Lagrangian QED & force between 2 protons

We start with the Quantic Electro Dynamic Lagrangian to the calculus of the repulsive forces between 2 nucleons that change magnetron according to classic interaction with τ neutrino will collide with proton generating the process of continuous migration of pairs protons-neutrons generating gravity, magnetron, and the μ neutrino that generates the hologram of space. We will analyze the Hydrogen atom. (1)

$$p + \check{\rceil}\tau \xrightarrow{transf} n + \nu\hat{\rceil} + \pi^+ + \mu\hat{\rceil} \xrightarrow{decay} (p + e + \nu\hat{\rceil}) + \mu\hat{\rceil} + \check{\rceil}\pi^- + \pi^+ = p + (e + \pi^+) = p + \mu + \Delta E$$

In other atoms, there must exist at least 2 nucleons in a specific amount of time of around $\sim 10^{-6}$ seconds to interact with two pairs of binding spin proton-neutrons that change state each other and exchange magnetron.
The approximation of magnetic forces is given by Lagrangean even if we do not know the correct value of the magnetic field but must obey the boundary condition and thus must be 0 on H(2R) = 0 and like the gravitational field in the first approximation that is also 0 at radius 2R; That approximation is the starting point of the forces between 2 nucleons. The electrostatic repelling between nucleons combined with the attractive gravitational force, strong nuclear forces, and attraction quantic magnetic forces, four balance each other's pulsating electrostatic force of repulsion that changes every ~ 4 -$7\cdot 10^{-7}$ sec.
We start with the gravitational field created by a nucleon V(r)= - g·m/r and the gravitational force between 2 nucleons in Newton each of m mass in Kg and r in matters is: $F_{g1} \sim \frac{1.85\cdot 10^{-64}}{r^2} \div \frac{4.09\cdot 10^{-64}}{r^2}$ (2)

<u>We have from Feynman Physics Vol 2 Cap 19:</u>

Feynman: "If you take the case of the gravitational field, then if the particle has the path x(t) (one dimension first) the kinetic energy is $m/2(dx/dt)^2$ and the potential energy at any time is m·g·x. Let's suppose that at the original time t_1 we start at some high and at the end of time t_2 we are ending at some other place. Thus the integral is:

$$\int_{t1}^{t2} \left[\frac{1}{2} m \left(\frac{dx}{dt}\right)^2 - mgx\right] dt \qquad (3)$$

Action => $S = \int_{t1}^{t2} \left[\frac{1}{2} m \left(\frac{dx}{dt}\right)^2 - mgx\right] dt$ (4)

Now the idea is that we calculate the action S for the trail path x(t), then the difference between that S and the action that we calculated for the true path x(t) and the difference between the true and trail path must be zero. And it must be true for any small variation n(t). So the deviation in our n(t) have to be 0 at each end $n(t_1) = 0$ and $n(t_2) = 0$;
The idea is to substitute x(t) = x(t)+n(t) in the formula of action: $S = \int_{t1}^{t2} \left[\frac{1}{2} m \left(\frac{dx}{dt}\right)^2 - V(x)\right] dt$

Where I call the potential energy V(x). The derivate dx/dt+dn/dt so we have the expression:

$$S = \int_{t1}^{t2} \left[\frac{1}{2} m \left(\frac{dx}{dt} + \frac{dn}{dt}\right)^2 - V(x)\right] dt \qquad (5)$$

Now I must write this out in more detail for the squared term:

$$\left(\frac{dx}{dt}\right)^2 + 2\left(\frac{dx}{dt}\right)\left(\frac{dn}{dt}\right) + \left(\frac{dn}{dt}\right)^2 \sim \left(\frac{dx}{dt}\right)^2 + 2\left(\frac{dx}{dt}\right)\left(\frac{dn}{dt}\right) + second\ and\ higher\ order$$

Now we need the potential V at x+n. I consider n small as a Taylor series

$$V(x+n) = V(x) + nV(x) + \frac{n^2}{2} V''(x) + \cdots \qquad (6)$$

The terms that involve n^2 and higher power are small and we neglect second and higher order.

$$S = \int_{t1}^{t2} \left[\frac{1}{2} m \left(\frac{dx}{dt}\right)^2 - V(x) + m\left(\frac{dx}{dt}\right)\left(\frac{dn}{dt}\right) - nV'(x) + (higher\ order)\right] dt \qquad (7)$$

Thus the difference between true and trial paths is:

$$\delta S = \int_{t1}^{t2} \left[m\left(\frac{dx}{dt}\right)\left(\frac{dn}{dt}\right) - nV'(x)\right] dt \qquad (8)$$

Now the problem is this: I don't know what the x is yet, but I know that no matter what n is, that integral must be zero.
Now integrating by parts :

$$\delta S = m\frac{dx}{dt} n(t)\Big|_{t1}^{t2} - \int_{t1}^{t2} \frac{d}{dt}\left(m\frac{dx}{dt}\right) n(t) dt - \int_{t1}^{t2} V'(x)\, n(t) dt \qquad (9)$$

The first term must be evaluated at the two limits t_1 and t_2. Now the integrated parts disappear, adding conditions to make that n must be 0 at both ends of the path because the principle is that the action is a minimum provided that the varied curve begins and ends at the chosen points.

$\delta S = \int_{t1}^{t2} \left[-m \frac{d^2x}{dt^2} - V'(x) \right] n(t) dt$ (10)

We have an integral of something or other times n(t) is always zero:

$\int F(t) n(t) dt = 0$ (11)

Thus if our integral is zero for any n, then the coefficient of n must be zero. The action integral will be a minimum for the path that satisfies this complicated differential equation:

$\left[-m \frac{d^2x}{dt^2} - V'(x) \right] = 0$ (12)

It's not really so complicated, it is just F=ma. The first term is mass times acceleration, and the second is the derivative of the potential energy, which is the force:

$F = -\frac{V\prime(x)}{m}$ (13)

Now let's take the case where the charge density is known everywhere, and the problem is to find the potential Φ everywhere in space. You know that the answer should be:

$\nabla^2 \Phi = -r/\varepsilon 0$ (14)

But another way of stating the same thing is this: Calculate the integral U^*, where

$U^* = \frac{\varepsilon_0}{2} \int (\nabla \Phi)^2 dV - \int r \Phi dV$ (15)

Which is a volume integral to be taken over all space. This thing is a minimum for the correct potential distribution Φ(r). We can show that two statements about electrostatics are equivalent. Let's suppose that we pick any function Φ(r). We want to show that when we take for Φ(r) the correct potential Φ(r), plus a small deviation f, then in the first order, the change in U^* is zero. So we wright $\Phi(r) = \Phi_1(r) + f$.

Ignoring the relativistic effect the force term does come out equal to F = q·(E + V x B) as it should". End **Feynman**

The distance between protons of Fe (iron) is 4.2 fm thus we approximate the natural distance between helium $_2He^4$ to the same 4.2 fm. The calculus below is for attraction and repelling forces in the Helium atom. The Colombian rejection force between two protons at r = 4.2 fm in iron atoms is $F_{es} = \frac{q^2}{4\pi\varepsilon r^2}$ is around 13 N and quantum gravitational attraction forces ~ $5.712 \cdot 10^{-49}$ Newton according to Nucleus.mw. Let's see what forces are included in the nucleus and we particularized helium $_2He^4$($q=1.6 \cdot 10^{-19}$ C, $\varepsilon=8.85418 \cdot 10^{-12}$ F/m):

1) Colombian repelling forces between protons at a distance of 4.2 fm ~ 13N
2) From the 1S orbital, the electron at radius $r = 5.29 \cdot 10^{-11}$ m the attraction proton-electron is ~ $8.1 \cdot 10^{-8}$ N and the same reaction force in the nucleus and there are 2 electrons for Helium = $1.62 \cdot 10^{-7}$ N
3) Gravitational attraction forces between nucleons at r = 4.2 fm is around ~$2.3 \cdot 10^{-35}$ N multiplied by 4 nucleons $2.28 \cdot 10^{-34}$ N, there is no gravitational attraction between the nucleus and electrons because they don't change gravitons, according to Nucleus.mw approx. (2)
4) The Lorentz forces $F_L = q \cdot V \times B$ thus for protons $E_c = m \cdot V^2/2$ and $V = \sqrt{\frac{2E_c}{m_p}}$ and $F_L = q\sqrt{\frac{2E_c}{m_p}}\, B_1$

   For $E_c = 500eV = 1.024 \cdot 10^{-13}$ J=> $V = 1.1 \cdot 10^7$ m/s => $F_L \sim 2 \cdot 10^{-13}$ N with the approximation of magnetic field in the nucleus of Hydrogen atoms of B_1 =3.81Tesla, perpendicular to B and V and a negligible than Colombian Forces.
5) Last but not least probably very important the magnetic forces generated by the moving nucleons, especially generated by the spin energy equal to 3.59eV, and that value can be estimated nonrelativistic as follows: $E_s = h_m \cdot f = h \cdot \nu = 3.59eV = q \cdot \omega r^2$ where ω spin angular rotation with the approximation the inner magnetic field of nucleus of Hydrogen atoms the proton's inner magnetic field $B_2 = 3.81 \cdot 10^{14}$ Tesla link: https://www.sciencedirect.com/science/article/pii/S2211379718316176
   We will calculus the magnetic forces generated by spinning protons minimized the action thus the d/dt Lagrangian without knowing the exact value and formula of magnetic forces between points r=>1/R; H(1/R)=Rand 2R; H(2R)=0. $\left[-m \frac{d^2 fm(x)}{dt^2} - V'(x) \right] = 0$;

Ignoring the relativistic effect the force term does come out equal to F = q·(E + V x B) as it should.
The first term is Coulombian force q·E and the value of that force for 4.2fm is 25N. The second term is the magnetic force.
The electrostatic repelling between nucleons combined with the attractive gravitational force, strong nuclear forces, and attraction quantic magnetic forces, four balance each other's pulsating electrostatic force of repulsion that changes every ~ 4 -$7 \cdot 10^{-7}$ sec.

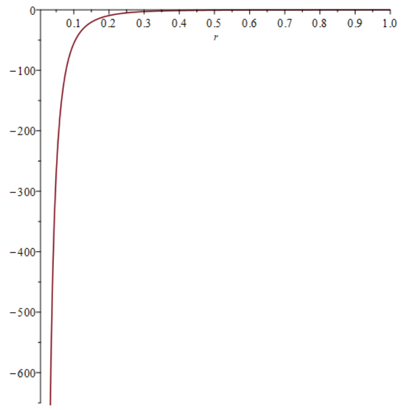
We start with the Quantic Electro Dynamic Lagrangian to the calculus of the repulsive forces between 2 nucleons that change magnetron according to classic interaction with τ neutrino will collide with proton generating the process of continuous migration of pairs protons-neutrons generating gravity, magnetron (π^- ,π^+) and the μ neutrino. Thus for Hydrogen.

$$n + \check{]}\tau \xrightarrow{\beta+ \, decey} p + \pi^-\hat{]} + \mu\hat{]} + \nu\hat{]} = \left(p + \check{]}optoelect + \nu\hat{]}\right) = n + \nu\hat{]} + \mu\hat{]} = n \qquad (16)$$

Thus there must exist at least 2 nucleons in a specific amount of time of around ~10^{-6} seconds to interact (mag) with two pairs of binding spin proton-neutron that change state each other and exchange magnetron. The approximation of magnetic forces is given by Lagrangean even if we do not know the correct value of the magnetic field but must obey the boundary condition and thus must be 0 on H(2R) = 0 and like the gravitational field in the first approximation that is also 0 at radius 2R. As we have Fmag in Flux.pdf: We can see the Magnetic Force decrease very abruptly thus the magnetron is the particle of magnetic forces. That approximation is the starting point of the forces between 2 nucleons. As we have Fmag in Flux.pdf:

$$Fmag := -\frac{\sqrt{2}\,R\left(e^{(2R-r)\sqrt{c}\sqrt{2}}-1\right)e^{\frac{\sqrt{c}\sqrt{2}\,(Rr-1)}{2R}}}{4\sqrt{c}\left(e^{\frac{(2R^2-1)\sqrt{c}\sqrt{2}}{R}}+1\right)\pi r^2} \qquad (17)$$

Because of e^{2R^2} is huge around ~e^{45} the computer can not process that amount of data…we plot with parameters below = the Magnetic Force at t = 0 is Fmag=H(r)/4πr² plot (18) for R=49 and r= 0.01..1:



We will calculus the magnetic forces generated by spinning protons minimized the action thus the d/dt Lagrangian without knowing the exact value and formula of magnetic forces between points r=>1/R; H(1/R)=Rand 2R; H(2R)=0. $\left[-m\frac{d^2fm(x)}{dt^2} - V'(x)\right] = 0$; thus in one-dimension approximation gravitational forces and V'(x) is Coulombian forces between protons that are 4.2fm is 13 Newton as above. The gravitational forces between nucleons have the value: (2)

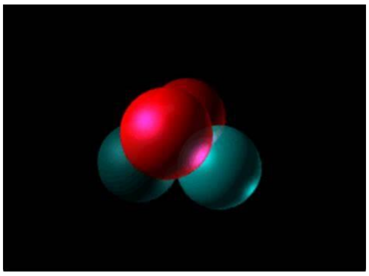
We have r_0 = 4.2fm the distance between the center of protons the angular spinning of protons per second and r is the nucleon's radius and we observe that it depends only on a radius that is almost and in general for any spinning particle B the inner magnetic field of electron = 4.2-8.2·10^{14} T the same for protons $E = \frac{B\cdot e\cdot h_m}{m}$. Thus the proton moment of the inertia sphere is $Js = \frac{2mr^2}{5}$ and kinetic spin energy $E = \frac{1}{2}\frac{2mr^2}{5}\omega^2$, $\omega_e = 2\pi\sqrt{\frac{5\cdot B\cdot e\cdot h_m}{m\cdot r^2}}$ thus ω_p=1.47·10^{14}rot/s where h_m = h·4.7946149·10^6 the magnetic minimum action constant 4794614 greater than Plank constant the microparticle is spinning with ω!

$\frac{d(g(r))}{dt} = \frac{\partial(g(r))}{\partial r}\frac{\partial r}{\partial t} = \left(-\frac{2\cdot 10^{-64}}{(3.567\cdot 10^{22})^{-3}}\right)\omega_p r_p = \sim 122N$ where $\frac{\partial r}{\partial t} = \omega_p r_p$

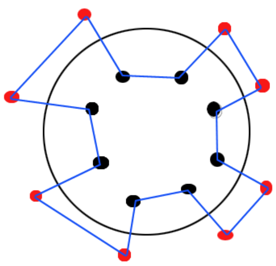
thus the average value of spinning magnetic forces is 122 Newton for r=25/R= 7·10^{-22} m where g'(25/R) = R. Thus attraction should be the correct value of the magnetic attraction force between pair neutron-proton at a distance edge to edge 7·10^{-22} m (25/R practically glued) would have that attraction force. Thus in the He nucleus, we have two pairs of neutron-proton that attract each other and proton at a distance of 2.4 fm that repel with Colombian forces of 40N and Lorentz magnetic force of around ~10^{-18} N we can approximate the value of attraction with the Lagrangian: http://michaelvio.orgfree.com/spin.pdf

$$g(r)\Big|_{4.2fm}^{2R} = \frac{2\cdot 10^{-64}}{r^3} - 0 \sim 122N \qquad (20)$$

The value in points 4.2fm and 2R where H(r) has the same value in the 4.2fm H(4.2fm) we don't know that, suppose that by looking at the variation of H(r) respectively at 2R the value equal to zero of derivate of gravitational force is g'(25/R) = R and g(2R)=0 respectively g'(2R) = 0 corresponding to magnetic forces H(r)=> H(1/R) = R and H(2R) = 0 at radius r = 4.2 fm we estimate to $\sim 10^{-18}$ Newton of attraction between nucleons, due to spin ~122N. The nucleus structure is in shells with a magic number of nucleons: 2, 8, 20, 28, 50, 82, 126, widely recognized as being "magic" numbers. The first shell is an alfa module with 2 protons and 2 neurons bonded together by magnetic forces as shown above. The first shell is shown below as an alfa module:



The second shell is composed of 4 pairs thus 8 nucleons, a total of 12 nucleons in two shells the third completed shell has 8 pairs, respectively a total amount of 28 nucleons, the fourth shell has 11 pairs and a total amount of 50 nucleons, and the fifth shell has 16 pairs, respectively a total amount of 82 nucleons and the sixth shell has 22 pairs, a total amount of 126 nucleons.
The third shell is as in the picture below:
There are almost magic numbers 184, and 236,… and the shells are growing bigger and bigger. There is also a sixth and seventh shell and there is a rule of completing the shells from the lower energy alfa module to the upper layers physically as onion leaves that cover each other rotating and being held together by magnetic spin forces. The shells could be incomplete which could provide different binding energy and proper stability shown by the number of isotopes. The tensor look like this:



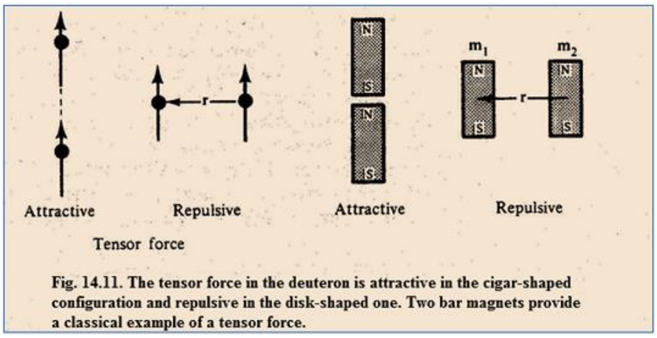


Fig. 14.11. The tensor force in the deuteron is attractive in the cigar-shaped configuration and repulsive in the disk-shaped one. Two bar magnets provide a classical example of a tensor force.

The pair of proton-neutron make a chain PNPNPNPNPNPNPNPN in which the nucleons are glued together at a very short distance proton-neutron of around $7\cdot 10^{-22}$ m and a relatively bigger distance between protons center equal to the diameter of neutron & proton about 3.6-4fm. The pair proton-neutron are lined attractively as above and between shells are repulsive forces like the Lagrangian show that sustained the rotating shells and the distance between them.

The model that I propose is accurate but the magnetic force generated by the exchange of magnetrons generates huge numbers that Maple generates float error in (17) because the number exceeds the maximum limit. That is the exact method of calculus but requires a proprietary program for plot and calculus. The Lagrangian is only an evaluation of forces to see what is the domain we talking about.

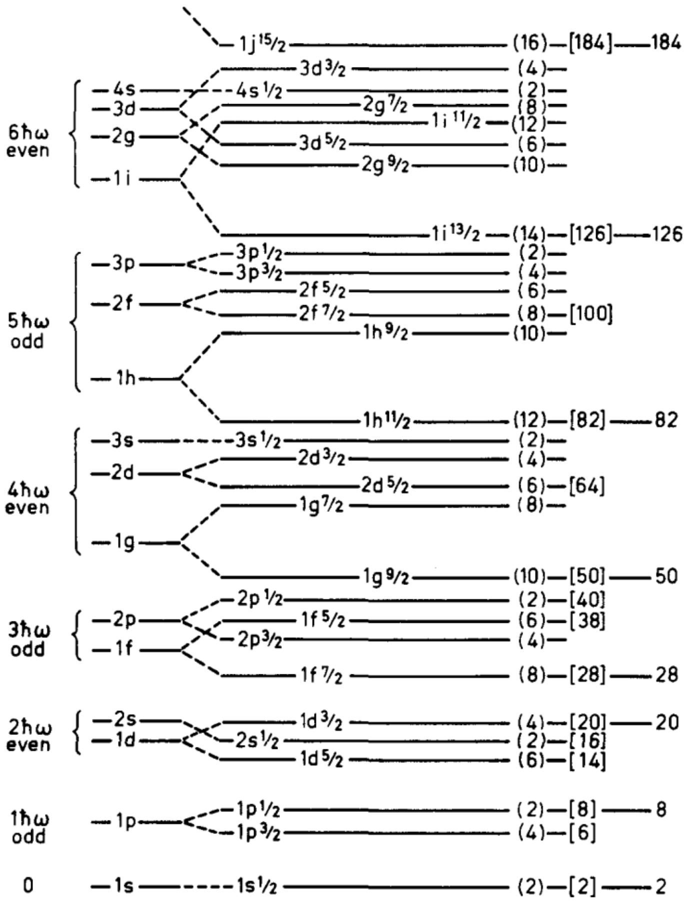


Figure 2-23 Sequence of one-particle orbits. The figure is taken from M. G. Mayer and J. H. D. Jensen, *Elementary Theory of Nuclear Shell Structure*, p. 58, Wiley, New York, 1955.

▼ *Spectra of odd-A nuclei compared with predictions of one-particle model* (*Fig. 2-24*)

There is a limitation of the number of elements that follows from the fact that there is a maximum speed in the Universe. That is, from the limit of the speed of light in a vacuum. Moreover, this can be shown using only Bohr's model of the atom (Bohr model - Wikipedia) and de Broglie's wave-particle dualism.

Thus, consider a point nucleus, which has a charge Z. Around this nucleus in the first Bohr orbit, an electron moves with a certain velocity v. Taking into account Newton's second law and Coulomb attraction, it is easy to get the dependence of the speed from the charge of the nucleus. we have $\frac{mv^2}{2}=\frac{kZe^2}{2}$; $v^2=\frac{kZe^2}{mr}$

where r - is the radius of the first Bohr orbit, m - is the electron mass, v - is the speed of an electron in the first Bohr orbit, e - is the electron charge, and k - is the corresponding constant from Coulomb's law.

Let us take into account the relativistic effects in the last formula. That is, the fact that when the electron moves, its mass will increase. Then we get the equation: $v^2=\frac{kZe^2}{mr\gamma}$ and $\gamma=\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$; where m0 - is the rest mass of an electron, ɣ - Lorentz factor. But, it is also necessary to take into account the fact that the radius of the Bohr orbit decreases with an increase in the speed of the electron. It is known that the length of the Bohr orbit is equal to the de Broglie wavelength. Therefore, as the electron speed increases, the de Broglie wavelength will decrease. Thus λ = 2·π·r = h/(m·v). As a result, we obtain a relativistic formula for calculating the speed of an electron in the first Bohr orbit of any nucleus: $r=\frac{\hbar}{v\gamma m_0}$ thus $Z=\frac{hv}{ke^2}$ respectively $Z=\frac{hc}{ke^2}$ Substituting the constants into the last formula, we obtain the nuclear charge equal to 137.036, at which the speed of the electron in the Bohr orbit is equal to the speed of light in a vacuum. The nucleus is limited as the number of protons by Z is smaller than 137 because the speed of electrons in "S" orbitals couldn't exceed the speed limit "c".

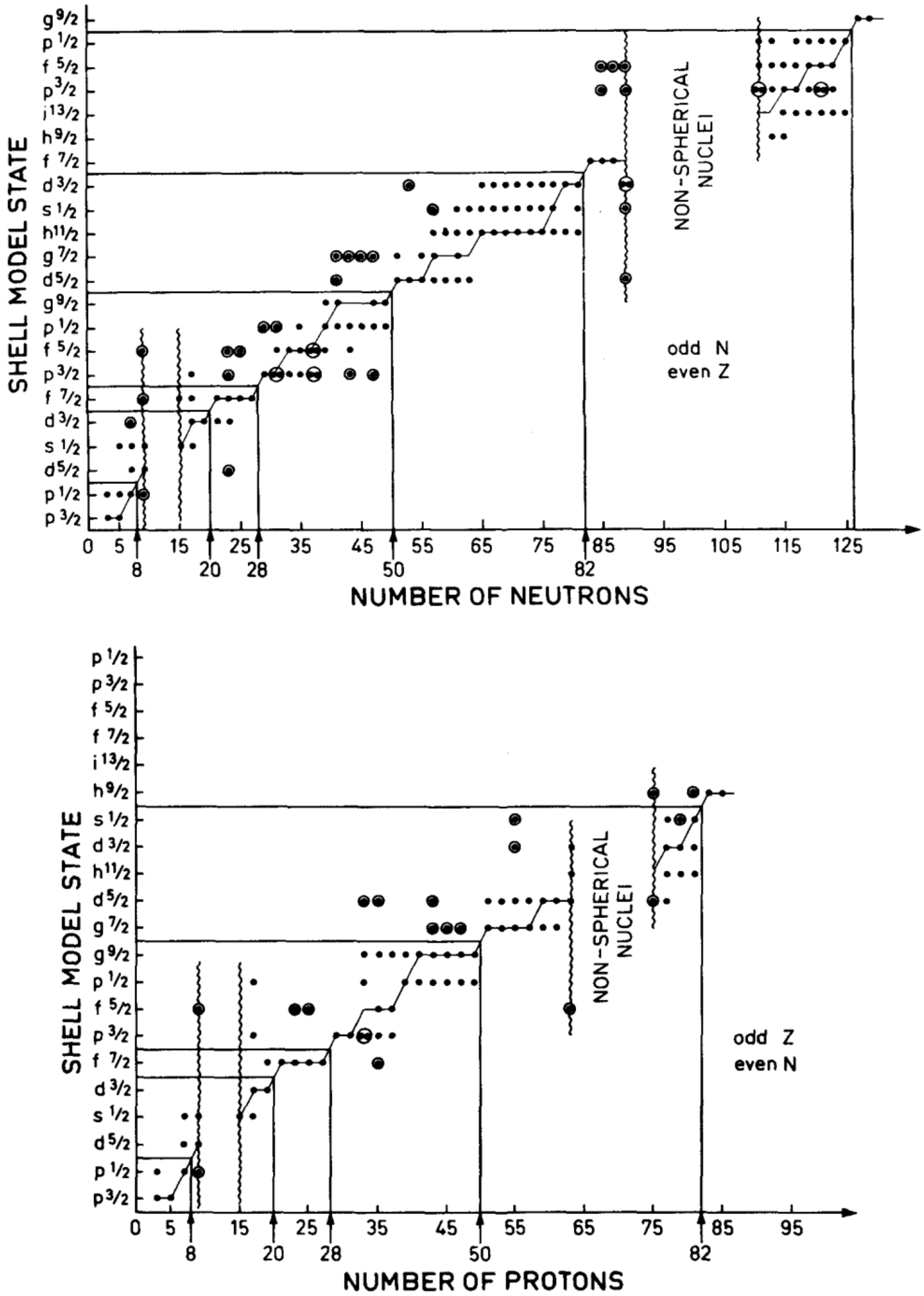


Figure 2-24 One-particle interpretation of low-energy levels in odd-*A* nuclei. The data for the figure are taken from Nuclear Data Sheets. The regions of stable ellipsoidal deformations are excluded, as indicated by the wavy lines. We wish to thank G. T. Ewan for help in the preparation of the figure.

Conclusion:

You don't have to go below the level of nucleons in the atom to explain the strong nuclear force. In this article, I present from the perspective of nucleons that change magnetrons, and the value of magnetic attraction due to the spin of nucleons partially explains the value of nuclear forces. The "strong nuclear force," the magnetic force of attraction between nucleons, together with gravitational forces, generates the stability of the nucleus. The electrostatic repelling force, which changes approximately every ~4×10^{-7} seconds, is balanced by the other three forces. The protons in the nucleus of helium are repelled by electrostatic forces for approximately ~4×10^{-7} seconds and attracted by magnetic and gravitational forces. For distances of approximately ~10^{-15} meters, the Lorentz force of attraction for rotating particles that change magnetrons is almost as the electrostatic repulsion between protons, as can be observed in the above graph. Quod Erat Demonstrandum. http://michaelvio.orgfree.com/lagrangian.pdf

11 Nov. 2023