Paper number 9

NEW NUCLEAR MODEL

ABSTRACT

In the current Nuclear Physics several nuclear models were adopted. Each model is applied for explaining a specific nuclear property. But although a model is able to explain a nuclear phenomenon (or a property of the nuclei), nevertheless it is unable to explain several other phenomena and it is incompatible with other several properties of the nuclei. There is among the nuclear physicists the belief that it is impossible to have a unique model able to explain all the nuclear properties, and that any attempt for finding such a unique model is a waste of time. However it's hard to believe that the Nature can use several different models for yielding the phenomena. And what is the worst**:** as the models of the current nuclear theory are incompatible among themselves, how could the Nature operate by using incompatible models? Herein it is proposed a new nuclear model which is UNIQUE, named the *Hexagonal Floors Model*. Through many posterior papers, we will show that such a model is compatible with the whole nuclear properties, and it is able to explain all the nuclear phenomena.

1. THE PROBLEM OF BINDING ENERGIES

After discovering in November-93 the basic structure (with hexagonal floors) of my new nuclear model, I invited a friend of mine, with PhD in Physics, to help me in getting mathematical confirmations for my nuclear model. Our first attempt was to get by theoretical calculation the binding energies of the light nuclei like 1H2, 2He3, 2He4, 4Be8, etc.

We tried during one week, without success. And we finally reached to the following conclusion**:** it was impossible to get theoretically the binding energies by my new model of nucleus. Then my friend, who was on vacation in the city where I lived, went back to the city he lived, leaving the problem in my hands, without solution.

Facing the breakdown of our attempt, my thought was the following**:**

"*I know that the Nature works by a PHYSICAL nuclear model, and obviously such a model used by the Nature is UNIQUE. I cannot believe that the Nature can work by four different incompatibles nuclear models, like proposed by the Nuclear Physics. Therefore the UNIQUE model exists, and it is used by the Nature, and therefore IT IS POSSIBLE TO FIND IT*".

On another hand, my nuclear model with hexagonal floors was able to explain many other nuclear properties, like for example the Magic Numbers. By this reason, I was sure that I was in the correct way, and probably my inability of getting the binding energies from my model should not be due to a deficiency of the model. Perhaps the problem was situated in the traditional method tried by me and the friend of mine. Then I had an idea, thinking about the following**:**

"*perhaps the model used by the Nature works by mechanisms that I and my friend did not consider, because they are unknown. If this hypothesis is correct, I need to discover these mechanisms, and later to try a mathematical confirmation. It seems that I and my friend made our first attemtp by a wrong logic, because the correct logic is firstly to find the correct mechanisms*".

So, starting from this idea, I faced the challange of discovering such mechanisms and by what sort of new principles they could work, in order that from my nuclear model I could calculate theoretically the binding energies of the light nuclei.

2. THE DISCOVERY OF THE NEW NUCLEAR MODEL

Among the several new concepts introduced in the present new nuclear theory I must firstly to mention the fields Sn(p) of the proton and Sn(e) of the electron. The proton can be seen in the Fig. 2, where it is shown that it has a body, which spin induces a principal field Sp(p). The rotation of the field Sp(p) induces a secondary field Sn(p), which is formed by a flux of gravitons and electric positives particles of the ether (responsible by the Coulombic interactions), while the flux of gravitons is responsible by non-Coulombic interactions (mentioned by Borghi's paper, and which probably is the agent responsible for the Nuclear Active Environment).

The electron has a principal field Sp(e) and a secondary field Sn(e). A heavy nucleus is then surrounded by the superposition of several fields Sn(p) and Sn(e). As we will see in other papers, the hypothesis of the field Sn(p) brings several advantages for the explanation of the nuclear properties, and in the paper number 20 we will see that the electron's field Sn(e) is responsible by the electron's equilibrium in the electrosphere.

I discovered the basic structure of my new nuclear model on 19^{th} of November-93, during a barbecue party. I was invited by my brother Aleksander, for the commemoration of his 23 years of Biochemistry graduation in 1970. During many weeks ago, I was trying to discover the structure of the nucleus, without success. But during that barbecue suddenly I had an idea, taking my new model of neutron as a point of departure. Let us see the sequences of my discoveries, as follows.

I never accepted the model of neutron proposed by Yukawa, because his model infringes some laws of Physics. Among others reasons, in the Yukawa's model two protons play a game with the electron like two players play tennis. But while the two players are tied to the game by the laws of the ethics (the tennis rules), we cannot believe that two protons are tied into Yukawa's model by the laws of the ethics. So, in 1991 I imagined a model of neutron with one electron turning about one proton.

Two years later, in June-1993, when my friend told me that neutron's decay spends 10 minutes, I realized that such a phenomenon is incompatible with Yukawa's model, because one unique player cannot play tennis alone with himself, during 10 minutes. But the 10 minutes of neutron's decay were compatibles with my model of neutron, because the electron could turn about a proton during 10 minutes, before to escape. Four months later, during October-93, I was trying to discover a nuclear model starting from one point of departure**:** the Magic Numbers. But during that barbecue on November 19^{th}, suddenly I realized the following fact **:** I was trying to explain the Magic Numbers without considering the participation of my model of neutron. At once I had an idea**:** putting a nucleon 2He4 in the center of the whole nuclei, two electrons turning about four protons would yield a strong magnetic field, which could capture many nucleons 1H2.

Therefore, my initial nuclear model was essentially electromagnetic. But with such a model there are two questions to be solved**:**

1- The electromagnetism is not able to get the aggregation of nuclei, because its magnitude is 10^2 times smaller than that due to the strong force.
2- There is a fundamental philosophical incoherence in the model's working.

Then I kept myself trying to find a solution able to eliminate these restrictions. I found it only three years later, in 1996, when I discovered that the two restrictions can be eliminated with the introduction of a gravitational flux into the nuclei, working together with the magnetic flux. By considering the gravitational flux, the coherence of the model becomes perfect, as it is proposed in the paper No. 18 entitled *Definitive Coherent Structure of the New Nuclear Model*. And many months later I discovered the dynamical cause through which my nuclear model explains the emission of alpha particles according to the statistical laws, in the alpha-decay of radioactive nuclei.

3. MAGIC NUMBERS

The model of Nuclear Theory, used for the calculation of the binding energy, is the Liquid Drop model. In reality such a model does not supply the binding energy, it supplies the mass $M_{Z,A}$ of nuclei, where Z is the quantity of protons, and A = Z + N is the quantity of protons + neutrons.
There is a paradox with the Liquid Drop model that we have to mention here. The model considers the nucleus like if it should be a sphere with constant density in its interior. The radius is proportional to $A^{1/3}$, while the area of the surface is proportional to $A^{2/3}$, and the volume is proportional to A. In the Liquid Drop model the influence due to *volume term* over the mass $M_{Z,A}$ is $f_1(Z,A) = -a_1.A$, while due to the *surface term* is $f_2(Z,A) = +a_2.A^{2/3}$. Therefore the model considers that the radius increases with the growth of A, $R \propto A^{1/3}$. But the problem arises from the following fact, detected by experiments: "*The radius does not increase with the growth of A. In reality it happens just the contrary: the light nuclei have R = 10F , while the heavy nuclei have R = 9F* ". Then it seems that there is other "*thing*" increasing with the growth of A. And perhaps such a mysterious "*thing*" would be the superposition of many fields Sn(p) and Sn(e) surrounding the nuclei.

Concerning to stability of nuclei, the binding energy of a nucleus can give us an idea of its stability, by its relation ΔE/A. But there is another more sensitive parameter that we can consider: the "*last neutron binding energy* En", and the "*last proton binding energy* Ep". They are the smaller energies necessary to extract a neutron or a proton from a nucleus.

From the Liquid Drop model we can get the theoretical En_T last neutron binding energy for the whole heavy nuclei. The Fig. 3.1 shows the difference $\Delta = En - En_T$. From the figure we realize that there is a big stability when Z= 28 , 50 , 82 , 126 . These nuclei with big stability are called Magic Numbers. They have Z= 2, 8, 28, 50, 82, 126. The 2He4 has En = 20,6 MeV and Ep = 19,8 MeV. They are exceptionally high , and the Nuclear Theory has not an explanation for this exceptional anomaly. Herein we will give an explanation for such anomaly.

In 1963 the physicists Jensen and Mayer have been awarded the Nobel Prize for their work explaining the reason why the Magic Numbers are more stable than the other nuclei. Their explanation is according to the Fig. 3.2 .

However, the Mayer-Jensen explanation is not perfect. Let's see why.
1-From Z=28 to Z= 184 , the Magic Numbers are selected according to the <u>lower</u> level of energy. For example, the level 1g has two levels of energy, and $1g_{9/2}$ is the lowest of them (see the Fig.

3.2). Therefore it is coherent the conclusion that 50Sn is a Magic Number, because in the lowest level of energy a nucleus has higher stability.

2-But with Z=8 and Z=20 , it is taken in consideration the highest level of energy. We can see in the Fig. 3.2 that the level 1d is lower in the level $1d_{5/2}$, and therefore from Mayer-Jensen theory the nucleus 14Si would have to be a Magic Number, and not the nucleus 20Ca (this one has four protons in the highest level $1d_{3/2}$). By the same way, because $1p_{3/2}$ is the lower level, from their theory the nucleus 6C would have to be a Magic Number, and not the nucleus 8O (this one has two protons in the highest level $1p_{1/2}$).

3-Conclusion**:** From Mayer-Jensen theory , the 8O and the 20Ca could not be Magic Numbers (but actually they are). Unlike, the 6C and the 14Si would have to be (but actually they are not).

4. THE NEW NUCLEAR MODEL

As at the present paper the nuclear model works by a magnetic flux, let us see by what way the nucleons 1H2 are tied by such a flux. The 2He4 and the two magnetic fluxes f_1 and f_2 are shown in the Fig. 4.1. These fluxes f_1 and f_2 are able to capture other nucleons like a proton, or a neutron, or a nucleon 1H2. In order to simplify the figures ahead, sometimes we will not show the electron and the two protons of the nucleon 1H2. We will replace them by a simple spire, as shown in the Fig. 4.2.

According to the nuclear model of the author, all the nuclei with Z>2 are formed by a nucleon 2He4 at the center of these nuclei. So, the hexagonal floor begins with the Lithium. The Fig. 4.3 shows the 3Li6, where the first nucleon 1H2 is captured by the flux f_1 . After the 2He4, the next Magic Number is the oxygen 8O16 , which structure is shown in the Fig. 4.4.
In the paper No. 18 the reader will see why the 8O16 is a Magic Number, but the 6C12 is not.

A nuclear model formed by magnetic fluxes cannot explain the nuclear properties. For example, consider the Fig. 4.4 , showing the structure of 8O16. Taking in consideration the direction of the fluxes f_1 , f_2 ,... f_6, we have to expect that all the nucleons $(1H2)_1$, $(1H2)_2$, ... $(1H2)_6$ have to be in the same energy level. This means that all the 6 nucleons 1H2 would have to be in the same level $1p_{3/2}$, but actually the 8O16 has not its nucleons in the same energy level.

There are also problems with the coherence of the nuclear model. For example, let us analyze the 2He4 of the Fig. 4.1, where the fluxes f_1 and f_2 have contrary directions (concerning to rotation of clock's hand). Considering the direction of f_1 and f_2 , the nucleons $(1H2)_1$ and $(1H2)_2$ must have a total nuclear spin i=2, but the 2He4 has i=0 . If we change the direction of the flux f_2 , in order to get i=0 in the Fig. 4.1, we will have a problem in the Fig. 4.4**:** that theoretical structure of the 8O16 (where the fluxes f_1 and f_2 of the central 2He4 have they both the same direction) cannot have a total spin i=0, but we know that actually the real 8O16 has i=0 .
All these problems are consequence of the fact that we are considering yet a magnetic flux. We eliminate them when we consider that f_1 and f_2 have gravitational origin , as we will see in the mentioned paper No. 18, where we will show that the 8O16 has four protons in the level $1p_{3/2}$, and two protons in the level $1p_{1/2}$, and two protons in the level $1s_{1/2}$, as proposed by Mayer-Jensen.

As said before about the new nuclear model based on hexagonal floors, its discovery happened thanks to the existence of Magic Numbers. Ahead it is expl.ained how they have suggested the author to conceive the Hexagonal Floors model.

The first Magic Number with Z>2 is the oxygen. So, by considering a central 2He4 (which would be performing a magnetic flux that captures the nucleons), then the distribution of deuterons around the central 2He4 would have to perform a hexagon. On this way, the basic structure of nuclei would be composed by several hexagonal floors, all they parallel to that first hexagon formed in the structure of the 8O16 (which would be the first Magic Number of a series of nuclei structured by hexagons surrounding a central 2He4). With such structure, the next Magic Number would have to be the 14Si28 (two complete hexagonal floors). However look at in the Fig. 4.5 what happens**:** in the second floor the spins of nucleons 1H2 are aligned with the spins of the 2He4 . But in the first floor happens the same, and therefore the second and the first floor have aligned spins. The situation is like to say that the 14Si28 has not a good structure from the viewpoint of the Pauli's Exclusion Principle, because two matched nucleons dispute a same quantum status. Two nucleons 1H2 with aligned spins can lose more easily one neutron, and then the 14Si28 is not a Magic Number, because it is not high its last neutron binding energy.

Therefore the next structure with complete hexagonal floors which requires greater energy necessary to extract a neutron will have 3 complete floors**:** the 20Ca40 . With three hexagonal floors, HF=3 , the structure is able to suppress the tendency of spins alignment occurred at the Fig. 4.5 , as we see in the structure of the 20Ca40 shown in the Fig. 4.6 . Thus, according to the new nuclear model, the 20Ca40 would be a Magic Number.

The 26Fe52 has the same problem of spins alignment, already explained for the 14Si28, and by this reason the iron would be not a Magic Number. Its structure is shown at the Fig. 4.7.
The problems arises after the 26Fe**:** the 28Ni56 would not be a Magic Number, according to the new nuclear model, but it is known that it is. At that time the author has supposed that 28Ni has an anomalous structure, as shown in the Fig. 4.8**:** with the addition of two nucleons 1H2 to the 26Fe52 , the tendency of spins alignment is eliminated, and the structure with HF= 5 becomes assymetric, similar to that of the 20Ca40 (but not an assymmetry due to the number of nucleons, because Z é par, Z=28). By this reason the 28Ni56 would be a Magic Number.

The next Magic Number according to the model of hexagonal floors would have to be the 32Ge64, but actually it is not. Such anomaly has been credited to the following**:** as said, with the addition of nucleons 1H2 to the 26Fe52 in the Figure 4.7, they broke the tendency of spins alignment. And when 4 nucleons 1H2 are added to the 28Ni56 , they will take place in the two ends of the nucleus, like shows the Fig. 4.10. Thereby, the structure of Fig. 4.9 would not be formed (it would not exist), and 32Ge64 would not be constituted by 5 complete floors, and then it would not be a Magic Number. The real structure of 32Ge54 would be according to the Figure 4.10 (not Magic Number).

Other problem of the theory appears with the nuclei with Z= 44 (HF=7), Z=50 (HF=8), and Z=56 (HF=9). The nuclei with Z=44 and Z=56 would have to be Magic Numbers, because HF=7 and HF=9 are odd, like in the case HF=3 of 20Ca40, but actually they are not Magic Mumbers. And 50Sn could not be a Magic Number, because HF=8 (pair). The 50Sn with its structure 2He4+8HF is shown in the Fig. 4.11.

The next Magic Number 82Pb, with structure 2He4+13HF+2H2, would not be a Magic Number too (its anomaly, according to the new nuclear model, would be similar of that seen in the case of 28Ni56).
So, the quantity of anomalies is greater than the normal cases where the theory is agree with the existence of Magic Numbers, when we consider that 2He4 capturates the protons and neutrons by a magnetic flux.

The correct explanation for the existence of Magic Numbers is explained in the paper No. 18, where it is considered that the central 2He4 produces a gravitational flux. The capture of nucleons by the central 2He4 obeys to a sequence that is agree with the levels of energy according to Mayer-Jensen spin-orbit interaction, shown in the Fig. 3.2.

5. SEMI-EMPIRICAL FORMULA OF LIQUID DROP MODEL

The Liquid Drop model is unable to supply the theoretical binding energies for the nucleons with $Z \leq 2$. Here we will see why.
But before showing it, let us analyze the semi-empirical formula used by the Liquid Drop model. The semi-empirical formula does not supply the binding energy**:** it actually supplies the mass of nuclei, and from the difference of masses Δm we can calculate the binding energy. Unlike, the calculation which we get from the present new nuclear model supplies directly the binding energy.

The semi-empirical formula is $M_{Z,A} = f_0(Z,A) + f_1(Z,A) + ... f_5(Z,A)$, where**:**

$f_0(Z,A) = 1{,}887825Z + 1{,}008665.(A - Z)$	is the mass without packing loss
$f_1(Z,A) = -a_1 .A$ **;**	volume term
$f_2(Z,A) = +a_2 .A^{2/3}$ **;**	surface term
$f_3(Z,A) = +a_3 . Z^2 /A^{1/3}$ **;**	Coulombian term
$f_4(Z,A) = +a_4 .(Z - A/2)^2 / A$ **;**	asymmetry term
$f_5(Z,A) = -f(A)$ **;** or $= 0$ **;** or $= + f(A)$ **;**	matching term

6. BINDING ENERGY OF NUCLEONS WITH Z ≤ 2

The graphic showing the influence of these terms is shown in Fig. 6.1. We see that, in average, the mass can be described by $M_{Z,A} = f_0(Z,A) - a.A^{p/q}$, where p and q are variables that we can choose arbitrarily for each number A.

Intriguingly, the "*surface term*" would have to change with the growth of the nuclei's radius. But since the radius does not change with the growth of A and N, it is reasonable to consider that the greatest influence on the binding energy is due to the fields Sn(p) and Sn(e) of A protons + N electrons into the nuclei, because we can expect that the surface term can grow due to the growth of the density of the superposition of fields Sn(p) and Sn(e) that surrounds the nuclei (as Sn(p) and Sn(e) are constituted by the ether, the density of the superposition of fields Sn(p) and Sn(e) grows with the growth of A and N).

Therefore it is reasonable exhibiting a calculation of binding energy based on the energy that is required for perforating each one of the fields Sn(e) and Sn(p), as we will do herein.

Consider that we want to pack two nucleons.
The packing energy of each nucleon will be **:** Etotal = Er + Ed + Em (see Table 6.1).

Er- it's the energy required to bring the nucleon from an infinite distance and to put it together to the other nucleon, when there is Coulombian repulsion between them**:** $Er = k_0.q^2/r$

Ed- it's the energy required for perforating the fields of protons and electrons inside the nucleus. On other words, it's necessary to produce work in order to put the secondary fields Sn(p) concentric with the secondary fields Sn(e), by having the bodies of protons and electrons in the center of the concentric fields.

Em- it's an energy required for packing only the nucleons 1H3 , 2He3 , and 2He4 **:** such an energy is required for matching the principal fields Sp(p) of two protons.

In the packing of 1H2 , 1H3, and 2He4 , the field of <u>one</u> proton needs to be placed concentric with the fields of other nucleons. From the results of experiments we can calculate Ed and Em .

6.1) THE PACKING ENERGY OF EACH NUCLEON

The values obtained from experiments are in the Table 6.1.1.
We will use the Table 6.1.1 for the obtainment of Ed and Em.

6.2) CALCULUS OF THE QUANTITY OF PERFORATED FIELDS

For the calculation of the energy Ed it's necessary to calculate the quantity of fields that must be perforated when the nucleons enter within the nuclei (See the Table 6.1.2)

6.3) THE ENERGY OF PERFORATION**:** Ed_1

From the packing of the 1H2 from 1 neutron + 1 proton we can calculate the energy Ed required for perforating each one of the fields (to put them concentrically). Let's calculate it, as follows.

There is no repulsion between the neutron and the proton, and then Er = 0.
Em = 0 because we don't have to match the spins of protons (see the sequence of figures 6.3.1, 6.3.2, 6.3.3 and 6.3.4).
Etotal = Ed

Then the 2,22 MeV for packing the 1H2 are spent for perforating the 4 fields.
2,22 / 4 = 0,555MeV for perforating each one of the fields (the energy to put concentric the field Sn(p) of <u>one</u> proton with the other fields Sn(p) and Sn(e) of the other nucleon).

Ed_1 = 0,555 MeV / field

This is the energy required when we are packing two nucleons, where one of them is constituted by only one proton (or only one neutron).

6.4) THE Em MATCHING ENERGY

We can use the binding energy of the 2He3 for the obtainment of the Em energy:

6 fields must be perforated in the packing of the 2He3 from 1H2 + 1H1 → 2He3 , then

$$Ed = 6 \times 0{,}555 = 3{,}33 \text{ MeV}$$

We have to bring the proton 1H1 near to the nucleon 1H2 , therefore the distance between them will be 10^{-15}m , which is the proton's radius. Then the Er energy of repulsion is**:**

$Er = 9x10^{9}x(1{,}6x10^{-19})^{2} /10^{-15} = 2{,}304x10^{-13}$joules = 1,44MeV
Ed + Er = 3,33 + 1,44 = 4,77 MeV

But the packing energy of 2He3 is 7,72 MeV , then Δ= 7,72 - 4,77 = 2,95 MeV

The difference 2,95 MeV is the necessary energy to put the body of proton number 3 beside the bodies of protons numbers 1 and 2 . This is the Em energy, Em = 2,95 MeV (see the Fig. 6.4).

Em = 2,95 MeV / proton

Therefore, 2,95 MeV is the energy required to match one proton (the body of proton number 3 like showed in the Fig. 6.4). For two protons, 3x2,95MeV= 8,85 MeV will be required.

6.5) THEORETICAL BINDING ENERGY OF 1H3
Fig. 6.5 shows the formation of 1H3 from the collision of one nucleon 1H2 with one neutron.
Er = 0
Ed = 12x0,555 = 6,66 MeV
Em = 2,95 MeV
Binding energy 1H3 = 9,61 MeV (experiments = 8,47 MeV)

7. THEORETICAL BINDING ENERGY OF NUCLEI WITH Z ≥2
We cannot begin yet the calculation for nuclei with Z ≥ 2, because till now we had worked with Ed_1=0,555MeV/nucleon, but this value concerns only to formation of nucleons obtained from (Z,A)+1H1. The 2He4 and the others nuclei with Z >2 are formed by (Z , A) + 1H2 .

Therefore we have to calculate for Z>2 the Ed_2 term , which is the necessary energy to pack a nucleon 1H2 into a nucleus (Z , A), getting a nucleus with Z≥3.

We must consider two different Ed_2 terms**:**
$Ed_{2(odd)}$ = concerning to Z = not pair
$Ed_{2(pair)}$ = concerning to Z = pair

7.1) THE $Ed_{2(odd)}$ TERM FOR Z = ODD
We get the 3Li6 from 2He4 + 1H2 → 3Li6.
The empirical packing energy of 3Li6 is 32,00 MeV.

Two protons of the 2He4 tries to expell the aproach of 1H2, then Er = 2 x 1,44 = 2,88 MeV
32,00 - 2,88 = 29,12 MeV is the energy necessary for perforating the 36 fields.
29,12 / 36 = 0,8089 MeV.

$Ed_{2(odd)}$ = 0,8089 MeV /field

7.2) THE $Ed_{2(pair)}$ TERM FOR Z = PAIR
We get the 4Be8 from 3Li6 + 1H2 → 4Be8.
The empirical packing energy of 4Be8 is 56,5 MeV.
Er = 3 x 1,44 = 4,32 MeV

It must be perforated 54 fields, then**:**
56,5 - 4,32 = 52,18 MeV is the necessary energy to drill 54 fields.
52,18/54 = 0,9663 MeV is the energy for perforating one field

$Ed_{2(pair)}$ = 0,9663 MeV

NOTES**:**

1) Pay attention that the value 0,8089 is connected to Z=2 of 2He4 in the packing of 2He4 + 1H2.
2) The packing and the crushing requires different values of the term Ed. While the packing can require Ed = 0,555MeV, the crushing can require Ed = 0,8089MeV or 0,9663MeV. When we want to extract a neutron from a nucleus, it is submitted to a crushing . So, if we have a crushing 2He4 → 2He3 + 0n1 , we must use Ed = 0,8089MeV (and not 0,555MeV), because the neutron has been packed in the reaction 1H2+1H2→2He4 . But the extraction of one proton from a nucleus 2He4 requires Ed = 0,9663 MeV in the crushing 2He4→1H3+1H1.

7.3) THEORETICAL BINDING ENERGY OF 2He4
We get the theoretical binding energy of 2He4 from the reaction 1H2 + 1H2 → 2He4 (Fig. 7.3)**:**

ΣEd = 18x 0,9663 =	17,39 MeV
Er =	1,44 MeV
Em = 3x2,95=	8,85 MeV
total =	27,68 MeV (compare with empirical value = 28,30 MeV)

7.4) LAST PROTON BINDING ENERGY OF 2He4
If we want extracting a proton from a nucleon 2He4, we need applying the same energy necessary to get a nucleon 2He4 from the reaction 1H1 + 1H3 → 2He4 , as shown at the Figure 7.4. We have**:**

Er =	1,44 MeV
ΣEd = (5x1 + 1x5)x0,9663 =	9,663 MeV
Em = 3x2,95 =	8,85 MeV
Ep of 2He4 =	19,95 MeV (empirical = 19,8 MeV)

7.5) LAST NEUTRON BINDING ENERGY OF 2He4
If we want extracting a neutron from a nucleon 2He4, we need applying the same energy necessary to get a nucleon 2He4 from the packing 0n1+2He3→2He4 , equivalent to the crushing 2He4→0n1+2He3, as shown at the Fig. 7.5.

We must use $Ed_{2(odd)}$ = 0,8089MeV (see "note" at the end of the item 7.2).
We have**:**

Er = 0

ΣEd = (4x2 + 2x4)x0,8089 = 12,94 MeV

Em = 3x2,95 = 8,85 MeV

En of 2He4 = 21,79 MeV (empirical = 20,60 MeV)

7.6) THE BINDING ENERGY OF 5B10

Er = 4 x 1,44 = 5,76 MeV

$Ed_{2(odd)}$ = 72 x 0,8089 = 58,24MeV

total = 64,00 MeV (empirical = 64,75)

7.7) THE BINDING ENERGY OF 6C12

Er = 5 x 1,44 = 7,20 MeV

$Ed_{2(pair)}$ = 90 x 0,9663 = 86,97 MeV

total = 94,17MeV (empirical = 92,20 MeV)

7.8) THE BINDING ENERGY OF 7N14

Er = 6 x 1,44 = 8,64 MeV

$Ed_{2(odd)}$ = 108 x 0,8089 = 87,36 MeV

total = 96,00 MeV (empirical = 104,66)

7.9) THE BINDING ENERGY OF $_8O16$

Er = 7 x 1,44 = 10,08 MeV

$Ed_{2(pair)}$ = 126 x 0,9663 = 121,75 MeV

total = 131,83MeV (empirical = 127,62).

Actually both $Ed_{2(odd)}$= 0,8089 and $Ed_{2(pair)}$= 0,9663 decrease with the growth of A, because the superficial tension of a sphere (constituted by the overlapping of many fields Sn(p) and Sn(e)) decreases with the growth of the radius of the sphere. In the Liquid Drop model this fact is represented quantitatively by the *surface term* $f_2(Z,A)= +a_2.A^{2/3}$. We also can introduce a correction, like for example $Ed_{2(odd)}$= 0,8089.f(A) , where 0<f(A)≤1 is a suitable function.

8. CONCLUSIONS

Herein we proposed a new nuclear model which is **unique**. The proposed model is unable yet to reproduce theoretically all the nuclear properties, because it works yet with a magnetic flux. Besides, there are philosophical incoherences in the working of the model. In a posterior paper(2) we will eliminate these flaws.
In other papers we will also show that electron's participation into the structure of nuclei is fundamental. Only with the electron participation into the structure of nuclei it is possible to explain many nuclear properties, as for example, the deuteron's electric quadupole moment, and the no-conservation of parity in the beta-decay.

NOTE: When the first version of this paper has been writen in 1994, the author did not have knowledge about the cold fusion existence. As it is known, several experimental findings are suggesting that cold fusion is a phenomenon that requires the participation of the electron into the structure of nuclei

References**:**

1. Guglinski, W. New Model of Neutron-First Part, "*Journal of New Energy*", 4, 4, 2000
2. Concerning to the questions of Nuclear Physics mentioned in this paper, they are the basis of the current Nuclear Theory, and therefore they can be found in any book. By this reason the author believes that it is not necessary to mention any specific book.

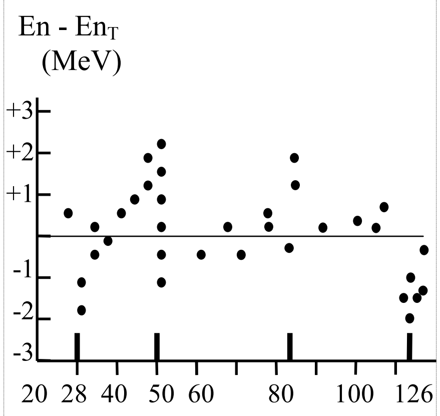


Fig. 3.1
Difference between En and En_T

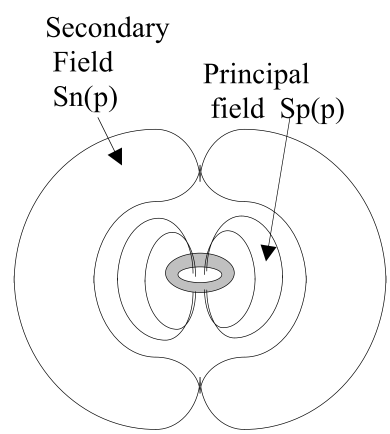


Fig. 2
The proton is constituted by:

1- A body-ring
2- A principal field Sp(p) induced by the rotation of the body-ring.
3- A secondary field Sn(p) induced by the rotation of the field Sp(p)

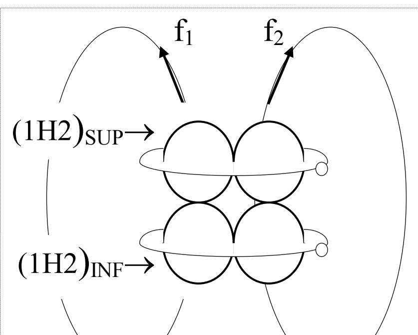


Fig. 4.1
The nucleus 2He4 by considering that f_1 and f_2 are magnetic fluxes

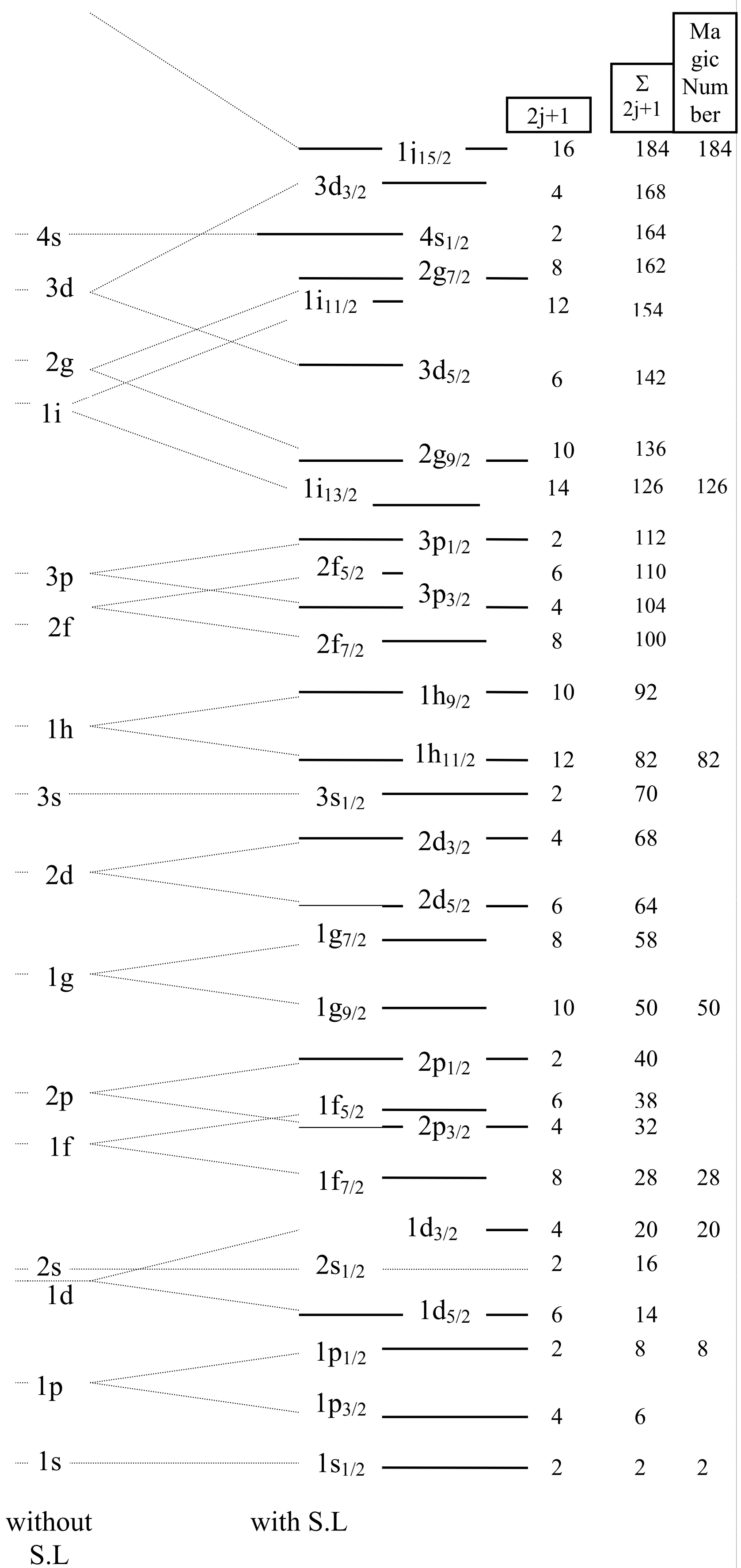


Fig. 3.2
Mayer-Jensen spin-orbit interaction

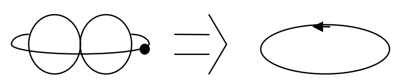


Fig. 4.2

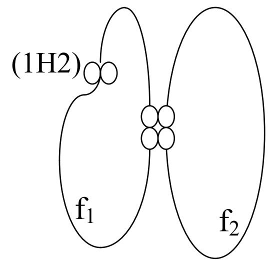


Fig. 4.3 - The 3Li6

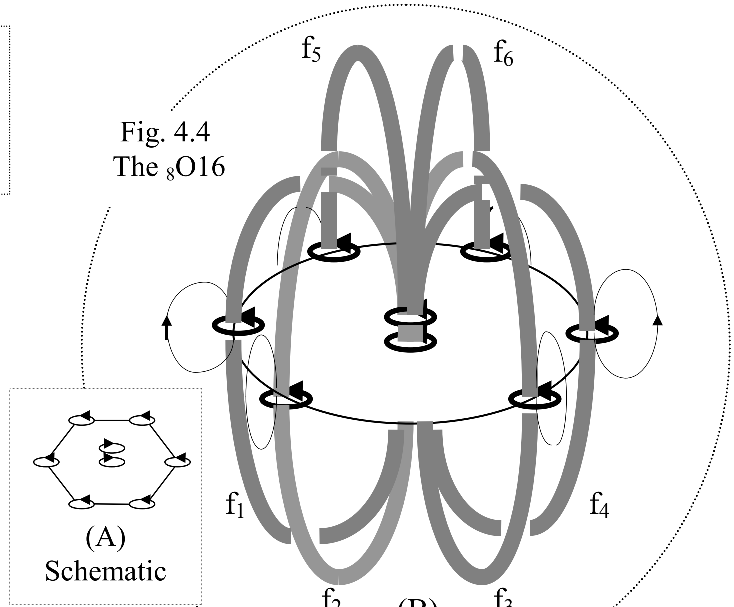


Fig. 4.4
The $_8$O16

(A)
Schematic

(B)
Perspective

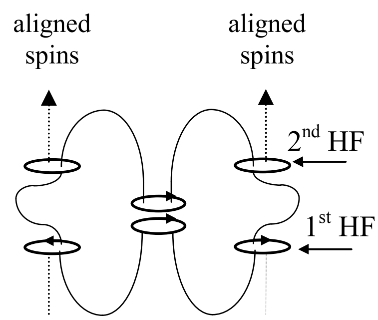


Fig. 4.5- The 14Si28**:**
2 completes hex. floors

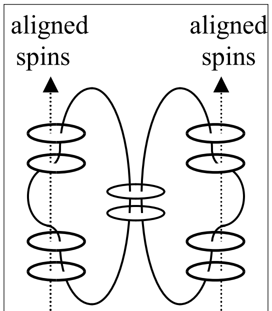


Fig. 4.7
The 26Fe52**:**
4 completes HF

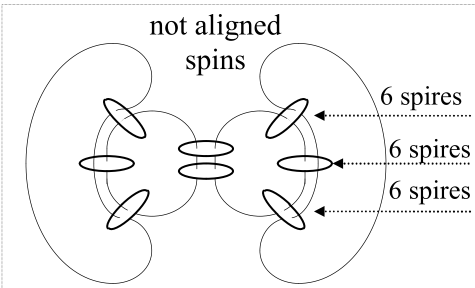


Fig. 4.6- The 20Ca40
3 completes hexagonal. floors

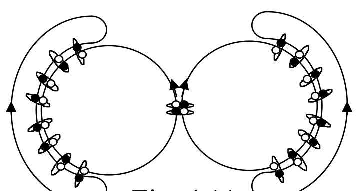


Fig. 4.11
The 50Sn

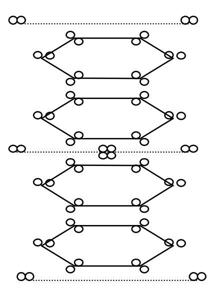


Fig. 4.10-
The real 32Ge64

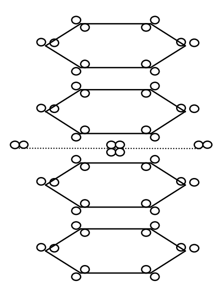


Fig. 4.8
The 28Ni56

6 complete HF

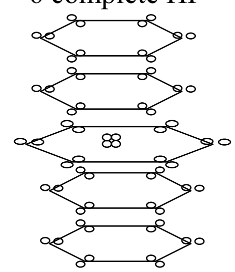


Fig. 4.9
If the 32Ge64 should have this structure, it would be a Magic Number

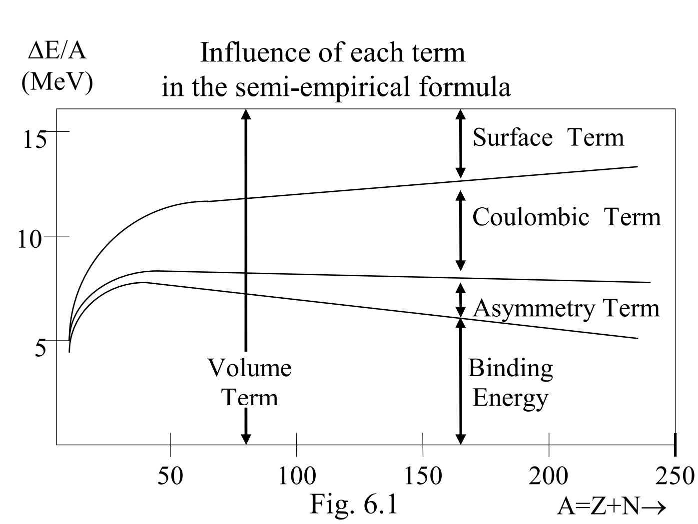


Fig. 6.1

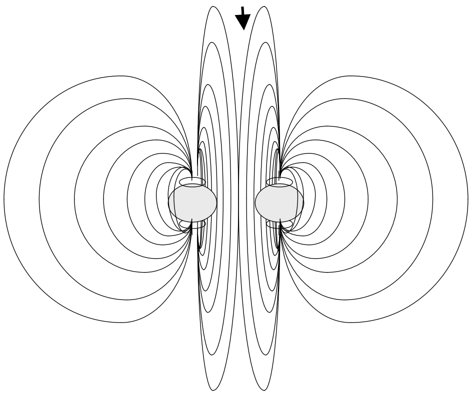
Fig. 6.3.1

The **secondary** repulsion between two protons due to the repulsion of their two principal fields Sp(p).

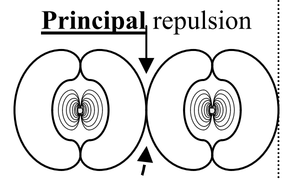
To bring one proton near to other, we need**:**

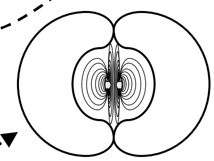
1- An energy Er able to win the principal repulsion between the two secondary fields Sn(p). (Fields Sn(p) are not shown in the figure at left).

2- An energy Ed able to drill the two secondary fields Sn(p) and get their overlap.



The two fields Sn(p) are not shown





The two fields Snp(p) were perforated and overlapped

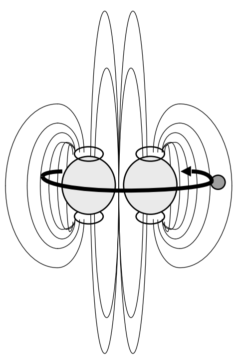


Fig. 6.3.2
The two protons of the Fig. 6.3.1 can stay together only if their secondary repulsion can be won.
It's necessary the help of a field of electron's spiral, in order to win the repulsion.

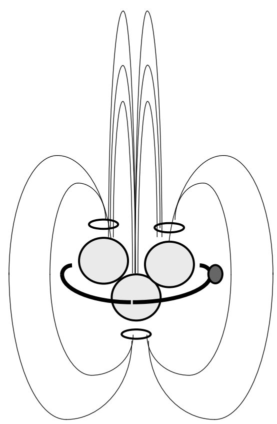


Fig. 6.3.3
For packing the third proton we need the Em energy. It will match the principal fields Sp(p) of protons.
Em = 2,95 MeV / proton

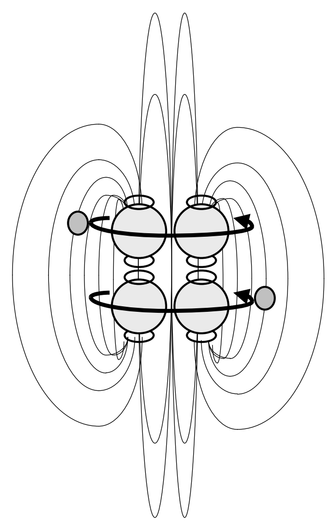
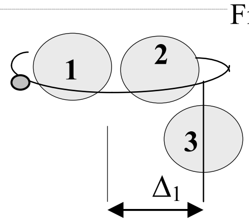
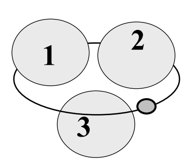


Fig. 6.3.4
When appears the fourth proton, only 1 spiral isn't enough to win the secondary repulsion, and it's required the participation of the 2nd electron's spiral.
Although here we are exhibiting magnetic fluxes, in the paper No. 18 it is exhibited a solution by gravitational fluxes.

Fig. 6.4



(A) – From this situation, it's required yet 2,95MeV for wining the distance Δ_1



(B)- The body 3 is matched

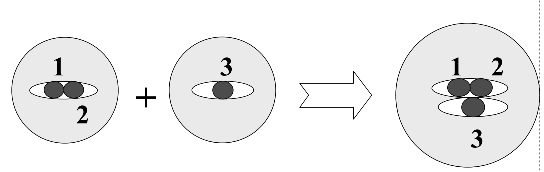


Fig. 6.5**:** 1H2 + 0n1→ 1H3

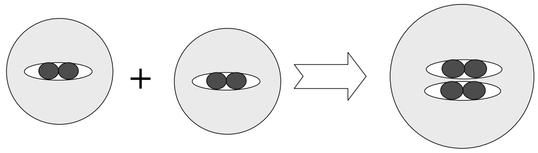


Fig. 7.3

(Ed_2 = 0,9663 MeV) In the Fig. 6.4 we had Em = 2,95 MeV with regard to one proton. In the present Fig. 7.3 we have two protons, then Em = 3 x 2,95MeV

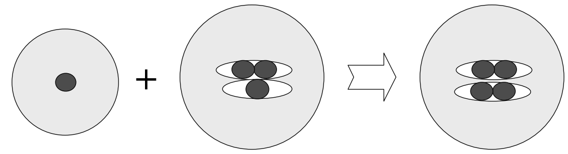


Fig. 7.4 : 1H1 + 1H3 → 2He4

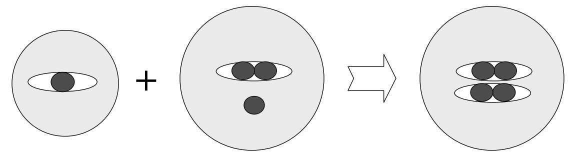


Fig. 7.5 : 0n1 + 2He3 → 2He4

TABLE 6.1

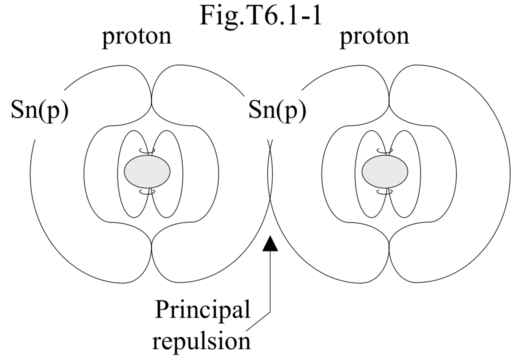
The three sorts of energy:

1 - Energy Er - Packing two protons:

"Er" is the energy required for **WINING** the Coulombic principal repulsion between two secondary fields Sn(p) , when one of the protons comes from an infinite distance:

$Er = k_0.q^2/r$.

Fig.T6.1-1



2 - Energy Ed - It is the energy required for **PERFORATING** the secondary fields Sn(p) and Sn(e):

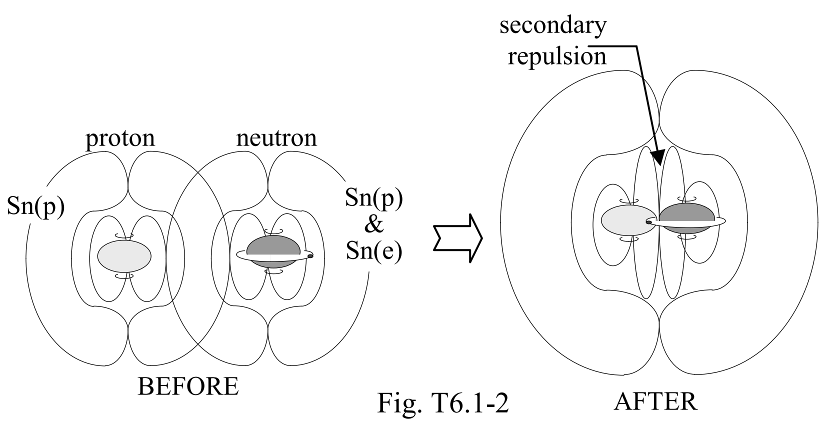


Fig. T6.1-2

3 - Energy Em - It is the energy required for **MATCHING** the principal fields Sp(p) of two protons:

Fig. T6.1-3

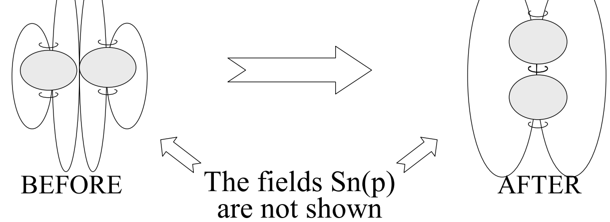


TABLE 6.1.1

	ΔE / A	ΔE
1H2	1,11	2,22
2He3	2,57	7,72
2He4	7,07	28,30
3Li6	5,40	32,00
4Be8	7,06	56,50
5B10	6,47	64,75
6C12	7,68	92,20
7N14	7,48	104,66
8O16	7,97	127,62

TABLE 6.1.2

NUCLEI FORMED BY (Z , A) + 1H1

neutron :
2 fields drilled : the body of proton drills the field of electron : 1
: the body of electron drills the field of proton : 1
total : 2

1H2
4 fields drilled : neutron = 2 fields
: proton = 1field
total = (2x1+ 1x2) = 4

1H3
12 fields drilled : neutron= 2 fields
: 1H2 = 3 fields
total = (2x3 + 3x2) = 12

2He3
6 fields drilled : 1H2 = 3 fields
: proton = 1 field
total = (3x1 + 1x3) = 6

NUCLEI FORMED BY (Z , A) + 1H2

2He4
18 fields drilled
3 bodies(2pr + 1elec) x 3 fields+
+ 3 bodies(2pr + 1elec) x 3 fields

3Li6
36 fields drilled
6 bodies(4pr + 2elec) x 3 fields+
+ 3 bodies(2pr +1 elec) x 6 fields

4Be8
54 fields drilled
9 bodies(6pr + 3elec) x 3 fields+
+ 3 bodies(2pr + 1elec) x 9 fields

5B10
72 fields drilled
12 bodies(8pr + 4elec) x 3 fields+
+ 3 bodies(2pr +1elec) x 12 fields

6C12
90 fields drilled
15 bodies(10pr + 5elec) x 3 fields+
+ 3 bodies(2pr + 1elec) x 15 fields

7N14
108 fields drilled
18 bodies(12pr + 6elec) x 3 fields+
+ 3 bodies(2pr + 1elec) x 18 fields

8O16
126 fields drilled
21 bodies(14pr + 7elec) x 3 fields+
+ 3 bodies(2pr + 1elec) x 21 fields