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ANOTHER VISION ABOUT BINDING ENERGY OF ALPHA 4

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ABSTRACT: *Two electrons in two deuterons exchange their energies in fusing four protons in alpha 4 where every electron divides its 2.2 Mev energy between two protons one of them is in the other deuteron .Therefore the electron's energy in neutron as a system and as a constant is that the nuclear binding energy and not the energy comes as a portion of mass turns out to be a pure energy from the two protons + two neutrons of alpha 4 according to Einstein's famous equation E=mc^2 , at least, because in 2.2 Mev energy, the speed of light is exceeded by the electron in the nuclear range !*

KEY WORDS: electron – neutron as a constant – deuteron – alpha 4 - nuclear binding energy – nuclear radius – speed of light – Maxwell's celebrated equation.

INTRODUCTION

We accustomed to believe that the actual mass of a nucleus is always less than the sum of the individual masses of its constituent protons and neutrons, because a "portion" of energy is taken from them when their nucleus is formed, this what is known as mass defect which can be calculated using Einstein's famous equation $E = mc^2$ The binding energy of alpha 4 is explained and calculated usually according to it. But we are going here to present another view about the binding energy of alpha 4 and in the same time of heavier nuclei proving that the neutron as a system and a universal constant is responsible for creating the deuteron consisting of one neutron + one proton as the first and basic nuclear entity from which alpha 4 is formed as two deuterons and from it heavier nuclei are created.

The problem and the solution:

Experimentally, the binding energy of deuteron fusing one proton to one neutron is 2.2 Mev[(1)], but surprisingly according to $E = mc^2$, nuclear binding energy of alpha 4 which is two deuterons is 28.3 Mev[(2)]! This situation is a great problem indeed, but it can be solved as follows:

The neutron is not an ordinary particle like a proton or an electron, it is a system consisting of these two particles, and in the same time it is a constant where the electron's energy inversely proportionate with its distance from the proton or other charged particle like a positron as we showed it in previous paper as constant U[(3)] where

$$m_e v^2 r = \frac{e^2}{4\pi\epsilon_0} 2.30 \times 10^{-28} J - m \qquad [1]$$

When the electron is at the basic nuclear radius[(4)] from the proton ($r = 1.30 \times 10^{-15} m$) it then has its maximum energy of $2.2\, mev = 3.52 \times 10^{-13}$ J. Using U in finding how a deuteron is formed, we discovered that the electron divided this amount of energy between its

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proton in the neutron and the other proton , therefore the share of each proton is 1.1 Mev, and the basic nuclear radius r of the deuteron is nothing but the mentioned distance between the electron and the proton. Let us see now how the division of 2.2 Mev or $3.524 \times 10^{-13} J$ takes place through constant U giving exactly the basic nuclear radius r as follows:

$$\frac{2.30\times10^{-28} J-m}{3.524\times10^{-13}\,{}^{J}/_{2}} = 1.30 \times 10^{-15} m.$$

At it is clear this value is an ideal one of the constant r_0 as it is the basic nuclear radius between $1.4 \times 10^{-15} m.$ for the lightest nuclei and $1.2 \times 10^{-15} m.$ for the heaviest(4).

Formation of alpha 4 :

Let us denote the proton inside the neutron by (n proton) , therefore as alpha 4 consists of two deuterons, it cannot be created without each electron in each one of the two neutrons fusing its n proton with the proton in the other deuteron. This exchange in the functions of the two electrons explains the strength of alpha 4 to the degree of considering it one particle where we accustomed to call it alpha particle , therefore 4.4 Mev is still the binding energy of alpha 4, where 4.4 Mev is divided by 4 while the previous 2.2 Mev of deuteron is divided by 2 as follows

$$\frac{2.30\times10^{-28} J-m}{7.048\times10^{-13}\,{}^{J}/_{4}} = 1.30 \times 10^{-15} m.$$

Alpha 4 is emitted from nuclei as the most effective one of the three sorts of nuclear emissions besides beta and gamma. Gamma as it is well known is the result of the interaction between two electrons of opposite charges, while beta is emitted when one neutron breaks down missing its electron and turning out to be a proton where the atomic number goes up by one while mass number remains unchanged. When an alpha 4 is emitted in Rutherford's historical well known experiment the result was as follows :

1- The nucleus of an atom splits into two parts.

2- One of these parts (the alpha particle) goes zooming off into space.

3- The nucleus left behind has its atomic number reduced by 2, and its mass number reduced by 4 (that is by 2 protons and 2 neutrons)

It is very important to notice that there is no repulsion between the two protons neither in deuteron nor in alpha or in any larger nuclei as the electron in the neutron system with its negative charge neutralizes one of the two protons , and this is the real role of neutrons in atomic nuclei. This solves the problem of the repulsive protons crowded together in the very tiny nucleus where a strong force(6) called nuclear force is suggested to keep them from flying apart, but neither the nature of this force nor its source is known while here we know exactly that it is the electron's energy determined by its distance from the proton in neutron system, and this system is a constant having its mentioned definite value. For this reason the number of neutrons equals or being more than that of protons in atomic nuclei.

The half life time of nuclear decay:

Because every electron divides its energy equally between two protons from the beginning process of shaping nuclear range in deuteron and its double form of alpha 4, then the whole

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nuclear energy is thus divided into two parts as everything alive or not alive thing is divided into two equal parts in the universe including the circular motion itself which lies in the depth of engineering the universe , and the nuclear decay takes the same style occurring according to half lifetime where the half life period of a radioactive element is the time taken for any quantity of the element to decay by half of the quantity initially present , thus at the end of time T only half of the radioactive atoms remain unchanged(5). Therefore the decay process takes the same way of the formation of nuclear phenomenon but in the opposite direction.

The speed of light c is exceeded in nuclear range :

It is clear that an electron with the mentioned 2.2 Mev energy moves with a speed exceeding greatly the speed of light c, because the analytical form of Maxwell equation is as follows

$$c^2 = \frac{1}{\epsilon_0 \mu_0} = \frac{e^2}{4\pi r m_e \varepsilon_0} \qquad [3]$$

This analytical form is a special case in the previously mentioned constant U where

$$m_e v^2 r = \frac{e^2}{4\pi r \epsilon_0} = 2.30 \times 10^{-28} J - m$$

When $r = 2.8 \times 10^{-15} m$. which is the basic nuclear diameter, then we have Maxwell equation where the electron m_e moves with the speed of light c, and its energy thus is $m_e c^2 = 8.199 \times 10^{-14} = 0.511$ Mev. At less value of r , the electron moves with greater speed as it is the case of 2.2 Mev. Therefore Einstein equation $E = mc^2$ that considered the speed of light c is the maximum speed in the whole universe leads necessarily to erroneous result in nuclear range,and for this reason applying it to alpha 4 led to that 2 protons + 2 neutrons in are fused by 28.3 Mev energy while experimentally one proton + one neutron are fused by only 2.2 Mev ! let us say here that from the mentioned analytical form of Maxwell's equation $E = mc^2$ explains only the minimum value of beta and that of gamma when the distance between the electron and the proton and the positron is the basic nuclear diameter $2.8 \times 10^{-15} m$. but at less distance the speed of light c is exceeded as mentioned above.

CONCLUSION

The electron in a neutron system has the energy of fusing one proton with its proton in the neutron creating the nucleus called deuteron according to constant U that measures the energy of the electron according to its distance from the proton in neutron's system. The electron's energy of creating a deuteron experimentally was 2.2 Mev, therefore the energy needed to create two deuterons or alpha 4 is logically double 2.2 Mev or 4.4 Mev, not 28.3 Mev according to Einstein's formula $E = mc^2$, this result had been based on vague idea stating that a portion of the masses of the four nucleons formed alpha 4 is turned out to be a pure energy responsible for gathering them in the one entity of alpha 4 because the whole mass of alpha is slightly less than the masses of its 2 protons + 2 neutrons. But as neutron is a system consisting of two particles, it must not dealt with as one particle like a proton especially after proving that it is a universal constant U having a definite value, and that the analytical Maxwell celebrated equation is a special case in U , therefore the speed of light c according to it is not at all is the maximum speed in the universe which is the corner stone of S. Relativity.

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