostrong forces.

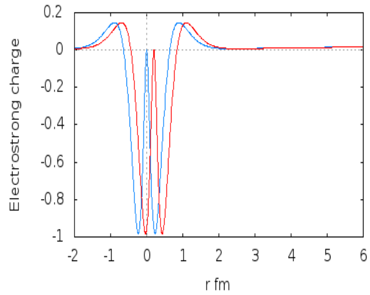
If we plot electrostrong density charges of two nucleons we can see that we have three cases according distance:



Weak Repulsion



Attraction



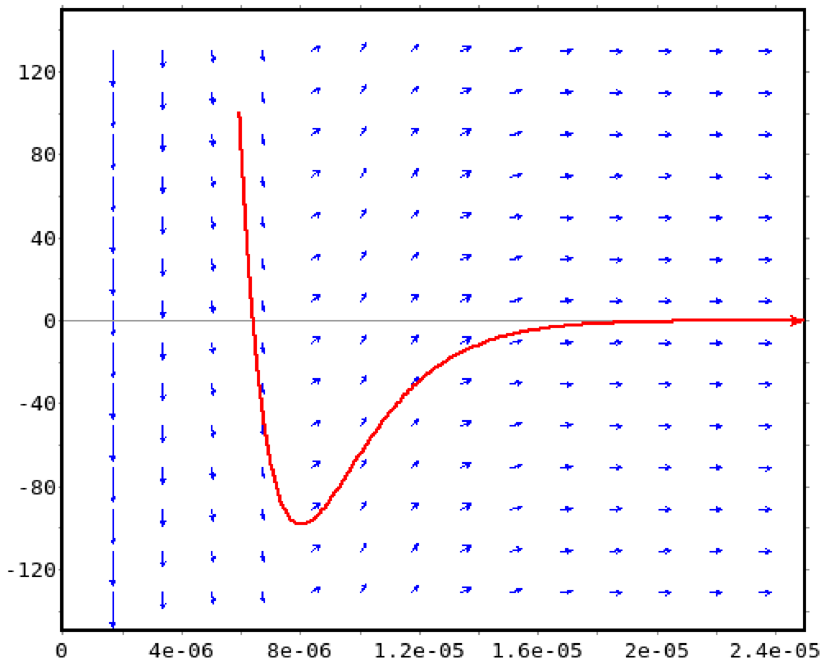
Strong Repulsion

In the proton-neutron case the force is predominant attractive, while in proton-proton and neutron-neutron is predominant repulsive.

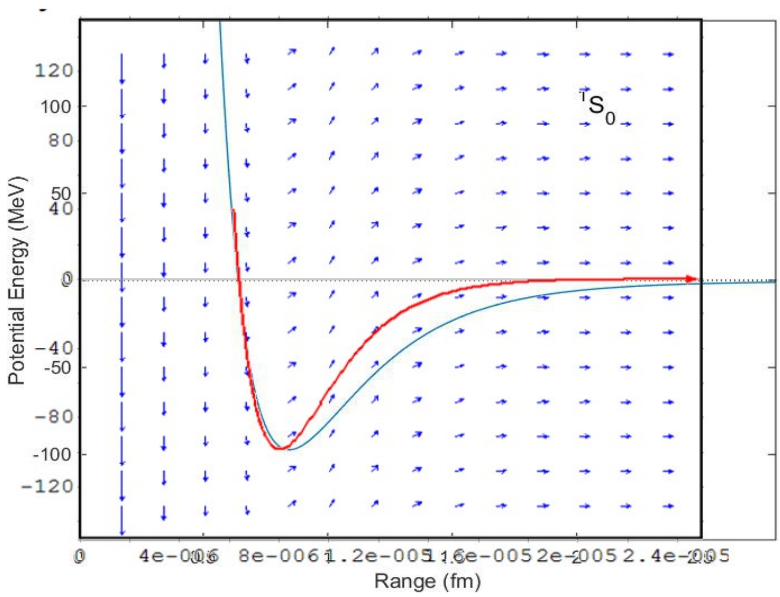
Again we can model this interaction from the quadratic wave-function.

$$\varphi' = \frac{53}{54} 634.9 \cdot 6211 \frac{r\left(r - 2 \cdot 3.2\,10^{-6}\right)}{\left(3.2\,10^{-6}\right)^4 e^{2r/3.2\,10^{-6}}} + K\left(-27\left(3.1522\,10^{-6}\right)^4 e^{-2r/3.1522\,10^{-6}} + 26\left(3.275\,10^{-6}\right)^4 e^{-2r/3.275\,10^{-6}} + 1\left(8{,}4\,10^{-6}\right)^4 e^{-2r/8.4\,10^{-6}}\right)$$

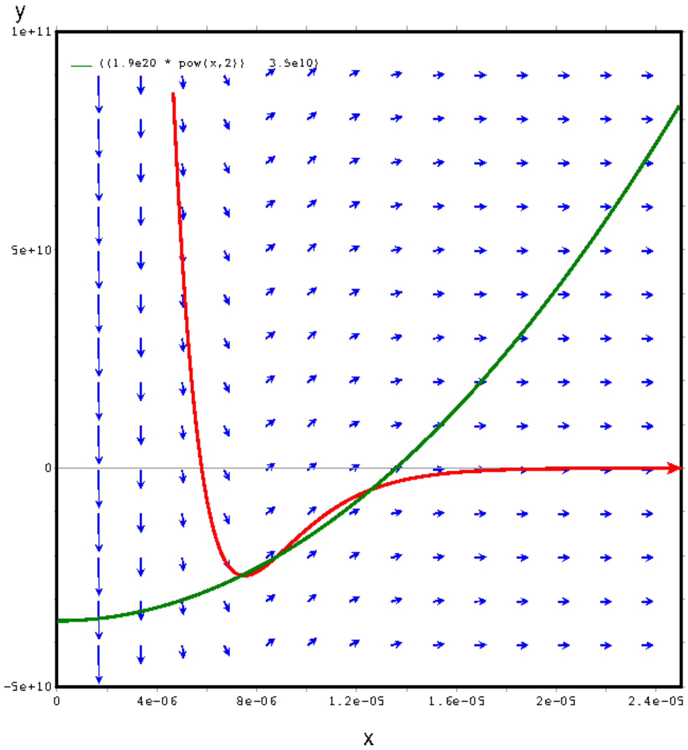
We can use K= 0.0119 in order to obtain a minimum energy of about -98 MeV (97.84 MeV). The minimun is then about 0.8 fm (Notice that x-axis is in Angstroms)



We can superimpose it with the Reid soft core potential



So it is proposed that residual strong forces are surface forces between nucleons and that this energy is related to the number of contact surfaces between nucleons. **This fact justify liquid drop model of nucleus**.



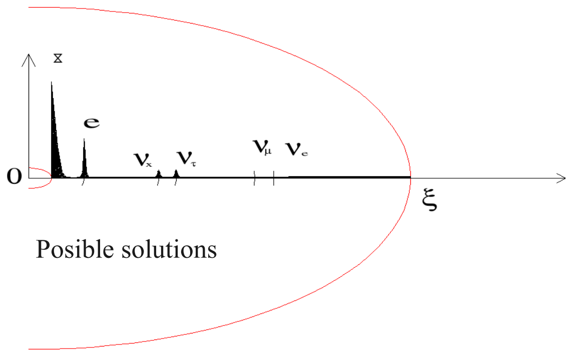
We can compare our proton-neutron potential curve with a quadratic function. **This plot justify shell model of nucleus**.

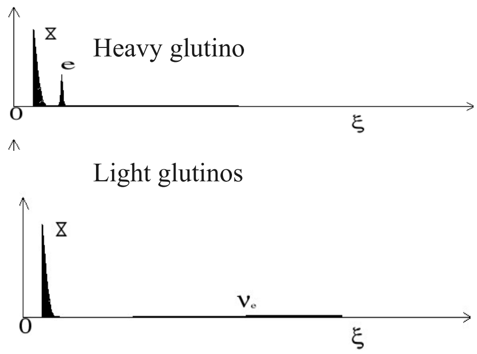
11. Summary and Conclusions .

Four solutions to gravitational wave equation have been found besides the already known and that was identified with the electron, these solutions have much lower mass than electron and can be identified with the three known neutrinos plus one supplementary. As it has not been found any greater mass solution that could explain hadrons it is forced to postulate the existence of a central hole in compacted dimensions. This postulate allow new solutions in the form of surfaces waves combined with any of the other five already found, never alone. These combinations have been called provisionally partons and the Iberian letter ⧖ was chosen as its symbol.

It is therefore possible to postulate a new particle system consists of the following components and their linear combinations:

Particle-pulsation	**mass**	**Principal interaction**
υ_e	18,75 eV	ELECTROWEAK
υ_μ	21,66 eV	ELECTROWEAK
υ_τ	1231,50 eV	ELECTROWEAK
υ_x?	1624,97 eV	ELECTROWEAK
$e^{+,-}$	0,511MeV	ELECTROMAGNETIC
⧖$^{0}_{light}$	11,87 MeV	ELECTROSTRONG
⧖$^{+,-}_{heavy}$	12,91 MeV	ELECTROSTRONG





For "matter as gravitational waves " there are only three types of interactions:

1º By dragging space-time :

It produces forces between parallel mass flows and is the origin of electromagnetic like forces, but differing in the order of magnitude. These are electrostrong, electromagnetic and electroweak interactions. These interactions are independent of each other because the dragging occurs at different levels of the compacted coordinate. Only solutions ν_e and ν_μ and can interact with all the others because its waves completely occupying the compacted dimensions.

2º and 3º By changing the refractive index and deforming propagation medium:

They produce gravity forces, residual nuclear forces and one kind of Van der Walls forces.

By the fact of having electrostrong charge partons can form structures similar to atoms, but with much more binding energy.
It is postulated that mesons are formed by two waves solutions(integer spin), while baryons should be formed by three wave solutions (half-integer spin). By solving gravitational wave equation in these conditions we can justify a multi-linear system for particle masses as it was postulated by Palazzi in [6]. Specifically solutions for pions, muon, proton and neutron are proposed. In all cases it is possible to estimate their masses with a maximum error of 0.3%. The hypothesis is also able to determine the intrinsic magnetic moment, the size of the hadrons and the internal distribution of charges. These properties are compared successfully with existing experimental data on the proton and the neutron.

Finally it is established an hypothesis about the residual nuclear force. This force may be caused by refractive index gradients caused by mass distribution in hadrons (like a hollow sphere) and relating it to Van der Walls forces, specifically London interactions. This hypothesis support both shell model and liquid model of nucleus.

Hypothesis is supported in General Relativity, but in its expansion to quantum mechanics we used linear and semiclassical approximations. Because of this fact it is anything but mathematically elegant. However there are not infinities under any conditions and it has a great physical simplicity. In fact, it is physically elegant: Everything can be explained by a single substrate (space-time) with anisotropic curvature. The vibrations of spacetime generate matter and energy, while all interactions are reduced to three types of interactions with mechanical equivalents.

However the cost to be paid is tremendous: the concept of particle and by extension the concept of matter, the quarks, the primacy of matter versus space, the probabilistic interpretation of quantum mechanics, the force fields interpretation..., therefore it is not strange that a lot of smart people can not find an unified system. We must abandon a lot of erroneous concepts. We can begin with the particle concept,. we have to write "particle approximation" in the same way we write "ray approximation" in Optic, so , we can abandon the horrible probabilistic interpretation of quantum mechanics, which is only based in the necessity of save the particle concept, but that has not any sense.

In the year of our Lord 2015.

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