Unified Field Theory and Topology of Nuclei

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Abstract This paper proposes that a nucleus has a lattice configuration. A nucleus can not be seen visually. The configuration of a nucleus is studied in theoretical models, such as lattice, NCFC, and water drop. There are a few theories study many body interactions in a nucleus, such as Ab initio calculation, BCS formalism, and SEMF. However, the precise structure of an isotope is not known. According to Unified Field Theory (UFT), a proton has the shape of an octahedron. Since the strong forces are along the axes of the octahedron of protons and neutron, the structure of ground state isotopes of any given element can be logically induced. Furthermore, only two of three axes of the octahedron nucleus possess interactive forces. Therefore, any nuclear structure has one layer only. Our results demonstrate that there is a configuration for any isotope. Mass, stability and configuration of an isotope are related. We anticipate our essay to be a starting point of new method that provides precise configuration for each isotope, theoretical mass calculation for an unknown isotope, and nuclear characteristics/stability analysis for a given configuration. For example, the best symmetrical lattice of an isotope can be selected from all possible lattices. The selected lattice for the isotope can decide the stability of the isotope.

Keywords: *Nuclear Physics, Particle Physics, Unified Field Theory*

1. Introduction

The latest UFT (e.g. [1], [2]-[5]) predicted that proton and neutron are in an octahedron shape (e.g. [5]) with three axes. The nuclear theories, such as Lattice model (e.g. [7],[8]-[31]), Water Drop model (e.g. [32],[33]-[36]), BCS formalism, Ab initio calculation, SEMF, can only speculate or model nuclear structure. As result, the existing theories can not predict the stabilities of Technetium (e.g. [37], [38]-[53]).

Neutron and proton are interacted mainly via two strong interactive axes.

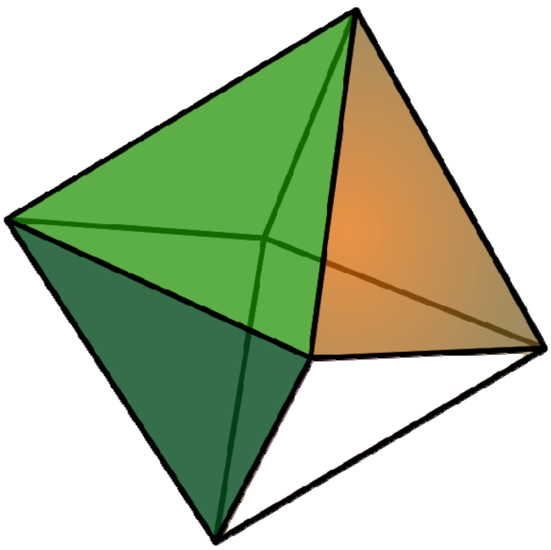

Fig. 1. Octahedron Proton

Octahedron protons and neutrons pile themselves up to make a nucleus. The configuration of proton/neutron octahedron pile decides the characteristics of a nucleus.

This paper analyzes the piling structures for some stable nuclei and unstable nuclei. The stability of a nucleus is largely based on whether the piling is symmetrical or not. A symmetrical nucleus is stable; otherwise, it is not stable.

2. Topology of Nuclei

The following UFT concepts will be used extensively in the paper:

The main structure of the Proton and Neutron are their axes (e.g. [5]): A^2, A^2 and A (some time B).

The component "A" has the following mass formula:

A = (2*3*5)

In addition,

A^2 = (2*3*5)* (2*3*5)

Component "B" has the following mass formula:

B = 2*2*4 (for proton) or 2*2*2*2 (for neutron)

2.1. Nuclear Lattice

When the proton count is more than four, the protons and neutrons are piled on a 2D plane formed by two main octahedron axes A^2 and A^2. The particles are aligned along the octahedron axes so that the roaming waves are moving along the straight lines.

2.2. Particle Piling

A proton has a single charge. The charged forces are evenly distributed vertical to the eight faces of the proton (e.g. [5]).

The proton structure needs to be symmetrical to make the structure stable.

3. Bonding Forces

3.1. Deuterium

A deuterium (e.g. [54], [55]-[61]) nucleus has a proton and a neutron. It is a stable symmetrical nucleus.

Proton:

$2A^2$+A+2*3+137/900+8/(137*137)+ (5/2)/(137*137*2*3)

Neutron:

Proton+137/(900*2.5*2)+10/(137*137)+ 1/(137*137*6)

When a proton and a neutron form a nucleus, one of the axes A from proton bonds with an A axis from neutron introduce a new bonding force of 137/900. Wave 2*3 becomes 2*2 to resonant with two nodes.

The wave 2.5 of neutron becomes 2 to resonant with the other 2*2 waves. The dissonant weak interaction of 2.5 with 2*3 no longer exists since 2*3 wave changed to 2*2.

Wave 2*2 weakly interacts with A (2*3*5). 5 is not direct energy and it has factor of ½. The self-dissonance weak interaction wave of 2*3*5 is:

5/(137*137*2*2*3) = 0.000022

A transformed proton and neutron has lower energy in the ^{2}H nucleus.

Proton:

$2A^2$ + A + 2*2+ 137/900 + 8/(137*137) + 137/(900*3*2) + 5/(137*137*2*2*3) = 1834.15267

Neutron:

$2A^2$ + A + 2*2 + 2 +137/900 + 8/(137*137) + 5/(137*137*2*2*3) + 1/(137*137*6)= 1836.17805

Strong interaction on the bonding point:

1*137/900

Total: 3670.48294

It matches exactly to the known value: 3670.48294 of ^{2}H mass.

3.2. Tritium

A deuterium (e.g. [62], [63]-[69]) nucleus has a proton and two neutron.

Since there are two neutrons, two negative waves 3 are shared among them. Proton only contains three axes:

3*($2A^2$ + A) + 2*3 = 5496

Two energy 3 waves strongly interact with three nucleons:

2*3*137/900 = 0.9133333

The 2.5 wave in neutron is missing; the neutron bonding remains, as there are one more neutrons than protons. The energy is reduced to one quarter of neutron bonding:

137/(900*5*2*2) = 0.0076111

The weak interaction on eight faces of octahedron structure:

8/(137*137) = 0.000426

The weak interaction of two wave 3:

2/(137*137) = 0.000107

The total mass: 5496.9215

It matches the experimental data of ^{3}H mass: 5497.9215

3.3. Helium-3

A helium-3 (e.g. [70], [71]-[78]) nucleus has two protons and a neutron. It is a stable symmetrical nucleus.

Since there is single neutron, only has single wave 5:

2*($2A^2$ + A) + ($2A^2$ + A + 5) = 5495

A^2 aggregates with A during interaction (A^2 + A = 930) as charged protons dominate the nucleus. Three nucleons strongly interact via two bonding points. But each bonding point has half the energy since the nucleons can rotate.

2*137/(930*2) = 0.147312

Dissonance wave of 5:

5*137/930 = 0.736559

Additional interactions are between 930, 30 and 5:

137/(930*30*5) = 0.001

The total mass: 5495.8851 matches the experimental data.

3.4. Helium-4

A helium-4 (e.g. [70], [71]-[78]) nucleus has two protons and two neutrons. It is a stable symmetrical nucleus.

Since there are two neutrons, two positive waves 3 are shared among them. The charged axis A changes to B (2*2*4) to interact with the central waves of $2A^2$. Wave 2*3 facilitates passing wave’s direction changes. Energy formula becomes:

4*($2A^2$ + B + 2*3) + 2*3 = 7294

Four nucleons strongly interact via four bonding points. But each bonding point has half energy since the nucleons can rotate. A^2 aggregates with B during interaction (A^2 + B = 916) as charged protons dominate the nucleus:

4*137/((900 + 2*2*4)*2)= 0.29912664

Weak interaction:

4/137*137 = 0.0002131173

The total mass: 7294.29933975 matches the experimental data: 7294.299

4. Light Nuclei

4.1. Hydrogen

A hydrogen (e.g. [79], [80]-[96]) nucleus with a single proton is the simplest stable symmetrical nucleus.

A deuterium nucleus has a proton and a neutron. It is a stable symmetrical nucleus.

A tritium nucleus has a proton and two neutrons. It is a symmetrical but unstable nucleus and can be decayed into a Helium atom through beta decay.

4.2. Beryllium

A Beryllium-9 (e.g. [697], [98]-[107]) nucleus has four protons and five neutrons. It is a stable symmetrical nucleus.

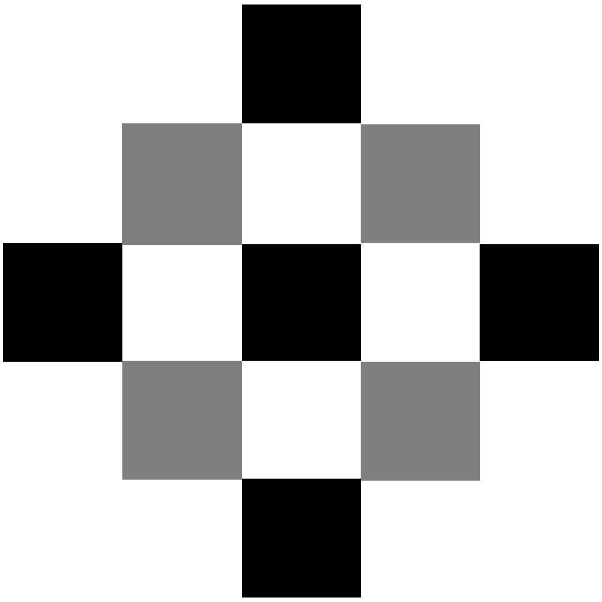

Fig. 2. ^{9}Beryllium

9*(2A^2 + B + 2*2 + 2*2) + 2*2 + 2*2 = 16424
Strong interaction:
9*137/(926*5) = 0.2663
Closely matches the experimental data: 16424.2504

4.3. Phosphorus

A Phosphorus-31 nucleus has fifteen protons and sixteen neutrons. It is a stable symmetrical nucleus.

Mass formula:
31*1816 + 20*(2+3)+11*(2*2)+2*3

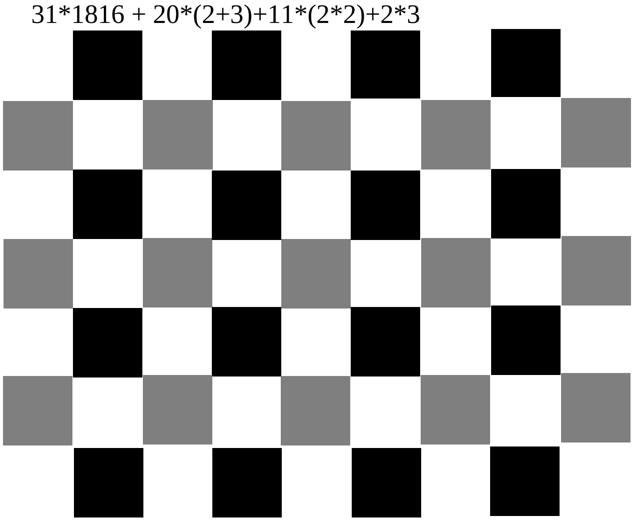

Fig. 3. ^{31}Phosphorus

5. Heavier Nuclei

5.1. Potassium

A Potassium-41 (e.g. [108], [109]-[113]) nucleus has nineteen protons and twenty two neutrons. It is a stable symmetrical nucleus.

Atomic number: 19

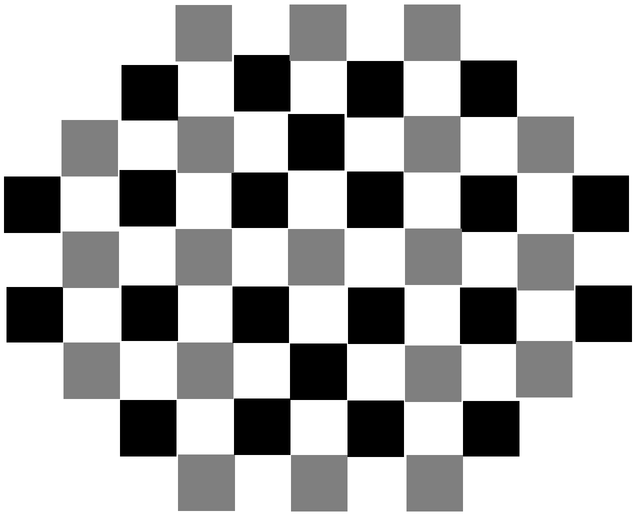

Fig. 4. Potassium structure

5.2. Ruthenium

A Ruthenium-104 (e.g. [114], [115],[116]) nucleus has 44 protons and 60 neutrons. It is a stable symmetrical (except the base square) nucleus.

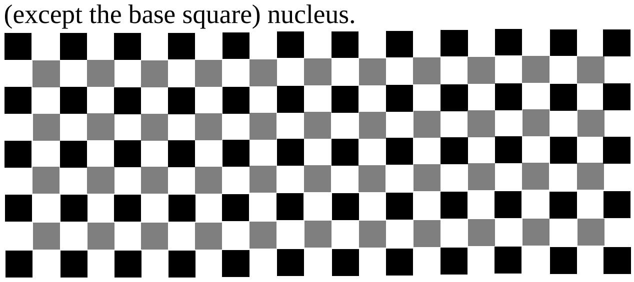

Fig. 5. Ruthenium Structure

5.3. Samarium

Atomic number: 62
The possible Structure for ^{144}Samarium:

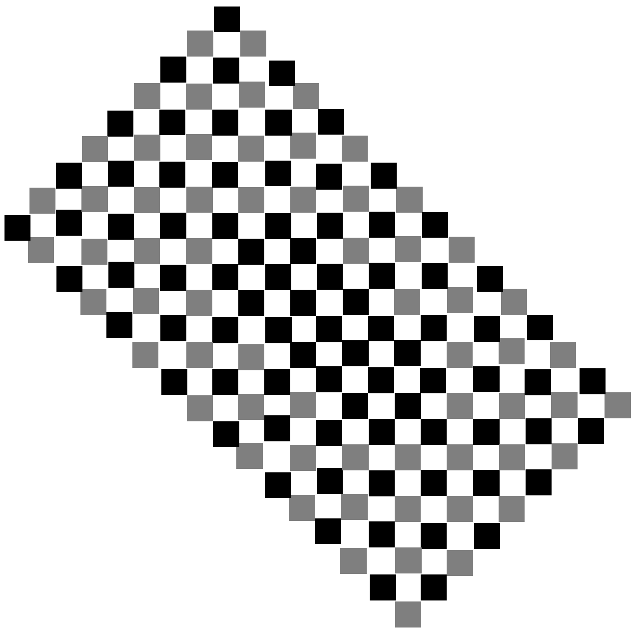

Fig. 10. ^{144}Samarium

The Structure for ^{150}Samarium:

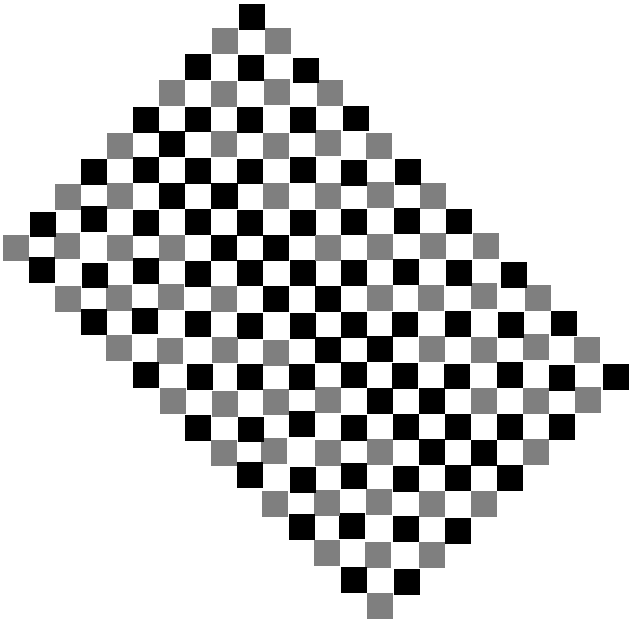

Fig. 11. ^{150}Samarium

The Structure for ^{152}Samarium: 8*19

The Structure for ^{154}Samarium: 14*11

5.4. Ytterbium

Atomic number: 70

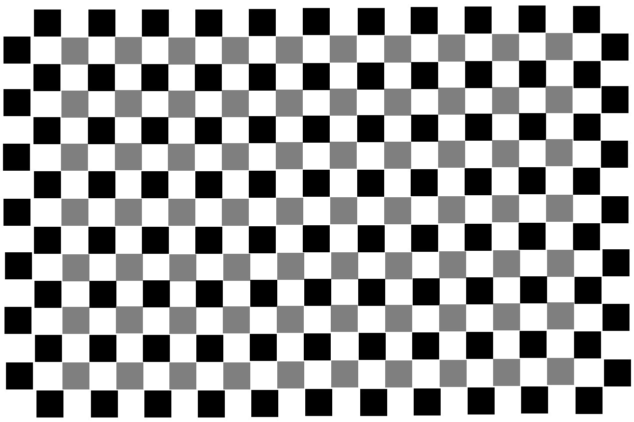

Fig. 12. ^{172}Yetterbium

5.5. Thulium

Atomic number: 69
The Structure for ^{169}Thulium:

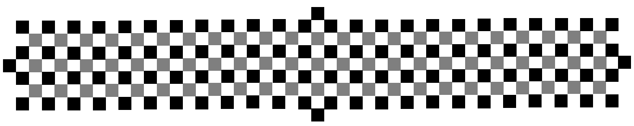

Fig. 13. ^{169}Thulium

5.6. Lead

Atomic number: 82
The Structure for ^{204}Lead:

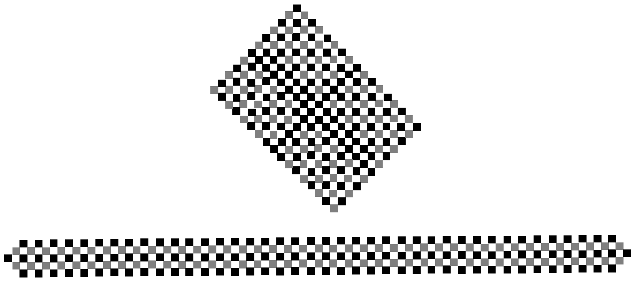

Fig. 14. ^{204}Lead

The Structure for ^{206}Lead:

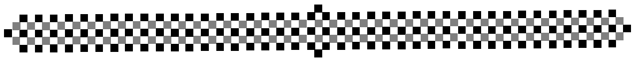

Fig. 15. ^{206}Lead

The Structure for ^{207}Lead:

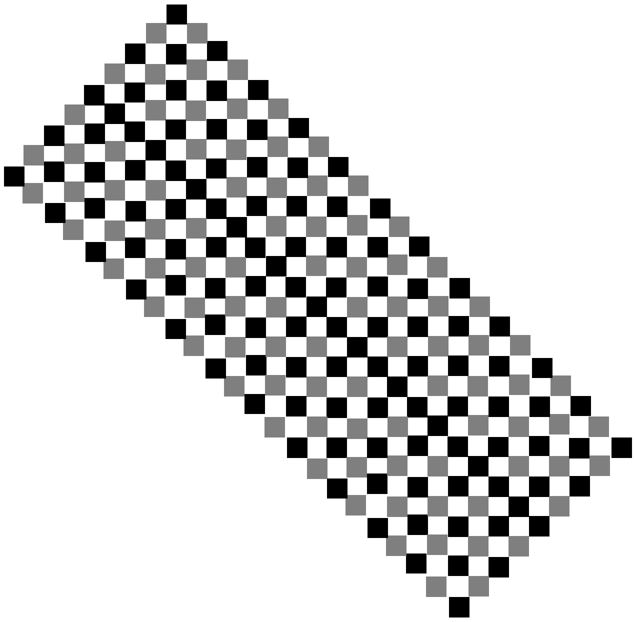

Fig. 16. ^{207}Lead

The Structure for ^{208}Lead:

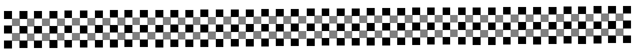

Fig. 17. ^{208}Lead

5.7. Uranium

Atomic number 92

The Structure for ^{238}Uranium (e.g. [117], [118],[118]):

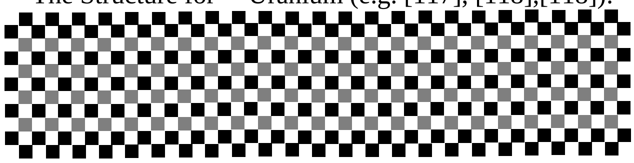

Fig. 18. ^{238}Urarium

The Structure for ^{236}Uranium:

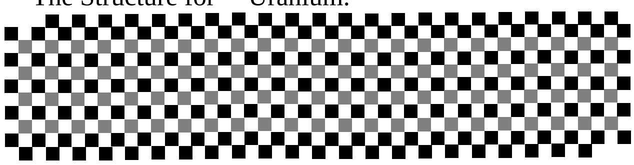

Fig. 19. ^{236}Urarium

The Structure for ^{235}Uranium:

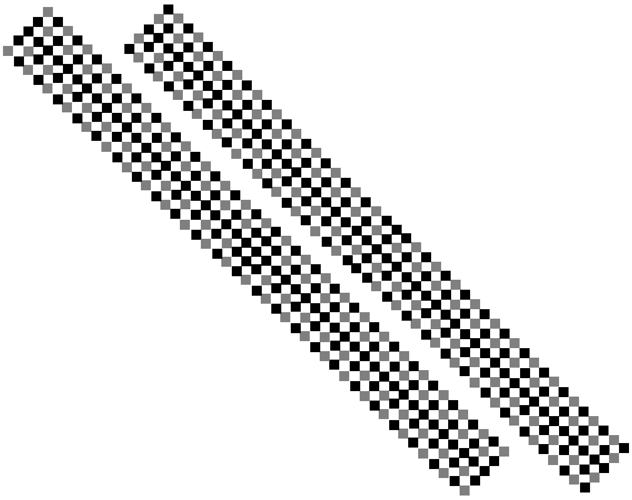

Fig. 20. ^{235}Urarium

The Structure for ^{234}Uranium:

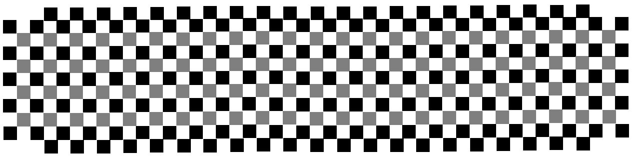

Fig. 21. ^{234}Urarium

The Structure for ^{233}Uranium:

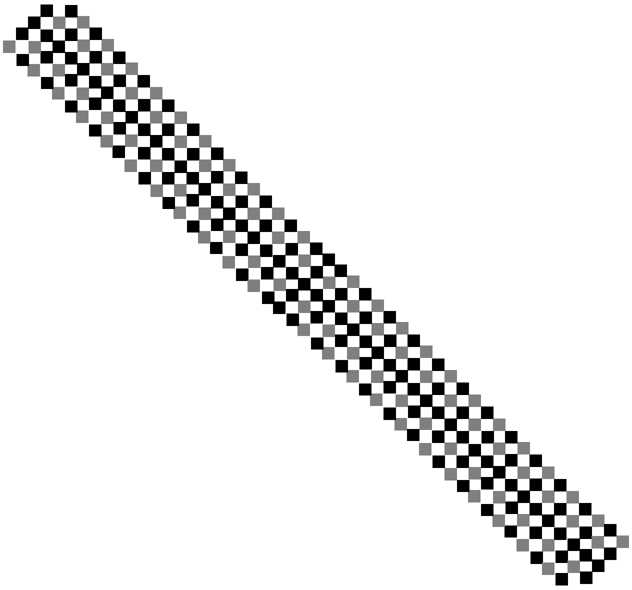

Fig. 22. ^{233}Urarium

6. Unstable Nuclei

6.1. Technetium

Atomic number 43

Technetium (e.g. [37], [38]-[53]) has no stable isotopes.
The Structure for ^{99}Technetium:

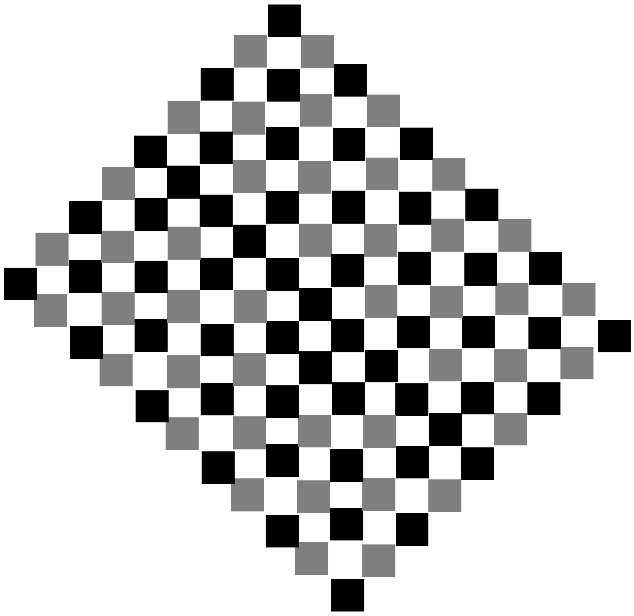

Fig. 23. ^{99}Technetium

The Structure for ^{98}Technetium:

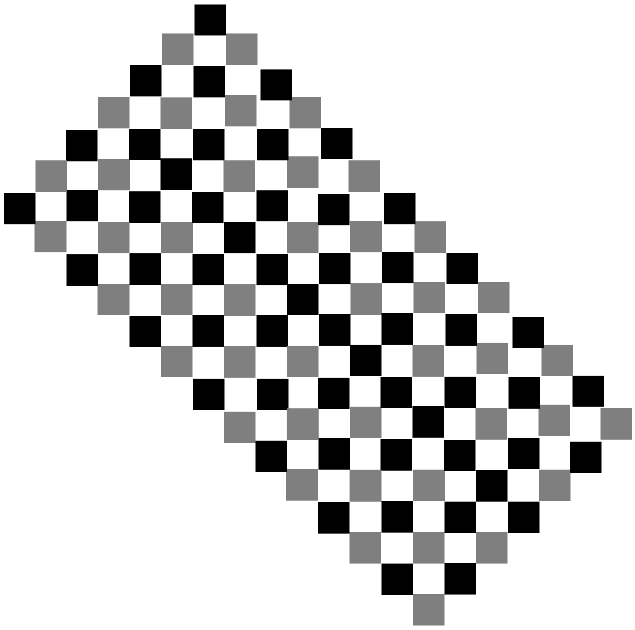

Fig. 24. ^{98}Technetium

The Structure for ^{97}Technetium:

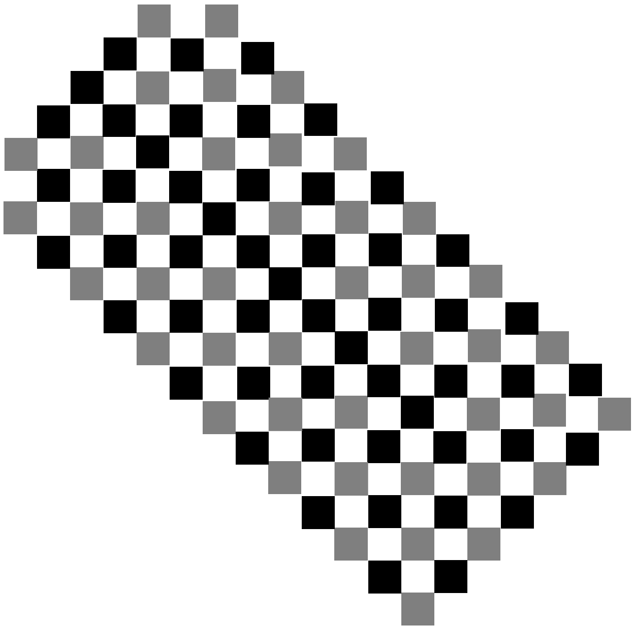

Fig. 25. ^{97}Technetium

6.2. Promethium

Atomic number 61

Promethium (e.g. [129], [130]-[133]) has no stable isotopes.

There are a few relatively stable isotopes:

The Structure for ^{145}Promethium:

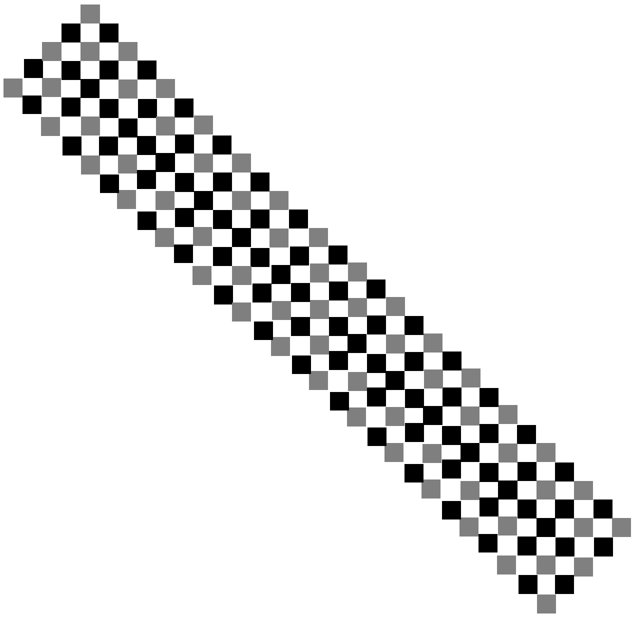

Fig. 26. ^{145}Promethium

7. Conclusions

1. The structures of nuclei are mainly the result of octahedron shaped protons and neutrons piling in a two dimensional plane.

2. Piled neutrons and protons keep the $2A^2$ structure. When atomic number is greater than two, 2*3*5 + 2*3 will be changed. Proton will have 2*2*4 + 2*2 or 2*2*4 + (2+3) structure. Neutron will have 2*2*2*2 + 2*2 or 2*2*2*2 + (2+3) structure.

3. Symmetrical piling is required for a stable nucleus.

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