# Why the Nuclear Drip Line Skews

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## Abstract

Helium-4 nucleus is shown with the six attachment points for added neutrons and four attachment points for added protons, which matches the known isotopes of helium.

## Contents



### Claims of Novelty

- Helium-4 nucleus has six specific attachment points for added neutrons and four specific attachment points for added protons.

# Chapter 2 Introduction

***Dedication***

This work is dedicated to Ginger

***Previous Work***

The text and diagrams are substantially the same as my paper posted on the physics archive https://vixra.org/abs/2209.0057. In particular, the paper about tetrons Tetrons, viXra.org e-Print archive, viXra:2307.0050 is essential to understand the tetron references throughout this paper.

# Chapter 3 Planar Configuration of Bound Nucleons

The planar configuration of bound nucleons is due to sharing gluons with neighboring particles. In particular, the 2 vertices available for attachment of the neutron compared to the 1 vertex available for attachment of the proton is responsible for the mass difference of the neutron and proton. This can be calculated.

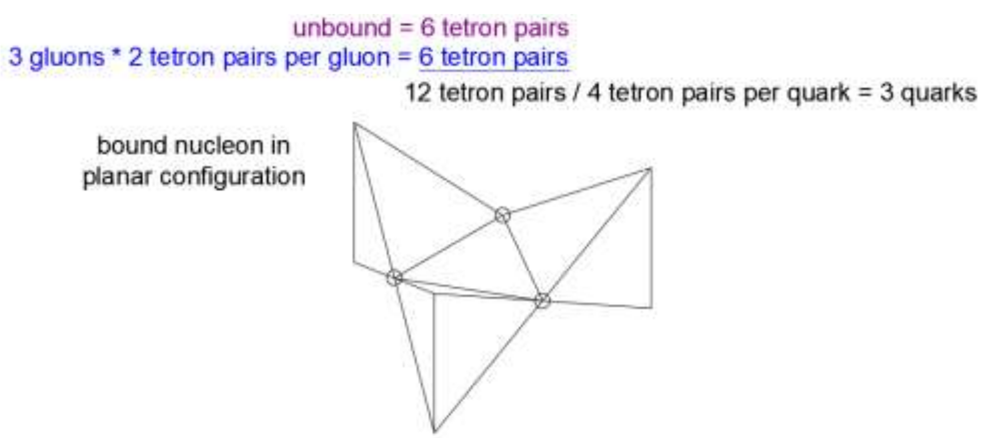


*Figure 1 - Bound Nucleon in Planar Configuration*

Proton mass = 938.27208816 MeV/$c^2$ [1]
Neutron mass = 939.56542052 MeV/$c^2$ [2]
Difference = 1.29333 MeV/$c^2$
Neutron mass = 3*quark mass + 3* internal gluon mass + 2* inter-particle gluon mass
Proton mass = 3*quark mass + 3* internal gluon mass + 1* inter- particle gluon mass
Assume internal gluon mass = inter-particle gluon mass
Neutron mass = 3*quark mass + 5* gluon mass
Proton mass = 3*quark mass + 4* gluon mass
Difference = 1 gluon mass

[1] Proton - Wikipedia
[2] Neutron - Wikipedia

Free neutron mass = free proton mass = bound proton mass - gluon mass = 938.27208816 - 1.29333 = 936.97876 MeV/$c^2$

## The Strong Force

In a high energy state, a gluon is simply extra mass added to a quark's spine tetrons via $E=mc^2$. The secondary gluon or gluons formed between particles is the strong force. That means the strong force between two particles will be 1, 2 or 3 units of strength, depending on how many tetrons form a gluon bond.

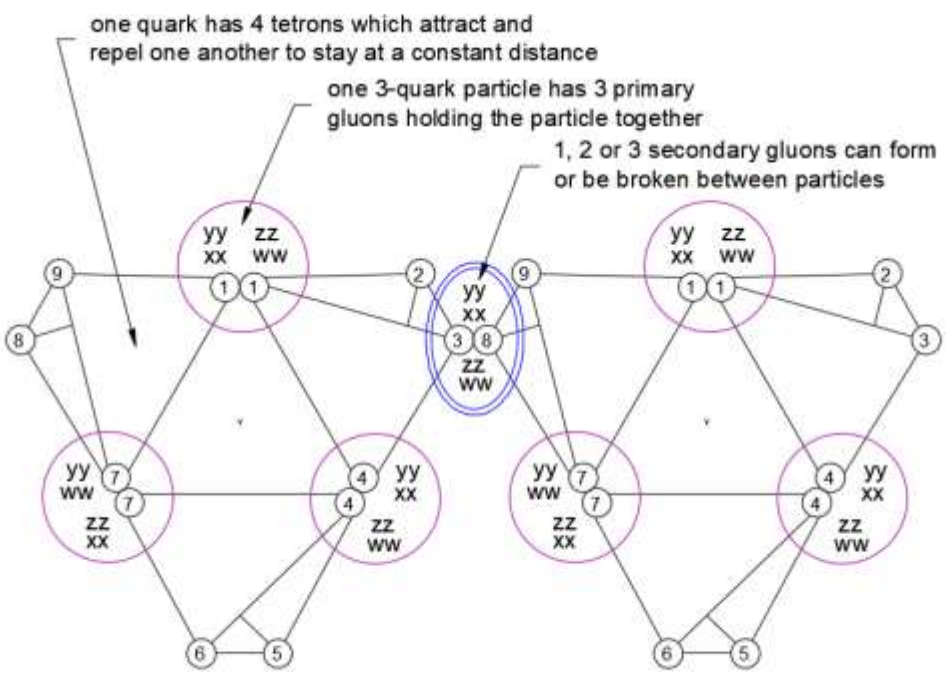


*Figure 2 - Comparing Forces Within a Quark, Particle and Between Particles*

# Chapter 4 Nucleons

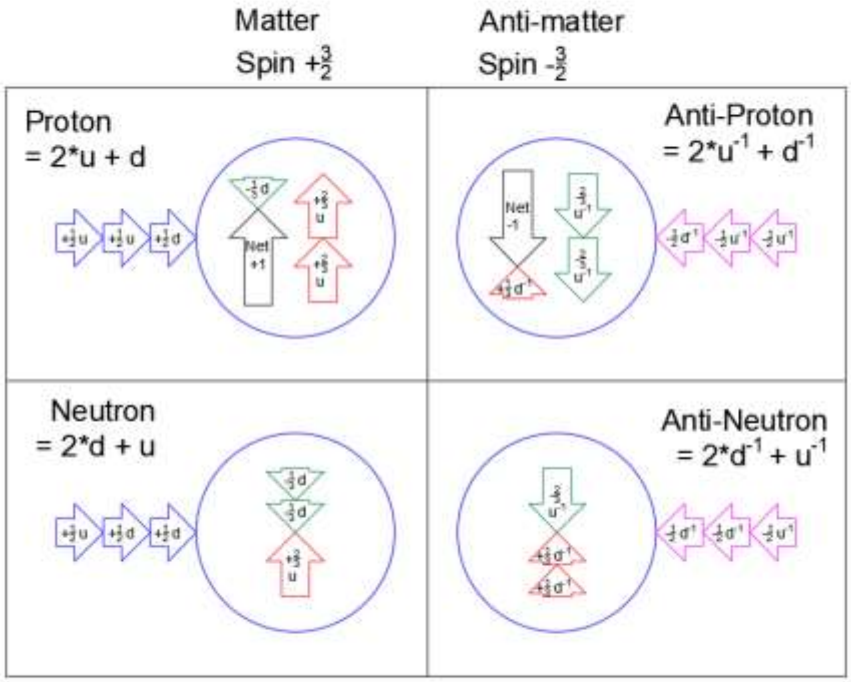


*Figure 3 - Nucleons*

## Particle Pairs

Matter particles and their antimatter mirrors are permanently in a congruent particle pair, and do not collide in an annihilation event. Head-on annihilation does not occur if particles in a pair are congruent.

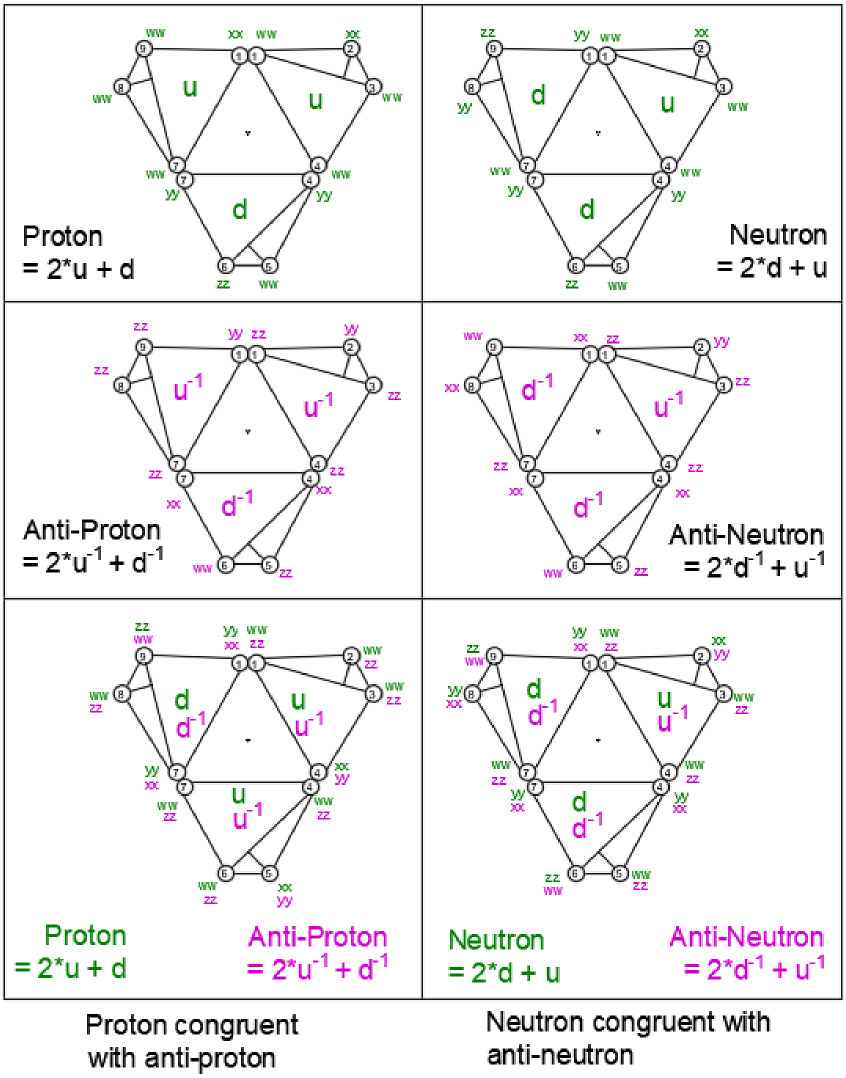


*Figure 4 - Particle Pairs*

## *Nucleons Pictorial*

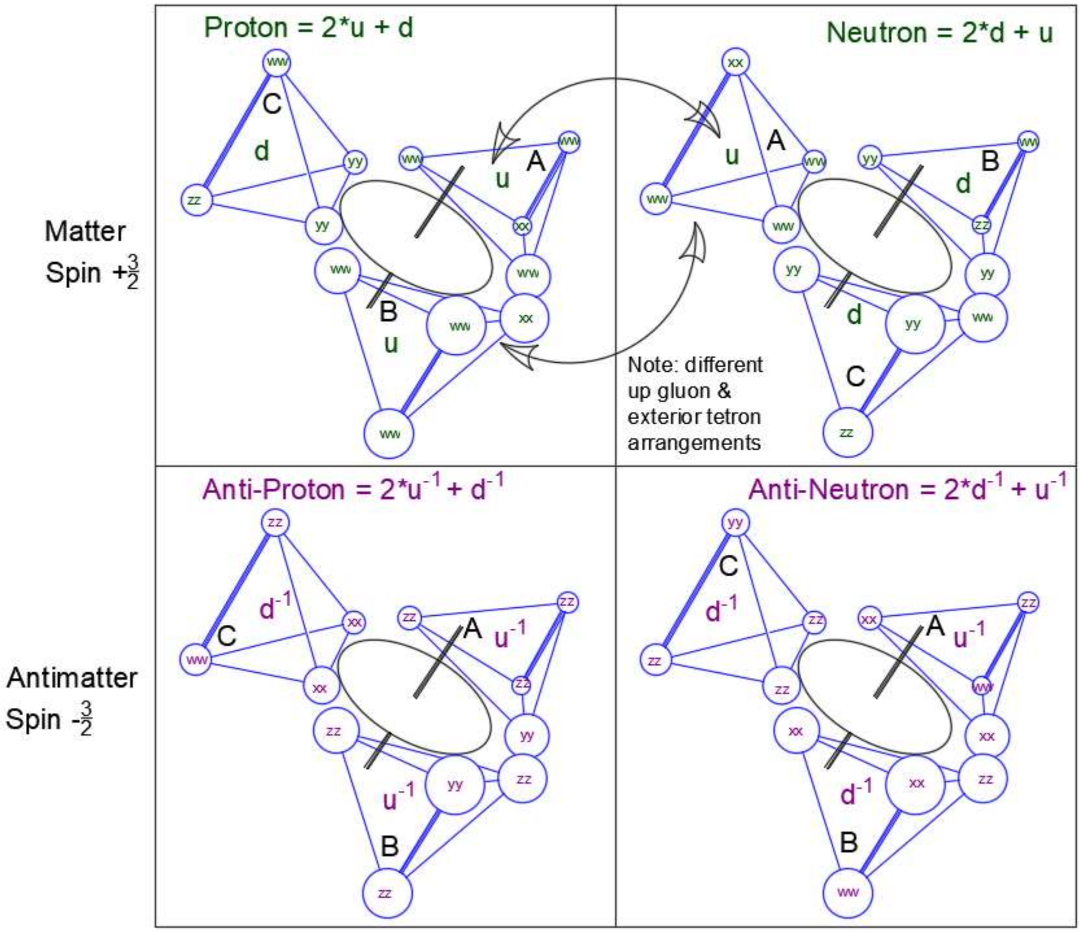


*Figure 5 - Nucleons Pictorial*

## Nucleon Matter and Antimatter Pairs

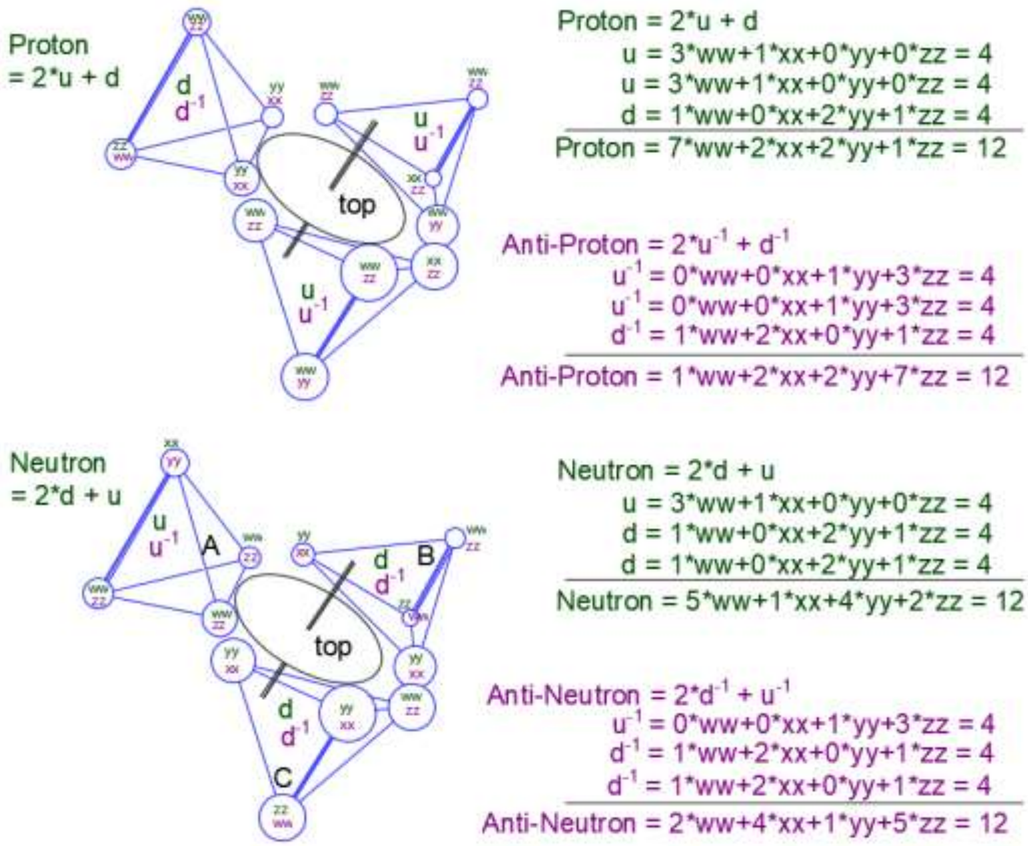


*Figure 6 - Nucleon Matter and Antimatter Pairs*

# Chapter 5 Nucleus

## Nuclear Isotopes

Postulate the deviation of the proton - neutron ratio from 1 to 1 is due to neutrons having more potential gluon points than protons, explained in the following few diagrams.

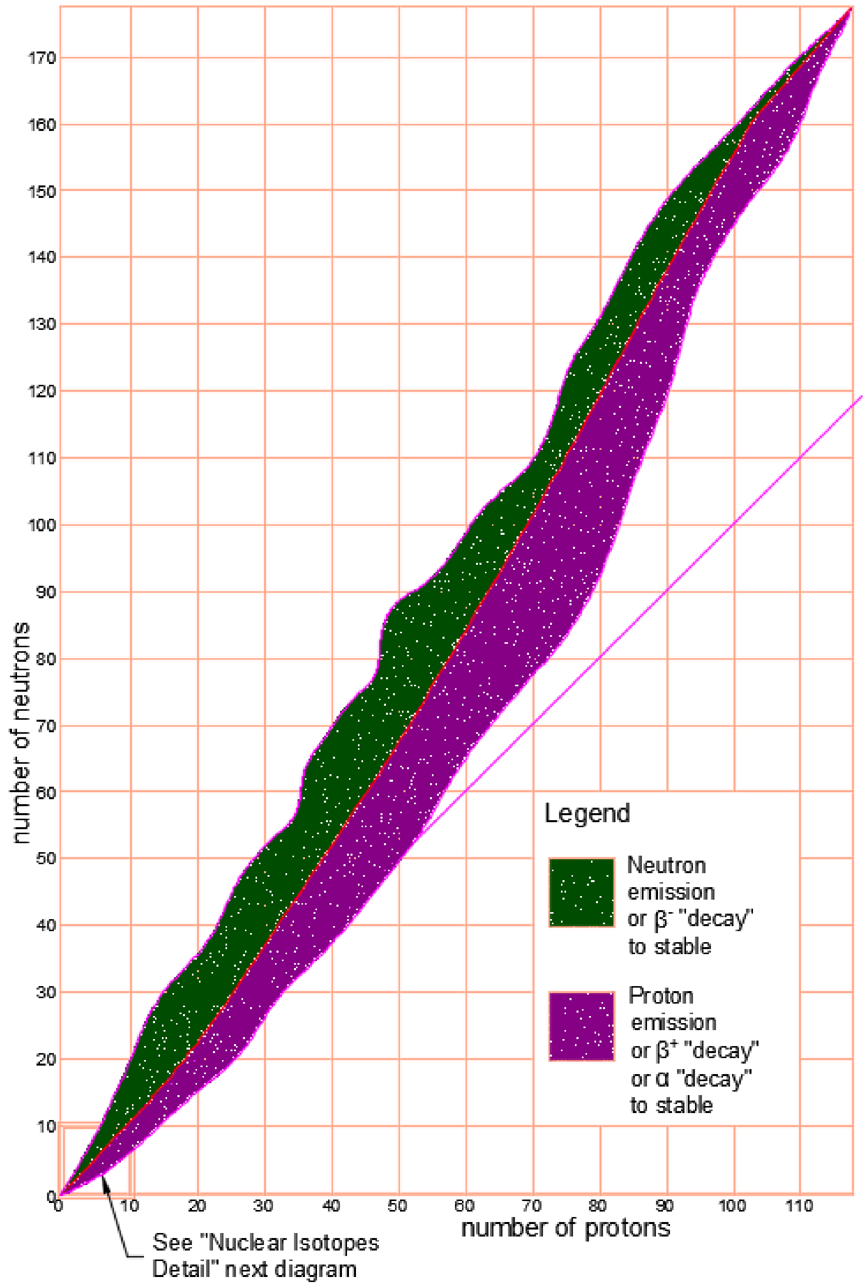


*Figure 7 - Nuclear Isotopes*

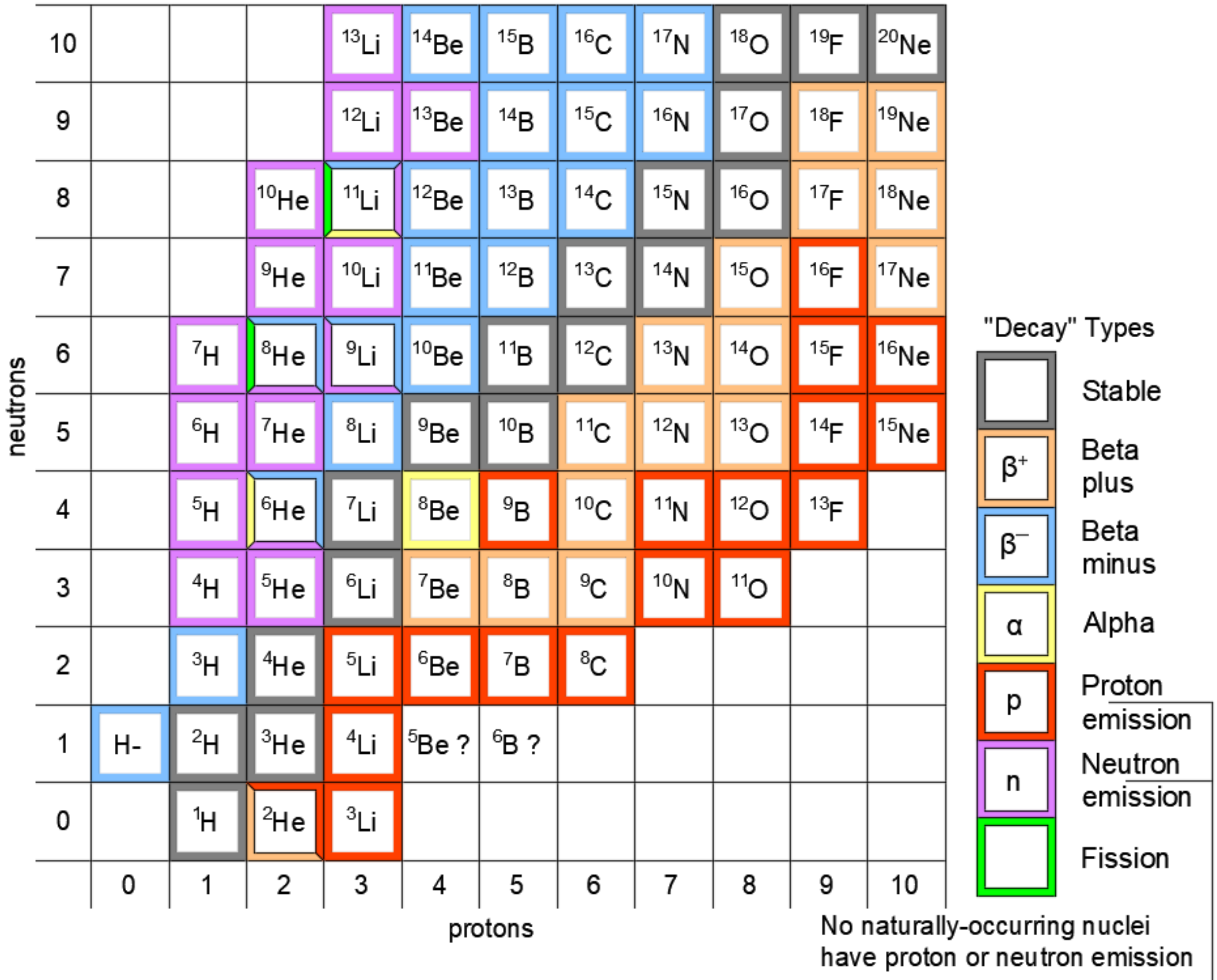


*Figure 8 - Nuclear Isotopes Detail*

## *Nuclides Drip Line "Decay"*

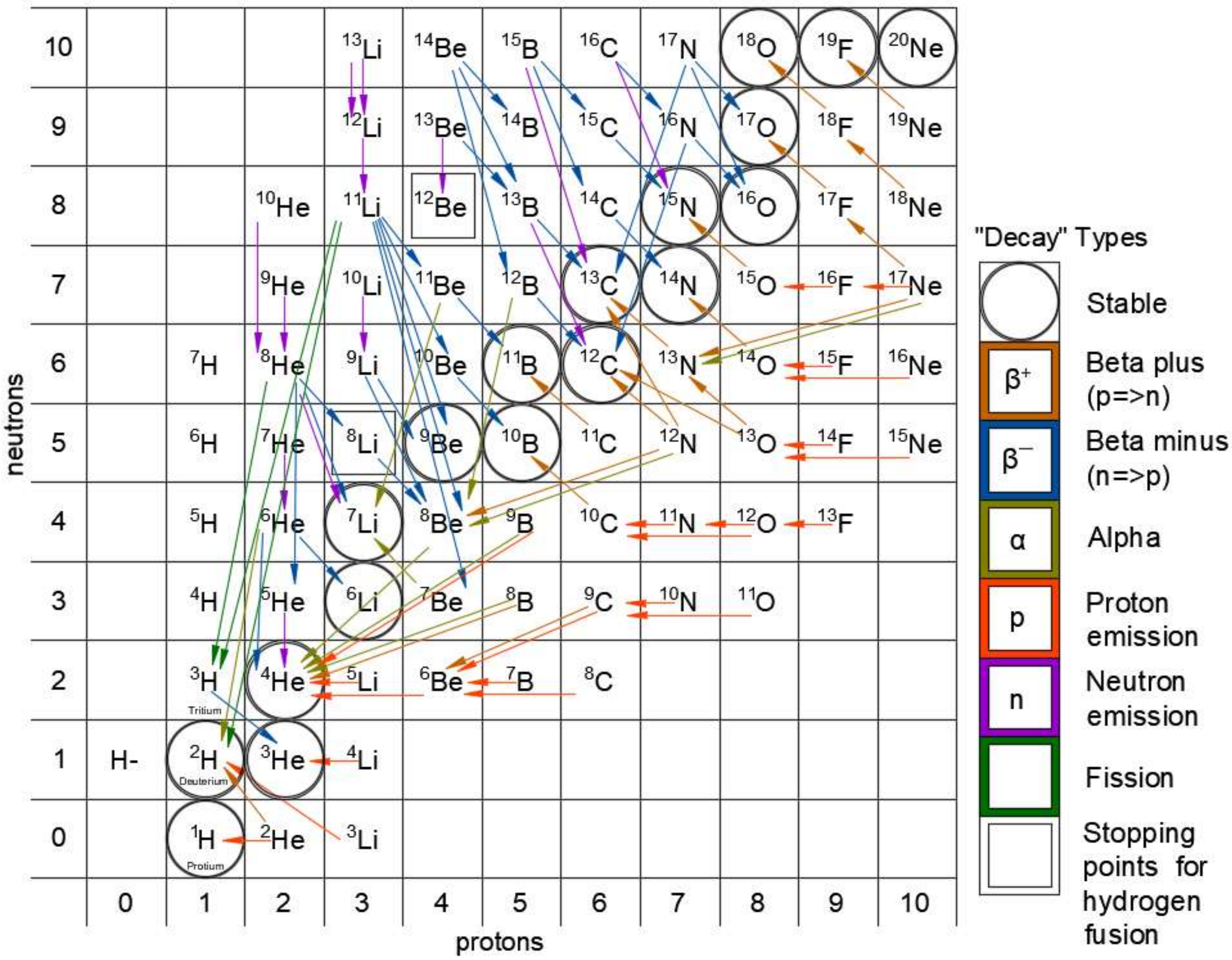


*Figure 9 - Nuclides Drip Line "Decay" Paths*

## *Common Properties in Particle State Diagrams*

In a proton or electron, vertex 8 is ww//zz and is available to form an apex bond with vertex 2, which is xx//yy. This will leave the proton or electron with only ww//zz vertices and able to bond only with a particle with a free xx//yy vertex, such as a neutron or electron neutrino. In the nucleus, protons and neutrons have an abundance of ww//zz valence tetrons. Protons have only ww//zz valence tetrons left if an apex (fourth) gluon is formed. Neutrons have one remaining xx//yy valence tetron left after forming an apex (fourth) gluon. This leaves neutrons in the nucleus with more inter-particle gluon possibilities than protons.

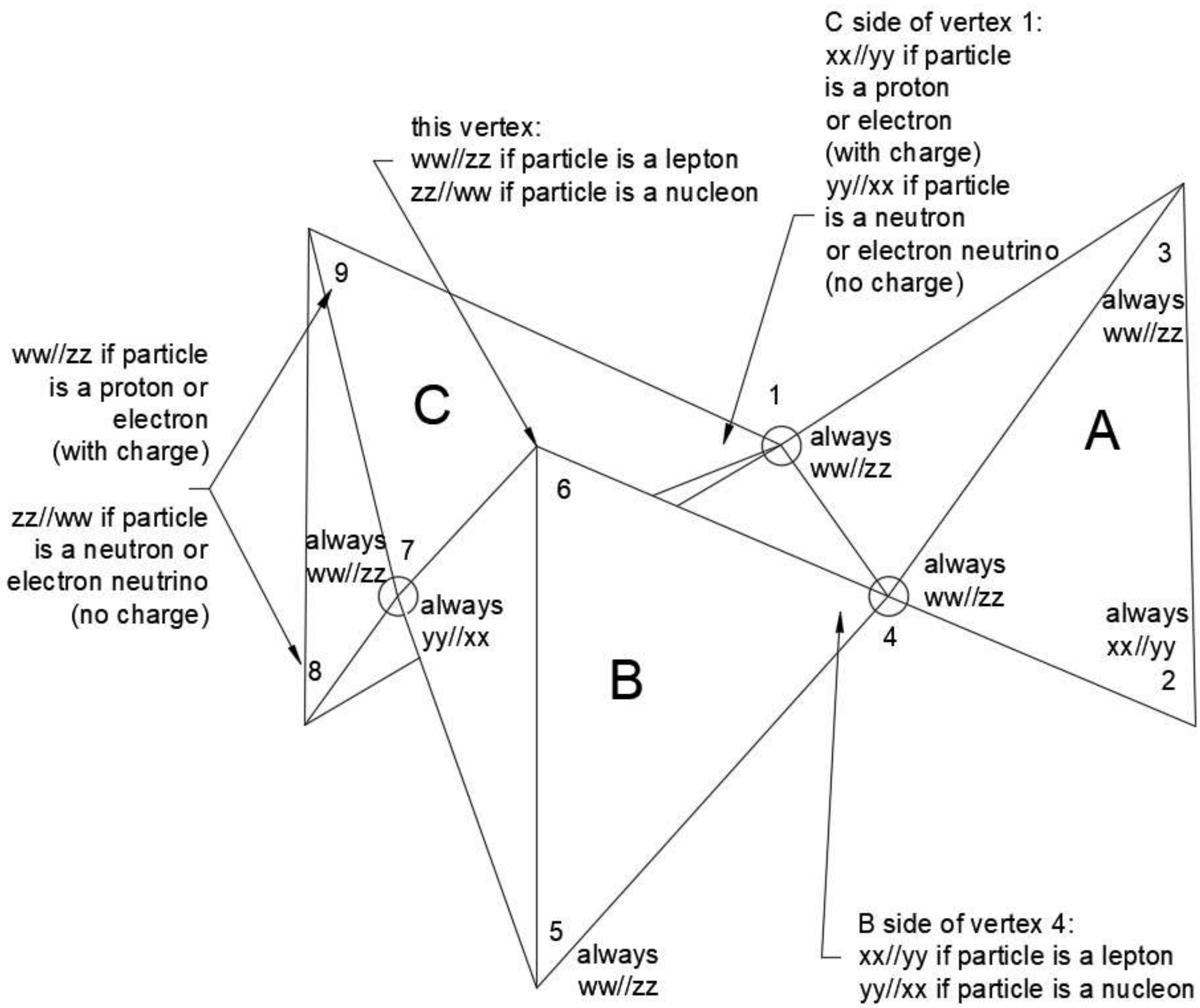


*Figure 10 - Common Properties in Particle State Diagrams*

*<u>Apex (Fourth) Gluon Formation Between Quarks A & B</u>*

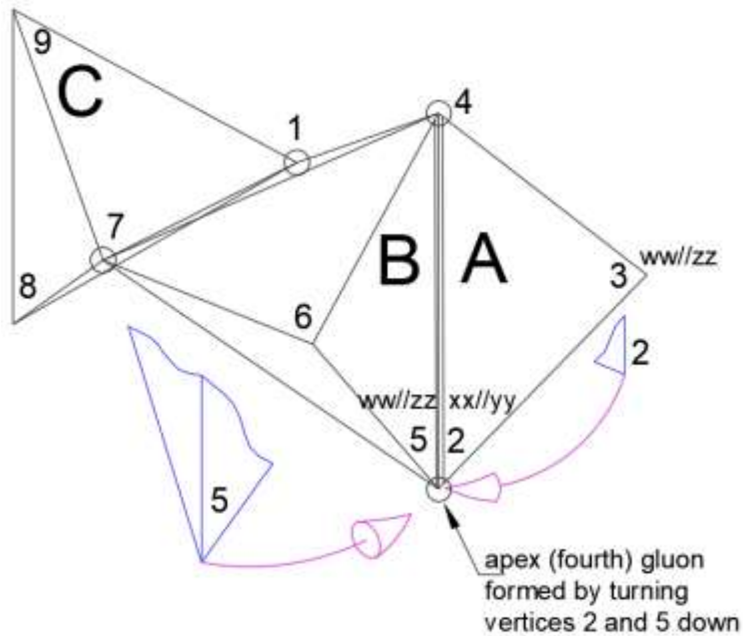


*Figure 11 - Apex (Fourth) Gluon Formation Between Quarks A & B*

*<u>Protium (Hydrogen-1) Nucleus</u>*

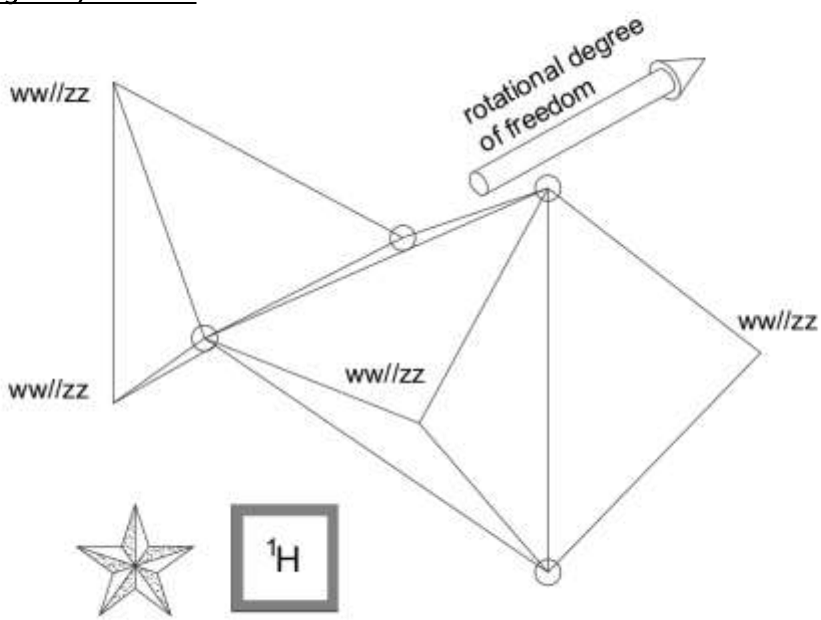


*Figure 12 - Protium (Hydrogen-1) Nucleus*

## *Internal Tetrahedron in Apex Gluon Particle*

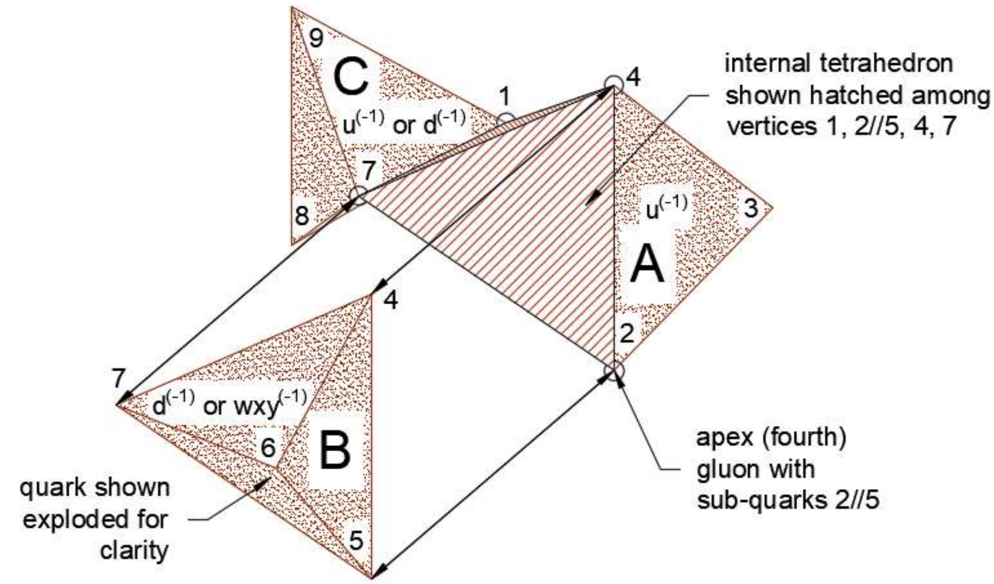


*Figure 13 - Internal Tetrahedron in Apex Gluon Particle*

## *Orthogonal Views of 3 Gluon Particle*

Example is single proton nucleus of hydrogen-1 (protium)

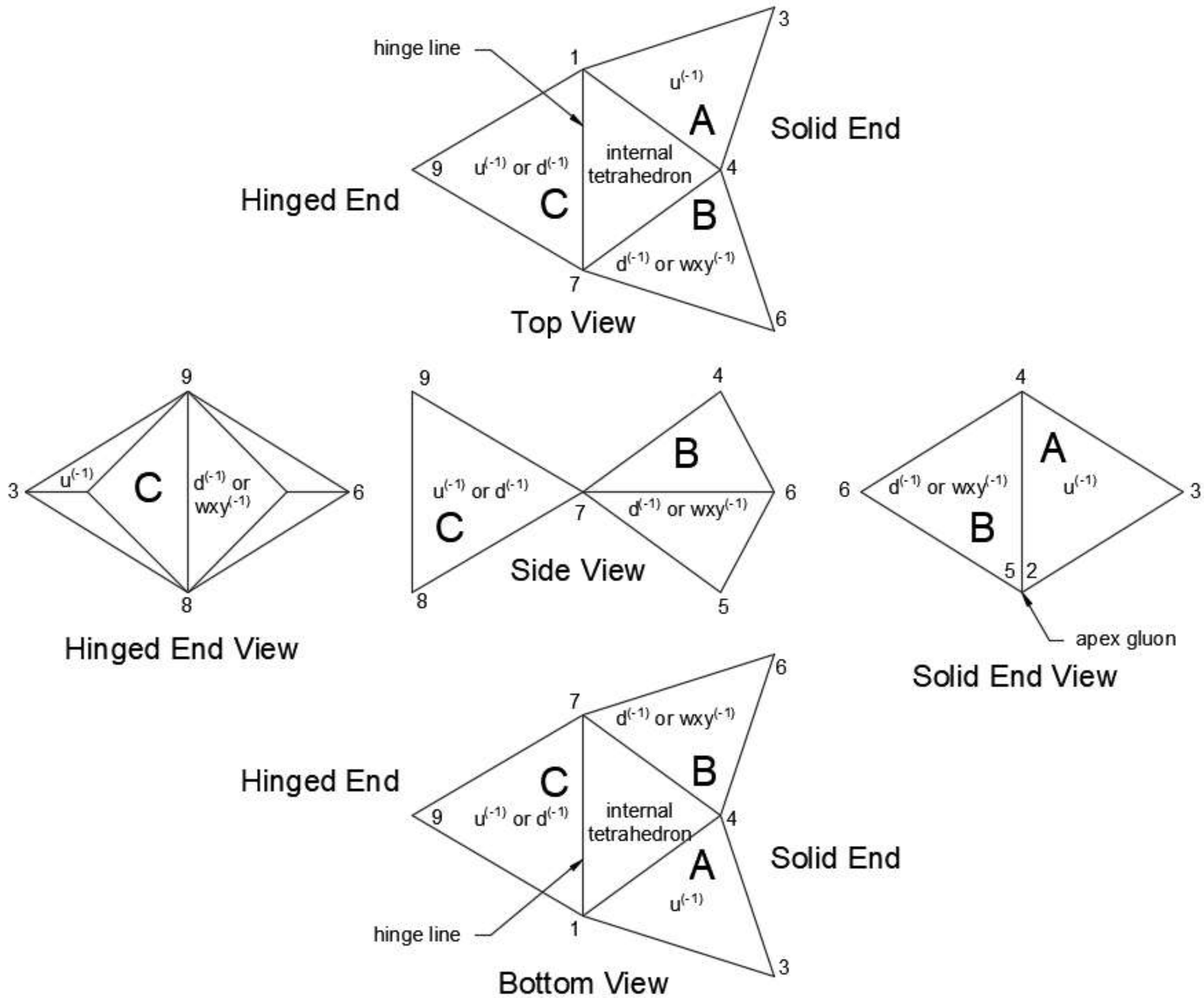


*Figure 14 - Orthogonal Views of 3 Gluon Particle*

## *Deuterium*

9 gluons and 6 ww//zz tetrons (exposed vertices) that are non-reactive with ww//zz vertices of other particles. This is the most likely isomer.

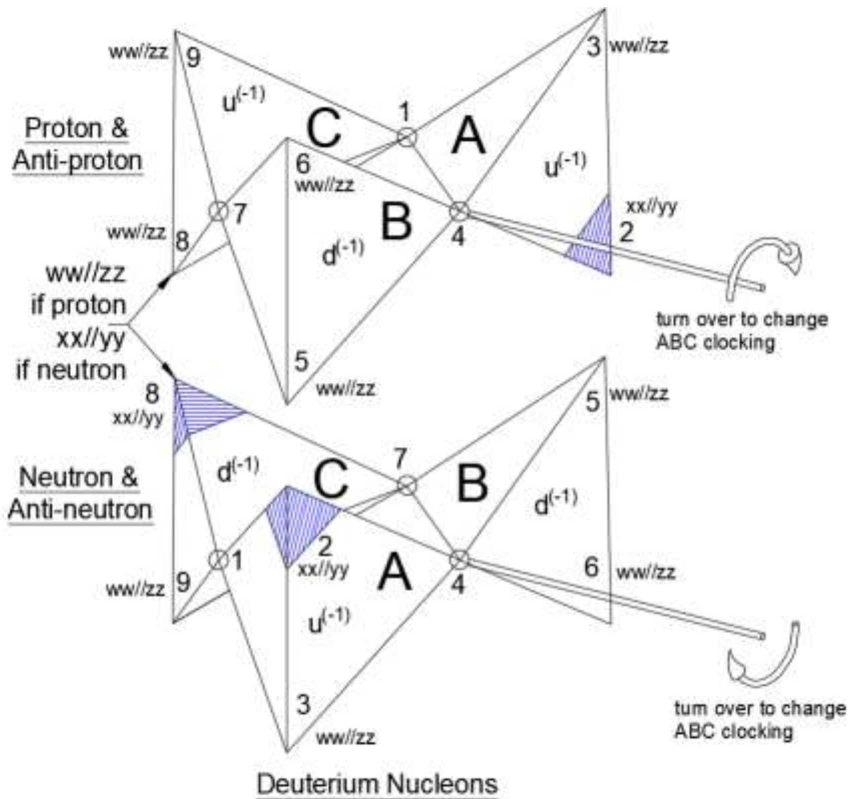


*Figure 15- Deuterium Nucleons*

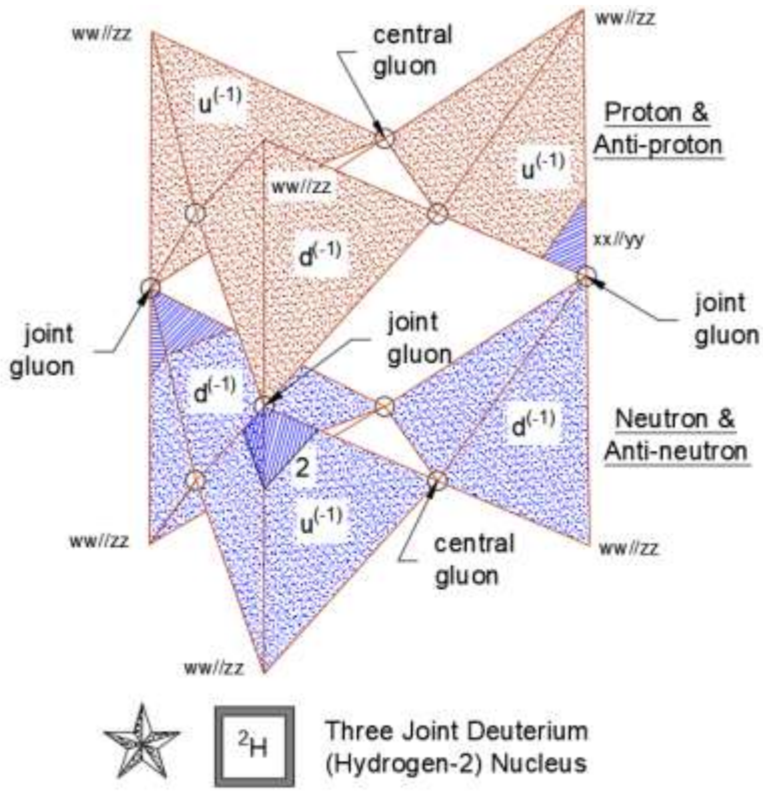


*Figure 16 - Three Joint Deuterium (Hydrogen-2) Nucleus*

## ***Tritium***

- 1 reactive xx//yy vertex
- This is the most likely isomer

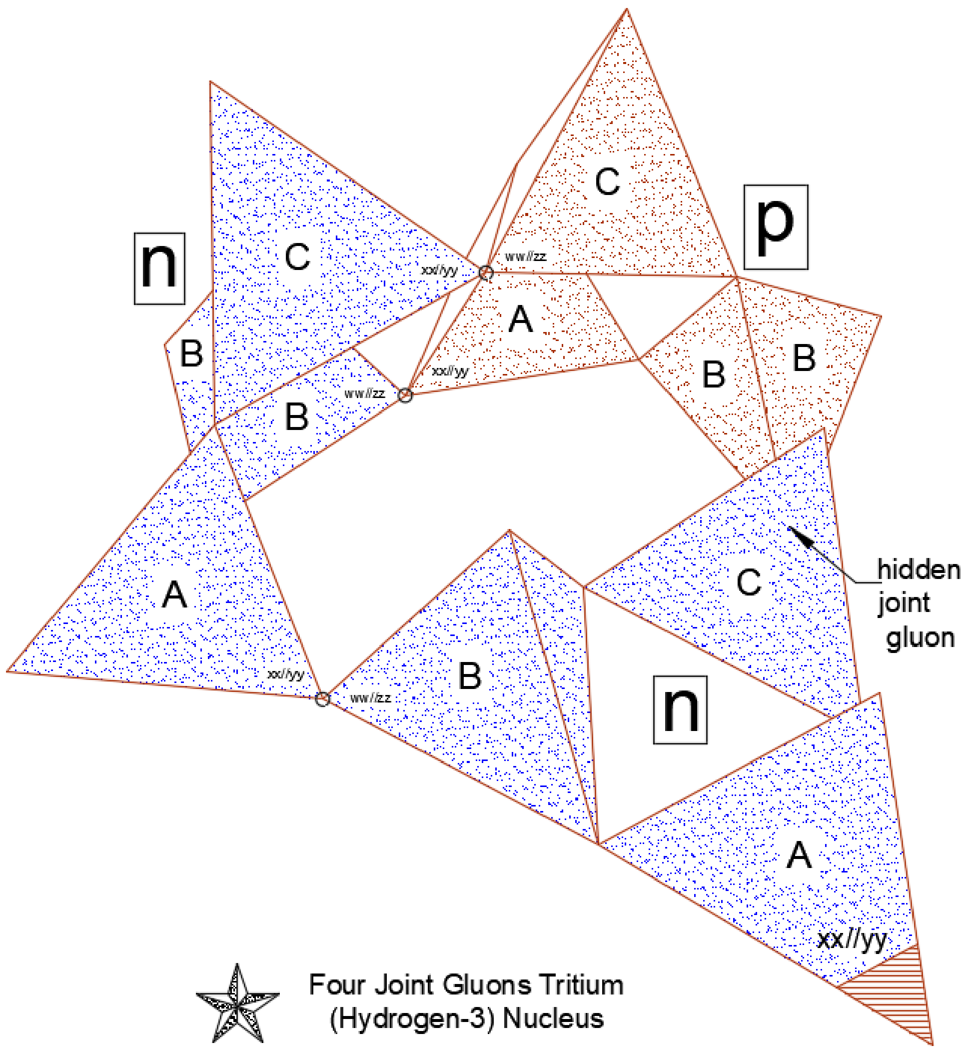


*Figure 17 - Four Joint Gluons Tritium (Hydrogen-3) Nucleus*

## *Helium-2 Nucleus*

- 2 protons
- 0 neutrons
- no reactive xx//yy vertex
- no apex gluons
- geometric symmetry about center
- hinge lines

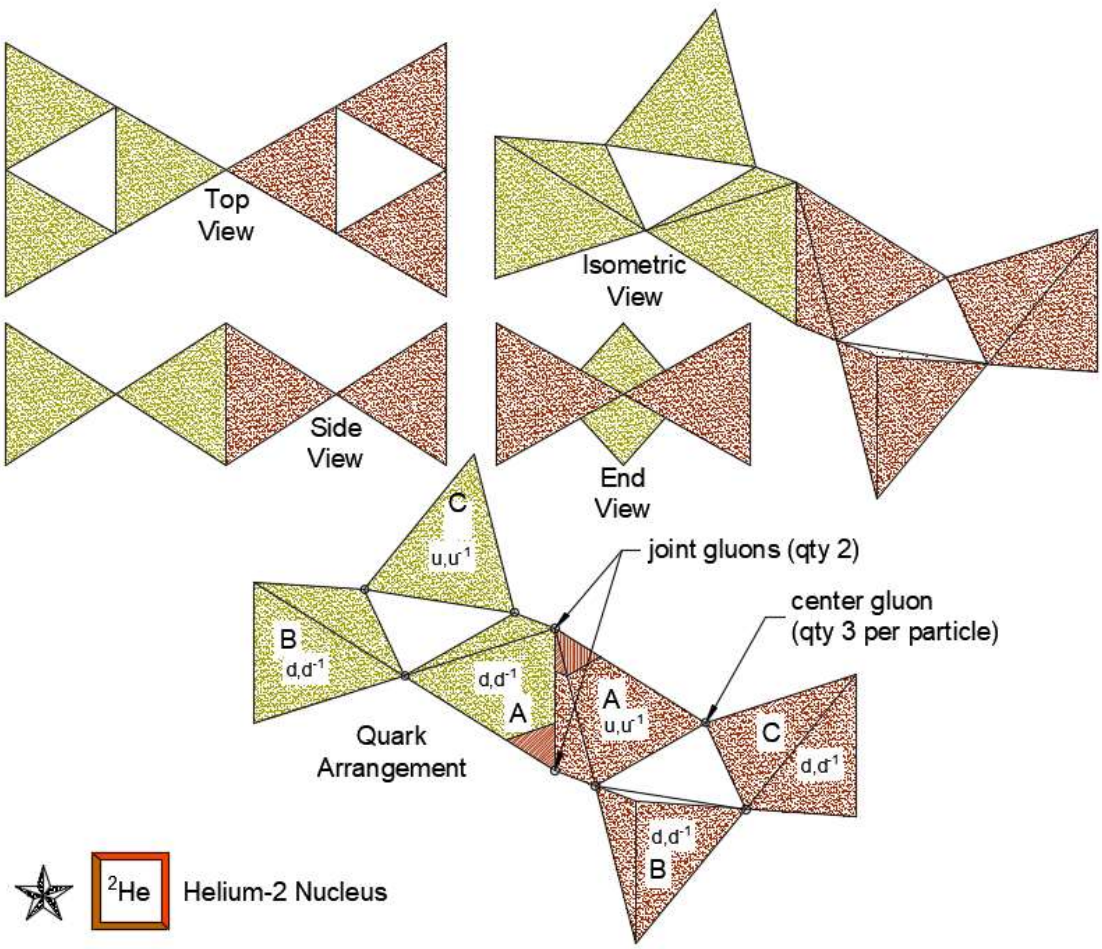


*Figure 18 - Helium-2 Nucleus*

## *Helium-4 Model*

- 2 protons
- 2 neutrons
- 6 joint gluons
- no reactive xx//yy vertex
- no apex gluons
- geometric symmetry about center
- hinge lines

Selected for helium-4 nucleus because:

- even though there are 2 hinge lines and 2 pivot points between the 4 particles, the amount of rotation is limited by the ring nature of the structure
- one of the degrees of freedom between the neutron side and the proton side is at right angles with the remaining 2 degrees of freedom about the same particle types (2 neutrons hinge about their 2 connecting vertices and 2 protons do likewise)

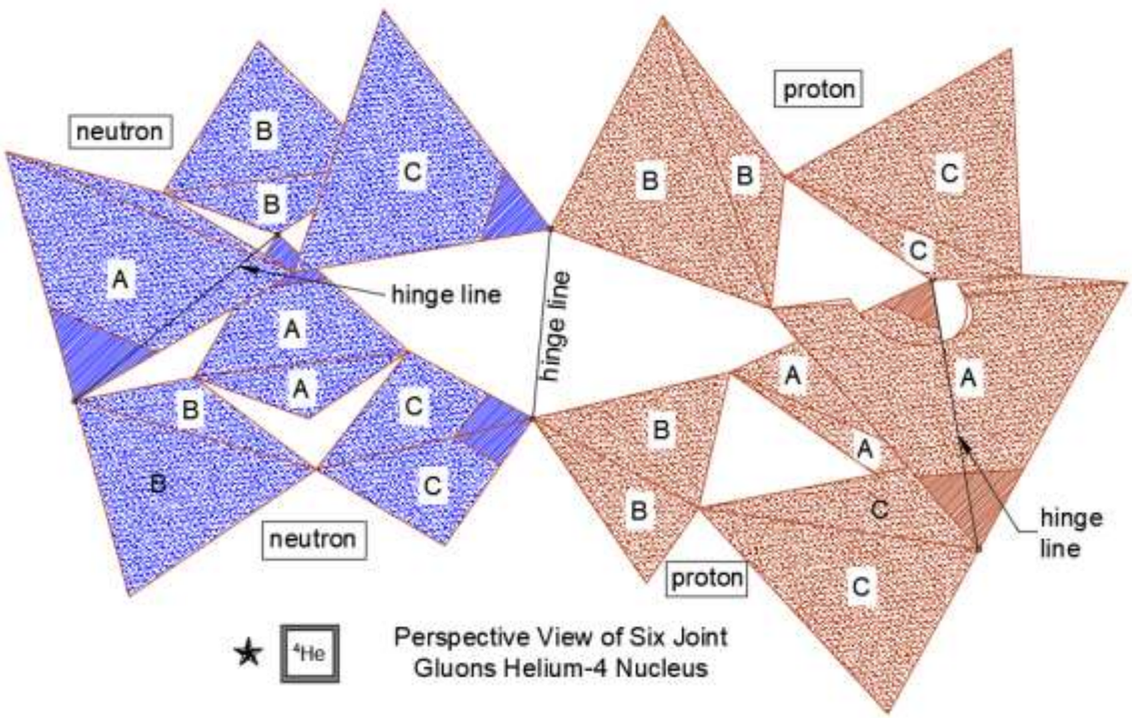


*Figure 19 - Perspective View of the Helium-4 Nucleus*

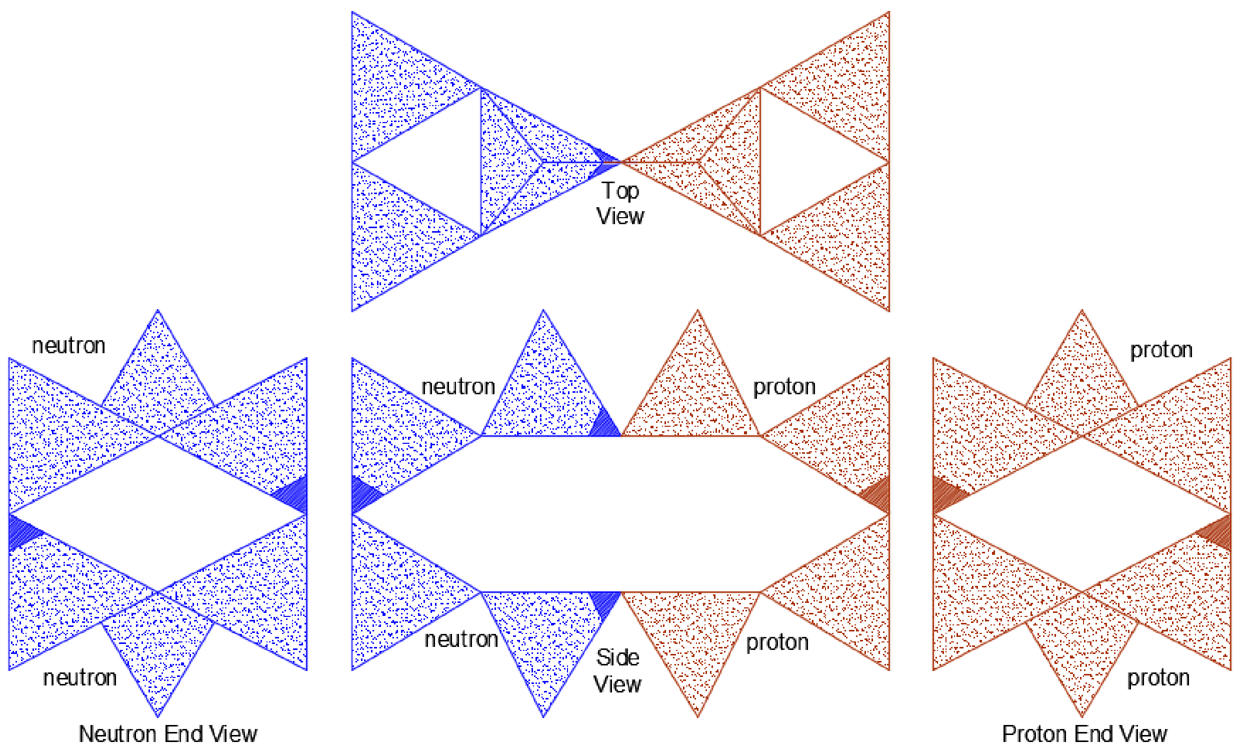


*Figure 20 - Orthogonal Views of the Helium-4 Nucleus*

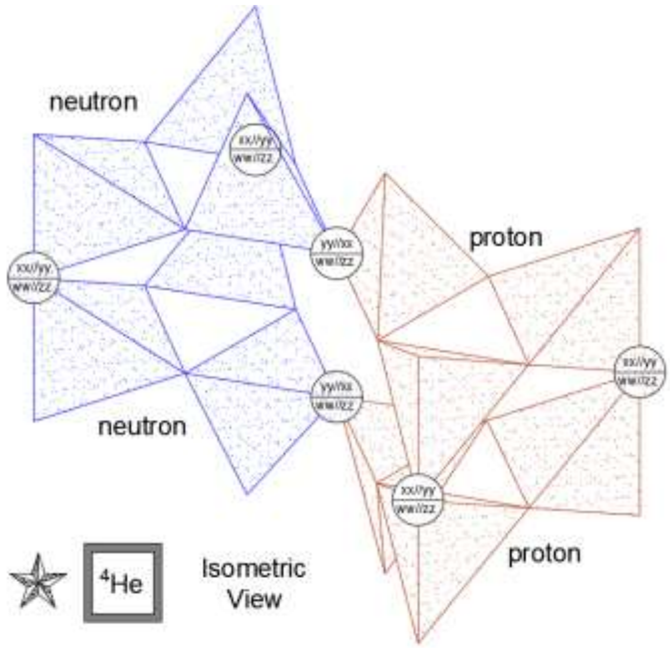


*Figure 21- Orthogonal Views of Six Joint Gluons Helium-4 Nucleus*

## *Helium-4 Attachment Positions for Free Neutron // Anti-neutron Pairs*

For background on the beta reaction referenced in the following sections, see [The Weak Reaction, viXra.org e-Print archive, viXra:2307.0076]

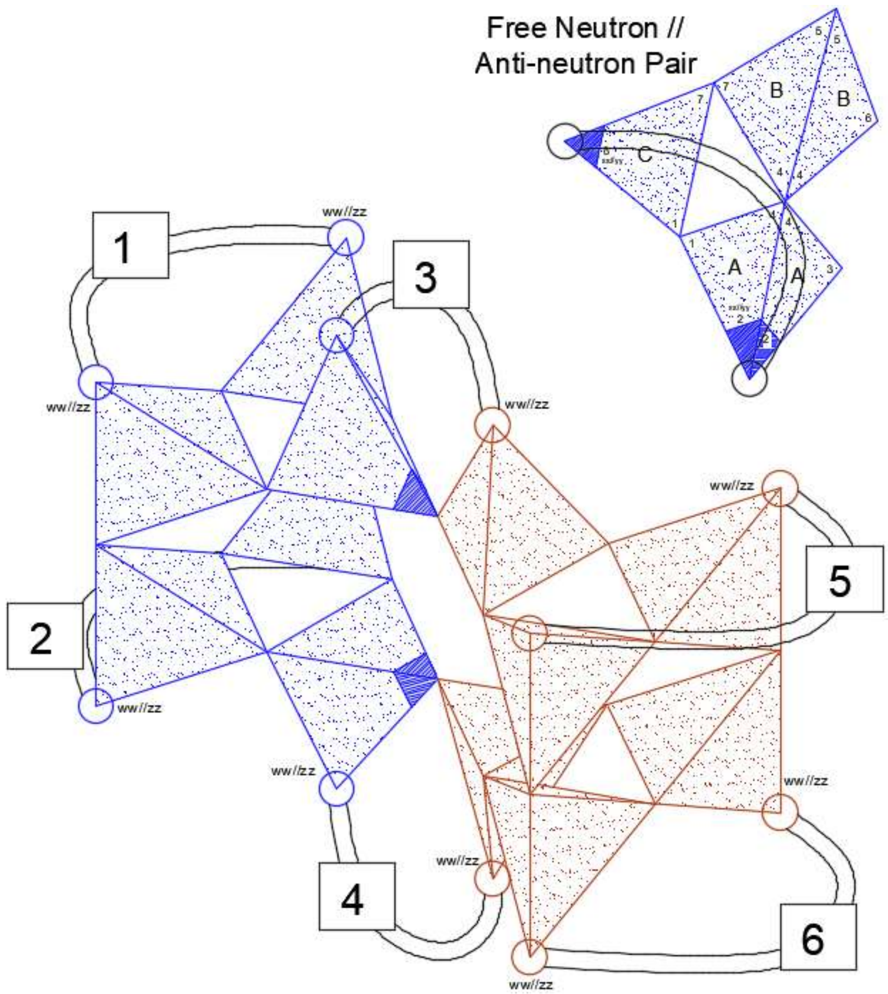


*Figure 22 – Six Helium-4 Attachment Positions for Free Neutron // Anti-neutron Pairs*

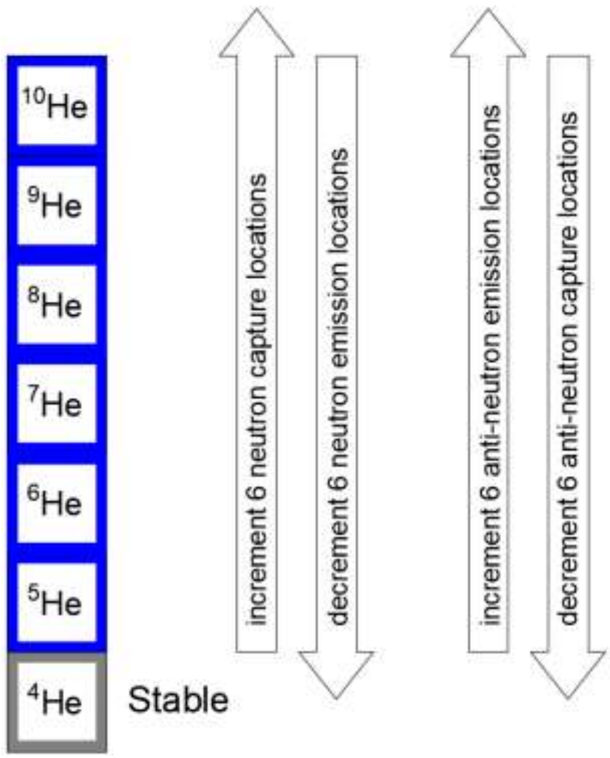


*Figure 23 - Helium-4 Increments of Free Neutron Addition*

Summary:

- A neutron emission is an anti-neutron capture
- A neutron capture is an anti-neutron emission

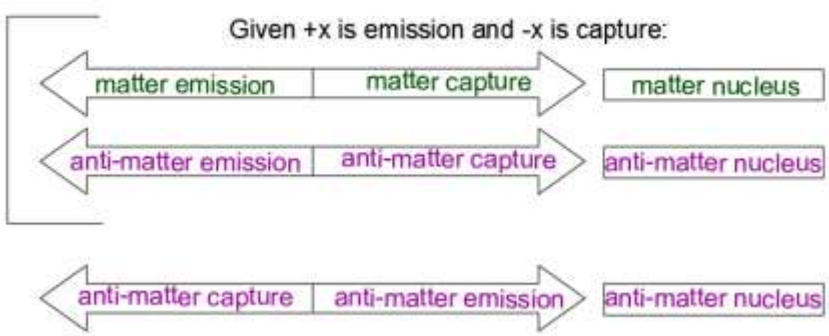


*Figure 24 - Emission and Capture are Mirror Reactions*

Findings from beta minus reaction extended to neutron emission & capture:

To matter observer:

- Matter velocity direction is the same as matter cause-effect direction
- Antimatter velocity direction is opposite of cause-effect direction

*Four Helium-4 Attachment Positions for Free Proton // Anti-proton Pairs*

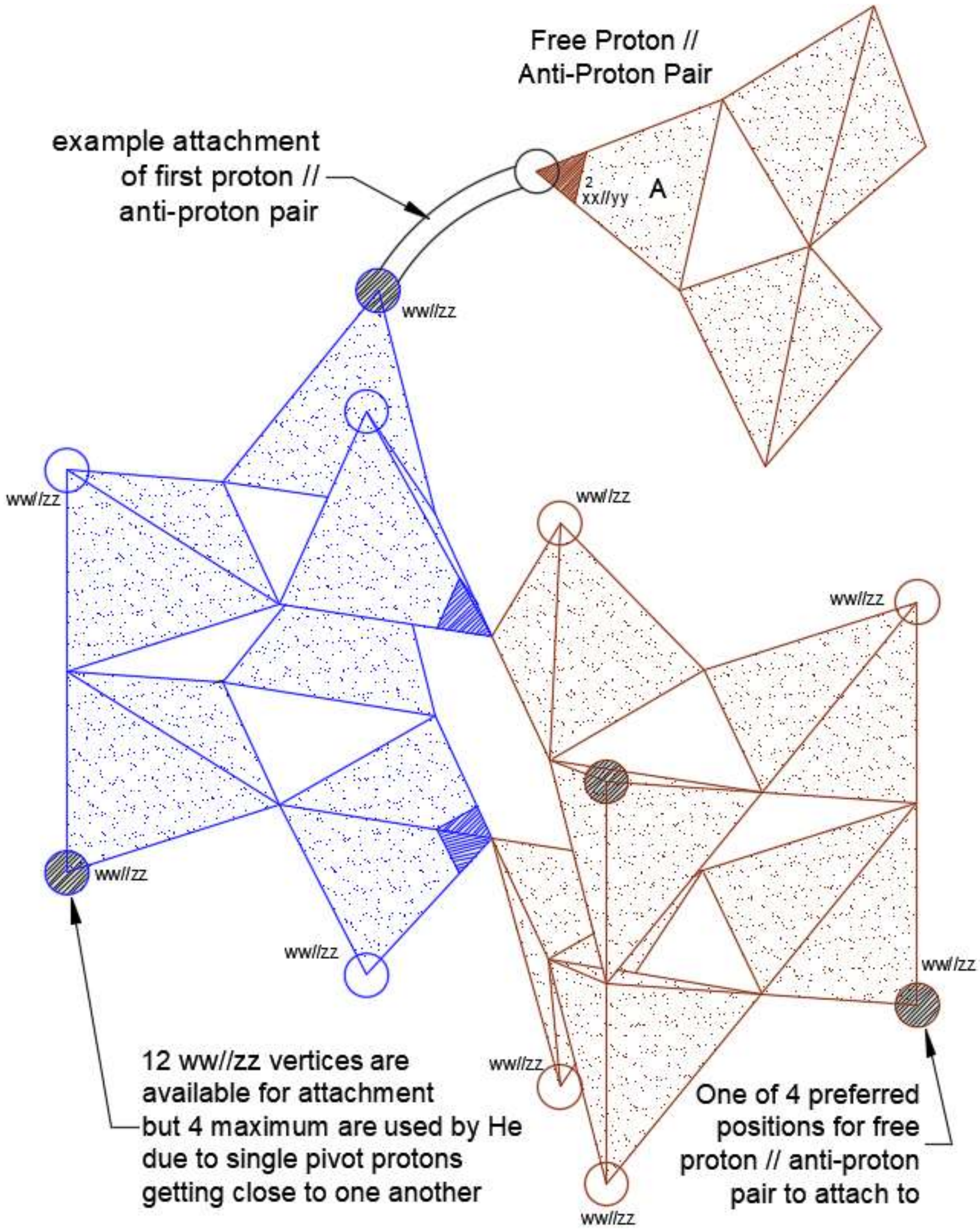


*Figure 25 - Helium-4 Attachment Positions for Free Proton // Anti-proton Pairs*

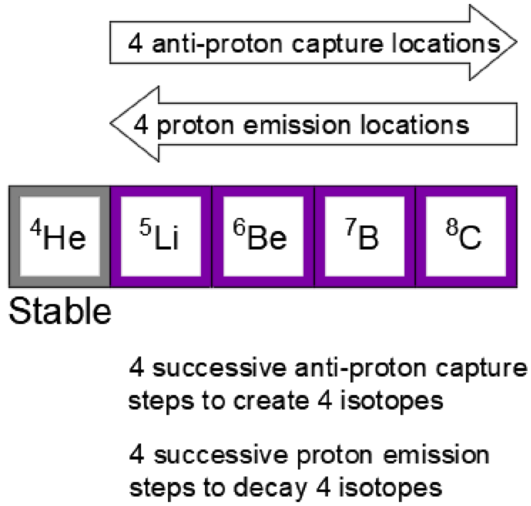


*Figure 26 - Helium-4 Increments of Free Proton Addition*

# Chapter 6 Summary

Chapter 3 introduced planar configuration of bound nucleons, which is bound by 3 gluons per particle. Chapter 4 introduced matter particles and their antimatter mirrors, which are permanently in a congruent particle pair. Chapter 5 claims the deviation of the proton to neutron ratio from 1 to 1 is due to neutrons having more potential gluon points than protons. Specifically, the Helium 4 nucleus is an example where six sites for a free neutron exceeds the four sites for a free proton.

The neutron has two xx//yy tetrons whereas the proton only has one xx//yy tetron. This may be visualized as a highly reactive free xx//yy tetron in an environment of available ww//zz tetrons. The neutron has two of these highly reactive tetrons, and the proton only has one. In addition to having more binding sites, a free neutron will likely bond both xx//yy tetrons, creating a more stable resultant nucleus. The proton has only one xx//yy tetron to bond, leaving this newly bonded nucleon with many more degrees of freedom to rotate around.