Sub-quarks, Anti-matter and Red Shift

John Caywood

Unaffiliated

john_caywood@hotmail.com

ABSTRACT

Four sub-quarks make matter and anti-matter. Quarks are tetrahedrons with four sub-quarks. Besides two-quark mesons, three quark particles form baryons and leptons. Two new quarks and their anti-quarks are components of leptons. Beta decay is a misinterpretation of beta reaction because anti-matter velocity is opposite from the cause-effect direction. A model of the helium-4 nucleus is shown with the six attachment points for extra neutrons and four attachment points for extra protons. Electrons and positrons exit from the bottom spherical shell of the nucleus. Electron plus and minus spins are the two polarities of light. Lorentz formulas are modified to become Lorentz-Pythagorean circles with half for matter and half for anti-matter. All matter has parity, charge and time reversed anti-matter existing congruently with it. Two nested half sphere universes exist. One is dominated by matter and the other is dominated by anti-matter. The strong force present in the gluon is the cancellation of iso spin in the four sub-quarks. Energy removed from iso spin cancellation is stored as curvature of space. Time history is different from rate of time passage. Varying rates of time passage accumulate as local time history. Redshift of distant objects is an artifact of observation. The uncertainty of one photon going thru two slits is explained by adding the anti-photon going backwards in its time.

Keywords: special relativity, general relativity, Lorentz, length contraction, time dilation, beta decay, quark, red shift, anti-matter, uncertainty

INTRODUCTION

The following document is an illustrated journey in theory from the structure of the universe to the parts of a quark. It starts with a revised understanding of the Lorentz equations of length contraction and time dilation. In the middle is a lengthy section on the beta "decay" being explained as a reaction due to the velocity direction of a positron neutrino being reverse of the cause-effect direction. It ends by explaining the uncertainty principle with the velocity of an anti-photon going backwards from the cause-effect direction. Because velocity direction being backwards from cause-effect direction is such an unnatural concept, allowing this reality is the most difficult mental leap required.

Included diagrams show how the new theories postulated in this paper follow logically from generally accepted phenomena. Being theoretical, there is no experiment that results in a proof. There are, however, examples leading from this introduction to the final discussion.

The math in this paper is minimal, the most complex being squares and square roots. All of the concepts in this paper are diagrammed and explained with as much ordinary English and as little jargon as possible. I hope that any educated person can follow this paper. Most of the background material required to follow the logical progression is given.

One well remembered event during my college years was a speech by John Wheeler at University of Texas at Austin. When his speech ended, he asked for questions. After no one offered, I asked, "What about anti-matter?" He replied, "We don't know much about that". I have his autograph, "To John Caywood, colleague in the search. John Wheeler 10 Oct. '78" in my copy of *Spacetime Physics*, which I brought to that event.

I purchased the Misner, Thorne and Wheeler *Gravitation*, and it lay dormant on my shelf for four decades until the Covid-19 pandemic's idle time gave me time to read it uninterrupted. I did not accept the idea of converging geodesic lines being the cause of gravity because I reasoned that a spaceship whizzing back and forth many times between two places in space was experiencing the equivalence principle without following a geodesic line.

Another disappointment was that every science article about physics would end with the hopes that a bigger and better telescope, accelerator or magnet would provide the answers.

The original research presented herein is based on works provided via the internet, search engines, and especially Wikipedia articles. As the abstract above indicates, I have created intriguing illustrations and explanations tackling topics ranging from cosmology to particle physics. The results were too compelling to collect dust in a notebook.

Please email me if you find any errors.

METHODS AND MATERIALS

All of the illustrations are done with Autodesk AutoCAD LT 2021. The ability of AutoCAD to make blocks allowed easy creation of a library of particle symbols. Text and spreadsheet material was done with Microsoft Office Professional Plus 2016.

The computer used is a Microsoft Surface Book connected to two external 27" diagonal monitors. This allows the internal display to be turned off for longevity. The best feature of this model is no disk drive, meaning you can leave it running all the time. My printer is an HP Color LaserJet Pro M254dw, which has four toner cartridges.

Microsoft Access is a part of the Office suite and was used to create a database of sub-quarks, quarks, particles, particle and anti-particle pairs and atoms. Using Access, I created a report which is a pattern of a three-quark particle. The notation on the pattern changes depending on the particle being printed. Fortunately, this three tetrahedron particle model can be folded from a flat pattern of thirteen triangles.

The most successful folded models have colored sub-quark vertices with colored pipe cleaners, hot melt glued to the interiors of the quarks and extending out the vertices. This allows connection of particles into nucleus, reaction and photon models. These models in turn where photographed and the digital images traced in AutoCAD and refined. Email me for a free copy of this 12 Mb database from which may be printed all the particle patterns. If you update it with more data, please send your improved database back so I can distribute it to those who have already requested it.

DEFINITIONS

History of Time's Passage and Rate of Time Passage

History of time passage is different from rate of time passage. An object at a distance from an observer has a history of time passage which has recorded the observed rate of time passage and distance traveled at that rate. A Minkowski diagram has a geometrized treatment of time and does not separately record the rate of time passage and the distance traveled at that rate. Rate of observed time passage for an observed object slows due to acceleration or gravity, therefore a Minkowski diagram is not a true record of elapsed time for the observed object.

The Feynman diagram is a particle version of the Minkowski diagram, where only a qualitative understanding of direction of travel is necessary. The Feynman diagram does not account for spin, which this proposal does.

Spin

Isospin, hereafter called spin, is the expression of time rate that is present in all particles. Spin is a tri-directional constant angular velocity. Positive spin is dominant in matter and negative spin is dominant in anti-matter.

1 COSMOLOGY and ASTROPHYSICS

1.1 Lorentz Circle

The Lorentz equation for length contraction is:

L = length observed in the other reference frame
L_0 = length in observers own frame of reference (rest length)
v = the speed of the moving object
c = the speed of light in a vacuum

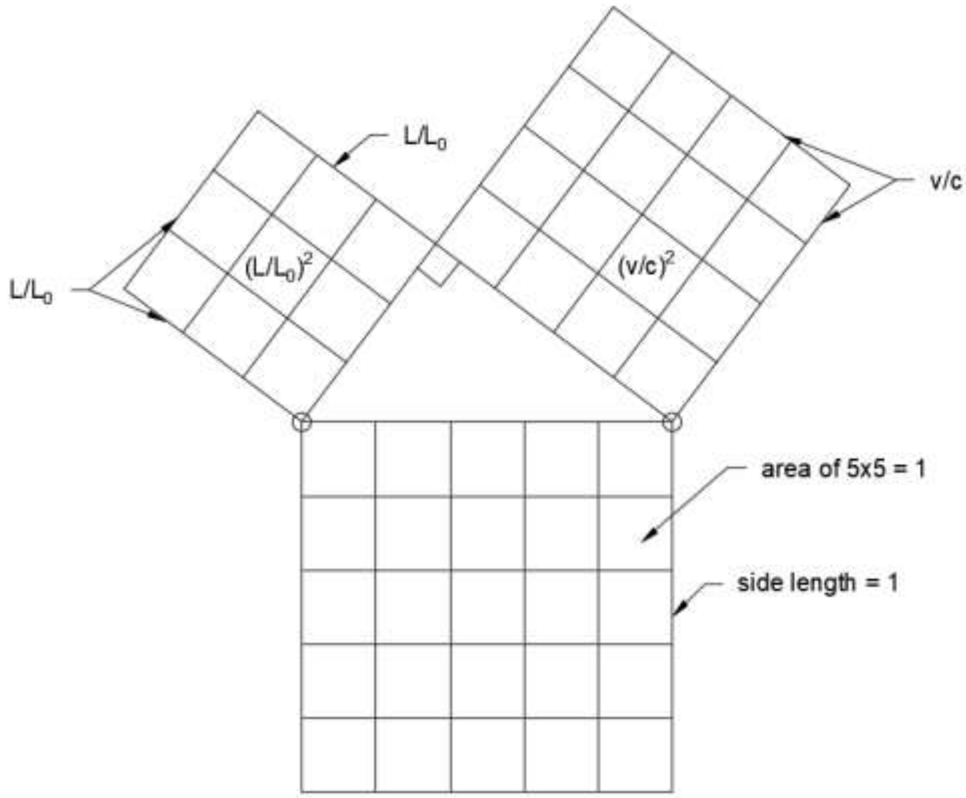
$L = L_0\ (1-(v/c)^2)^{1/2}$
$L/L_0 = (1-(v/c)^2)^{1/2}$

Square both sides of an equation, which introduces both a real and an imaginary solution

$(L/L_0)^2 = 1-(v/c)^2$
$(L/L_0)^2 + (v/c)^2 = 1$
$(L/L_0)^2 + (v/c)^2 = 1^2$
This is a Pythagorean formula
Let L have an imaginary and a real component:
Where $L_{i\text{ and }r}$ = real L_r and imaginary L_i
$(L_i)^2 = (L_r)^2$
$(L_i/L_0)^2 = (L_r/L_0)^2$
$(L_{i\text{ and }r}/L_0)^2 + (v/c)^2 = 1^2$

1.1.1 Special Relativity as a Pythagorean Geometry

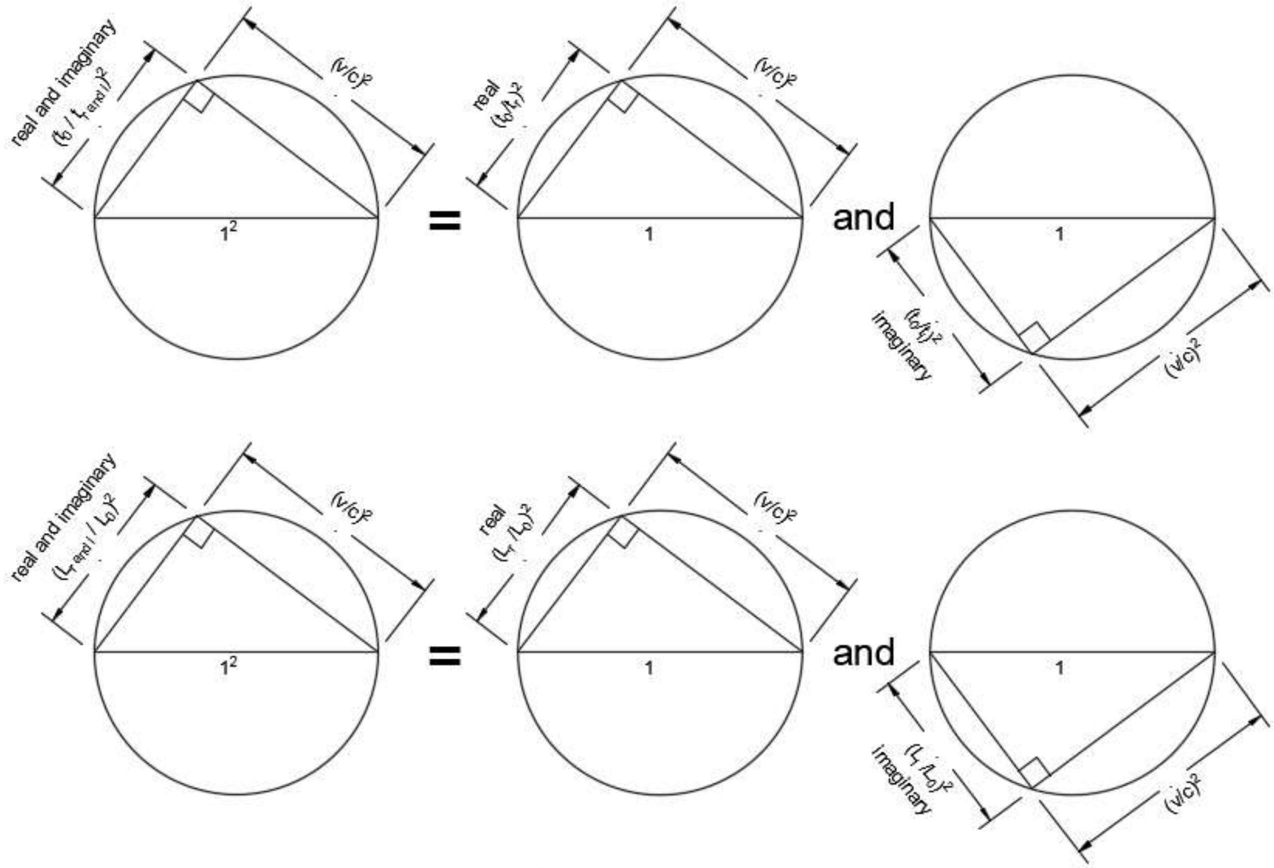
Draw the Pythagorean triangle from the above equation in the below figure



1.1.1 Special Relativity as a Pythagorean Geometry

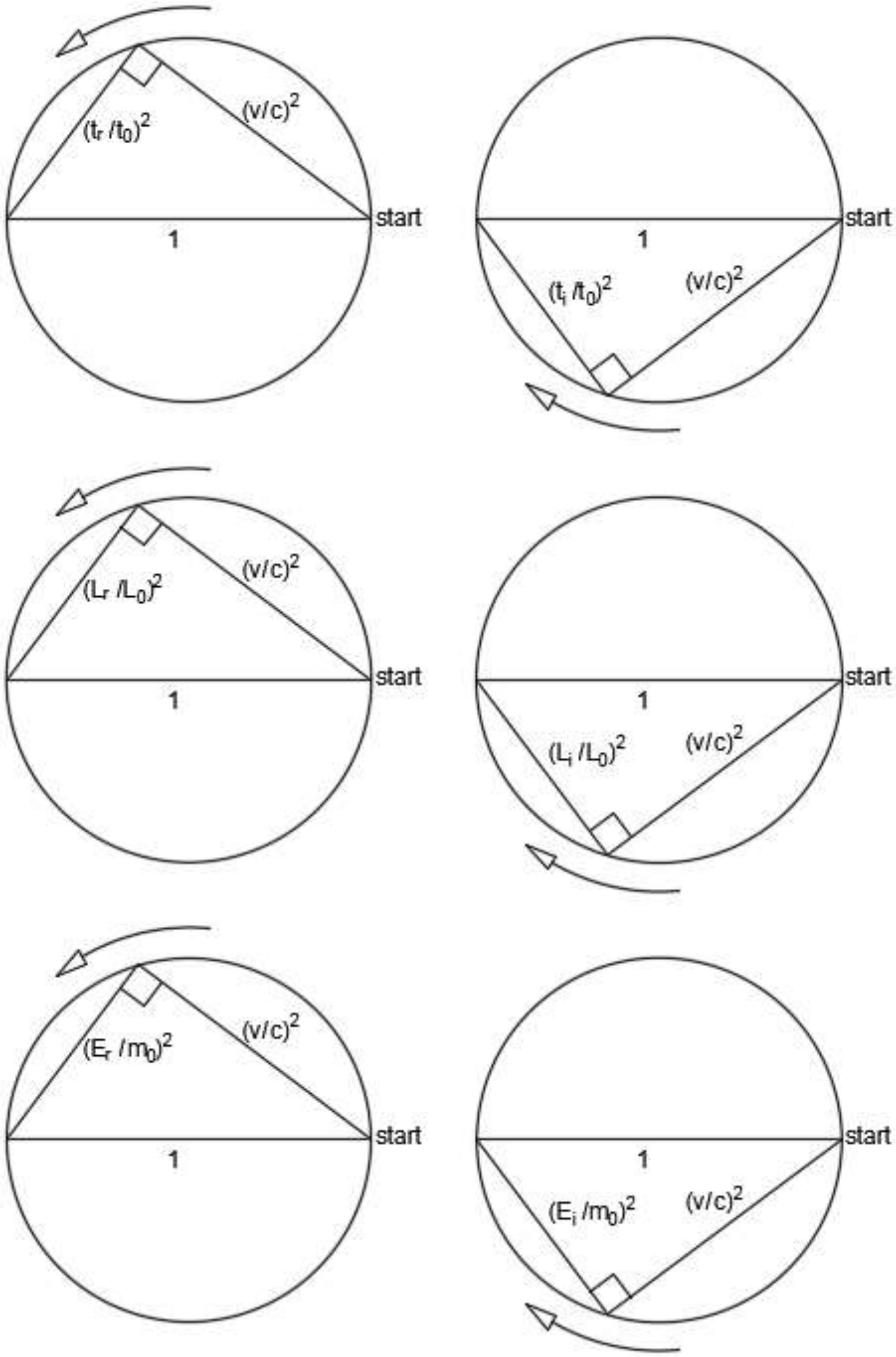
1.1.2 The Lorentz Circle

Draw the Lorentz Circle in the below figure



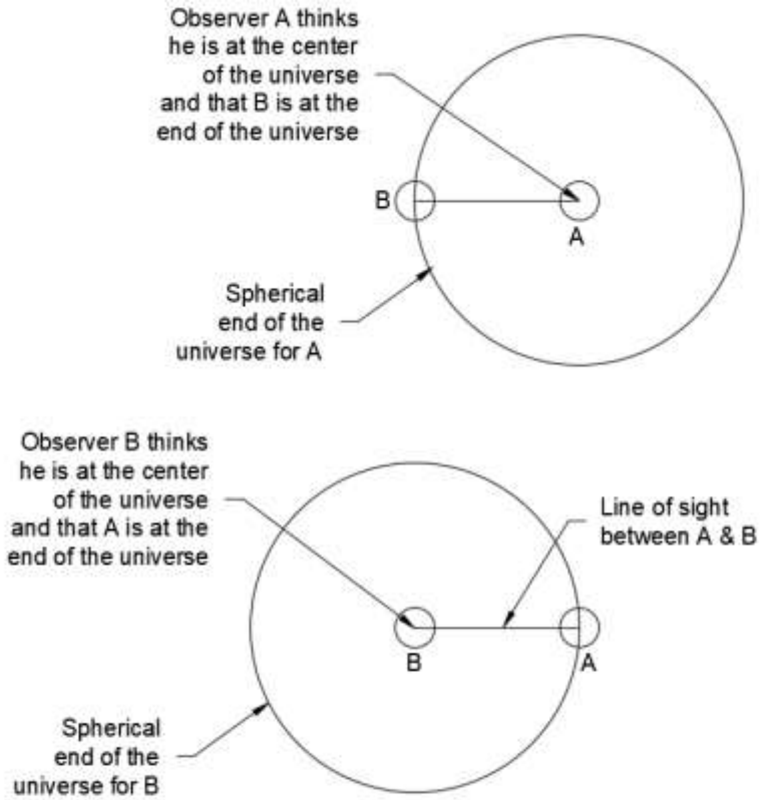
1.1.2 The Lorentz Circle

1.1.3 Lorentz-Pythagorean length and mass circles with co-varying real and imaginary components



1.1.3 Lorentz-Pythagorean length and mass circles with co-varying real and imaginary components

1.1.4 <u>The Problem of the Correct Observer in a Flat 3D Universe</u>



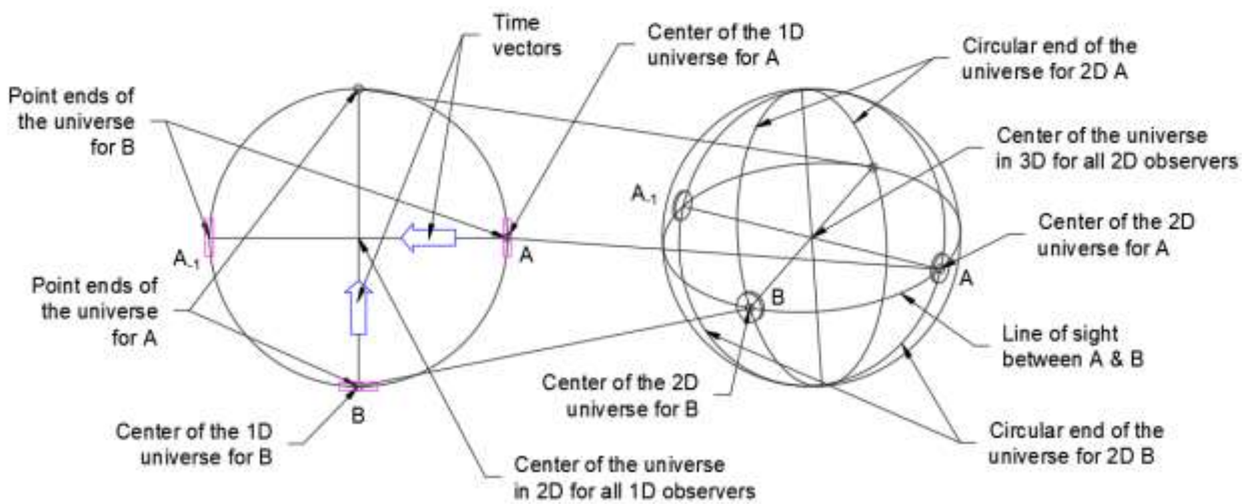
1.1.4 The Problem of the Correct Observer in a Flat 3D Universe

1.1.5 <u>All Observers are Correct in a Spherical Universe Containing Flat Worlds</u>

Why the universe is a sphere:

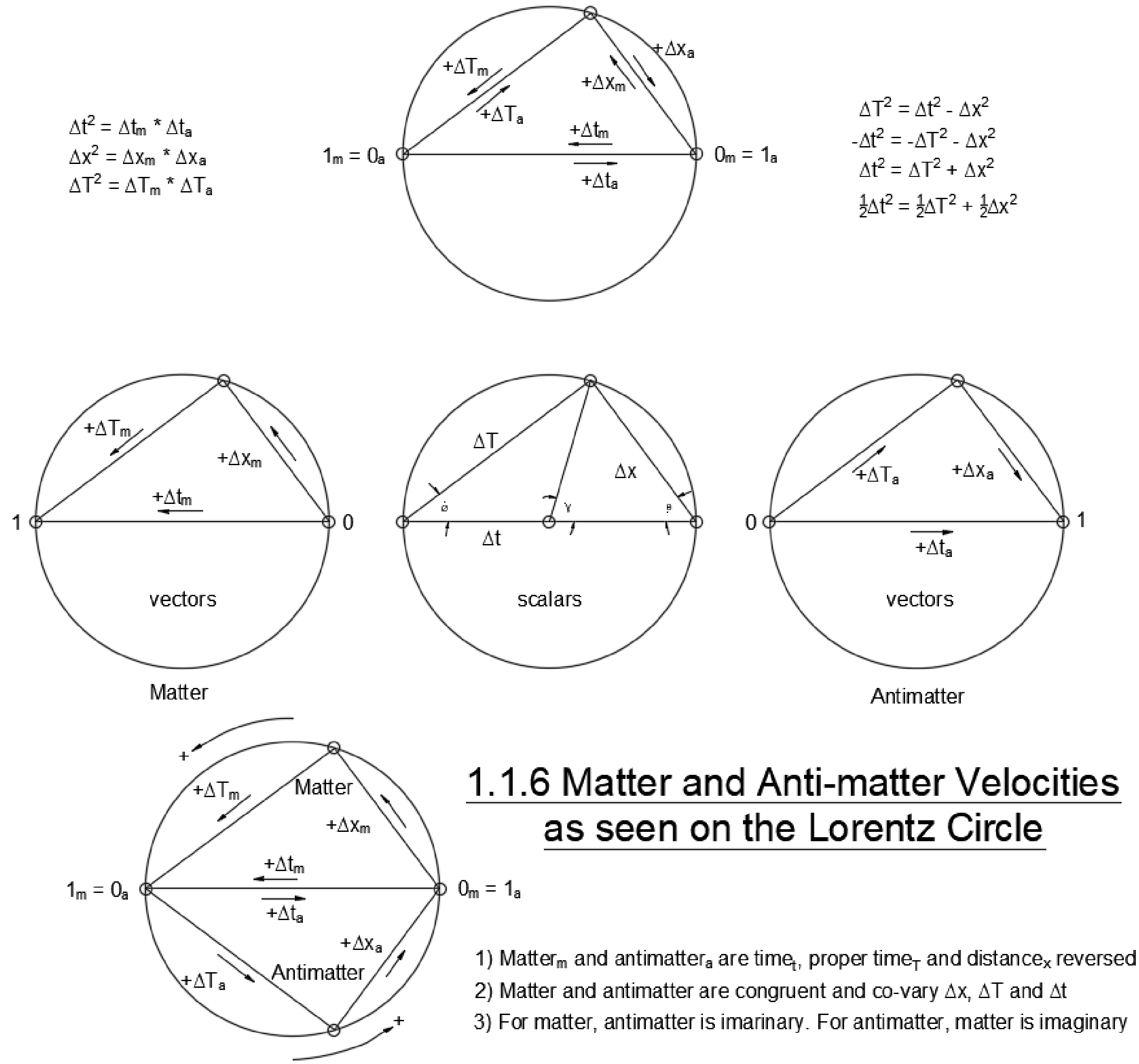
- It is the simplest geometry
- It is isotropic
- It is closed

The universe must be closed to exist, otherwise it has no definition of location and extent to exist. Both location and extent problems are solved with a sphere.

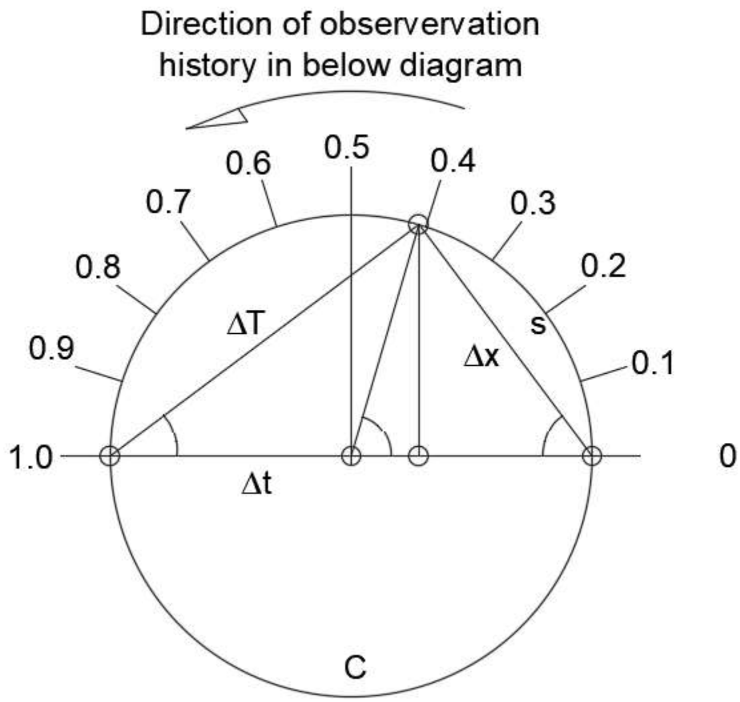


1.1.5 All Observers are Correct in a Spherical Universe Containing Flat Worlds

1.1.6 Matter and Anti-matter Velocities as seen on the Lorentz Circle

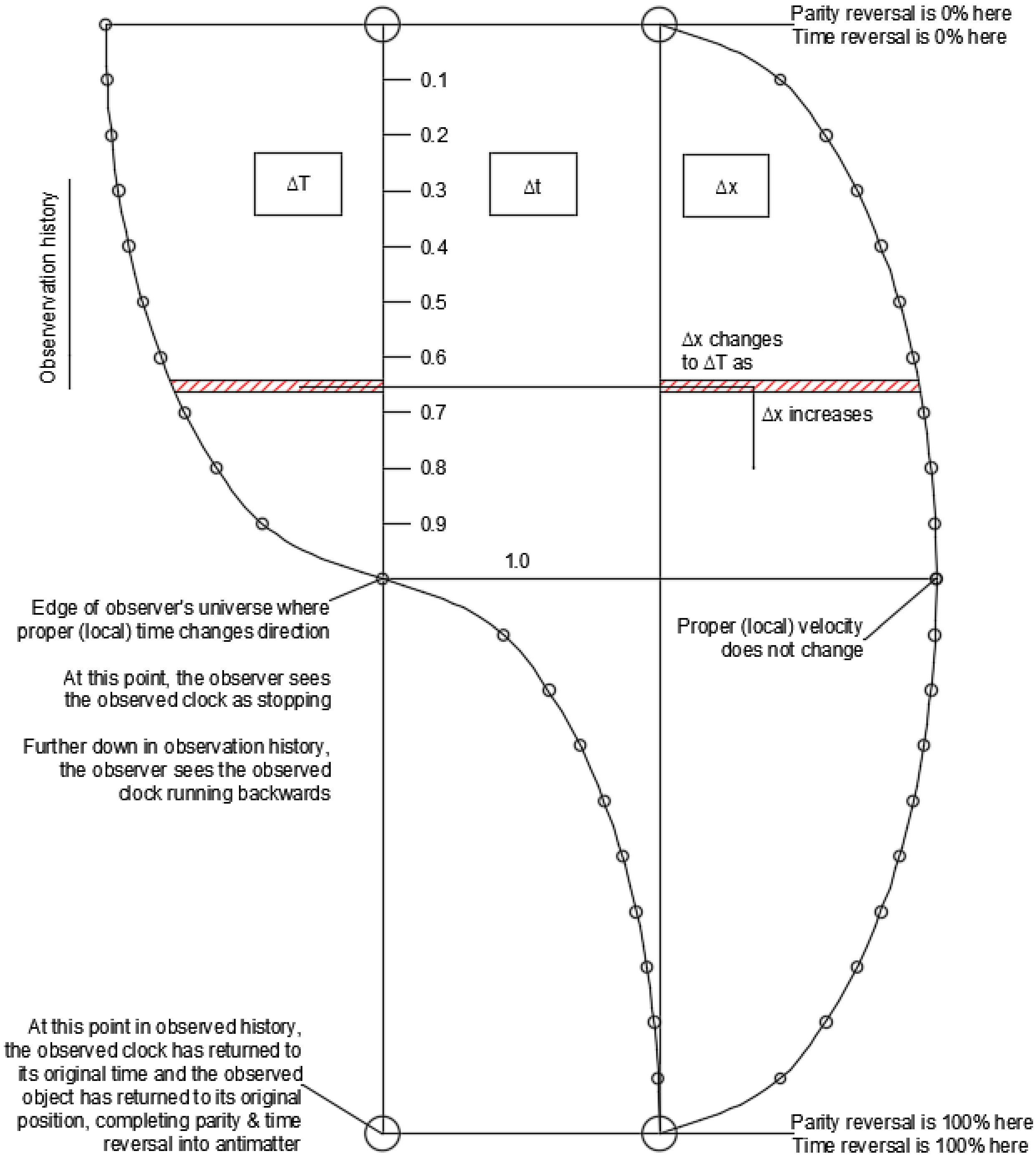


1.1.7 Progression of Elapsed Time



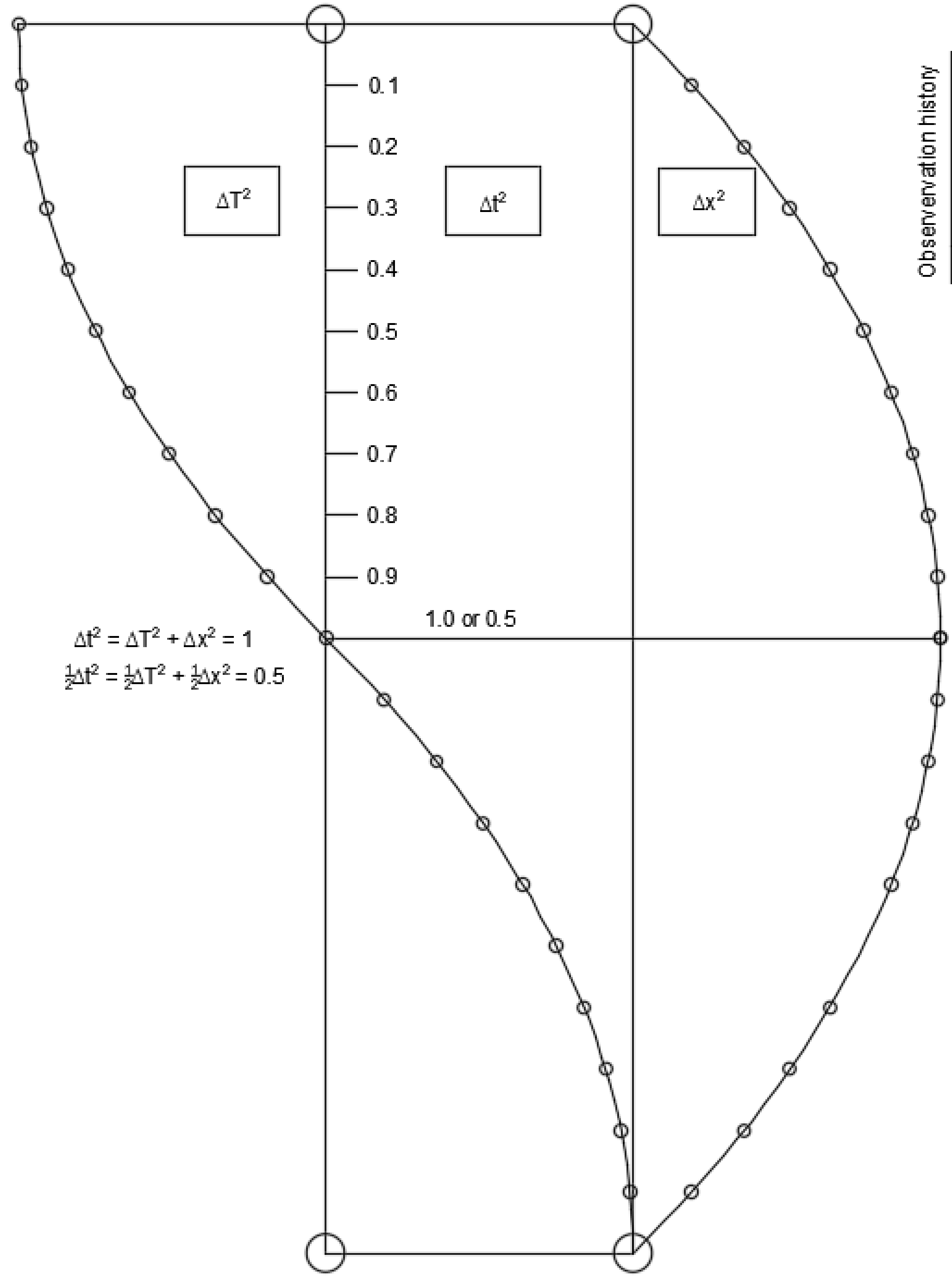
1.1.7 Progression of Elapsed Time

1.1.8 <u>Variable Values of the Lorentz Circle Over Global Time</u>



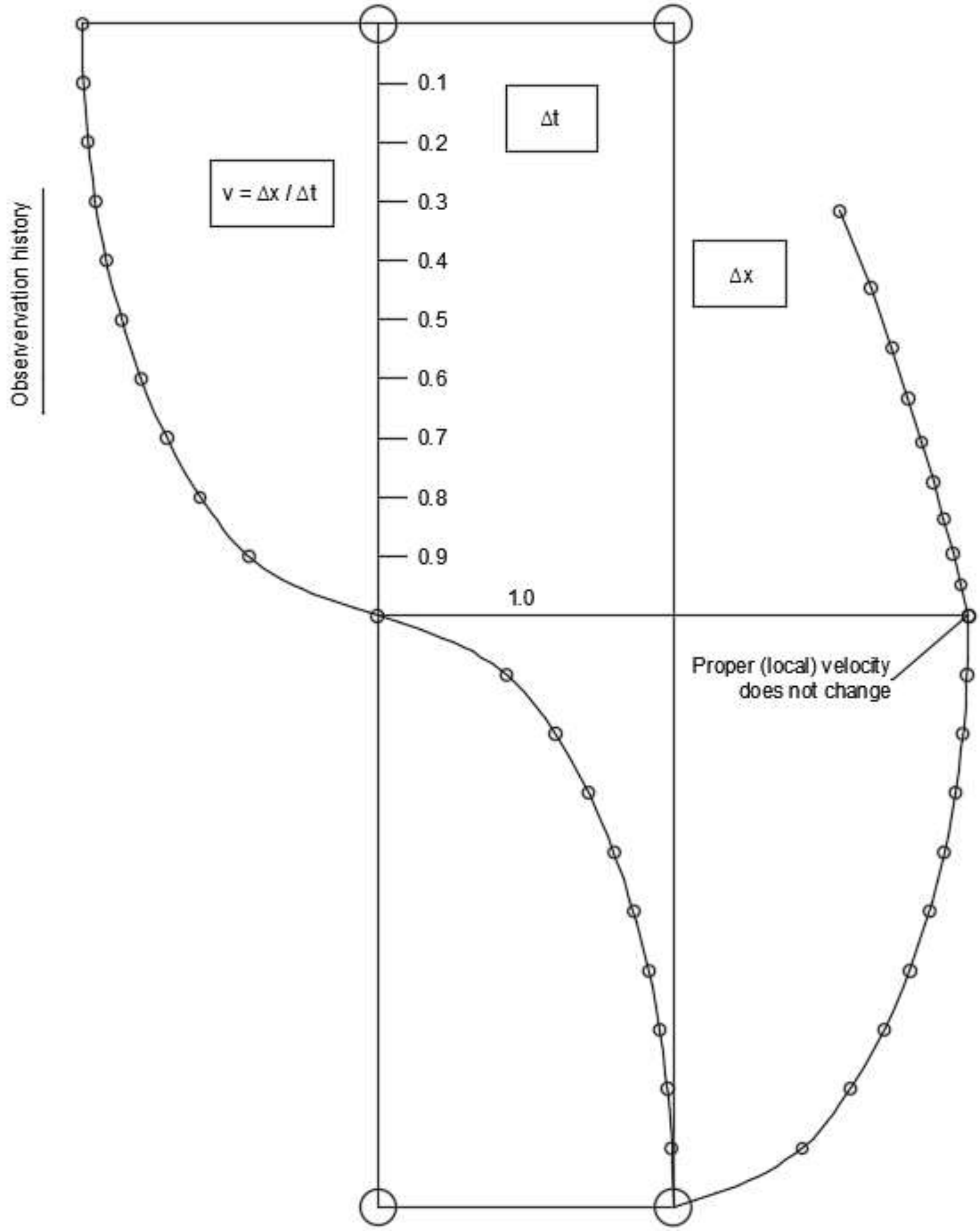
<u>1.1.8 Variable Values of the</u>
<u>Lorentz Circle Over Global Time</u>

1.1.9 <u>Squared Variable Values of the Lorentz Circle Over Global Time</u>



1.1.9 Squared Variable Values of the Lorentz Circle Over Global Time

1.1.10 Velocity Values Over Global Time



1.1.10 Velocity Values Over Global Time

1.1.11 Proper Time

Diagram 1.1.11 is both distance ratio and rate ratio.

The distances are:

1) ΔT = Observed object's rate of time passage calculated in distance units
2) Δx = Distance between observer and observed
3) $\Delta t = 1$ = The distance traveled by a photon in 1 unit of global time

The rates are:

1) ΔT = Observed object's rate of time passage in its local reference frame
2) Δx = Relative velocity between observer and observed
3) $\Delta t = 1$ = The speed of light

Example quotients of distances:

$\Delta x = 0.6$
$\Delta T = 0.8$

observed speedometer
$= \Delta x / \Delta T = 0.6 / 0.8 = 0.75$

observed velocity $= \Delta x / \Delta t = 0.6 / 1.0 = 0.6$

All these values are directionless scalars, not vectors.

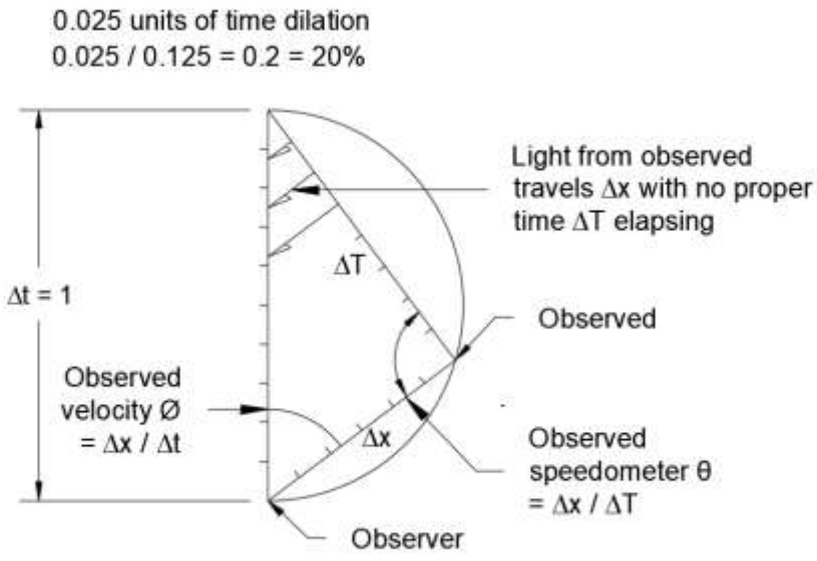
Distances and rates co-vary because they have the same relationship.

The rate of observed time ΔT passing depends on the distance Δx the observed object is from the observer. Rate depending on distance follows from rates and distances sharing the same Δt, ΔT, Δx ratios.

Light from the distant object was created in a time dilated relationship with respect to the observer

Observer and observed agree on their distance from one another, Δx, and they agree on their mutual recession or approach velocity, θ.

Observer and observed disagree on the wavelength of light sent from observed to observer.



1.1.11 Proper Time

1.1.12 Time Dilation

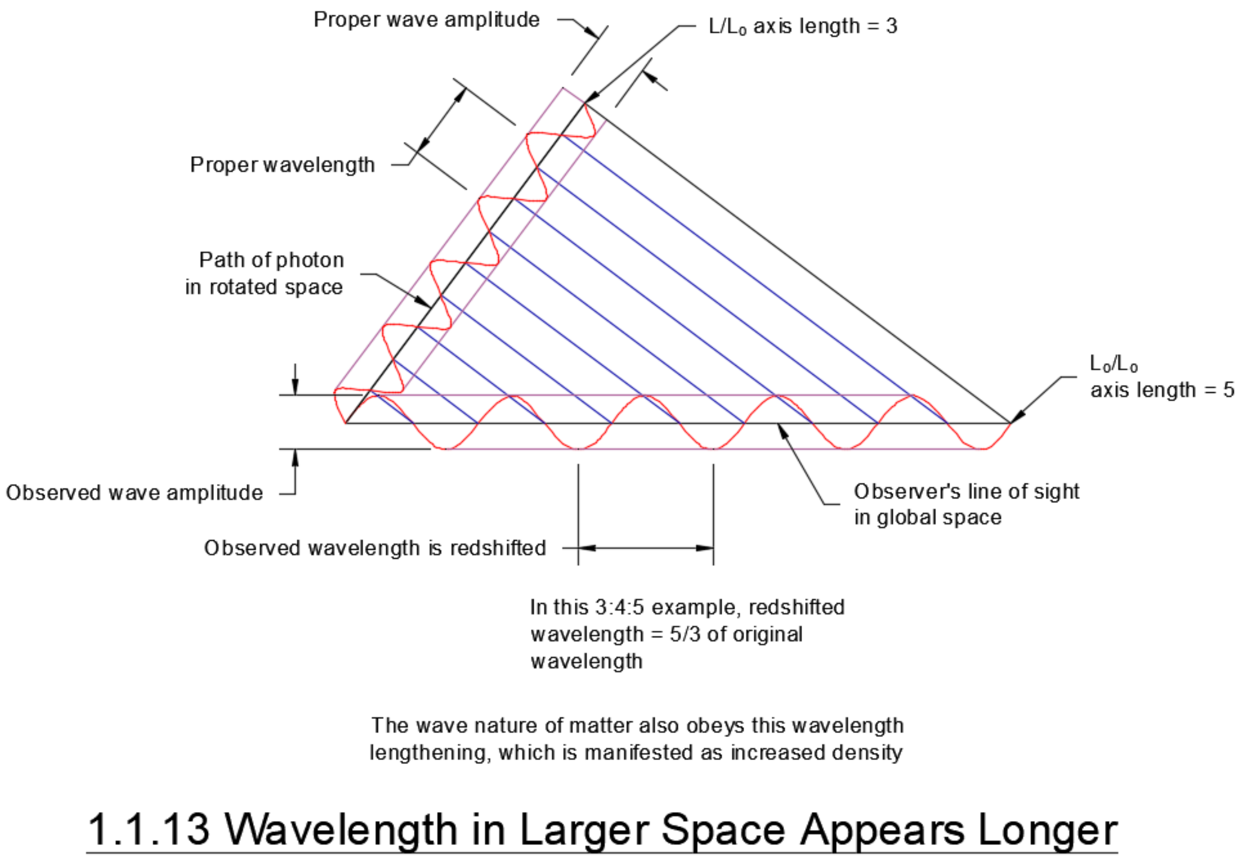
Example values:
$\Delta x = 0.6$
$\Delta T = 0.8$
$\Delta t = 1.0$
proper velocity = $\Delta x / \Delta T = 0.6 / 0.8 = 0.75$
global velocity = $\Delta x / \Delta t = 0.6 / 1.0 = 0.6$
time dilation = $\Delta t - \Delta T = 1.0 - 0.8 = 0.2$
if c = hypotenuse = 1:
$v/c = 0.6$
ΔL = length contraction = 0.8

The rate of global time passing is constant at 1

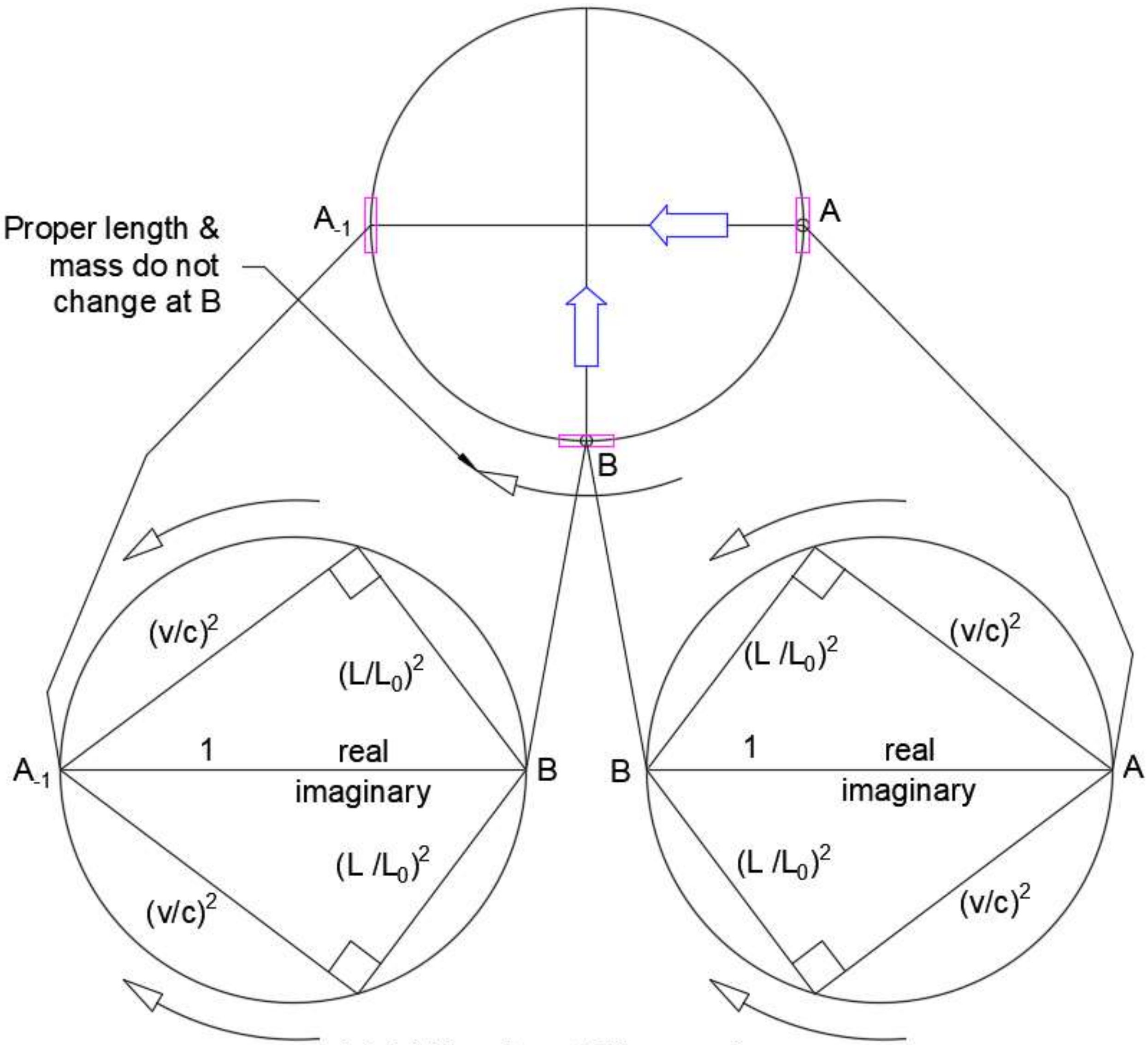
The rate of proper time ΔT passing (local to the observed object) depends on the distance Δx the observed object is from the observer

Light from distant objects was created in a time dilated relationship to the observer

1.1.13 Wavelength in Larger Space Appears Longer

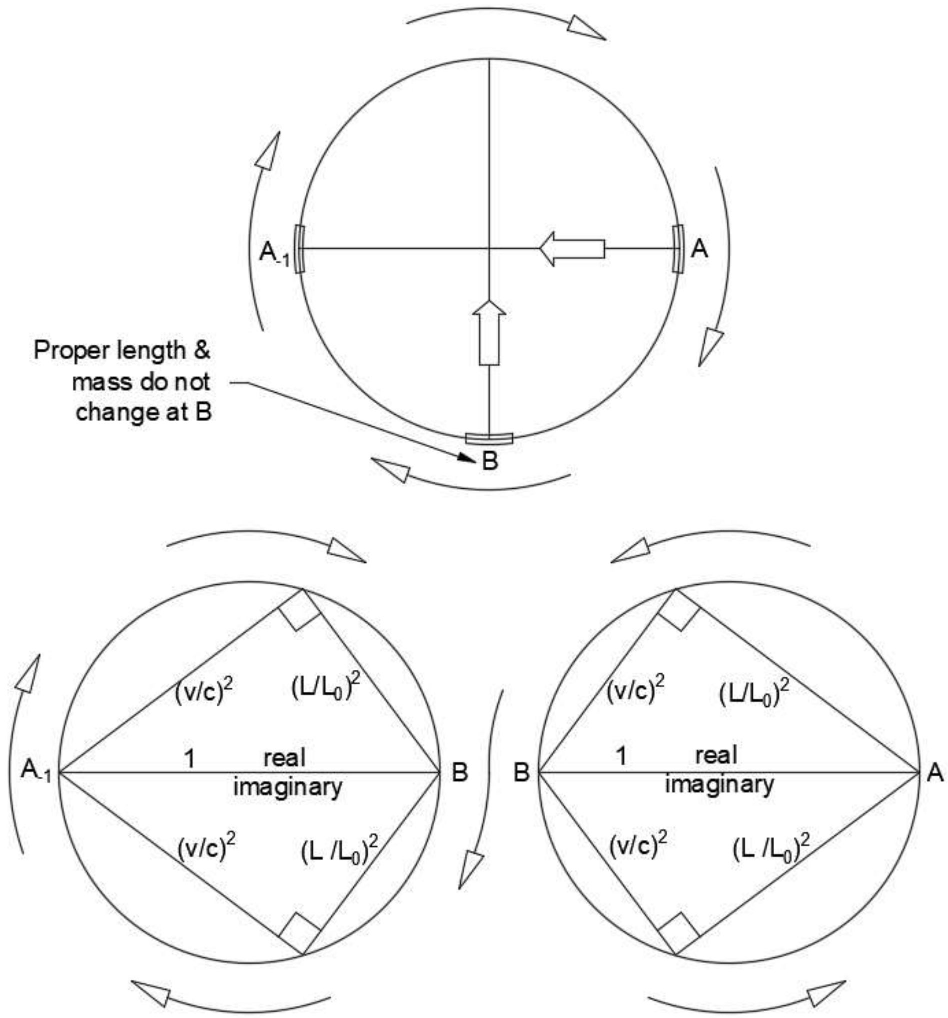


1.1.14 Mapping of Observer A sees traveler going from A to B to A_{-1}



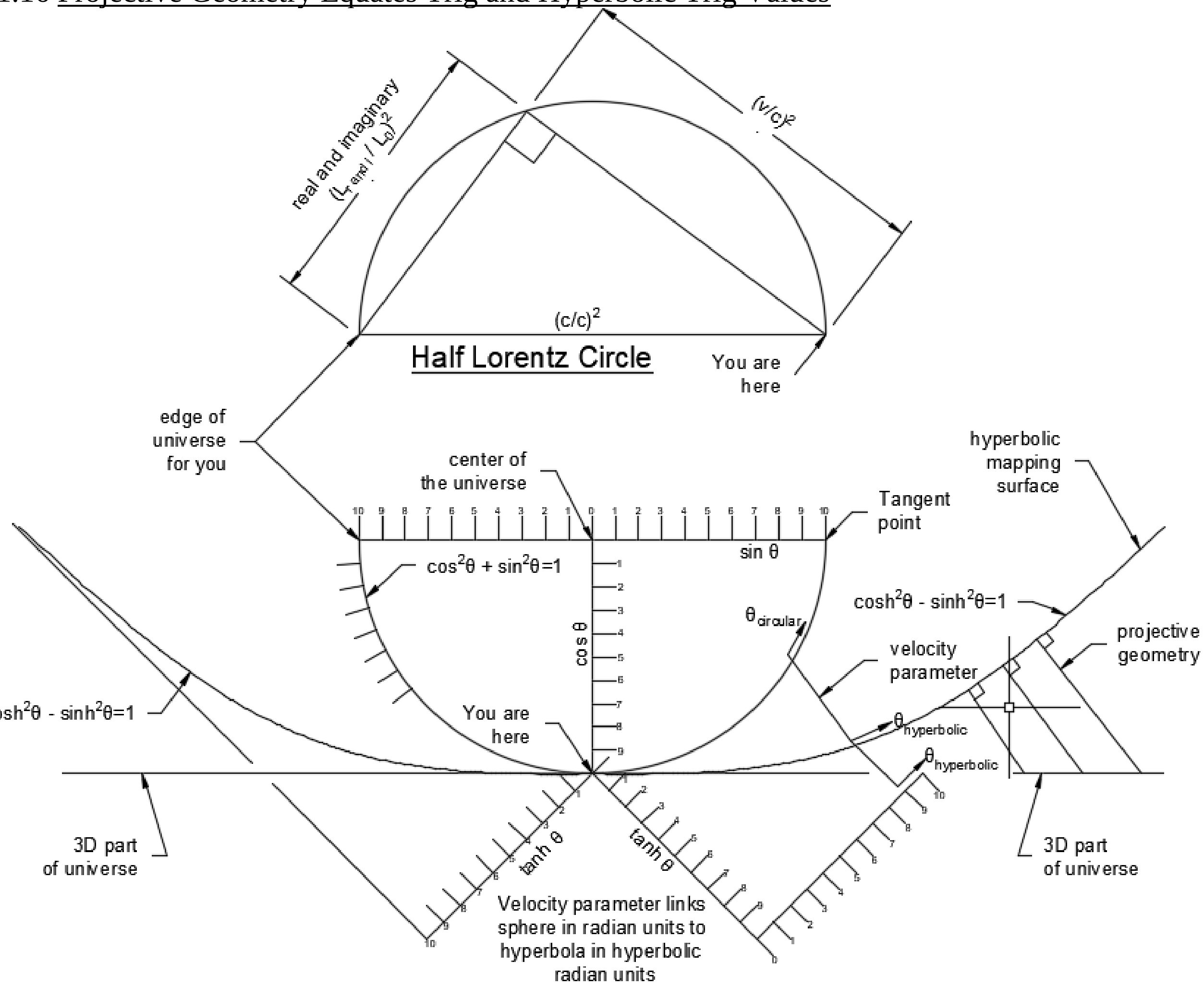
1.1.14 Mapping of Observer A sees traveler going from A to B to A_{-1}

1.1.15 Observer A sees traveler going from A to B to A_{-1}



1.1.15 Observer A sees traveler going from A to B to A_{-1}

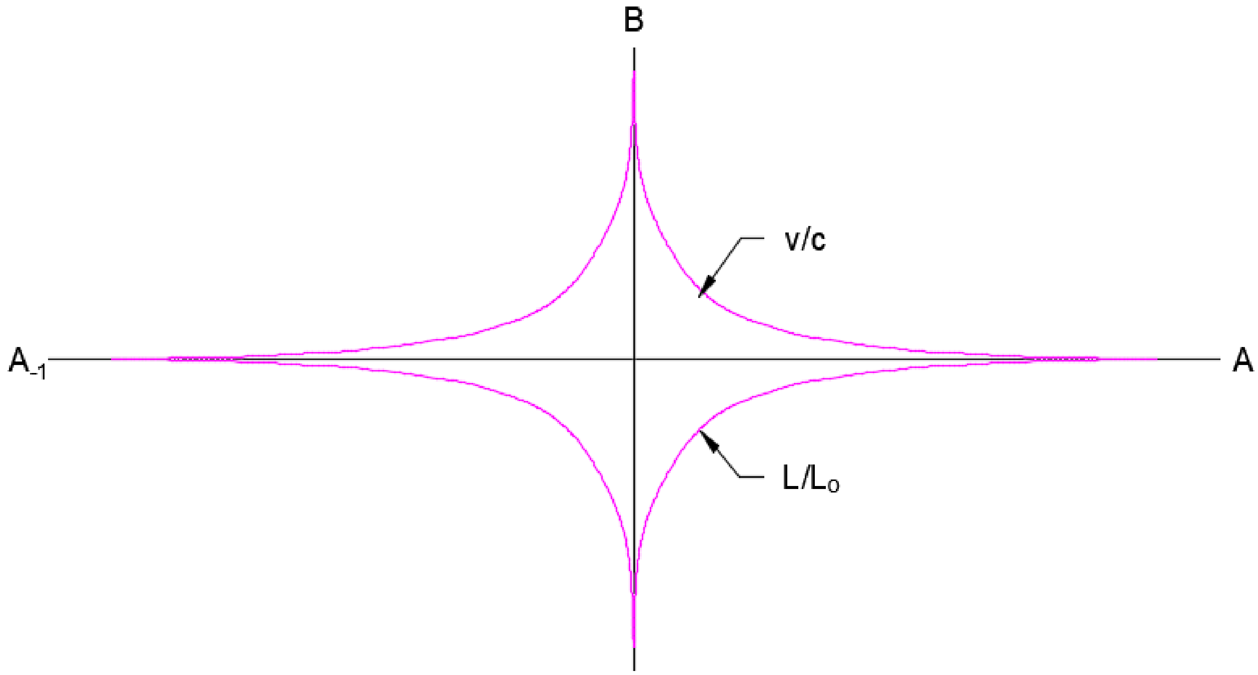
1.1.16 Projective Geometry Equates Trig and Hyperbolic Trig Values



1.1.16 Projective Geometry Equates Trig and Hyperbolic Trig Values

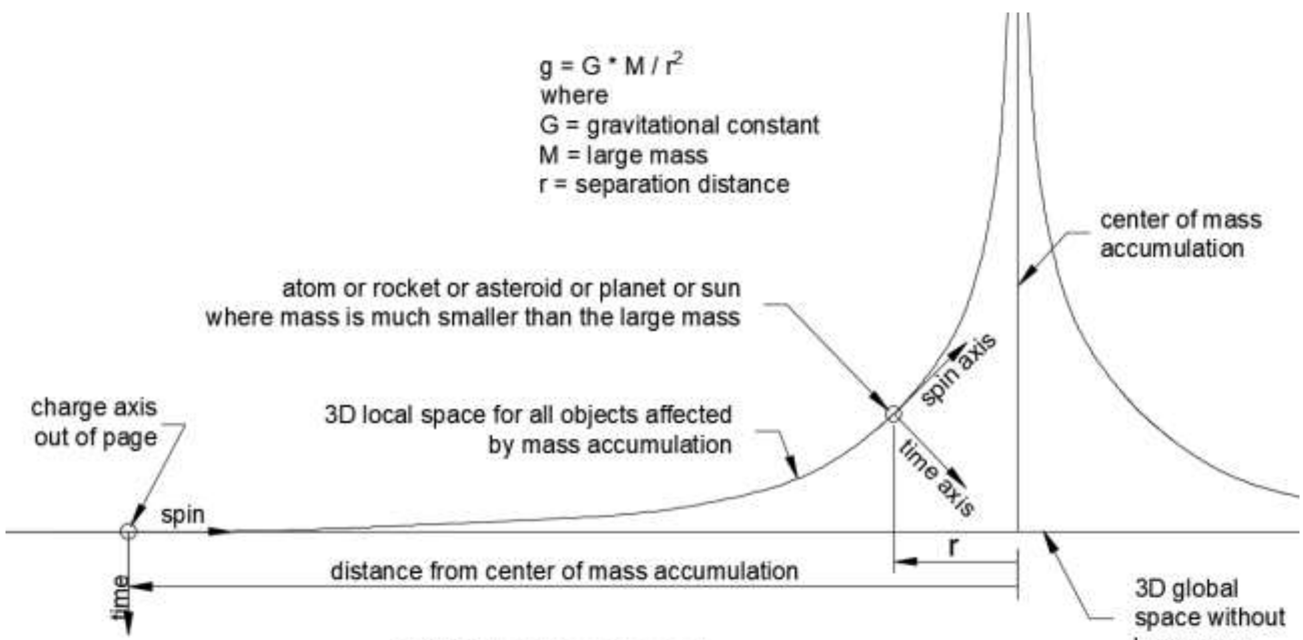
1.2 Equivalence Principle

1.2.1 Length Contraction on the Lorentz Circle



1.2.1 Length Contraction on the Lorentz Circle

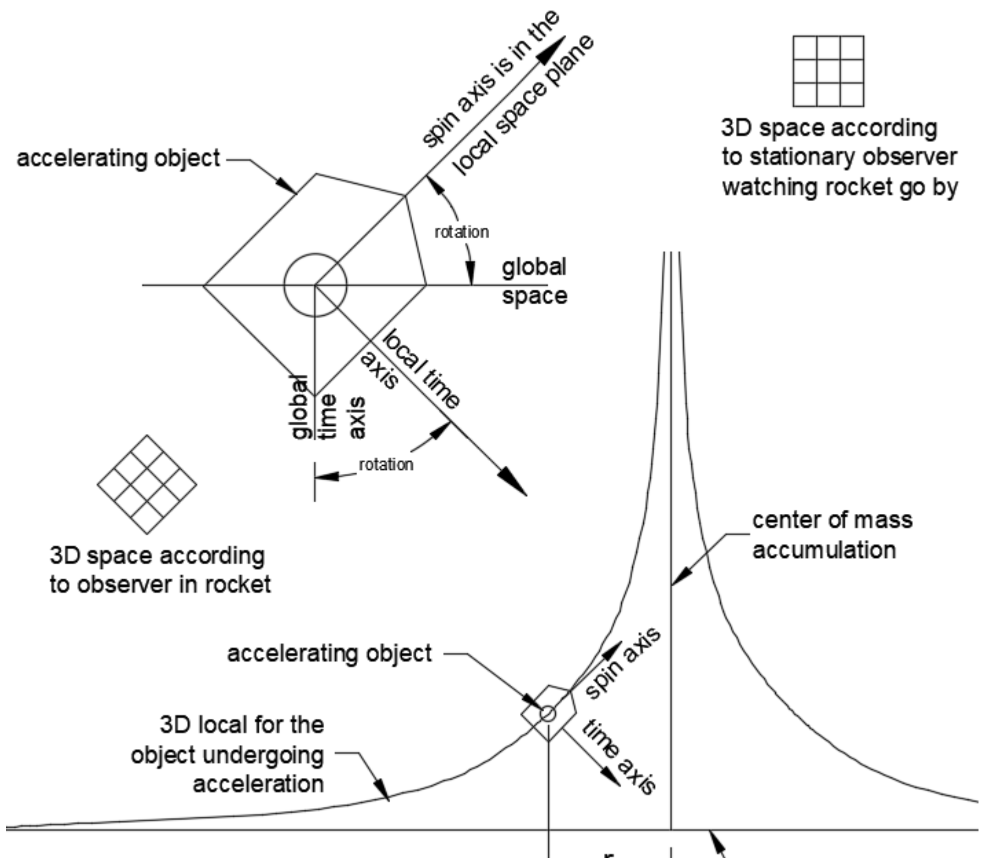
1.2.2 Object Moves Towards Center of Mass in Open Space



1.2.2 Object Moves Towards Center of Mass in Open Space

1.2.3 Rotation of Local Coordinates

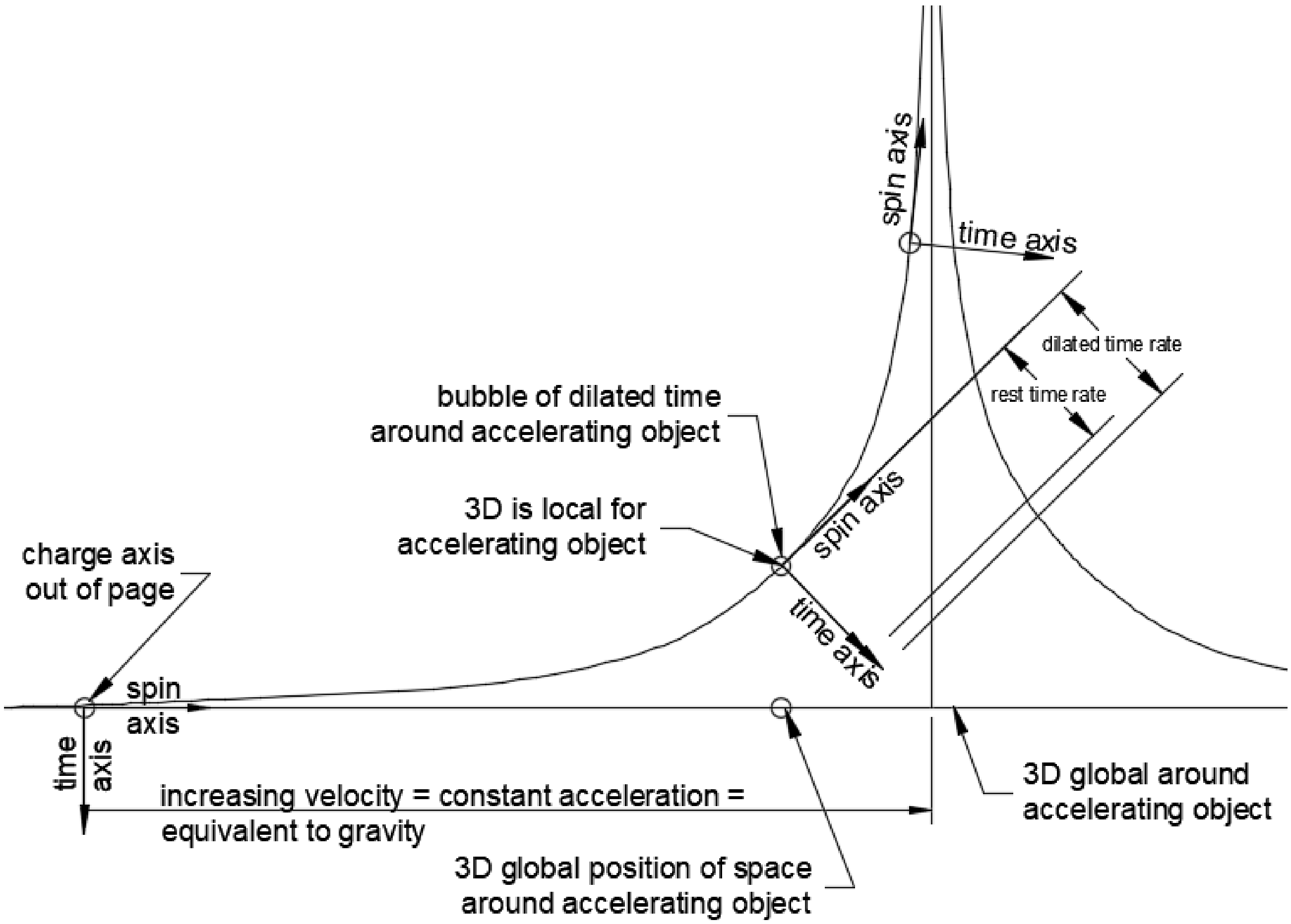
Length contraction is in all 3 dimensions, not just along direction of travel. A rocket traveling very near the speed of light appears, to a stationary observer, to be infinitesimally small and barely moving. That stationary observer may say the rocket converted all its length to time and all its time to length. The equivalence principle makes an accelerating object obey the same result as an object being attracted by gravitation. The object's spin axis is always local and always points toward a center of mass the object is being attracted to, or an equivalent direction of acceleration.



1.2.3 Rotation of Local Coordinates

1.2.4 Equivalence of Acceleration and Gravity

An accelerating object with a constant energy source pushes that object asymptotically close to the speed of light limit. The accelerating object never reaches the equivalent to infinite gravity for the same reason it never reaches the speed of light. Time rate is dilated by acceleration. Time history is the cumulative elapsed time of all time rates at the distance that time rate was in effect for. Time history for an accelerated object with dilated time rate periods will have less elapsed time during those dilated time rate periods where time rate is faster. When acceleration reduces, the time rate increases. Dilated time means fewer ticks of the clock occur within a given volume of space the object is passing through.



1.2.4 Equivalence of Acceleration and Gravity

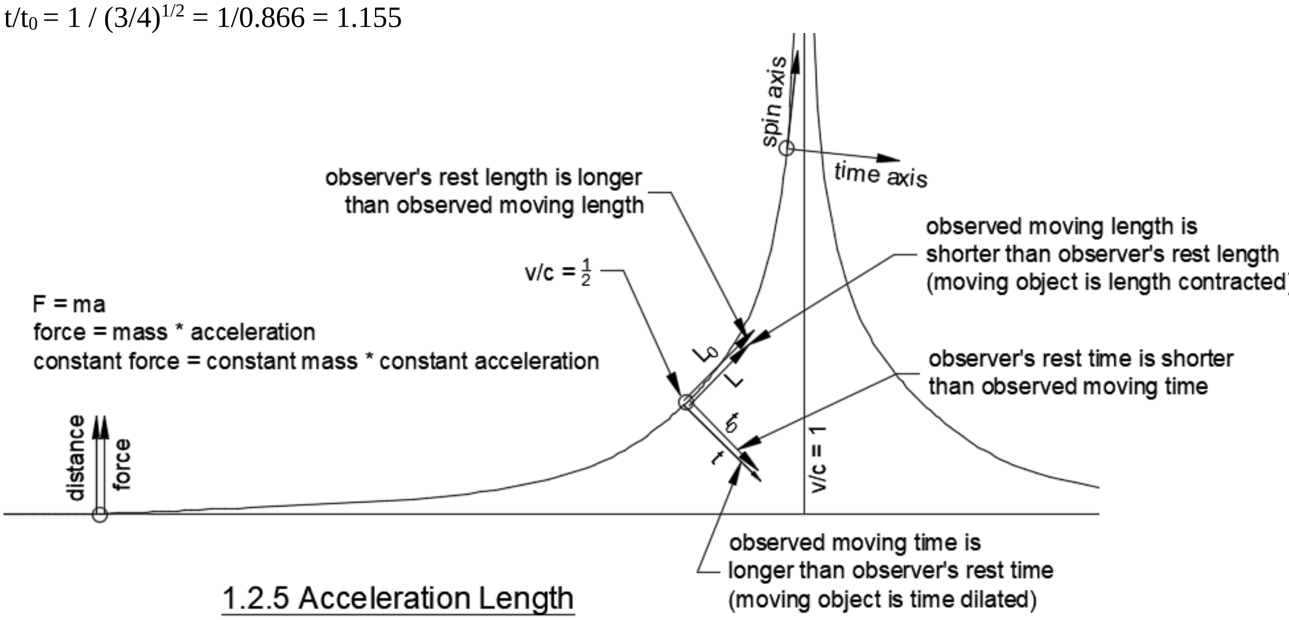
1.2.5 Acceleration Length Contraction and Time Dilation

Let t and t_0 be defined in terms of rate of time passage.

$v/c = 1/2$
$(v/c)^2 = (1/2)^2 = 1/4$
$1-(v/c)^2 = 1-1/4 = 3/4$

$L = L_0\,(1-(v/c)^2)^{1/2}$
$L/L_0 = (3/4)^{1/2} = 0.866$

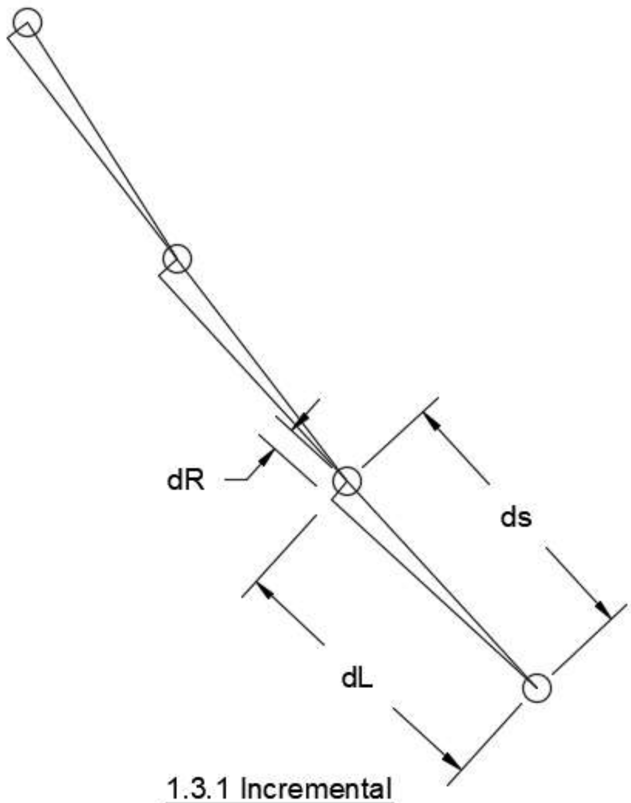
$t = t_0 / (1-(v/c)^2)^{1/2}$
$t/t_0 = 1 / (3/4)^{1/2} = 1/0.866 = 1.155$



1.2.5 Acceleration Length Contraction and Time Dilation

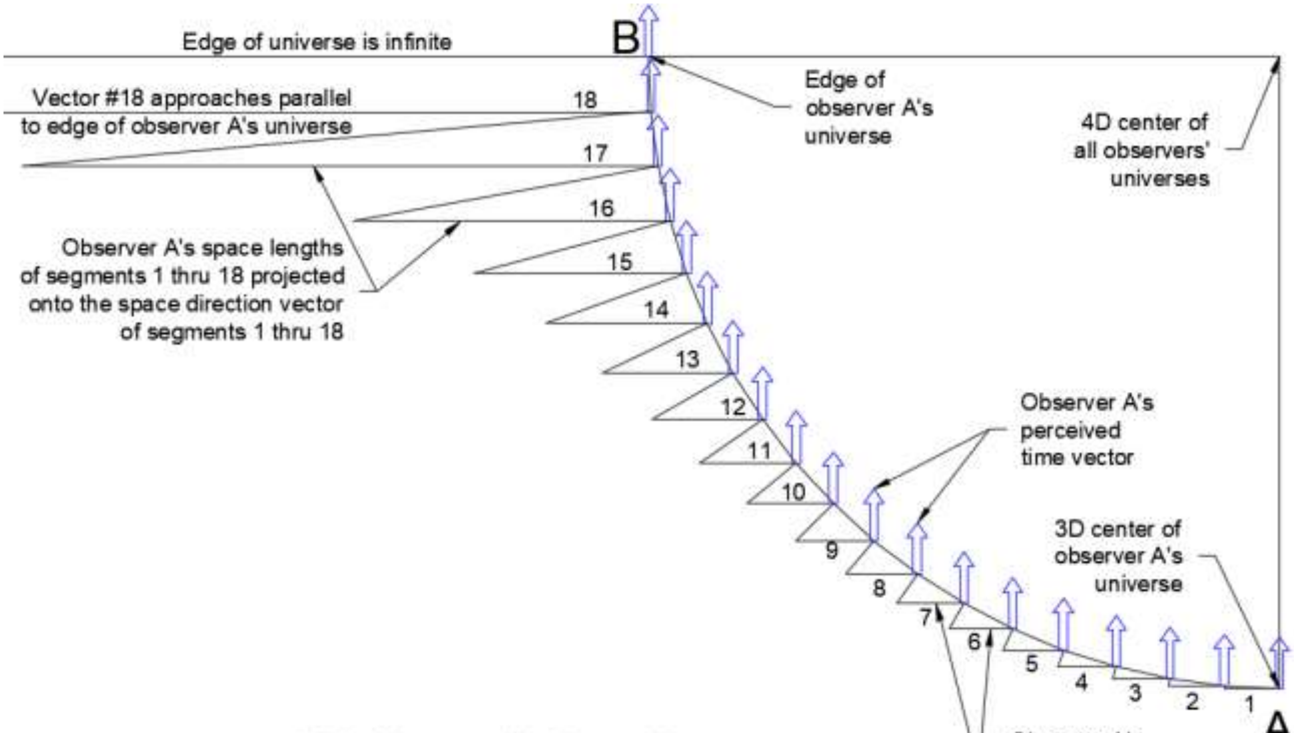
1.3 Space Diverges

1.3.1 Incremental Curvature of Space



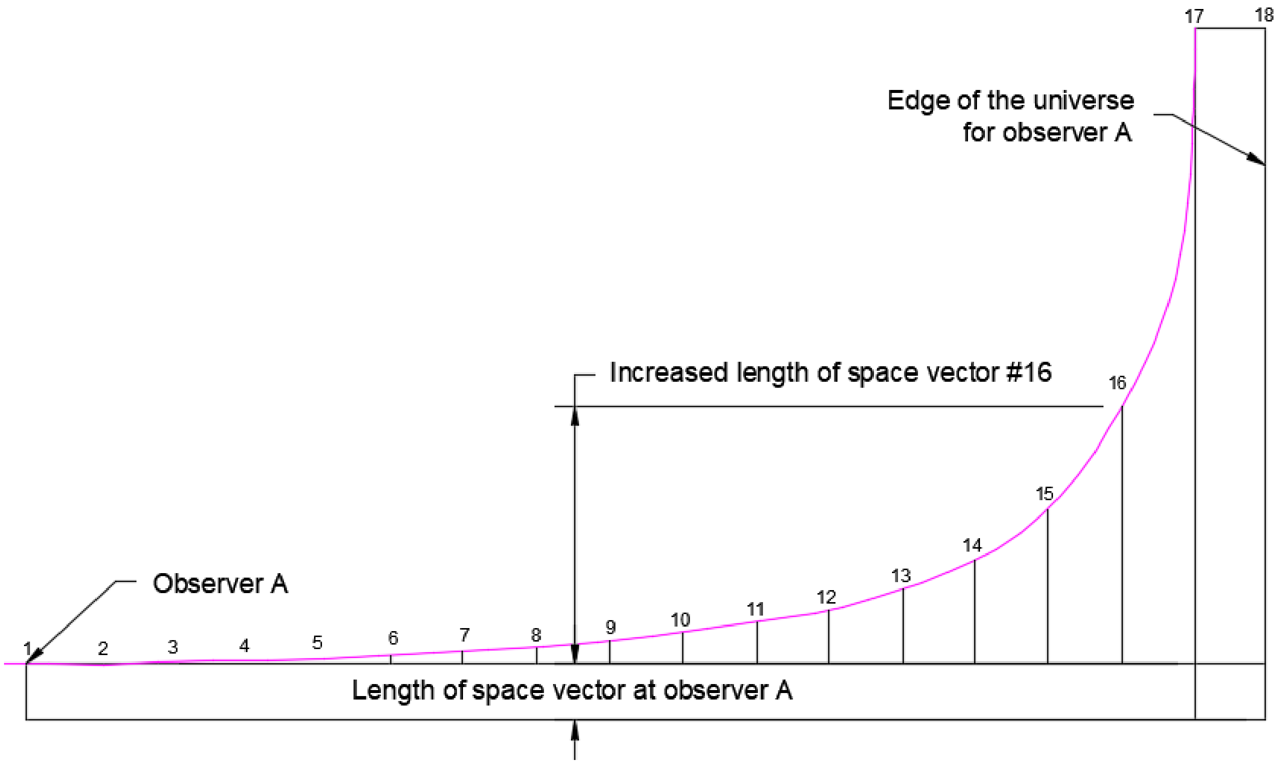
1.3.1 Incremental Curvature of Space

1.3.2 <u>Observer A's Space Vector Always Points the Same Direction</u>



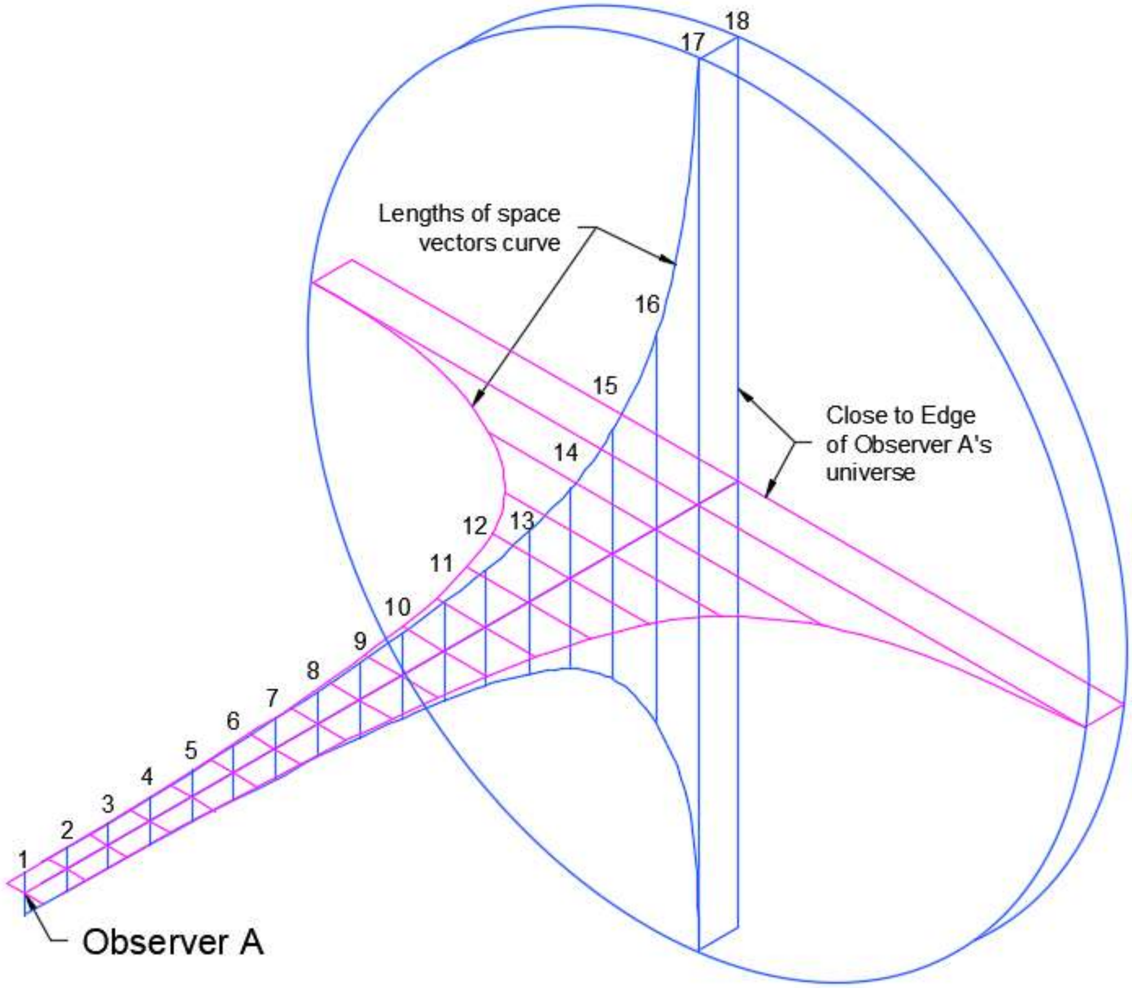
1.3.2 Observer A's Space Vector
Always Points The Same Direction

1.3.3 <u>Shape of Curve of Length of Space Vectors Going from Observer A to Edge of Universe</u>



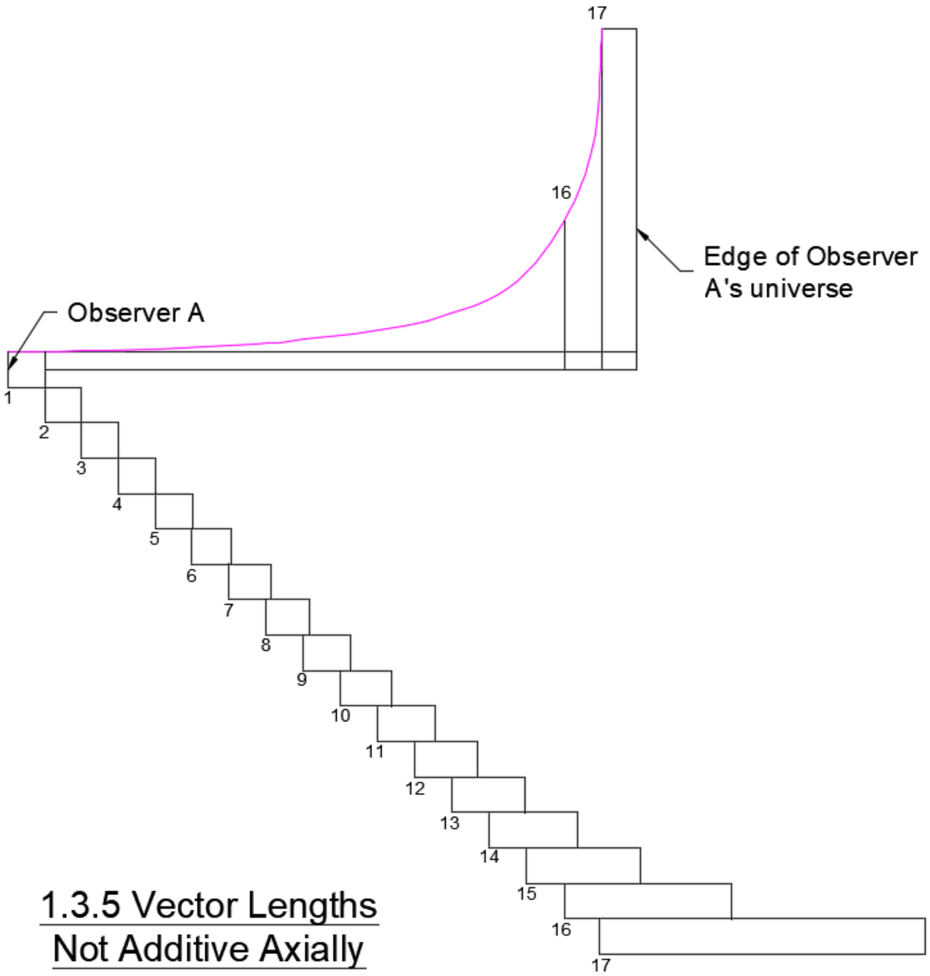
1.3.3 Shape of Curve of Length of Space Vectors Going From Observer A to Edge of Universe

1.3.4 Trumpet shape of space vector lengths going from observer A, to close to edge of universe



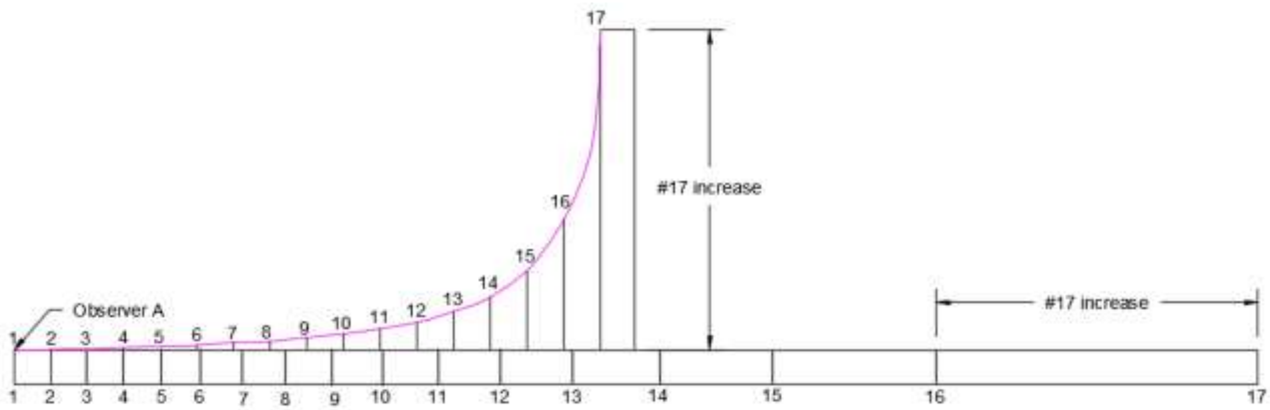
1.3.4 Trumpet shape of space vector lengths going from observer A to close to edge of universe

1.3.5 <u>Vector Lengths Not Additive Axially</u>



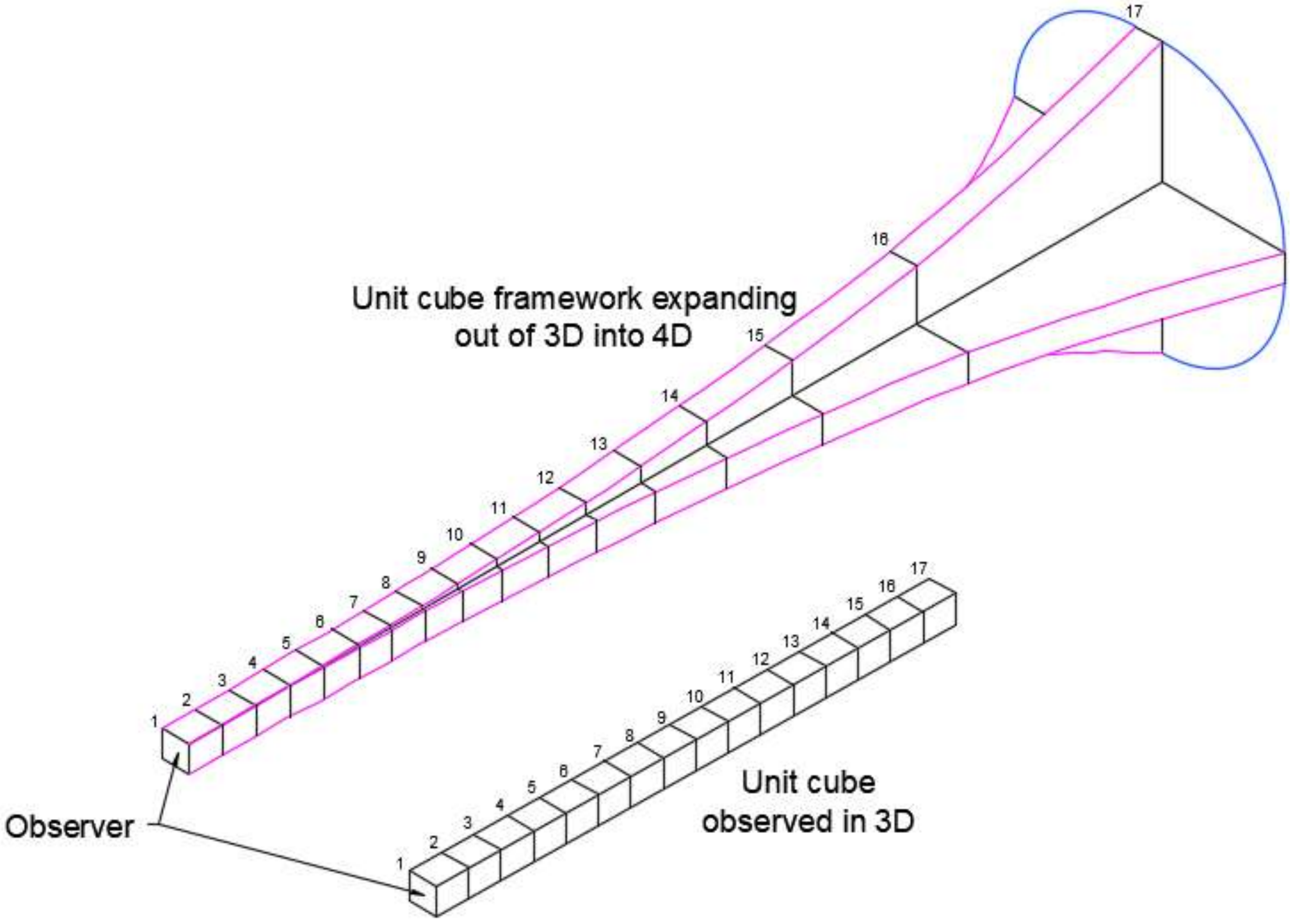
1.3.5 Vector Lengths Not Additive Axially

1.3.6 <u>Graph of Vector Lengths</u>



1.3.6 Graph of Vector Lengths

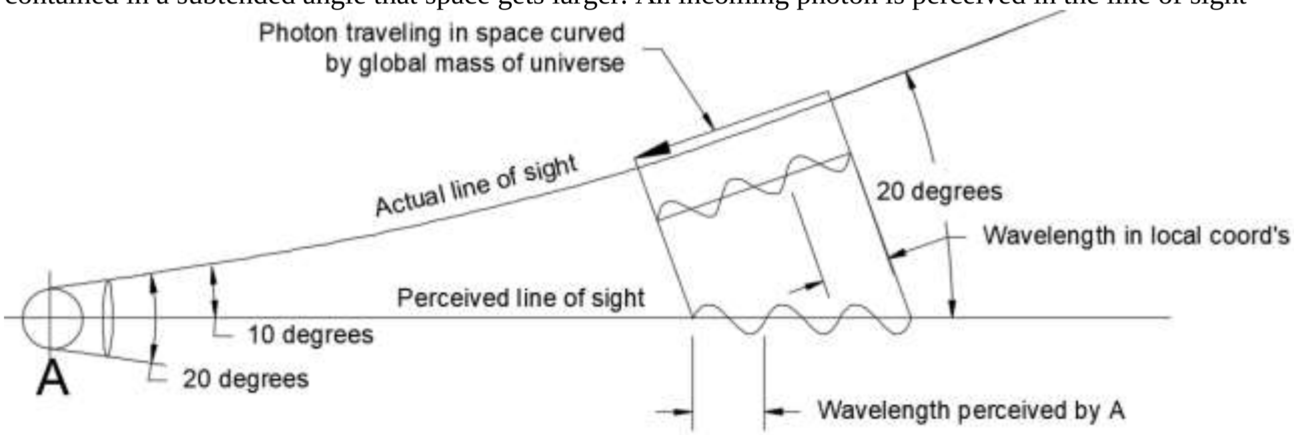
1.3.7 Unit Cube Expansion Axially



1.3.7 Unit Cube Expansion Axially

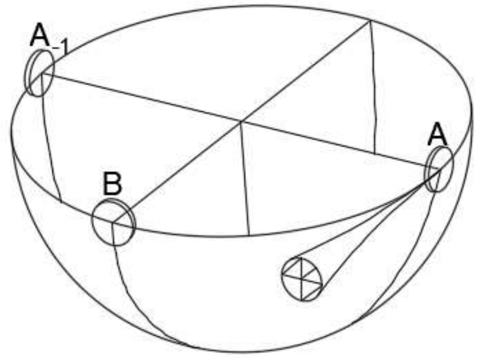
1.3.8 Observer's Space Diverges Further Proportional to The Distance Viewed

Space diverges at a distance in all directions away from observer A. Observer A has a telescope that views a subtended angle of 20 degrees of the sky. A photon is arriving some distance away where space has diverged such that he sees a subtended angle of 40 degrees. Along a direction away from observer A, a wavelength contained in a subtended angle that space gets larger. An incoming photon is perceived in the line of sight

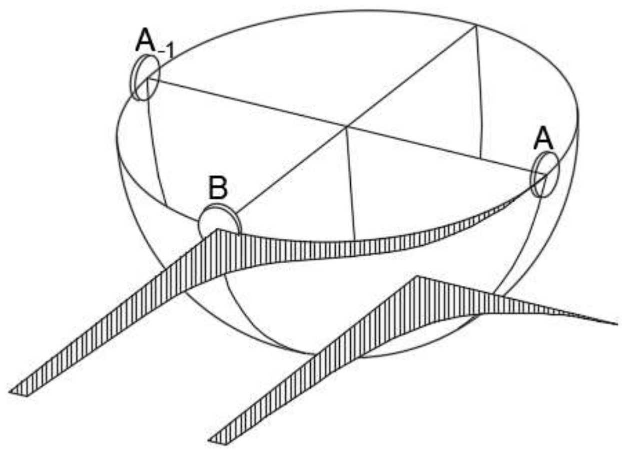


1.3.8 Observer's Space Diverges Further Proportional To The Distance Viewed

1.3.9 Trumpet cross section wrapped around circle



Looking straight out in a trumpet shape

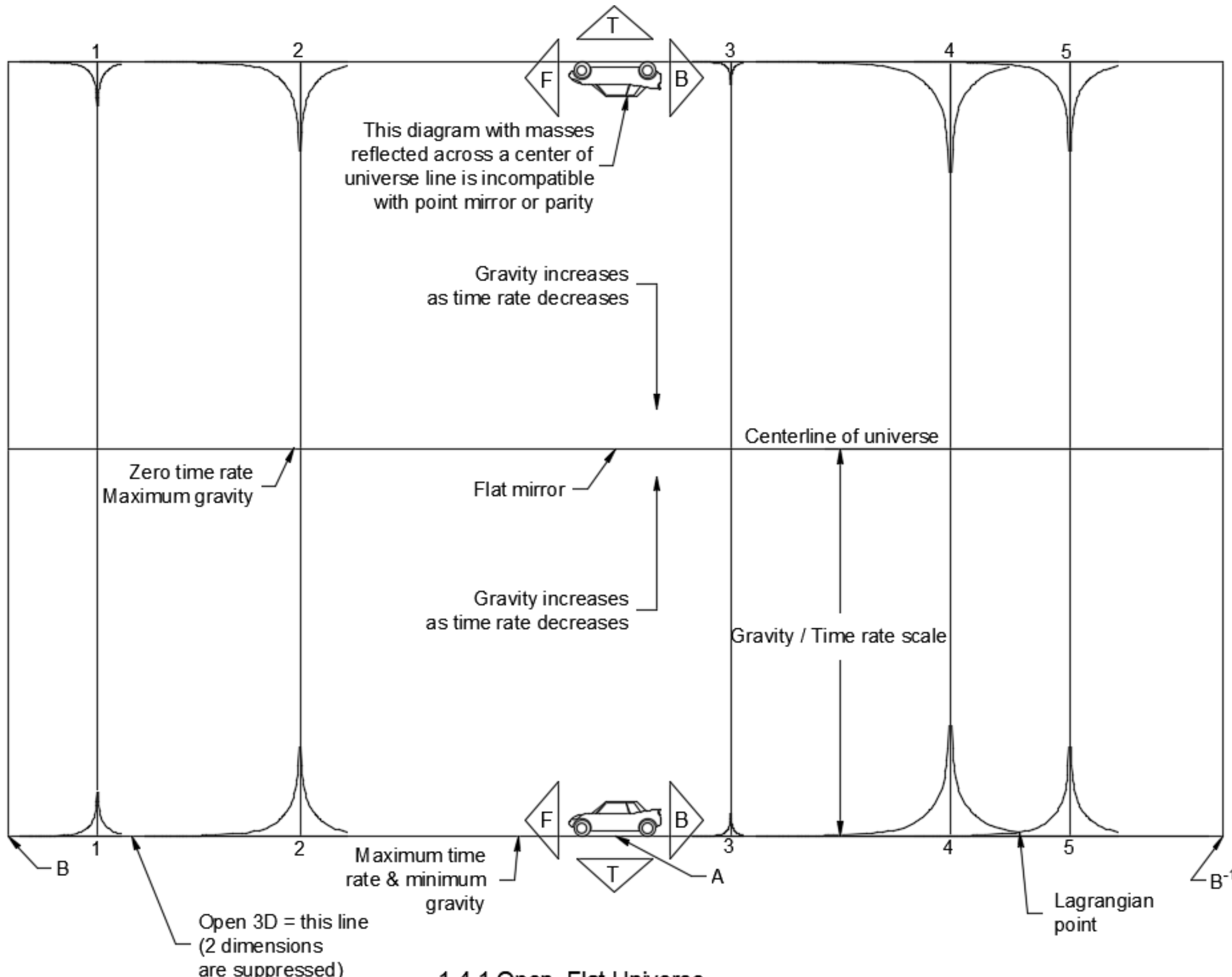


1.3.9 Trumpet cross section wrapped around circle

1.4 Shape of the Universe

1.4.1 Open, Flat Universe

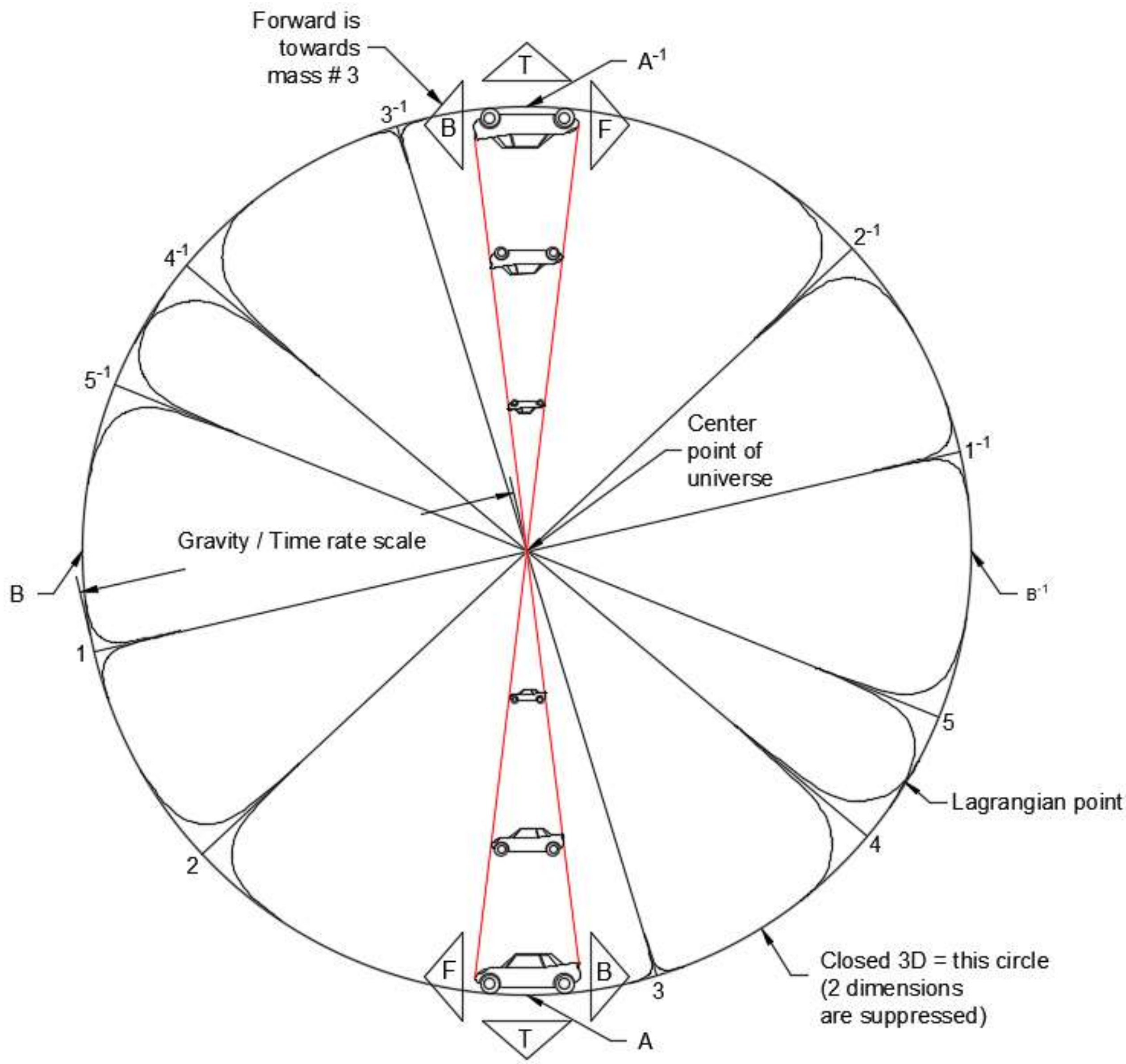
There is no way to depict an open, flat universe with a parity point mirror.



1.4.1 Open, Flat Universe

1.4.2 Misconception of a Point Mirror

in the 4th dimension mutually perpendicular to 3Ds, distance to center of universe is measured in rate of time units. In 3D, direction to center of universe is towards a body with mass. A 3D point mirror does not act like a pinhole camera. A pinhole camera inverts a 2D image up to down and left to right. The above illustration is of a pinhole lens at the center of the universe.



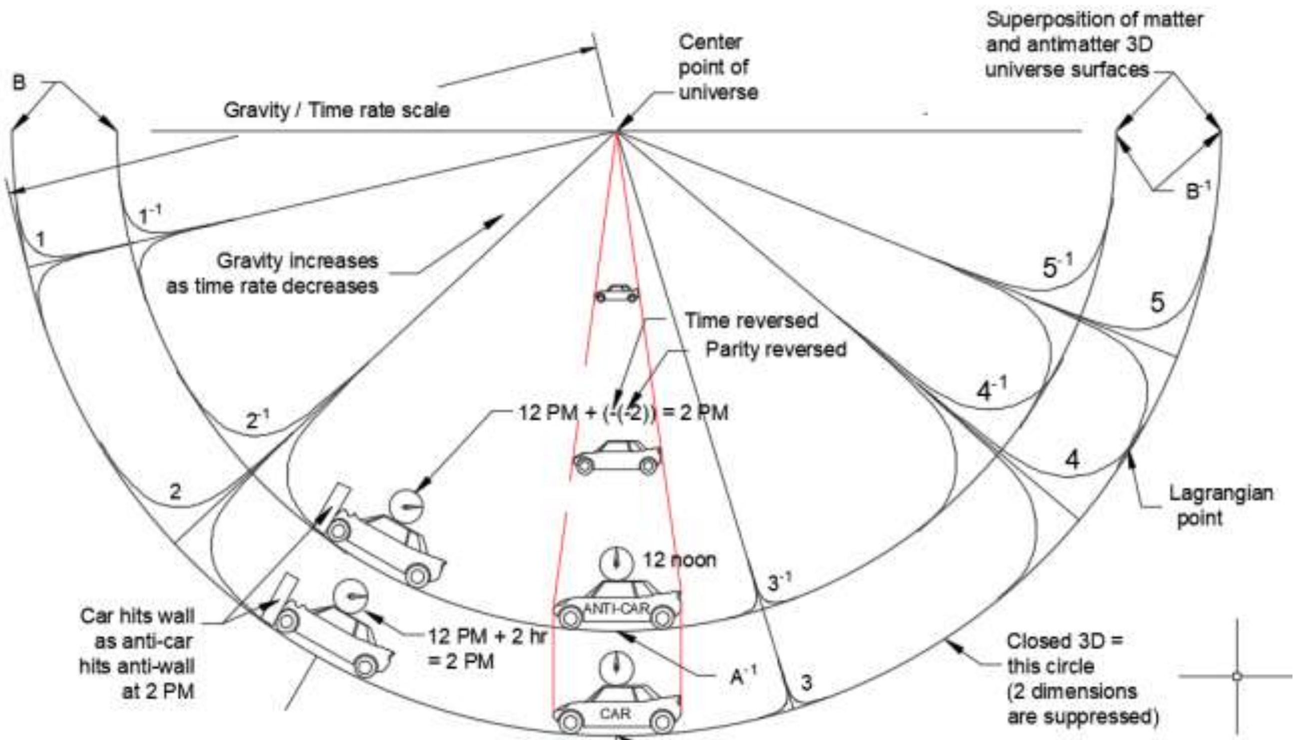
1.4.2 Misconception of a Point Mirror

1.4.3 Correct Concept of a 3D Mirror at the Center of the Universe

Anti-car travels in the same direction as car because its distance and velocity coordinates are reversed with respect to car, and its time runs backwards with respect to car, making them travel congruently. The parity and time reversal effects cancel one another. In the 4th dimension mutually perpendicular to 3Ds, distance to center of universe is measured in rate of time units. In 3D, direction to center of universe is toward any body with mass.

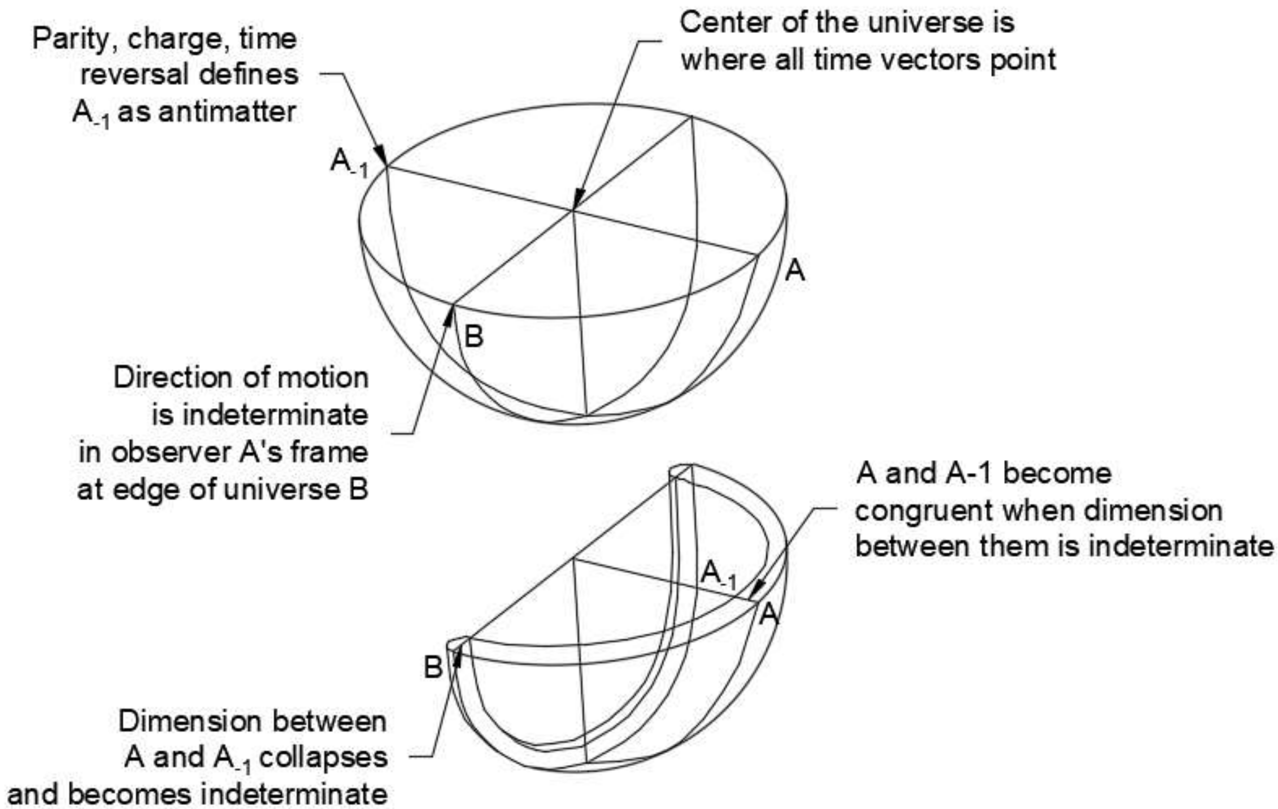
Parity, Charge, Time (PCT) reversal:

1. Linear parity (distance and direction, velocity, acceleration) is reversed
2. Angular parity (clocking, angular velocity, angular acceleration) is reversed
3. Time is reversed, so linear and angular parity revert to original
4. Matter and anti-matter are PCT reversed, so objects travel congruently



1.4.3 Correct Concept of a 3D Mirror at the Center of the Universe

1.4.4 Collapse Sphere into a Cup



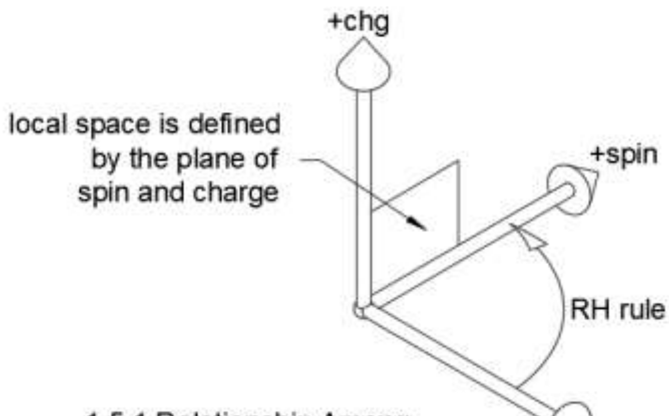
1.4.4 Collapse Sphere Into a Cup

1.5 Spin, Charge, Time

1.5.1 Relationship Among Spin, Charge and Time

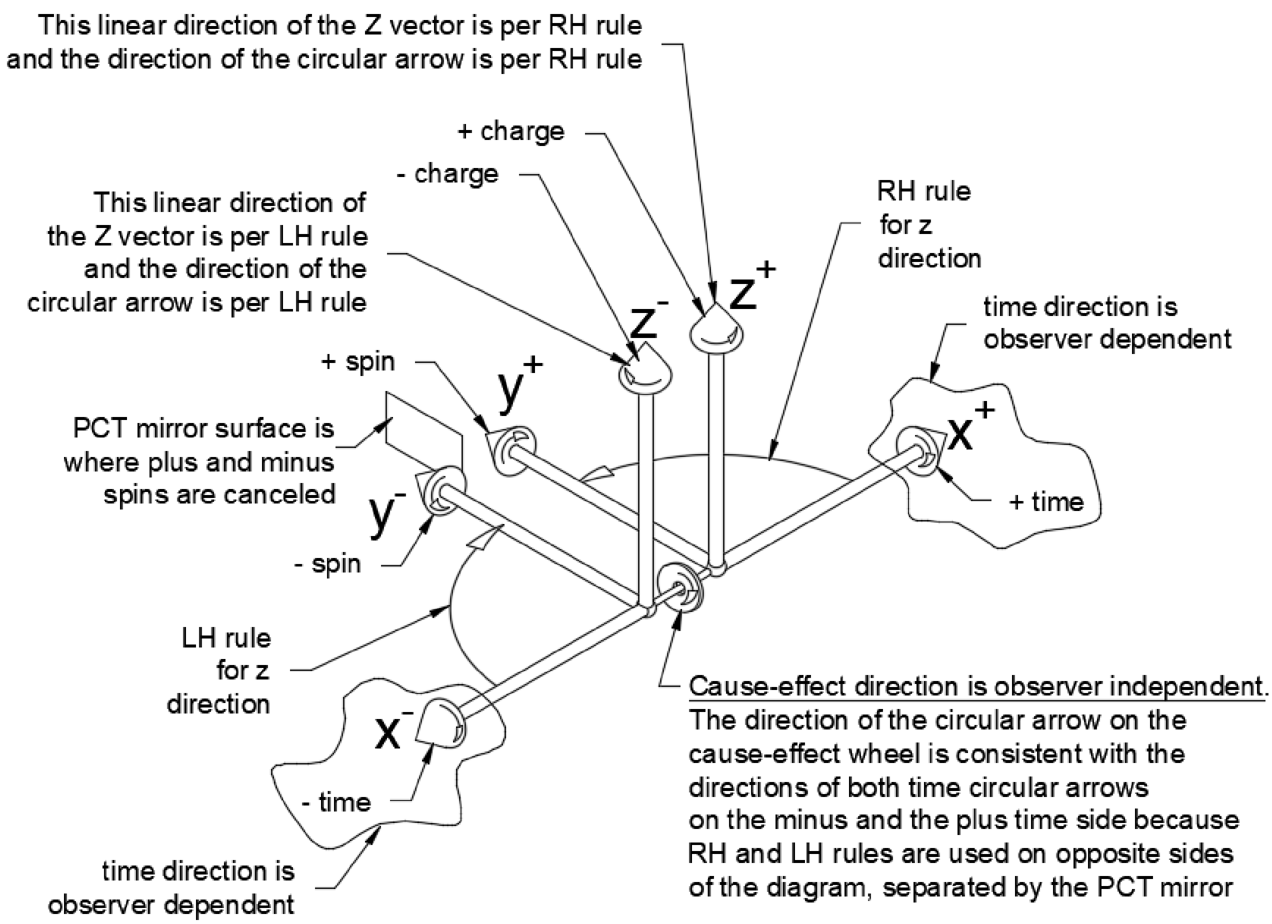
time X spin = charge
spin X charge = time
charge X time = spin

Spin crossed with charge yields time, which is always orthogonal to local space. Unit charge and unit spin are constant in local space. Unit time is constant, but its measurement varies with acceleration of local space with respect to global space.



1.5.1 Relationship Among Spin, Charge and Time

1.5.2 Time X Spin = Charge



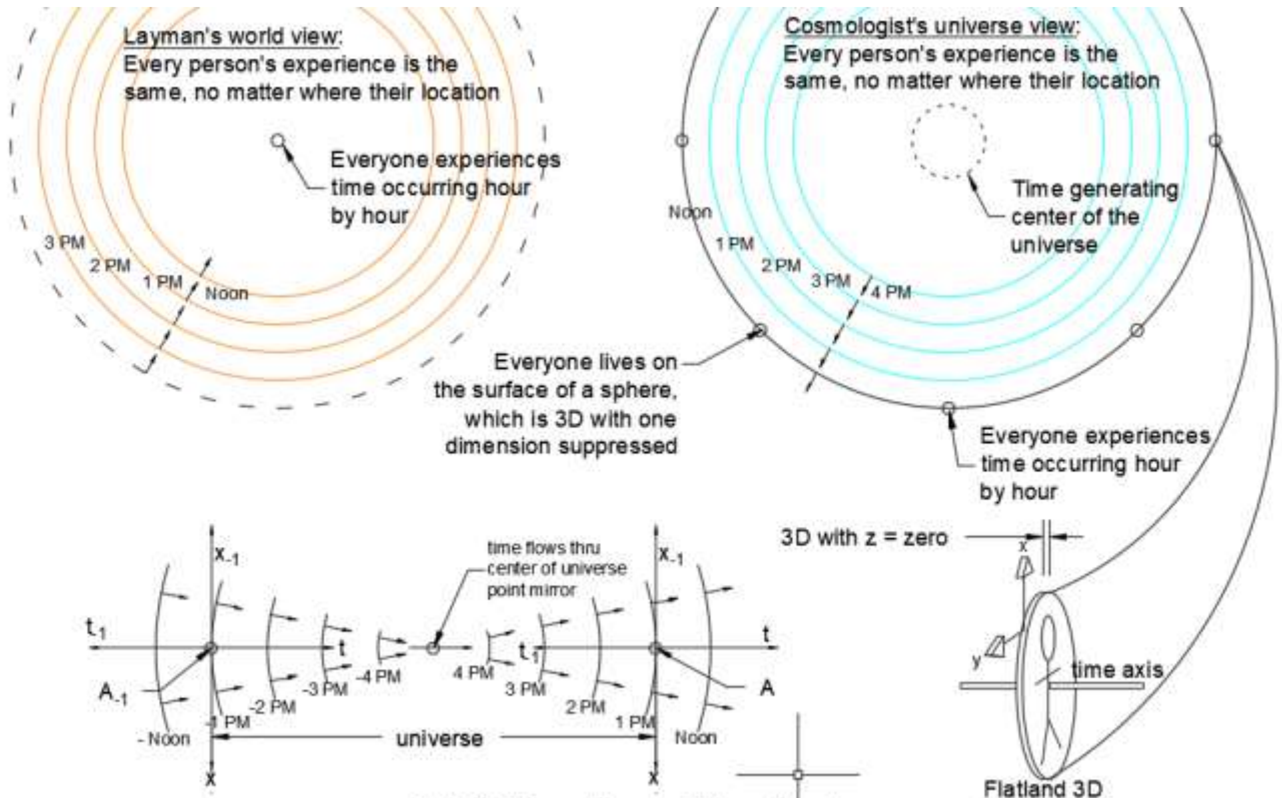
1.5.2 Time X Spin = Charge

1.5.3 Time Flows Thru Center of Universe Point Mirror

1) antimatter observer at point A/-1 is time reversed version of matter observer at point A
2) matter and antimatter observers are the same and are congruent
3) electrons in matter and positrons in antimatter coexist due to opposite spins

Each point has one time rate due to the independent influences of space curvature caused by:

1) other masses (a location has a time rate)
2) acceleration of the object occupying that point (an object has a time rate)

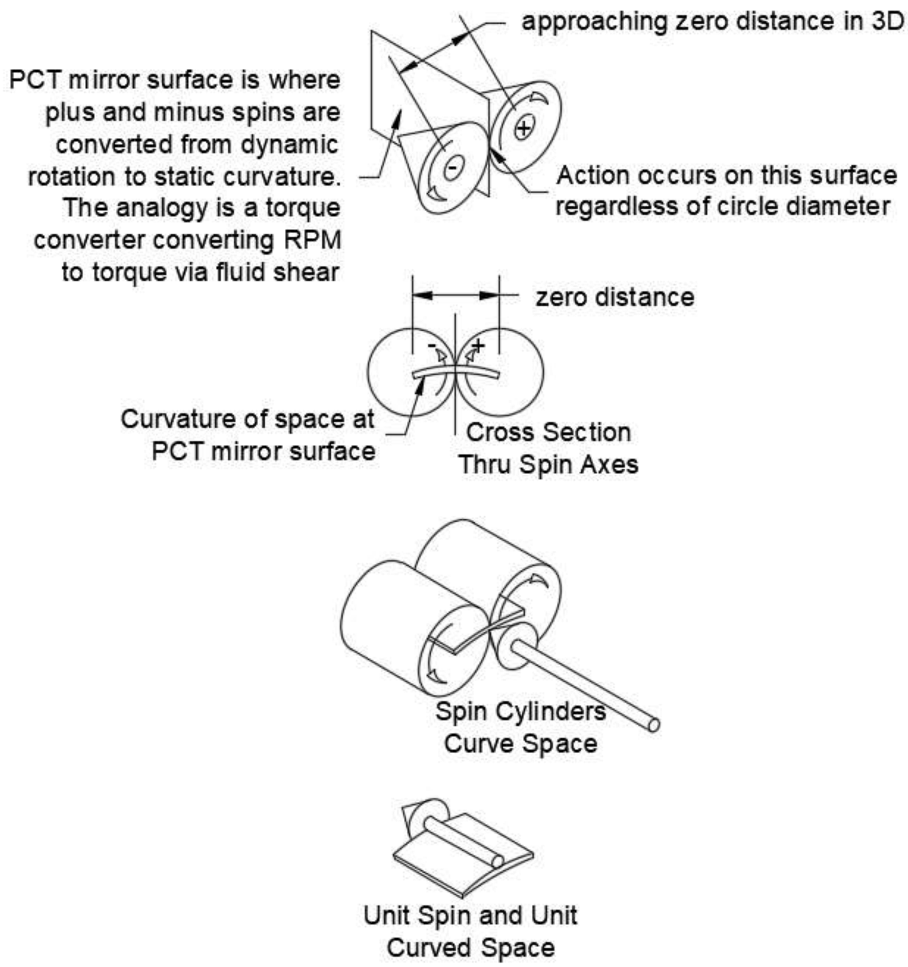


1.5.3 Time Flows Thru Center of Universe Point Mirror

1.6 Curvature of Space

1.6.1 How Spin Causes Curved Space

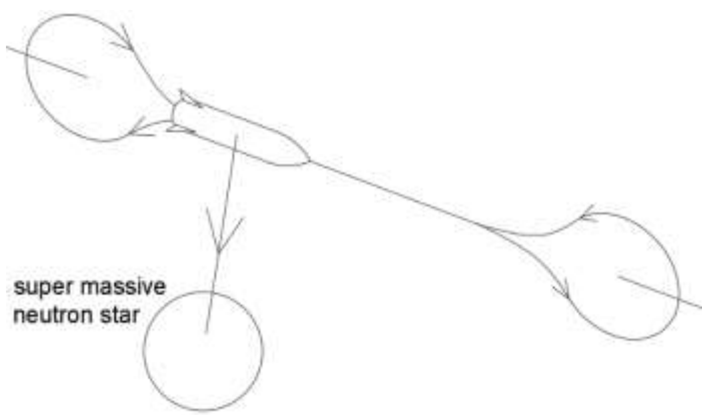
The below four diagrams all have directionality by their nature of having left, right, top and bottom. Since spin (iso-spin) does not have directionality or distance in 3D space, these diagrams show by analogy how spin induces curvature.



1.6.1 How Spin Causes Curved Space

1.6.2 Time Rate Slowing Due to Acceleration and Mass are Independent

Per the "Equivalence Principle", both acceleration and gravity are manifested in force. This proposal adds that acceleration and gravity are also alike in cause of and in reducing the rate of time passage. In the diagrams to follow in section 1.7 General Relativity, local time rate is described as being affected by both local acceleration and by global gravity. The time rate changes are additive and can be superimposed but they are independent. An example of the independence of gravity and acceleration is the time slowing in a rocket making many loops in space near a neutron star. The occupants experience time slowing due to both the rocket's acceleration and the massive gravity field of the nearby neutron star. In contrast, compare to another rocket making loops in space with very low gravity and yet another rocket near a neutron star with no motion.

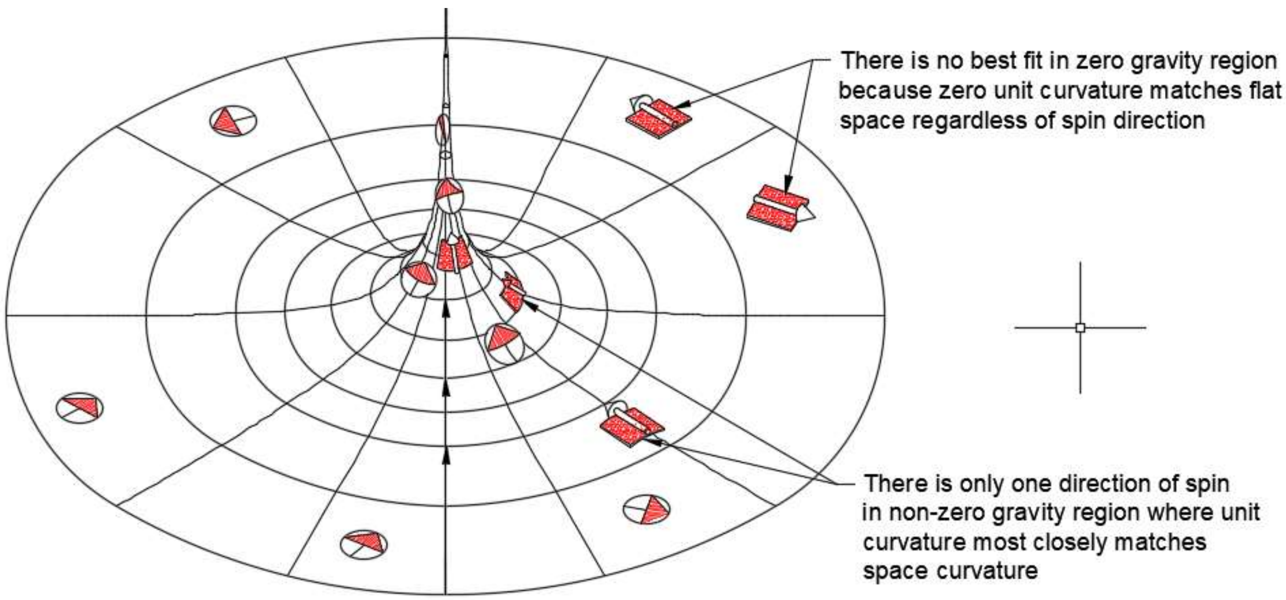


1.6.2 Time Rate Slowing Due to Acceleration and Mass are Independent

The acceleration and gravity are alike in that the rocket walls exert force on the inertia of the rocket interior contents. In section 1.2.3 "Rotation of Local Coordinates", a rocket experiences a rotation of local coordinates when undergoing acceleration. Gravitational acceleration happens without velocity. This is anti-intuitive because acceleration normally results in increased velocity. An apple on the ground has the same acceleration as an apple falling from a tree to the ground. If gravitational force equals mass times acceleration and neither force nor mass change, then acceleration is constant. The walls of the rocket in the above diagram prevent atoms from exiting the loop at the ends of the straight runs and also from exiting toward the massive neutron star. The centripetal acceleration at the loops is independent from the gravitational acceleration toward the star at all times.

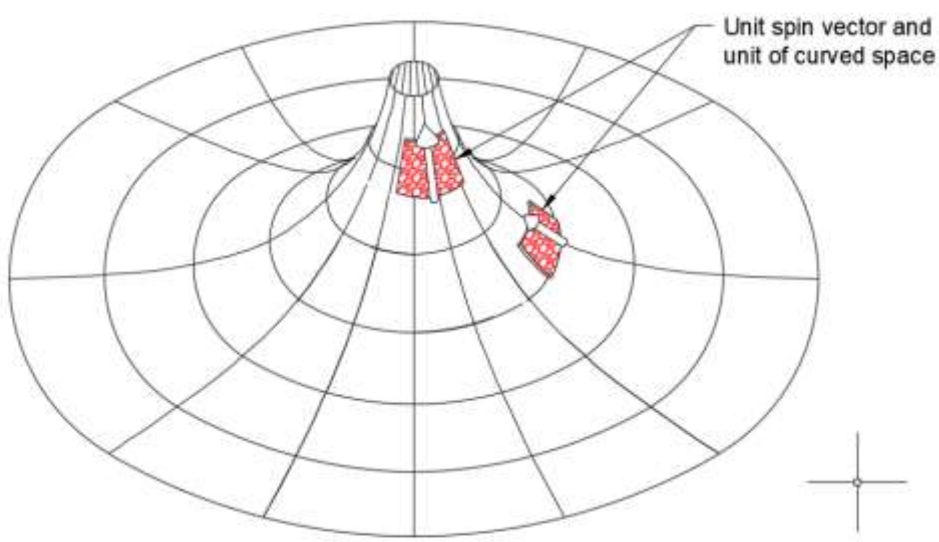
1.6.3 Gravity is a Curve Fitting

In addition to direction of curvature orienting direction of spin to center of mass, unit masses move toward the mass center where amount of curvature matches. Because the unit mass movement toward the mass center due to gravity force is never quenched, we conclude the curvature of space at the center of mass is the same as the curvature at each unit mass accelerating toward it. Otherwise, the unit mass would stop accelerating at the point where its unit of curvature matched the amount of space curvature at that place. The unit mass stops accelerating when the same-charge repulsion force reaches the space curvature matching force.



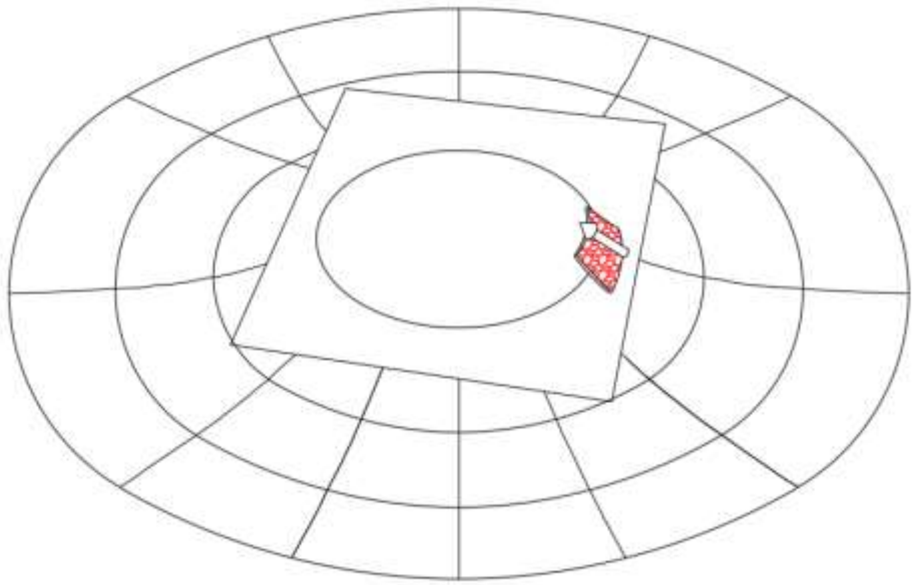
1.6.3 Gravity is a Curve Fitting

1.6.4 Curved Space Around Large Mass



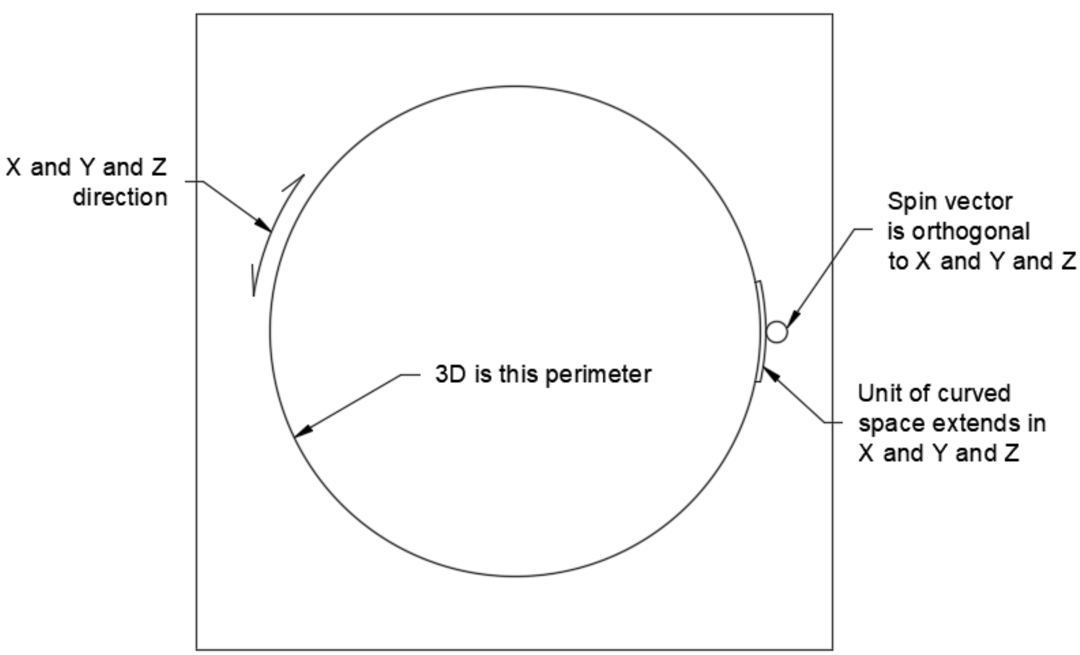
1.6.4 Curved Space Around Large Mass

1.6.5 A Slice Thru Curved Space



1.6.5 A Slice Thru Curved Space

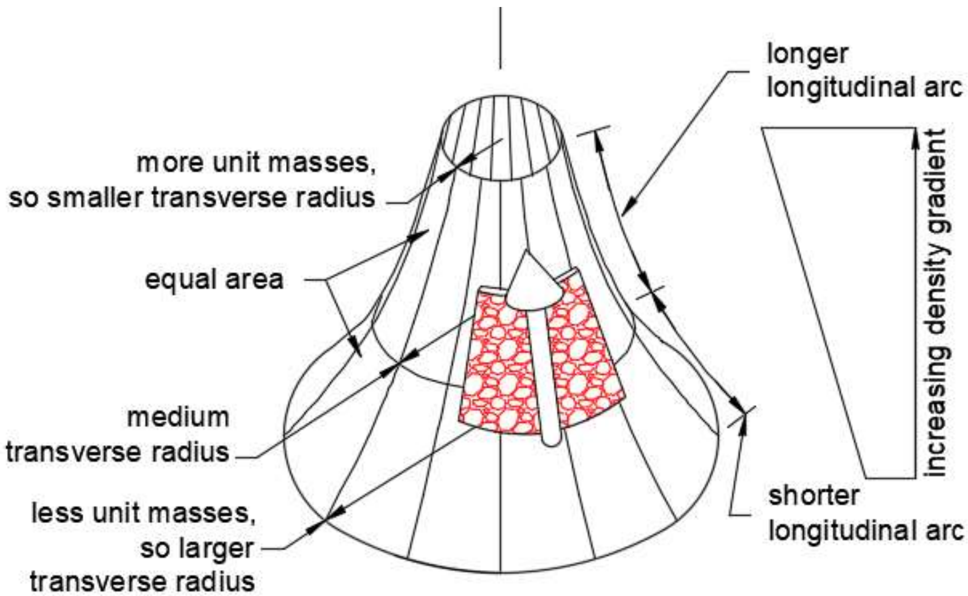
1.6.6 Top View of Slice Thru Curved Space



1.6.6 Top View of Slice Thru Curved Space

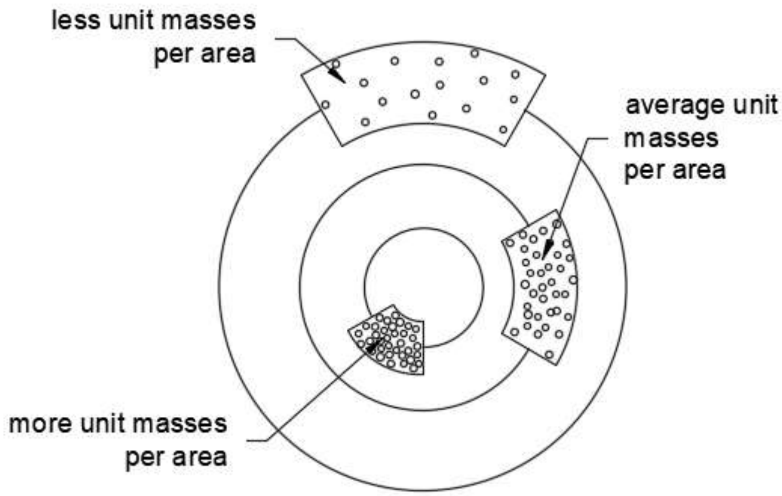
1.6.7 Length Contraction Due to Gravity

The below illustrates how a gradient of unit masses toward a center of mass creates a curvature of space gradient towards that mass center. In 3D space, units of space are all equal in volume. This is illustrated as all units of flat space being equal in area. To achieve a constantly equal area of a unit of surface, as the transverse radius decreases, so the longitudinal arc lengthens. Spin causes the surface to curve transversely, which causes the height of the space enlargement to rise above flat space. The lengthening of space is in the direction towards the center of gravity of the mass. The solid mechanics analog is Poisson's ratio. An object is not distorted, but the space along an axis toward higher gravity is lengthened. This causes the object to appear contracted in that direction.



1.6.7 Length Contraction Due to Gravity

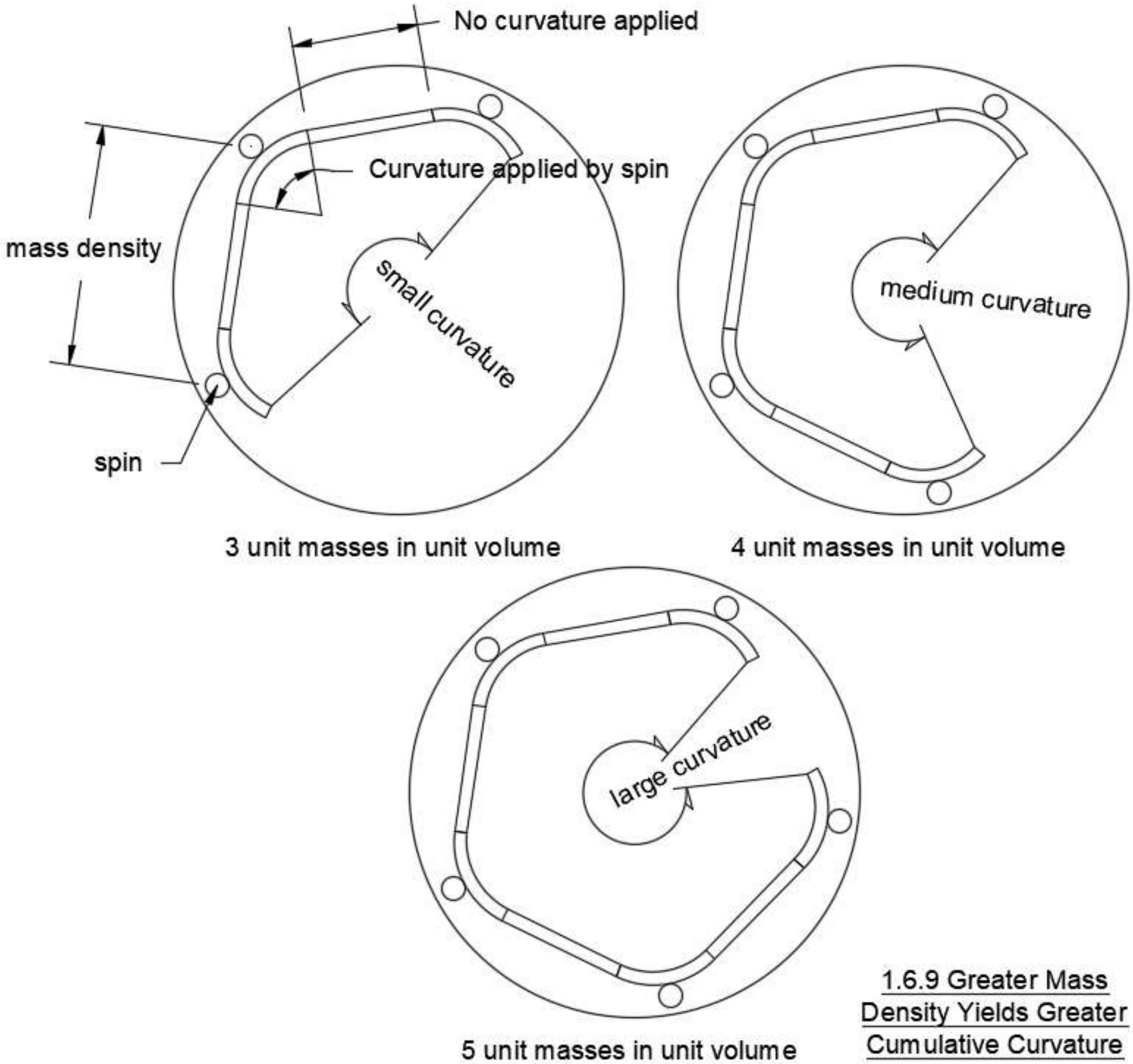
1.6.8 Increasing Density at Center of Large Mass



1.6.8 Increasing Density at Center of Large Mass

1.6.9 <u>Greater Mass Density Yields Greater Cumulative Curvature</u>

More unit masses in a unit volume add to curvature, which is not limited to a 360-degree circle. Curvature behaves more like a spiral spring that can clock an infinite amount.

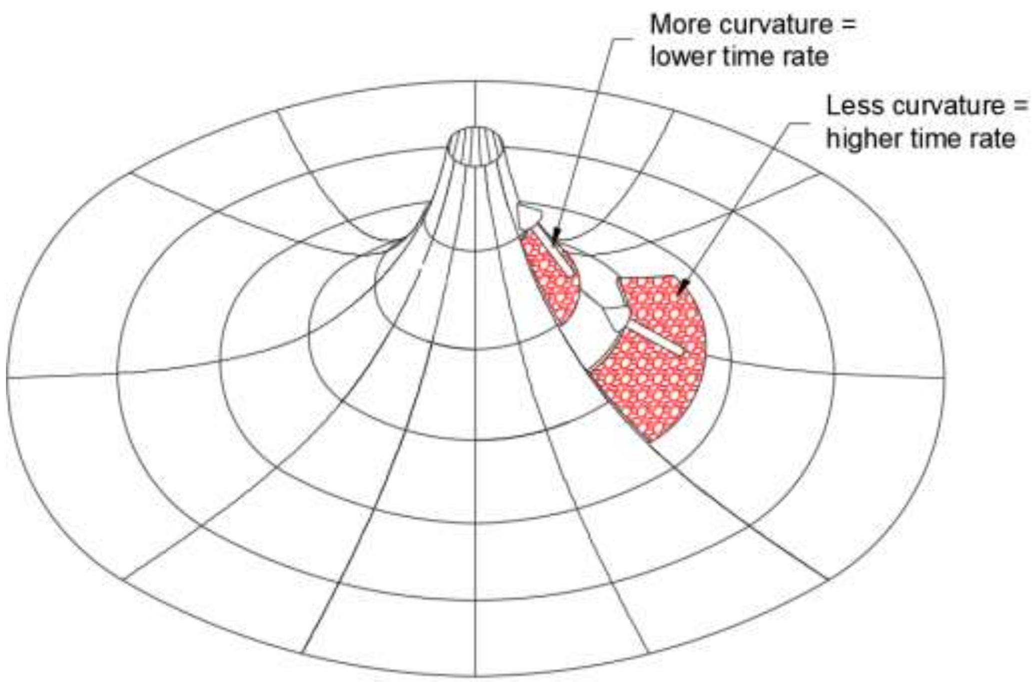


1.6.9 Greater Mass Density Yields Greater Cumulative Curvature

1.6.10 Time Rate Varies as Curvature Varies

In the previous figure 1.6.2 "Time Rate Slowing Due to Acceleration and Mass are Independent", a rocket is making a figure eight pattern of loops. In the below diagram of curvature vs. time rate, at each loop at the point of maximum centripetal acceleration, the rocket is at the "More curvature = lower time rate" point. On the straightaway, the rocket is at the "Less curvature = higher time rate" point in the curve.

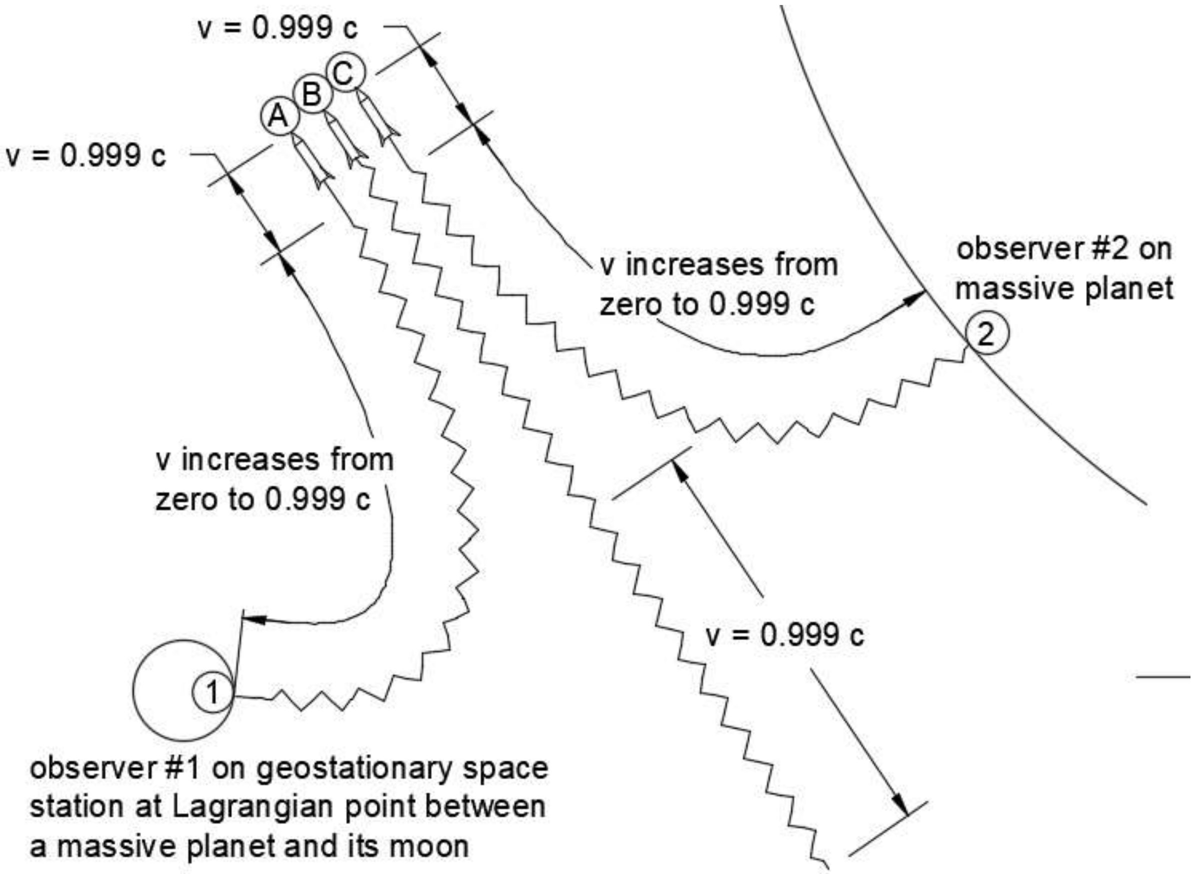
Similarly, a rocket slowly falling straight towards the star will go from the "Less curvature = higher time rate" point in the curve to the "More curvature = lower time rate" point. This same diagram describes the change of time rate for both gravitational acceleration towards a gravity source and acceleration not due to a gravity source.



1.6.10 Time Rate Varies as Curvature Varies

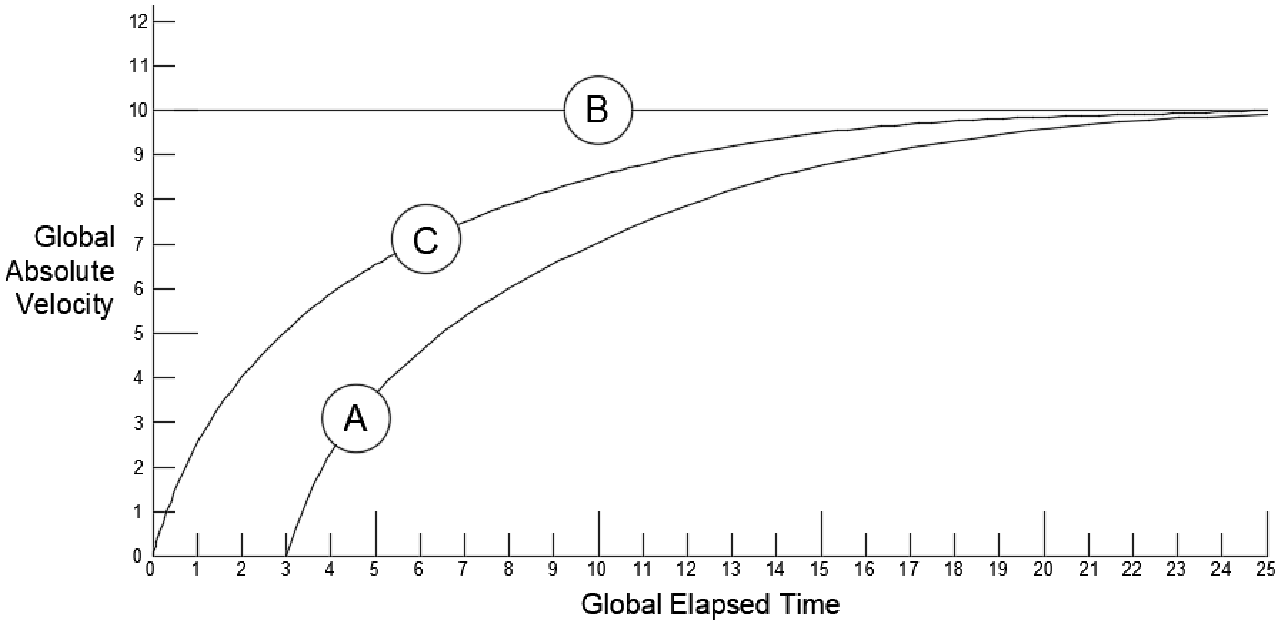
1.7 General Relativity

1.7.1 Example of General Relativity



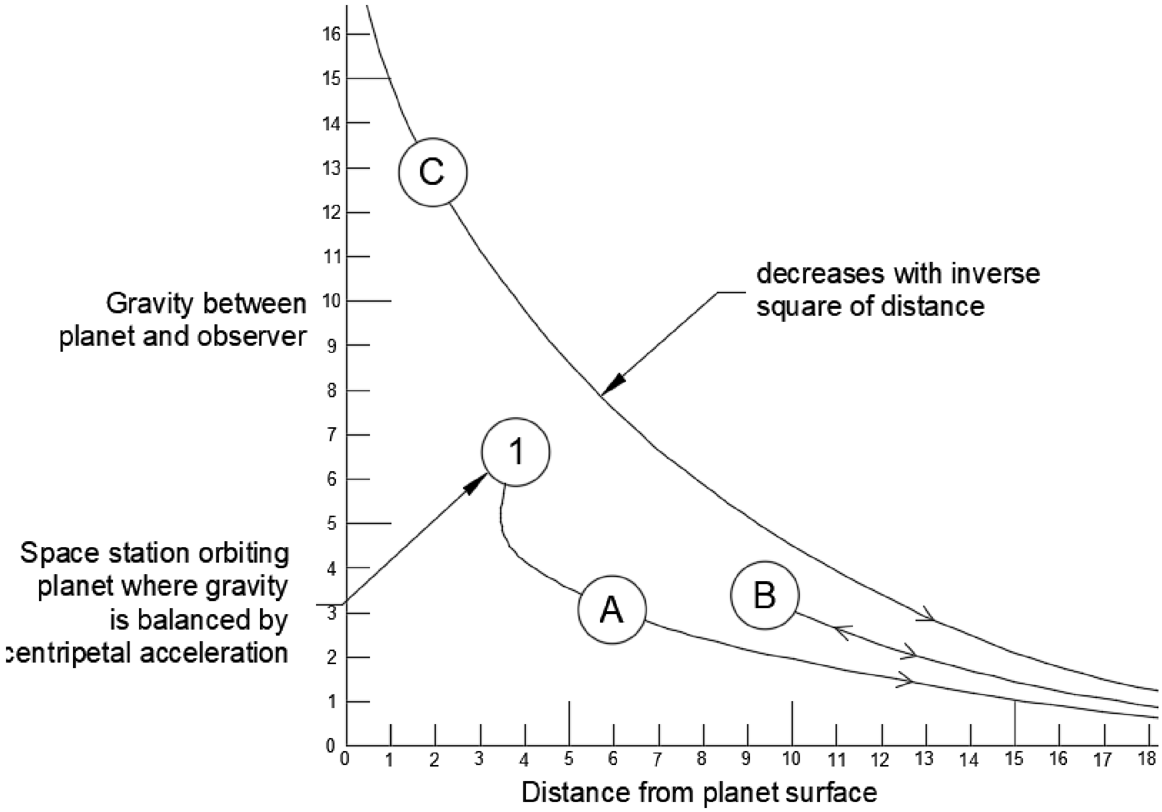
1.7.1 Example of General Relativity

1.7.2 General Relativity Velocity vs. Time



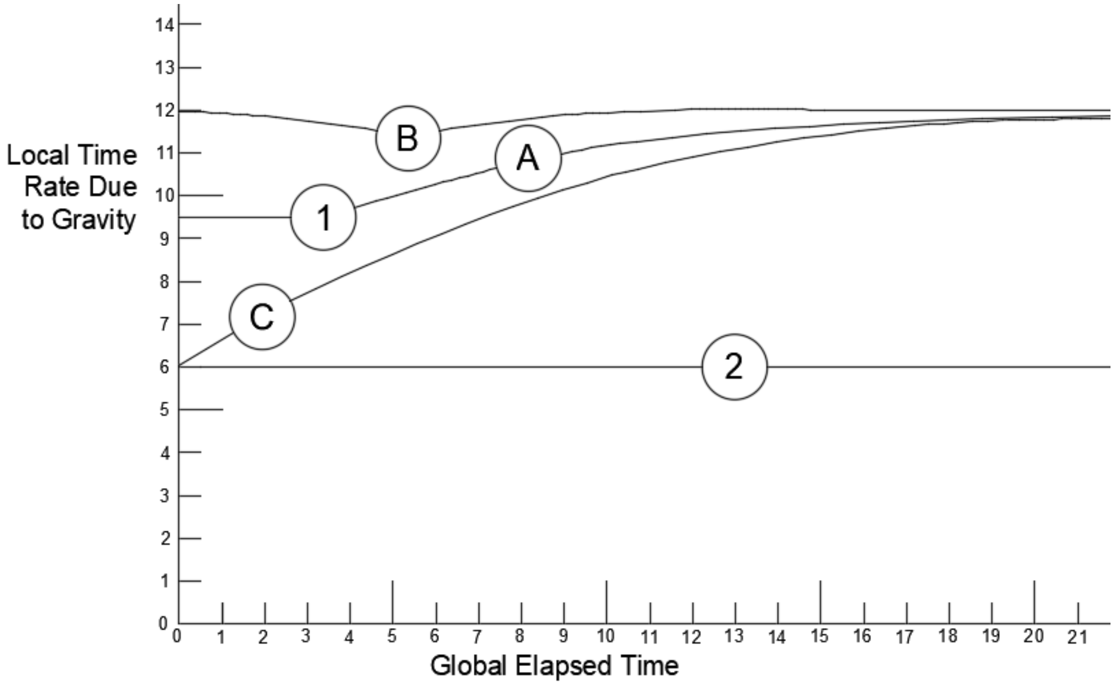
1.7.2 General Relativity Velocity vs. Time

1.7.3 Gravity between planet and observer



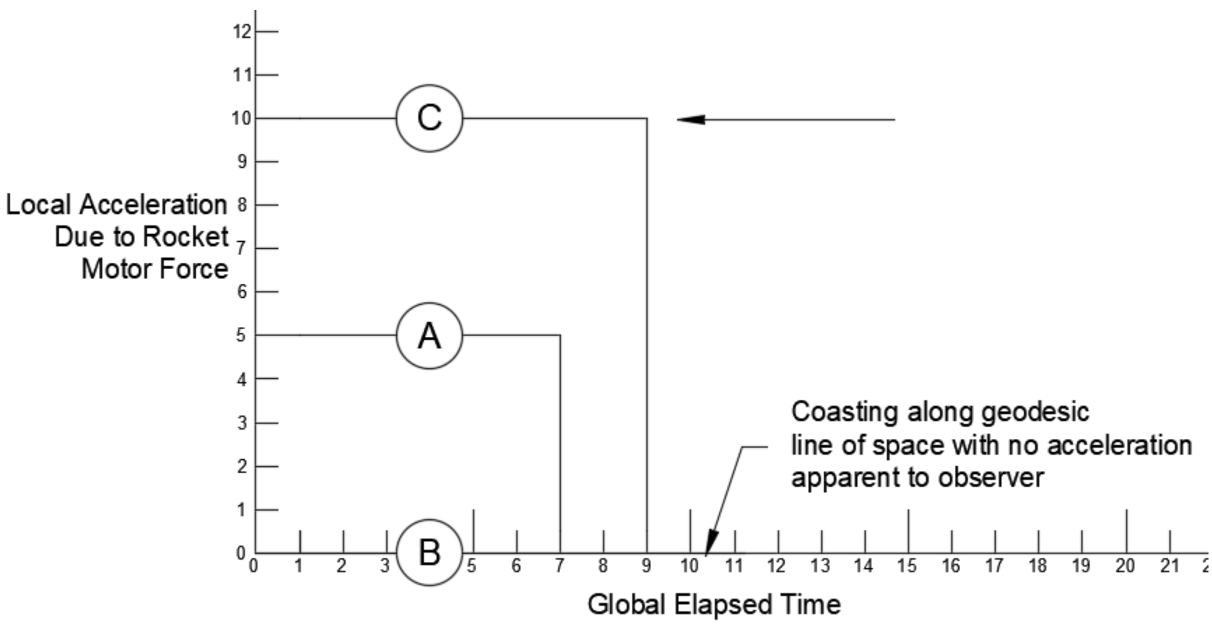
1.7.3 Gravity between planet and observer

1.7.4 <u>Local Time Rate Due to Gravity</u>



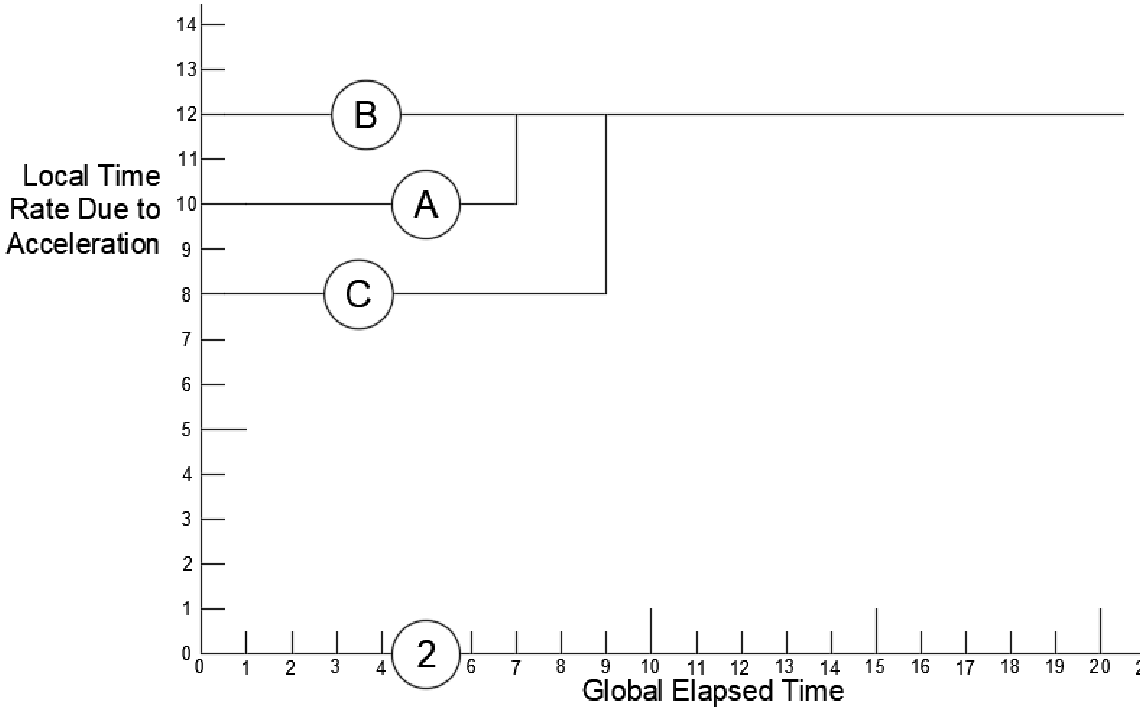
1.7.4 Local Time Rate Due to Gravity

1.7.5 <u>Local Acceleration Due to Rocket Motor Force</u>



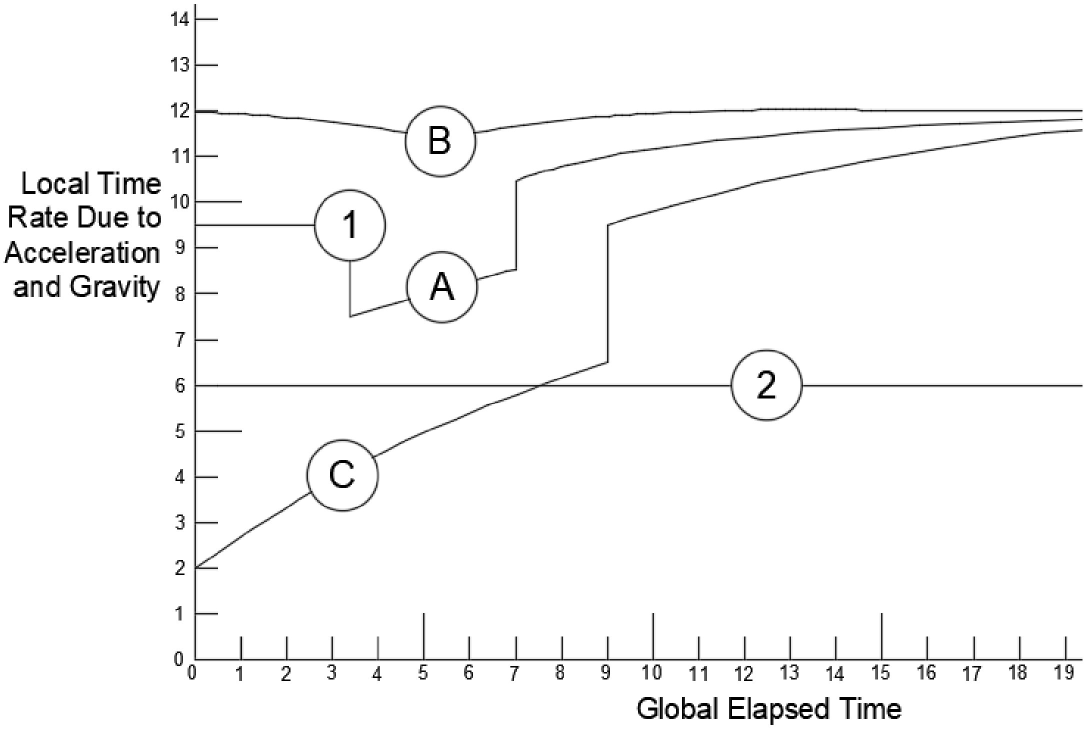
1.7.5 Local Acceleration Due to Rocket Motor Force

1.7.6 <u>Local Time Rate Due to Acceleration</u>



1.7.6 Local Time Rate
Due to Acceleration

1.7.7 Local Time Rate Due to Acceleration and Gravity



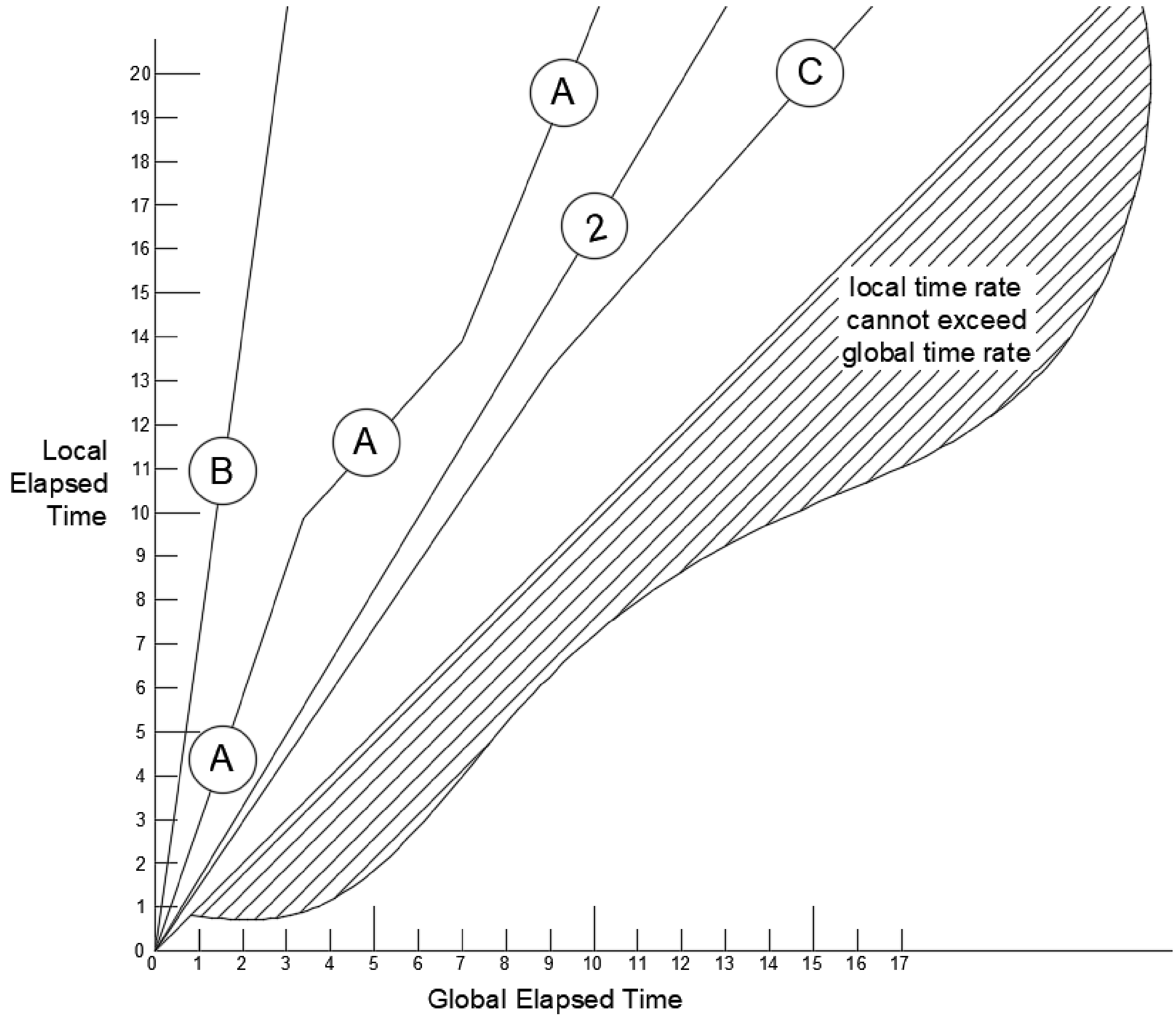
1.7.7 Local Time Rate Due
to Acceleration and Gravity

1.7.8 General Relativity

Q: Is the time dilation formula a time rate formula or an elapsed time formula?
$t=t_0/(1-v^2/c^2)^{1/2}$

> A1: It is an elapsed time formula only if the velocity is constant because it converts from elapsed time for a moving clock vs. stationary clock by observer. Example: rocket B and observer 2 on planet surface.
>
> A2: It is a time rate formula if velocity varies and it is desired to find the small change in moving object's time rate vs. stationary object's time rate.

Time is not dilated by velocity. Time is dilated by acceleration, and retains this dilation when velocity is constant. Time is dilated by gravity, which is acceleration. The legacy version of general relativity is it depends on distance from the observer and acceleration. That does not take into account the situation of a rocket accelerating back and forth a short distance from the observer. For this oscillating rocket, the history of time passage is retarded with respect to the observer because acceleration slowing time rate is not directional. The historical time passage is not corrected when the rocket oscillates in the opposite direction every other cycle. Every acceleration near the stationary observer has the same effect as if it happened at an extreme distance.



1.7.8 General Relativity

2 PARTICLE AND NUCLEAR PHYSICS

2.1 Sub-quarks

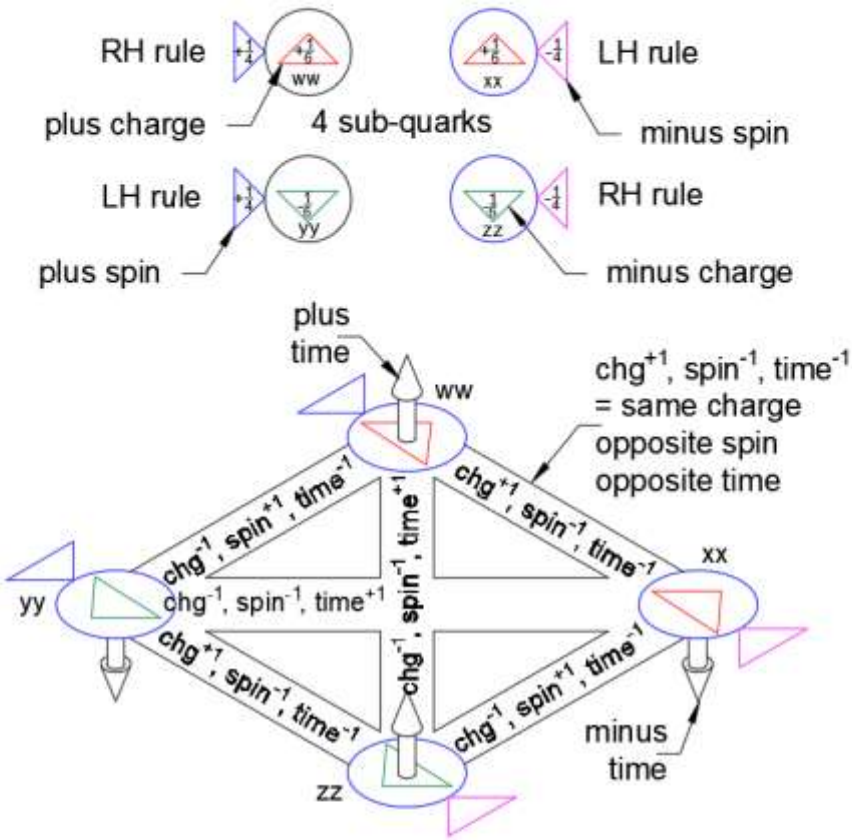
All quarks are composed of four sub-quarks. Each sub-quark has 3 fundamental units. All sub-quarks have the same absolute values of the units: spin is 1/4, charge is 1/6 and time rate is 1

2.1.1 Define Sub-quarks with Spin & Charge

Each sub-quark relates to three other sub-quarks. Opposite has the same time. Adjacent sub-quarks have the same spin or charge. Spin is the axis of parity. "Time" is time rate. None of the four sub-quarks has an anti-sub-quark that is a Parity, Charge, Time (PCT) mirror. Each of the four sub-quarks has three relationships which together form a PCT mirror.

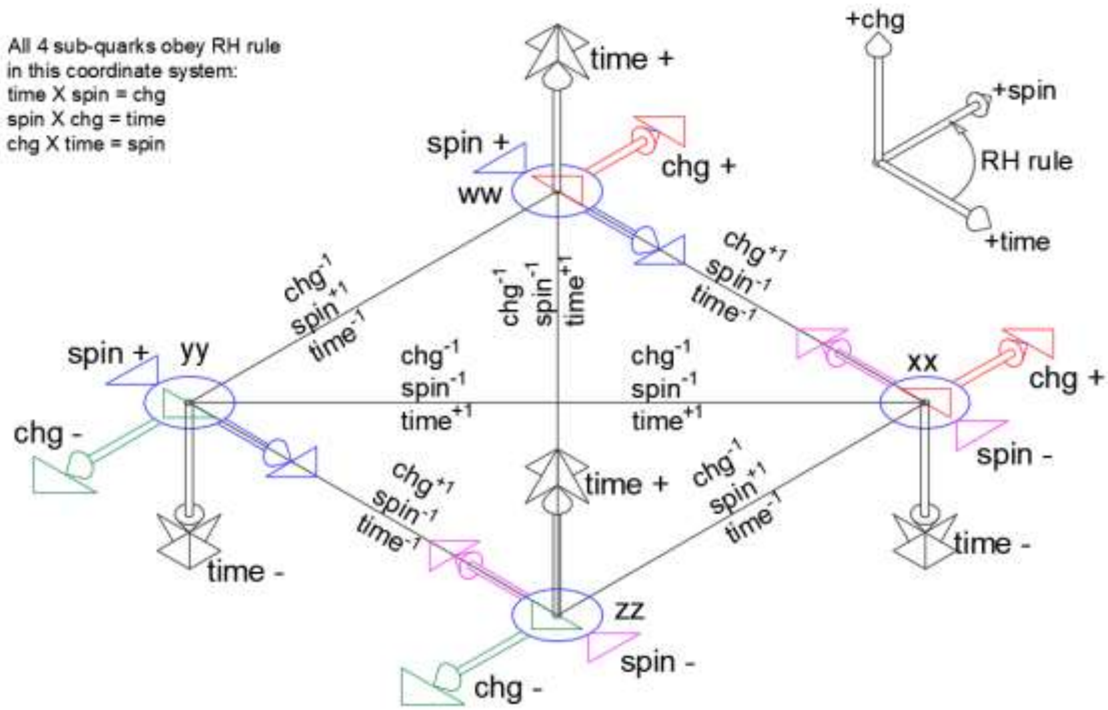
Vertical arrows are charge and horizontal arrows are spin. The ww sub-quark is +charge and +spin. The zz sub-quark is -charge and -spin.

Looking at the bars in the lower diagram connecting the sub-quarks, the bar connecting ww and xx is labeled, "chg^{+1}, $spin^{-1}$, $time^{-1}$". The exponent location is used to place +1 or -1 to denote same or opposite. The phrase in this bar means charge is the same, spin is opposite and time is opposite. Relative direction of the arrows reinforces this idea. The isometric diagonal has the same sub-quark symbols as the top half of the diagram, but adds 3D arrows up or down for the time direction.



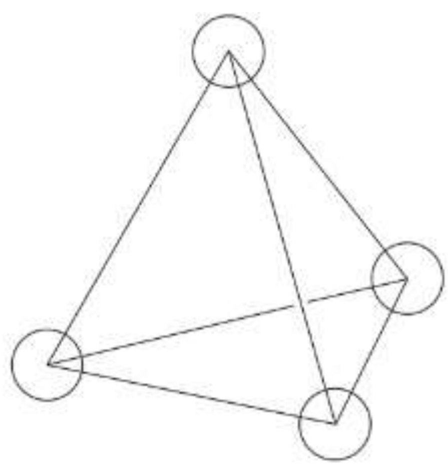
2.1.1 Define Sub-quarks with Spin & Charge

2.1.2 <u>All 4 Sub-quarks Obey RH Rule in this Coordinate System</u>



2.1.2 All 4 Sub-quarks Obey RH Rule
in this Coordinate System

2.1.3 <u>Four Sub-quarks in a Quark</u>

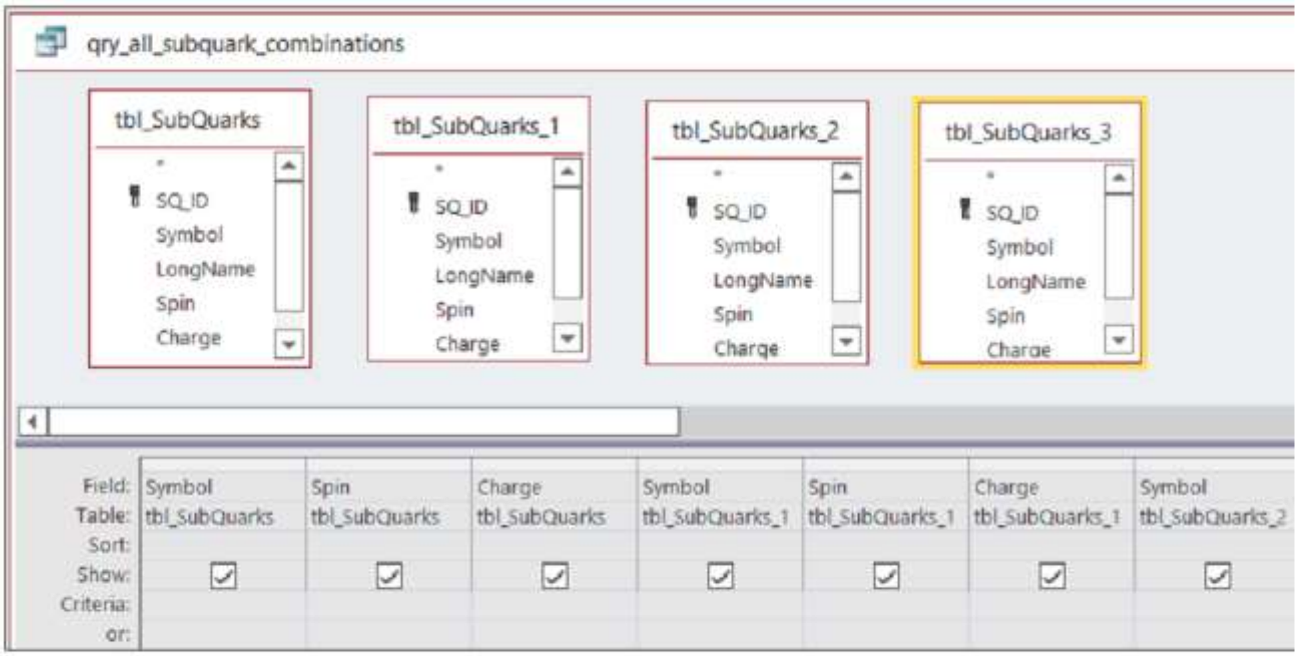


2.1.3 Four Sub-quarks in a Quark

2.1.4 All Possible Quarks Made of 4 Sub-quarks

How many quarks can 4 sub-quarks make? The answer can be found either by a math formula or structured query language (SQL). The formula is $4^4 = 256$, but this result contains duplicate quarks, since the position of sub-quarks in a quark does not matter if we exclude the case where all 4 sub-quarks are different. Such a 4 different sub-quarks quark would be zero spin and zero charge since all quantities cancel with their opposites. There cannot be a quark with all sub-quarks the same because the spins would sum to 1 or -1. That leaves us with quarks with either 2 or 3 kinds of sub-quarks. The SQL solution is easier to understand. Four identical tables containing the 4 sub-quarks has no join predicate, which gives all possible 256 combinations.

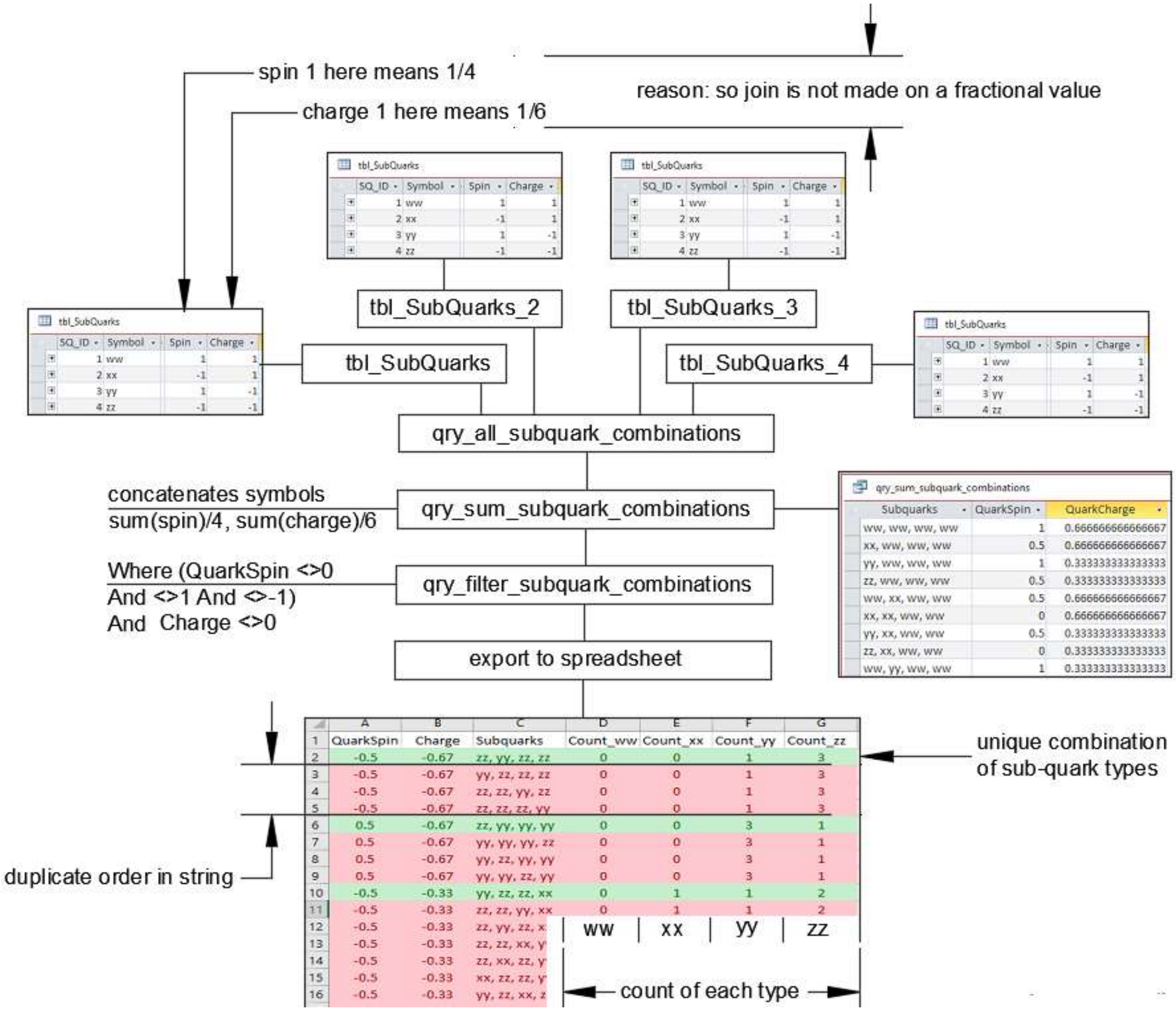
The SQL query design is as follows:



The resultant data is a follows, which is nested looping:

tbl_SubC	tbl_SubC	tbl_SubC	tbl_SubC	tbl_SubC	tbl_SubC	tbl_SubC	tbl_SubC	tbl_SubC	tbl_SubC
ww	1	1	ww	1	1	ww	1	1	ww
xx	-1	1	ww	1	1	ww	1	1	ww
yy	1	-1	ww	1	1	ww	1	1	ww
zz	-1	-1	ww	1	1	ww	1	1	ww
ww	1	1	xx	-1	1	ww	1	1	ww
xx	-1	1	xx	-1	1	ww	1	1	ww
yy	1	-1	xx	-1	1	ww	1	1	ww
zz	-1	-1	xx	-1	1	ww	1	1	ww
ww	1	1	yy	1	-1	ww	1	1	ww
xx	-1	1	yy	1	-1	ww	1	1	ww
yy	1	-1	yy	1	-1	ww	1	1	ww
zz	-1	-1	yy	1	-1	ww	1	1	ww
ww	1	1	zz	-1	-1	ww	1	1	ww

2.1.5 Data Analysis



2.1.6 Analysis of Sub-quarks in Quarks

* In the below spreadsheet, there are three separate sections. In the lower right section below the gray line, the brief phrase, "Count of sub-Q" means how many quarks have the above sub-quark in the quark. For example, in the next to last row, the "Count of sub-Q" is 3 sub-quarks of each sub-quark type ww, xx, yy and zz.

* It is considered a self-check but not a proof that each sub-quark is represented equally in the collection of all quarks.

* Due to the limitations of text editing within a spreadsheet cell, the prime character is used to denote an anti-quark. For example, yyz is considered a matter quark because it has positive spin. Its anti-matter opposite is written as yyz' in Excel and as yyz^{-1} in AutoCAD. The over line and apostrophe are not used in AutoCAD

because they are too easily not recognized as different. In Microsoft Word, the overline is not a supported font format.

* A new quark // anti-quark pair with unique charge and spin are yyz // yyz^{-1}. These are the same spin but opposite charge as the u // u^{-1}. The "//" notation splits the two halves of a particle // anti-particle pair.

* New quarks with duplicated charge and spin but different sub-quarks are wxy // wxy^{-1} and zww // zww^{-1}. The wxy and zww have the same +1/2 spin and +1/3 charge. The wxy^{-1} and zww^{-1} have same -1/2 spin and -1/3 charge. Let these same spin and charge but different sub-quarks be named isomers.

* The existing d quark has two different combinations of sub-quarks totaling the same charge and spin. Let these also be named isomers.

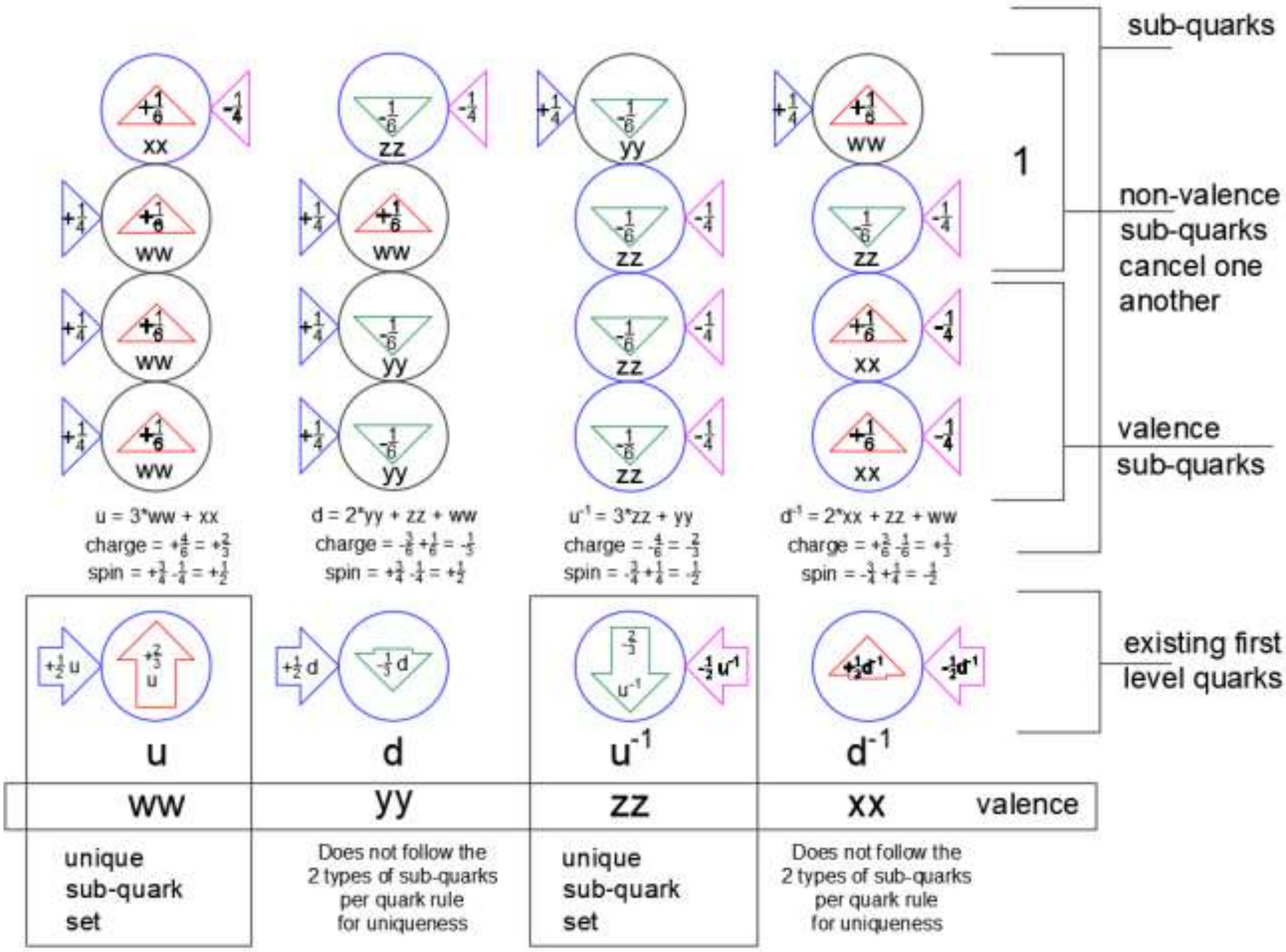
			count of each type					
			ww	xx	yy	zz		
Spin	Charge	Subquarks	ww	xx	yy	zz	Quark	Like
-1/2	-2/3	zz, yy, zz, zz	0	0	1	3	u'	
+1/2	-2/3	zz, yy, yy, yy	0	0	3	1	yyz	
-1/2	-1/3	yy, zz, zz, xx	0	1	1	2	wxy'	
+1/2	-1/3	yy, yy, xx, yy	0	1	3	0	xyy	d
-1/2	+1/3	xx, yy, xx, xx	0	3	1	0	xyy'	d'
-1/2	-1/3	zz, zz, zz, ww	1	0	0	3	zww'	wxy'
+1/2	-1/3	yy, ww, yy, zz	1	0	2	1	d	
-1/2	+1/3	xx, xx, zz, ww	1	2	0	1	d'	
-1/2	+2/3	xx, xx, ww, xx	1	3	0	0	yyz'	
+1/2	+1/3	ww, yy, xx, ww	2	1	1	0	wxy	
+1/2	+1/3	ww, ww, zz, ww	3	0	0	1	zww	wxy
+1/2	+2/3	xx, ww, ww, ww	3	1	0	0	u	

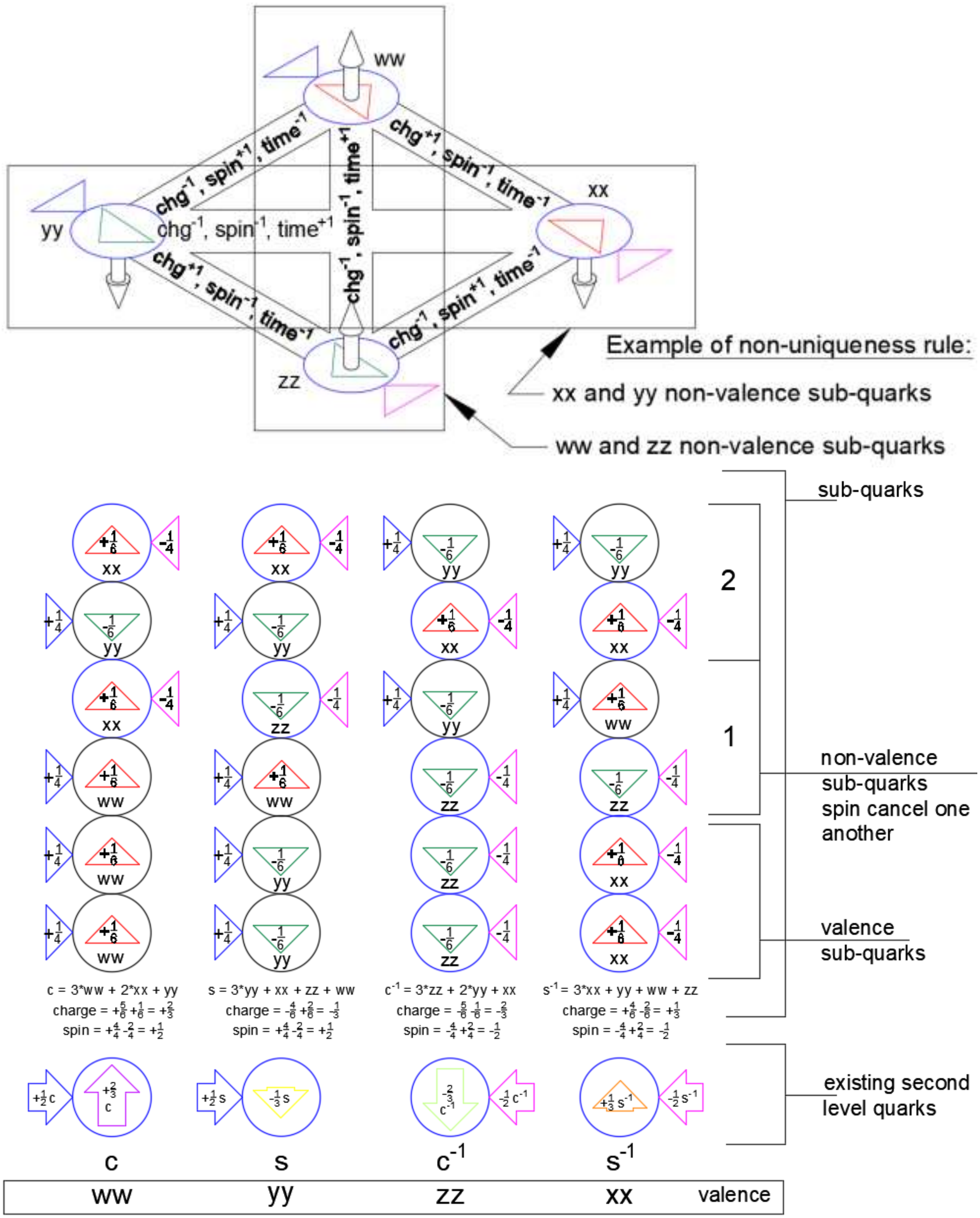
Quark	Count	Spin	Charge						Quantity
u'	1	-1/2	-2/3	Count of sub-Q	0	0	0	0	
yyz'	1	-1/2	+2/3	Quantity	5	5	5	5	(5 zeroes)
d', xyy'	2	-1/2	+1/3	Count of sub-Q	1	1	1	1	
wxy', zww'	2	-1/2	-1/3	Quantity	4	4	4	4	(4 ones)
yyz	1	+1/2	-2/3	Count of sub-Q	2	2	2	2	
u	1	+1/2	+2/3	Quantity	1	1	1	1	(1 two)
wxy, zww	2	+1/2	+1/3	Count of sub-Q	3	3	3	3	
d, xyy	2	+1/2	-1/3	Quantity	2	2	2	2	(2 threes)
	12								
	4	unique							
	8	duplicate							

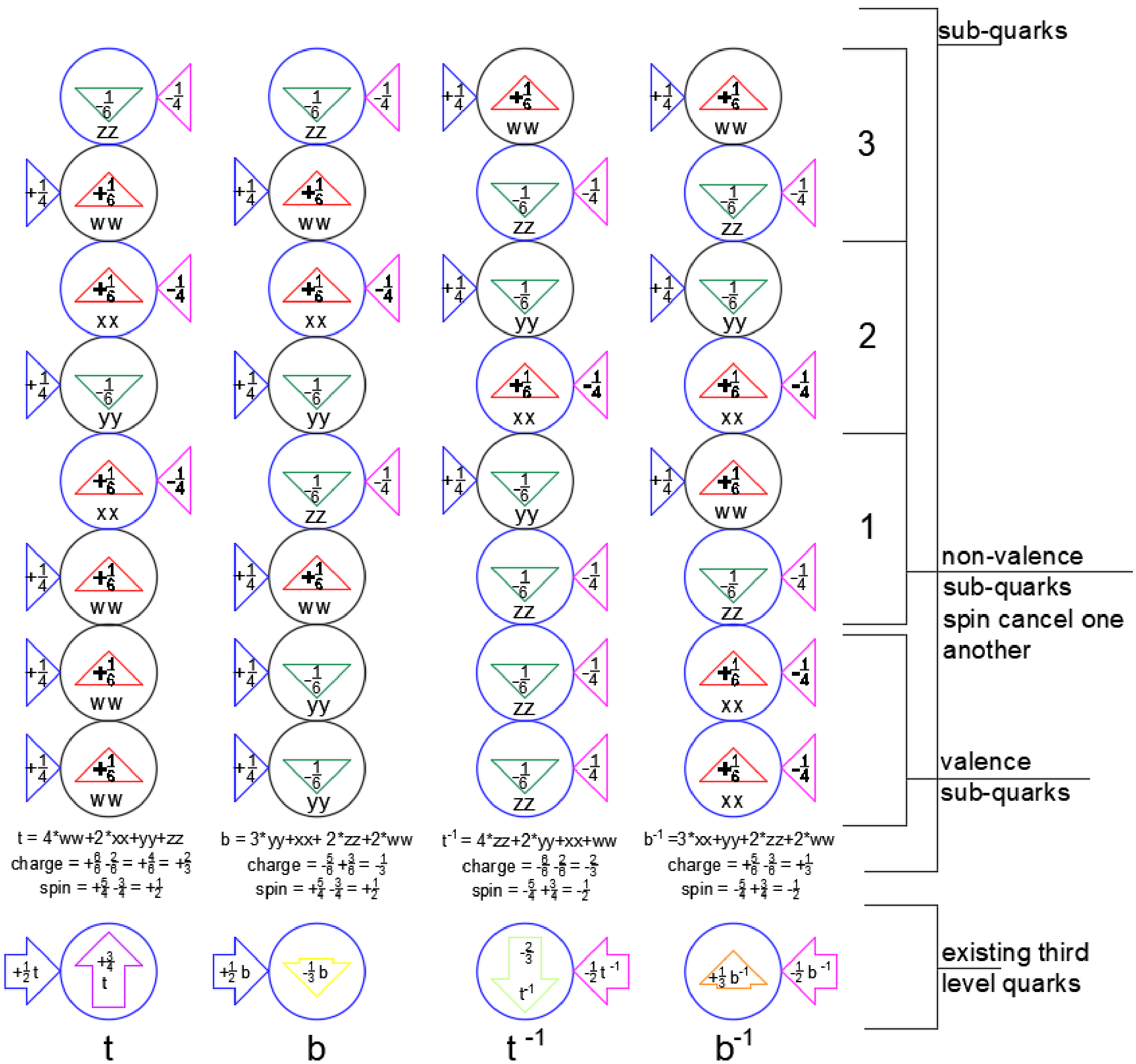
2.1.6 Analysis of Sub-quarks in Quarks

2.1.7 Define Existing & New Quarks as Combinations of Sub-quarks

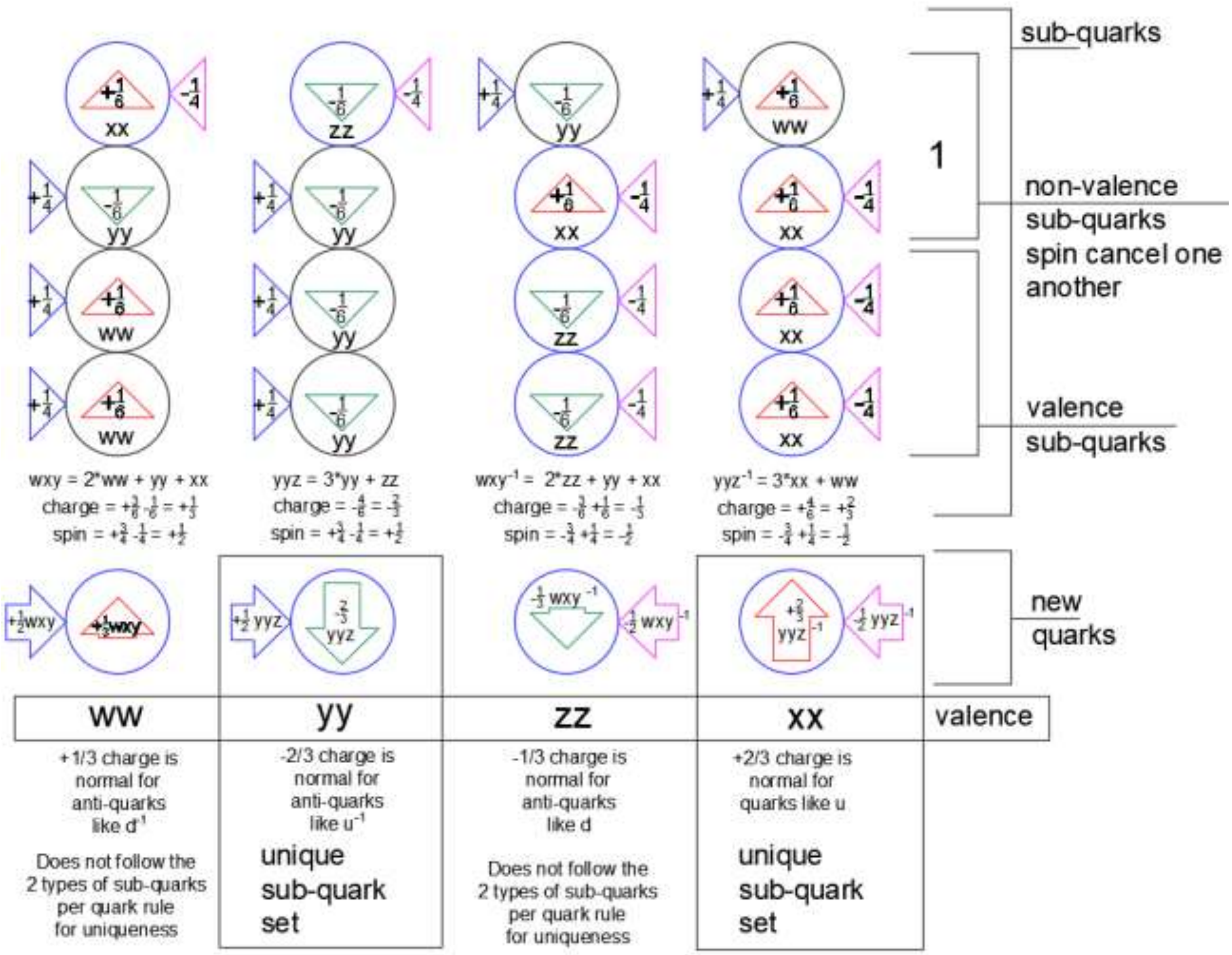
1) Each first level quark has 4 sub-quarks. Second level has 6 and third level has 8
2) Quarks and sub-quarks are never free particles because they would rotate
3) Uniqueness rule: 2 types of sub-quark per quark yields a unique quark
4) Non-uniqueness rule: 3 types of sub-quarks per quark yields a pair or quarks that are charge, spin and valence sub-quarks identical, but composed of different non-valence sub-quarks. Non-valence sub-quarks that are spin and charge opposite cancel one another, and are shown on opposite corners of the sub-quark diamond

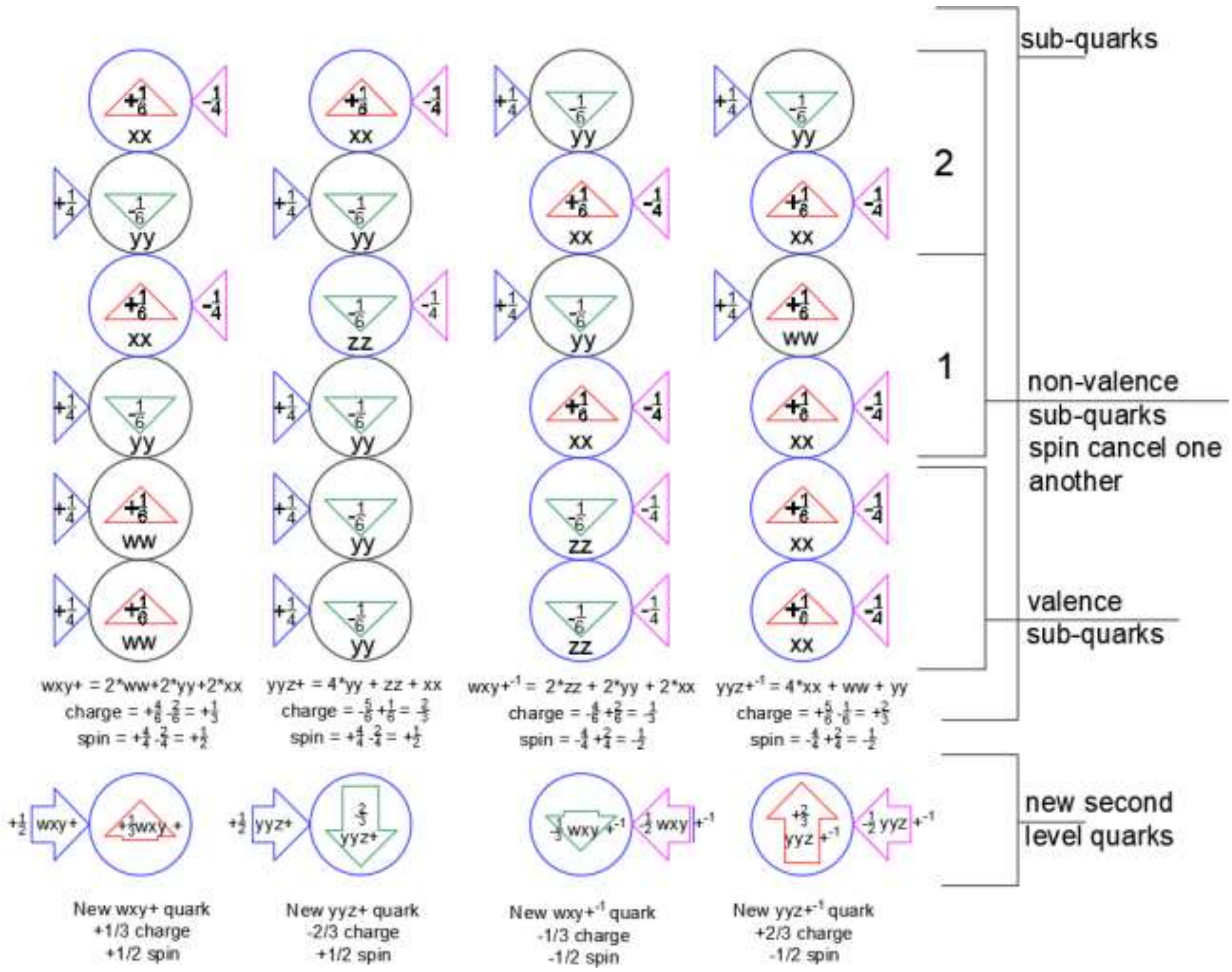


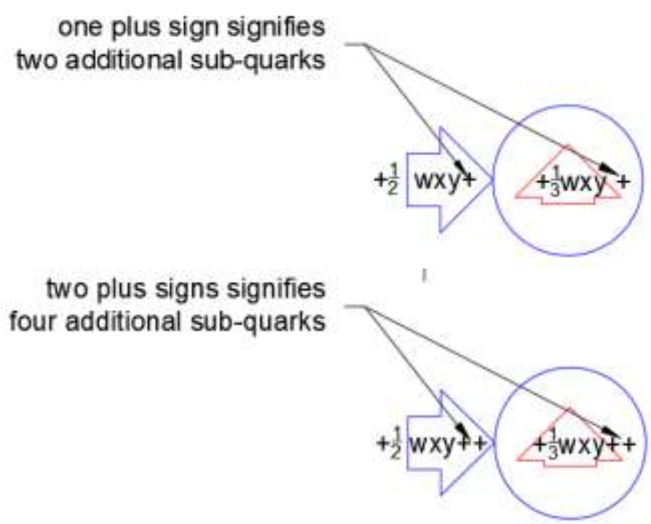

ww
xx
yy
zz
chg-1, spin+1, time-1
chg+1, spin-1, time-1
chg-1, spin-1, time+1
chg+1, spin-1, time-1
chg-1, spin+1, time-1
chg-1, spin-1, time+1
Example of non-uniqueness rule:
xx and yy non-valence sub-quarks
ww and zz non-valence sub-quarks
sub-quarks
2
1
non-valence sub-quarks spin cancel one another
valence sub-quarks
c = 3*ww + 2*xx + yy
charge = +5/6 +1/6 = +2/3
spin = +4/4 -2/4 = +1/2
s = 3*yy + xx + zz + ww
charge = -4/6 +2/6 = -1/3
spin = +4/4 -2/4 = +1/2
c-1 = 3*zz + 2*yy + xx
charge = -5/6 -1/6 = -2/3
spin = -4/4 +2/4 = -1/2
s-1 = 3*xx + yy + ww + zz
charge = +4/6 -2/6 = +1/3
spin = -4/4 +2/4 = -1/2
existing second level quarks
c
s
c-1
s-1
ww
yy
zz
xx
valence

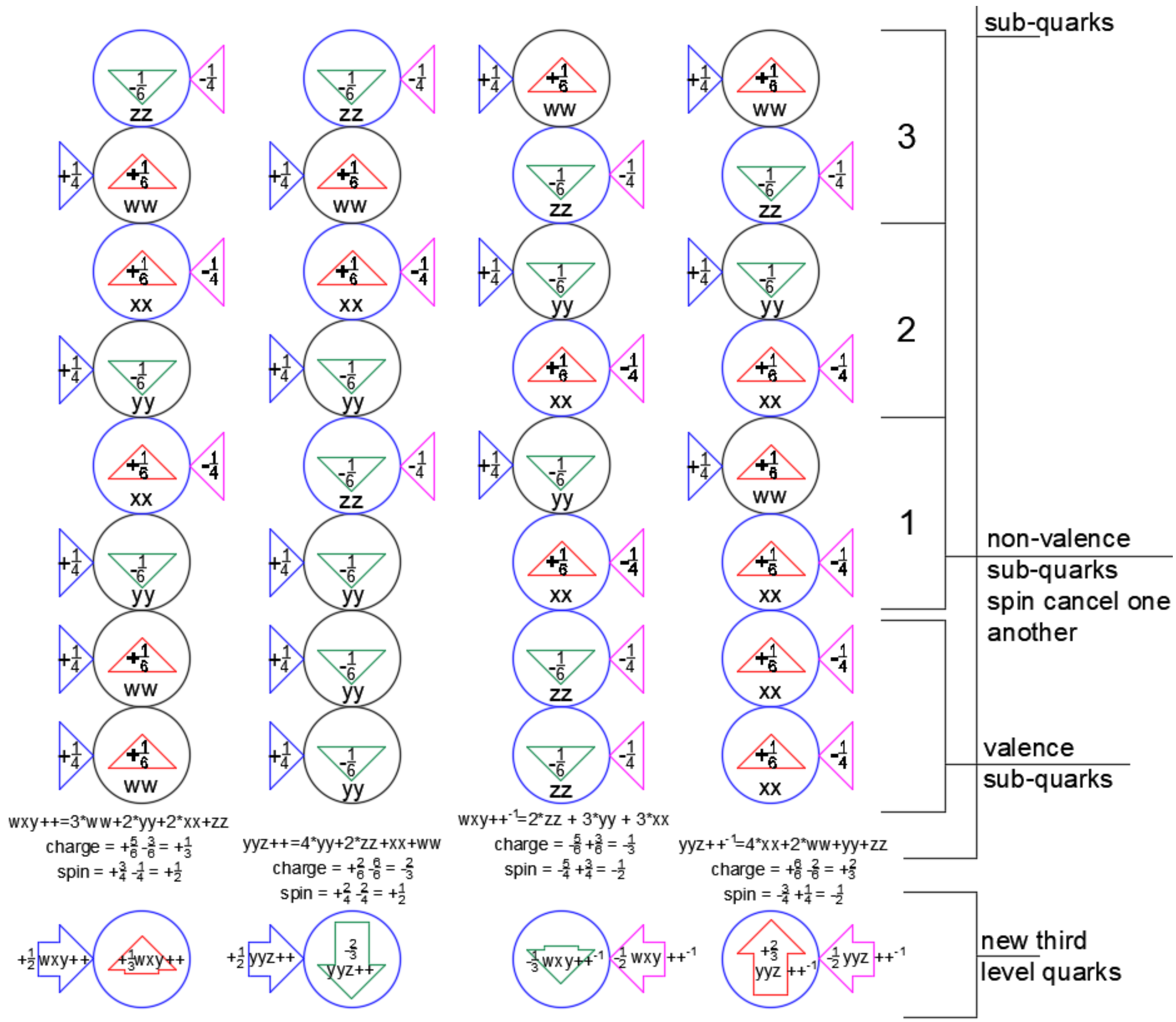


New quarks have higher mass versions with more balanced spin/charge pairs (non-valence sub quarks) as charm follows up and strange follows down. New quarks have the same spin, same charge type as existing quarks but different charge sign.


sub-quarks
1
non-valence sub-quarks spin cancel one another
valence sub-quarks
new quarks
valence
wxy = 2*ww + yy + xx
yyz = 3*yy + zz
wxy⁻¹ = 2*zz + yy + xx
yyz⁻¹ = 3*xx + ww
ww
yy
zz
xx
+1/3 charge is normal for anti-quarks like d⁻¹
Does not follow the 2 types of sub-quarks per quark rule for uniqueness
-2/3 charge is normal for anti-quarks like u⁻¹
unique sub-quark set
-1/3 charge is normal for anti-quarks like d
Does not follow the 2 types of sub-quarks per quark rule for uniqueness
+2/3 charge is normal for quarks like u
unique sub-quark set


sub-quarks
2
1
non-valence sub-quarks spin cancel one another
valence sub-quarks
new second level quarks
wxy+ = 2*ww+2*yy+2*xx
charge = $+\frac{4}{6}-\frac{2}{6}=+\frac{1}{3}$
spin = $+\frac{4}{4}-\frac{2}{4}=+\frac{1}{2}$
yyz+ = 4*yy + zz + xx
charge = $-\frac{5}{6}+\frac{1}{6}=-\frac{2}{3}$
spin = $+\frac{4}{4}-\frac{2}{4}=+\frac{1}{2}$
wxy+$^{-1}$ = 2*zz + 2*yy + 2*xx
charge = $-\frac{4}{6}+\frac{2}{6}=-\frac{1}{3}$
spin = $-\frac{4}{4}+\frac{2}{4}=-\frac{1}{2}$
yyz+$^{-1}$ = 4*xx + ww + yy
charge = $+\frac{5}{6}-\frac{1}{6}=+\frac{2}{3}$
spin = $-\frac{4}{4}+\frac{2}{4}=-\frac{1}{2}$
New wxy+ quark
+1/3 charge
+1/2 spin
New yyz+ quark
-2/3 charge
+1/2 spin
New wxy+$^{-1}$ quark
-1/3 charge
-1/2 spin
New yyz+$^{-1}$ quark
+2/3 charge
-1/2 spin

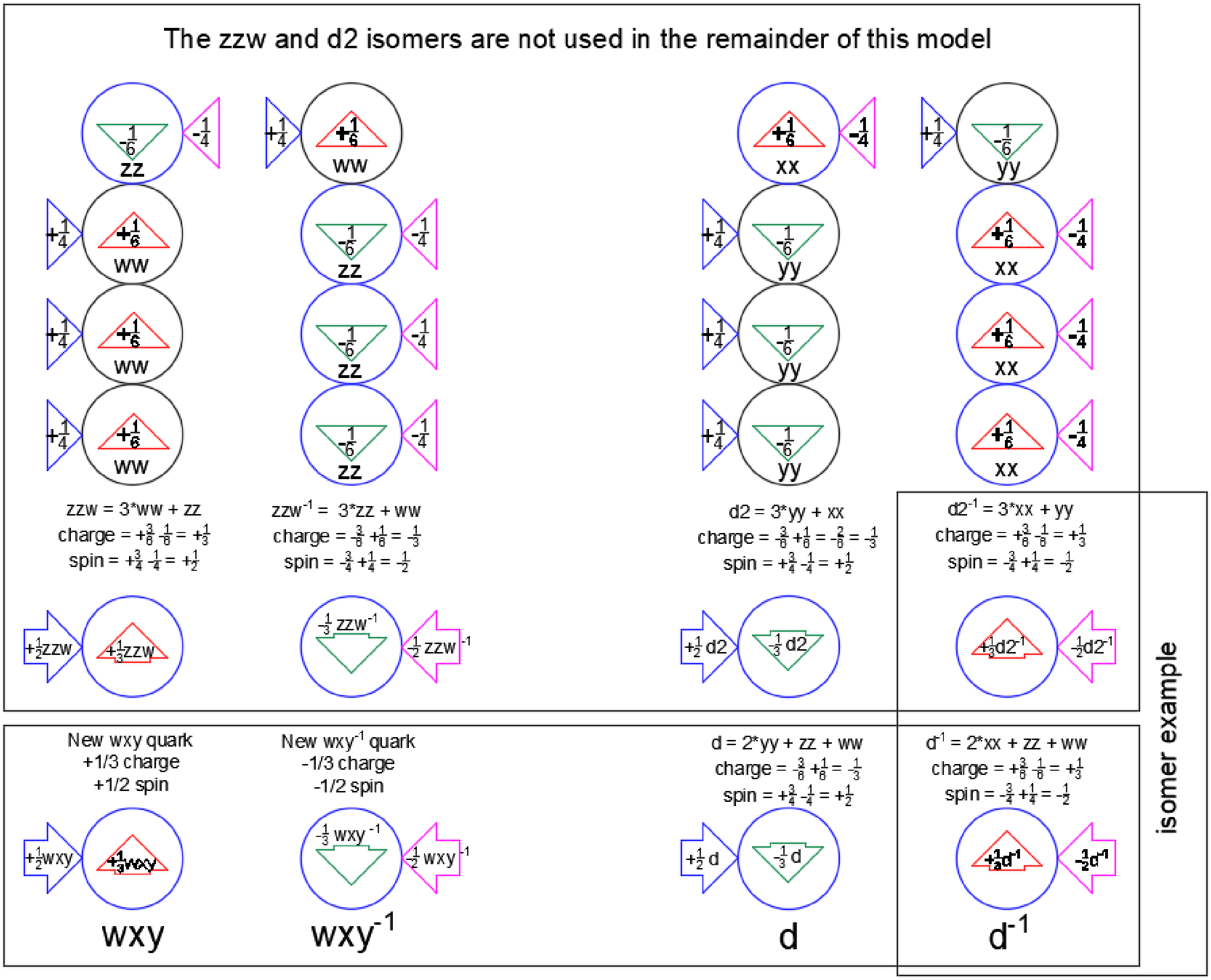

one plus sign signifies two additional sub-quarks
$+\frac{1}{2}$ wxy+
$+\frac{1}{3}$wxy+
two plus signs signifies four additional sub-quarks
$+\frac{1}{2}$ wxy++
$+\frac{1}{3}$wxy++



The molecular definition of isomer is, "two molecules with identical molecular formula but with different structural arrangements"

The nuclear definition of isomer is, "two atoms with an identical number of protons and neutrons in their nuclei but with different structural arrangements"

The quark definition of isomer is, "two quarks with the identical charge, spin and valence sub-quarks but with different sub-quarks"



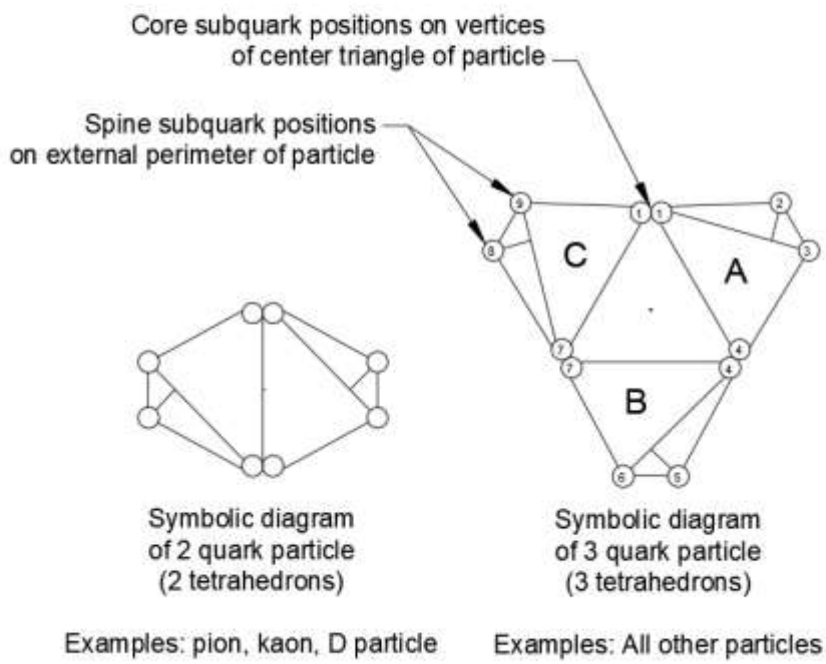
The wxy // wxy^{-1} and d // d^{-1} isomers are used in the remainder of this discussion for brevity of illustration. The zww // zww^{-1} and d2 quarks will be checked for sub-quark validity in reactions where the sub-quark identities play a role.

Sample Tabulation of Subquarks:

u = 3*ww+1*xx+0*yy+0*zz = 4
d = 1*ww+0*xx+2*yy+1*zz = 4
u^{-1} = 0*ww+0*xx+1*yy+3*zz = 4
d^{-1} = 1*ww+2*xx+0*yy+1*zz = 4

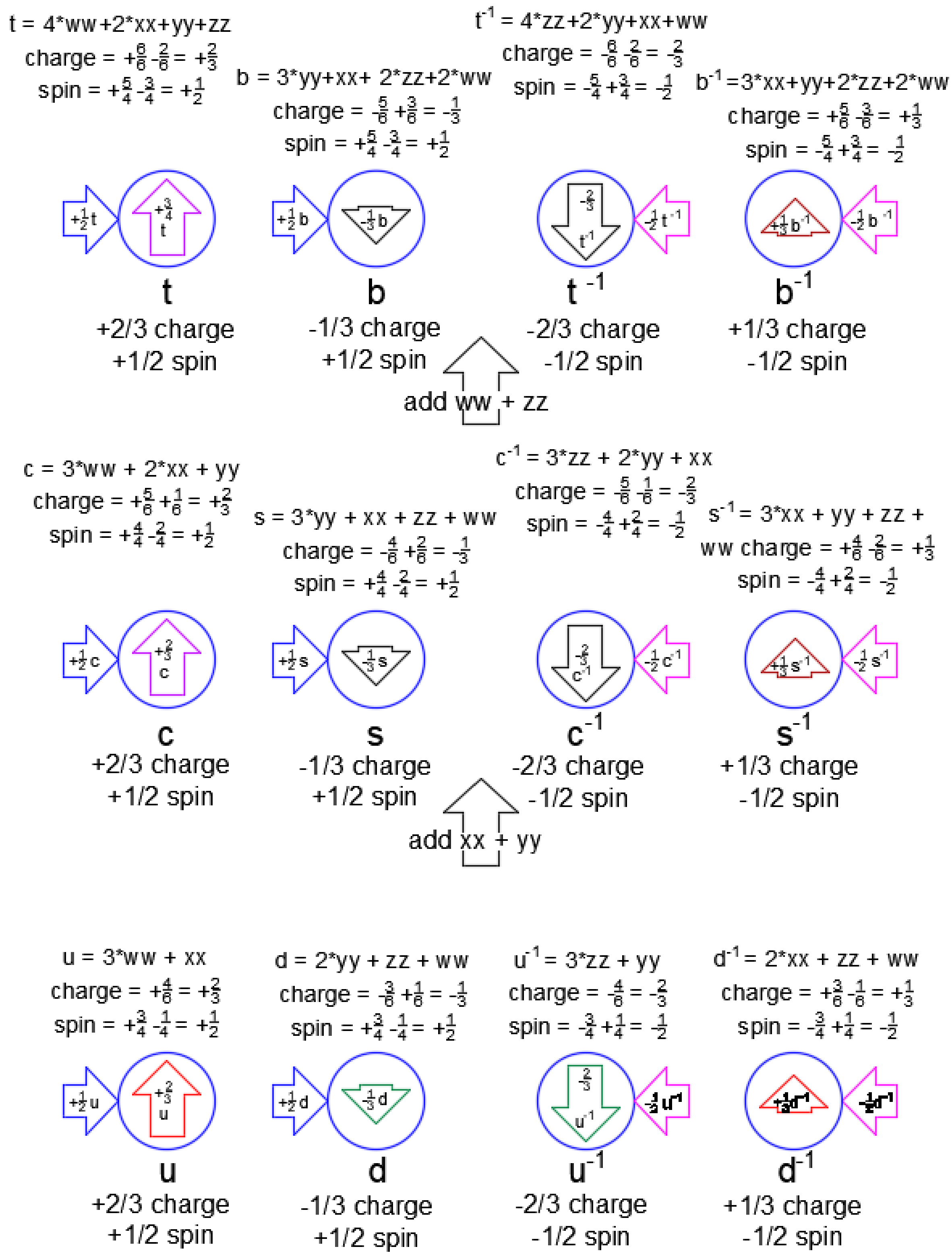
total = 5*ww+3*xx+3*yy+5*zz = 16

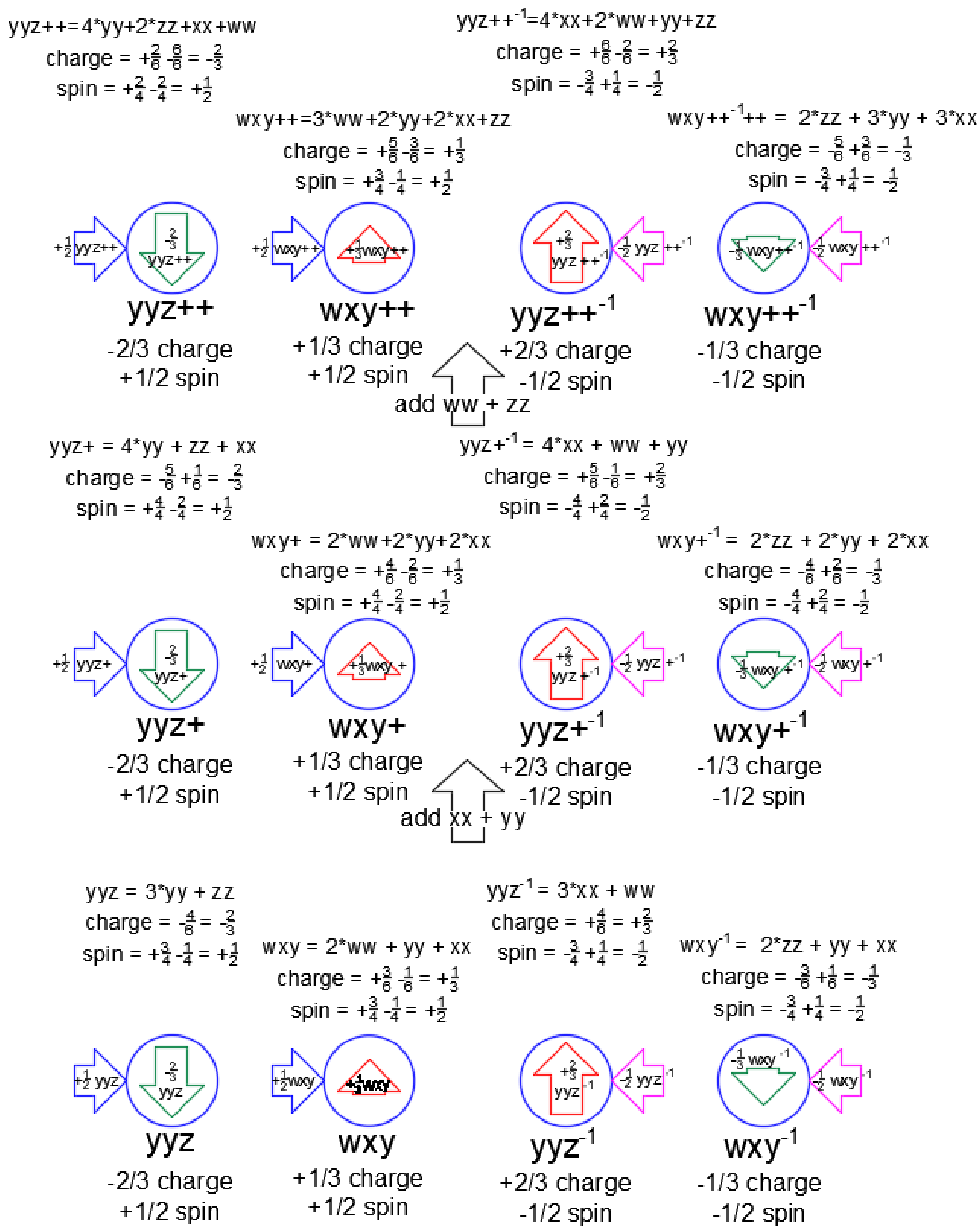
2.1.8 Two or Three Quarks in a Particle

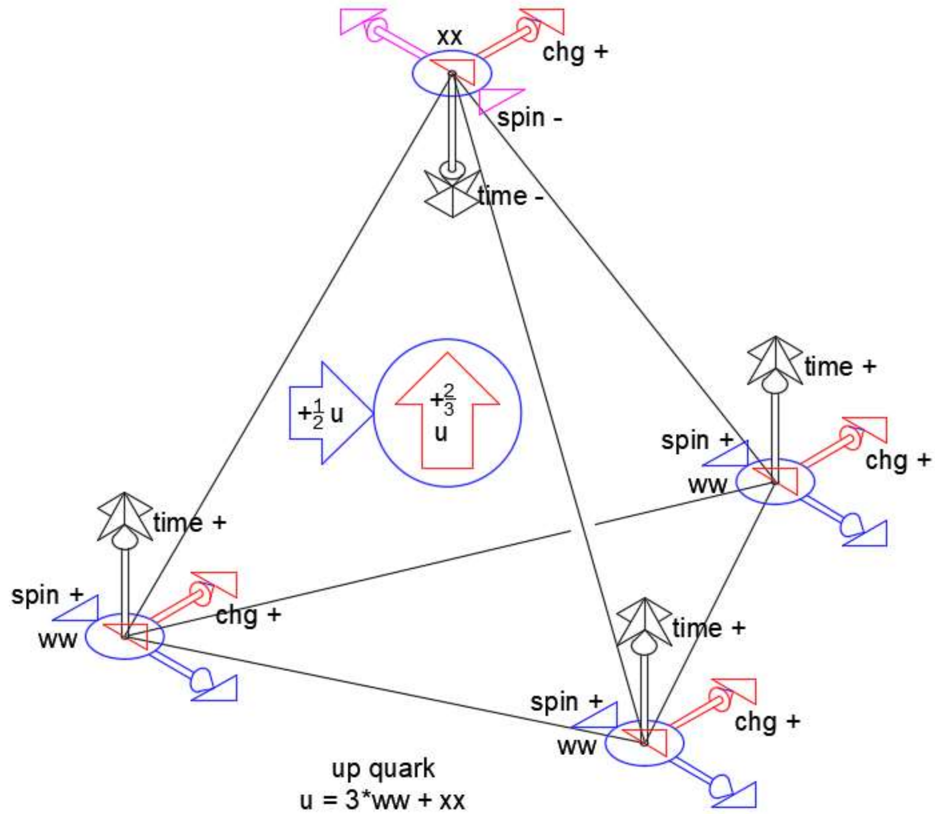


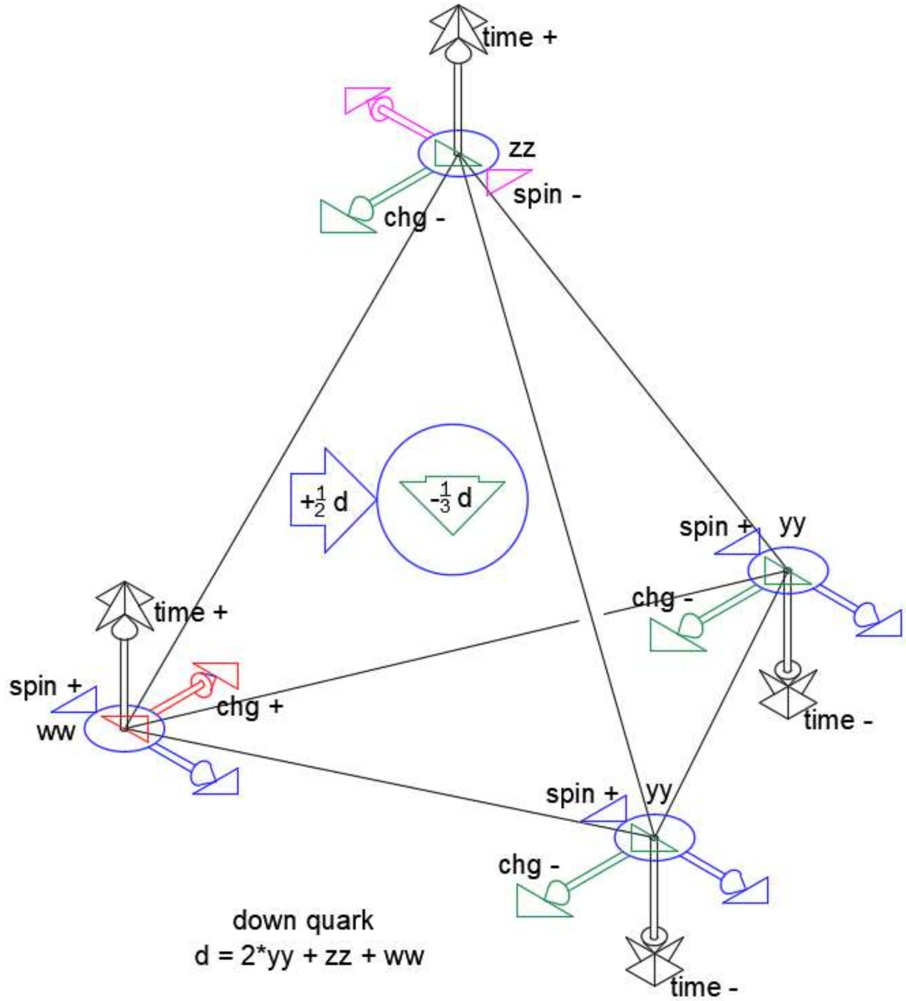
2.1.8 Two or Three Quarks in a Particle

2.1.9 Quark Summary

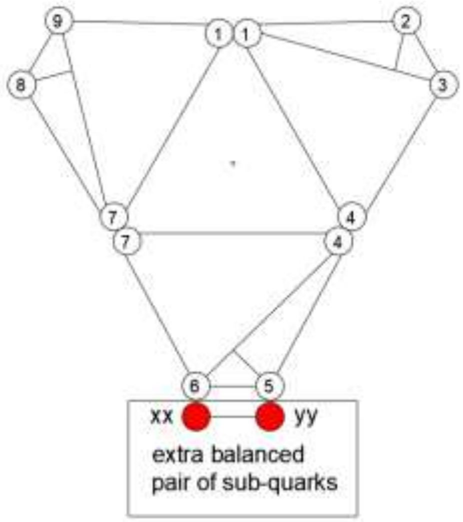



yyz++=4*yy+2*zz+xx+ww
charge = +2/6 -6/6 = -2/3
spin = +2/4 -2/4 = +1/2
yyz++^-1=4*xx+2*ww+yy+zz
charge = +6/6 -2/6 = +2/3
spin = -3/4 +1/4 = -1/2
wxy++=3*ww+2*yy+2*xx+zz
charge = +5/6 -3/6 = +1/3
spin = +3/4 -1/4 = +1/2
wxy++^-1++ = 2*zz + 3*yy + 3*xx
charge = -5/6 +3/6 = -1/3
spin = -3/4 +1/4 = -1/2
yyz++
-2/3 charge
+1/2 spin
wxy++
+1/3 charge
+1/2 spin
yyz++^-1
+2/3 charge
-1/2 spin
wxy++^-1
-1/3 charge
-1/2 spin
add ww + zz
yyz+ = 4*yy + zz + xx
charge = -5/6 +1/6 = -2/3
spin = +4/4 -2/4 = +1/2
yyz+^-1 = 4*xx + ww + yy
charge = +5/6 -1/6 = +2/3
spin = -4/4 +2/4 = -1/2
wxy+ = 2*ww+2*yy+2*xx
charge = +4/6 -2/6 = +1/3
spin = +4/4 -2/4 = +1/2
wxy+^-1 = 2*zz + 2*yy + 2*xx
charge = -4/6 +2/6 = -1/3
spin = -4/4 +2/4 = -1/2
yyz+
-2/3 charge
+1/2 spin
wxy+
+1/3 charge
+1/2 spin
yyz+^-1
+2/3 charge
-1/2 spin
wxy+^-1
-1/3 charge
-1/2 spin
add xx + yy
yyz = 3*yy + zz
charge = -4/6 = -2/3
spin = +3/4 -1/4 = +1/2
yyz^-1 = 3*xx + ww
charge = +4/6 = +2/3
spin = -3/4 +1/4 = -1/2
wxy = 2*ww + yy + xx
charge = +3/6 -1/6 = +1/3
spin = +3/4 -1/4 = +1/2
wxy^-1 = 2*zz + yy + xx
charge = -3/6 +1/6 = -1/3
spin = -3/4 +1/4 = -1/2
yyz
-2/3 charge
+1/2 spin
wxy
+1/3 charge
+1/2 spin
yyz^-1
+2/3 charge
-1/2 spin
wxy^-1
-1/3 charge
-1/2 spin

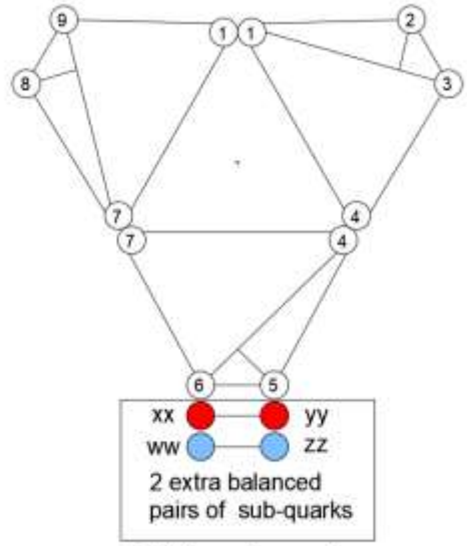

xx
chg +
spin -
time -
time +
spin +
chg +
ww
$+\frac{1}{2}$ u
$+\frac{2}{3}$ u
time +
spin +
ww
chg +
time +
spin +
chg +
ww
up quark
u = 3*ww + xx


time +
zz
spin -
chg -
$+\frac{1}{2}$ d
$-\frac{1}{3}$ d
spin +
yy
chg -
time +
spin +
ww
chg +
time -
spin +
yy
chg -
time -
down quark
d = 2*yy + zz + ww

Extra sub-quarks can add to any vertex that is not already a gluon with 4 sub-quarks, and where the sub-quark at that vertex is not the same as the one to be added

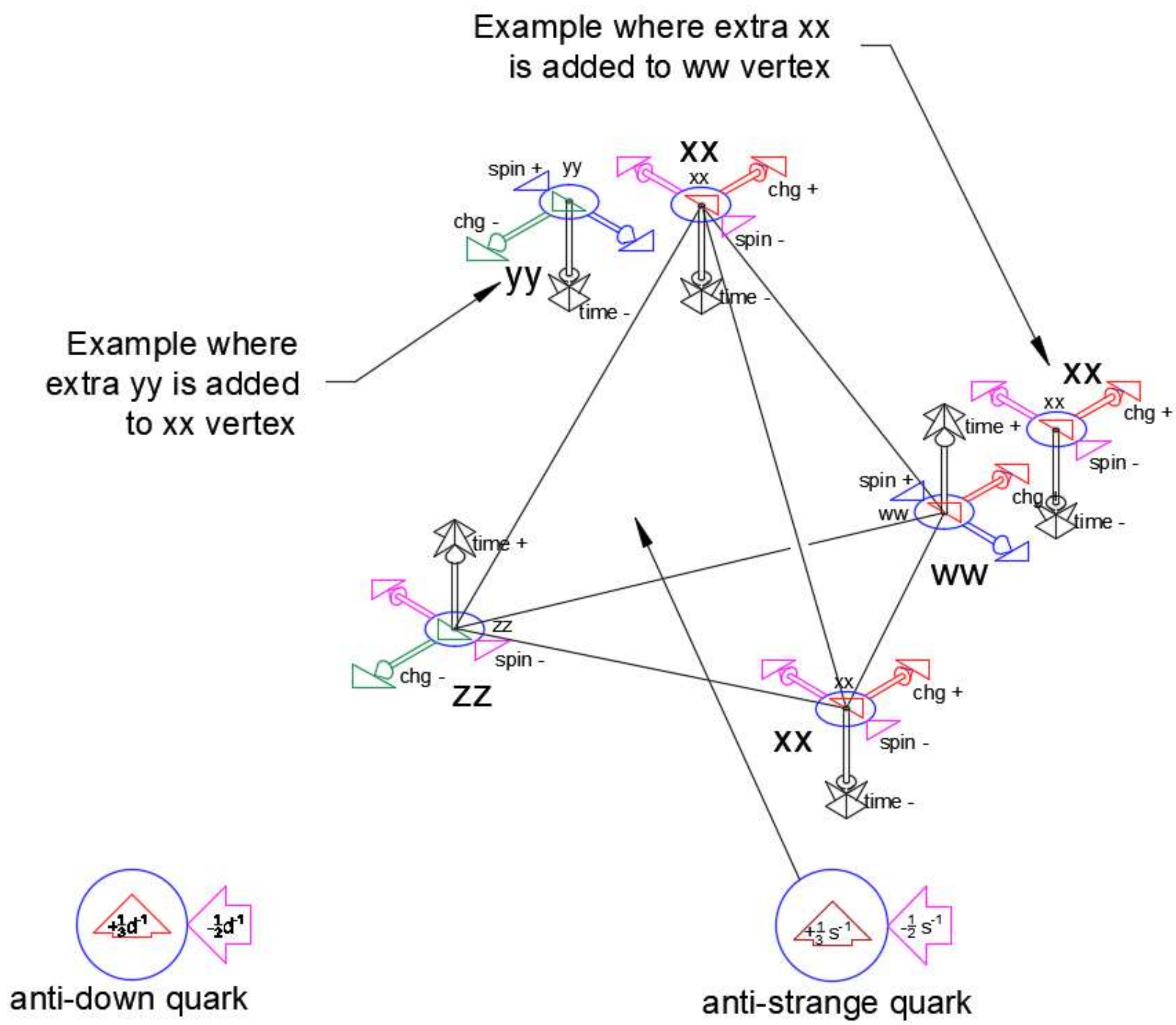


second level quarks



third level quarks

In the below example, the extra xx and yy sub-quarks are added to anti-down to change it into an anti-strange quark



$$(d^{-1} = 2*xx + zz + ww) + (xx + yy) = (s^{-1} = 3*xx + yy + zz + ww)$$

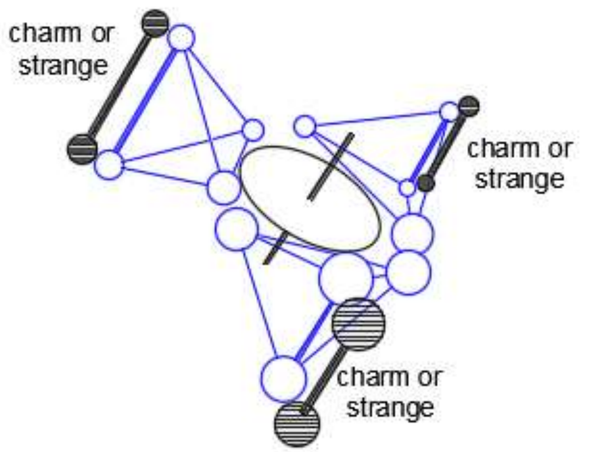
<u>2.1.9 Quark Summary</u>

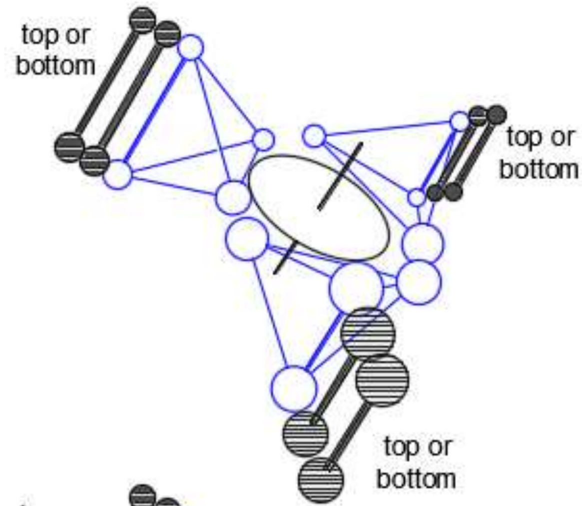
2.1.10 Higher Mass Quarks

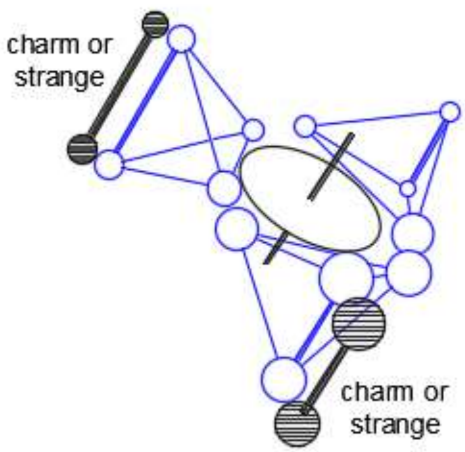
0 extra pair of sub-quarks = up, down
1 extra pair of sub-quarks = charm, strange
2 extra pairs of sub-quarks = top, bottom

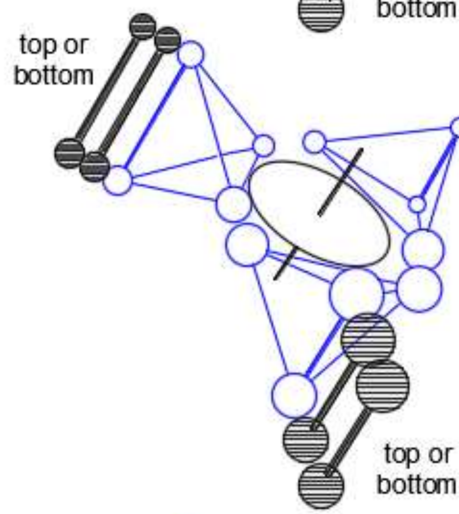
u, d and c, s and t, b can be combined in a particle

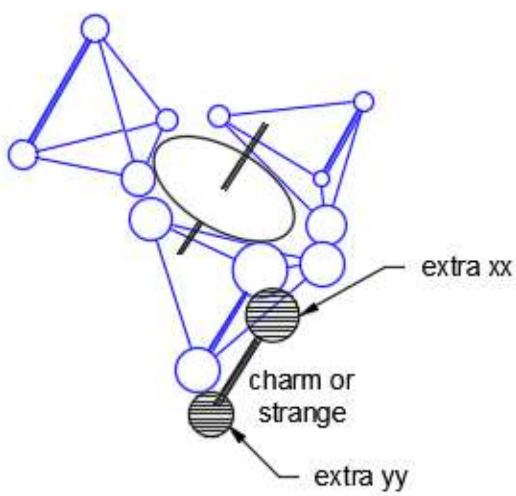
Up to 4 different sub-quarks can co-exist at one quark vertex. This makes a gluon, which can either connect 2 quarks, or simply be extra mass added to a quark’s spine sub-quark.

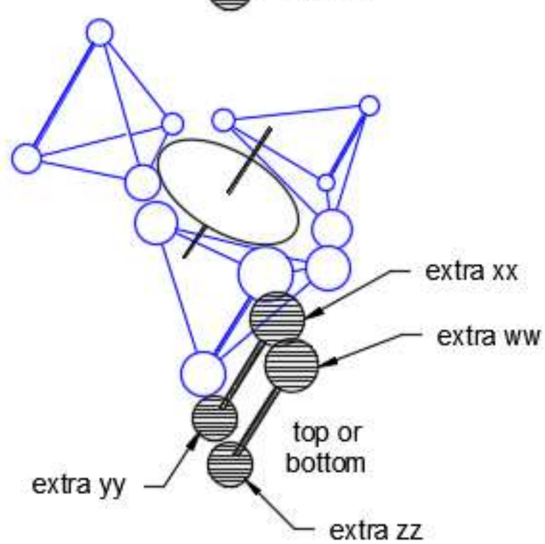

charm or
strange
charm or
strange
charm or
strange

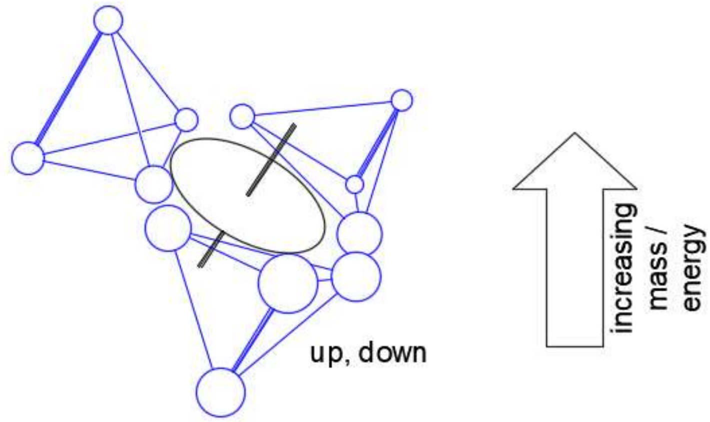

top or
bottom
top or
bottom
top or
bottom


charm or
strange
charm or
strange


top or
bottom
top or
bottom

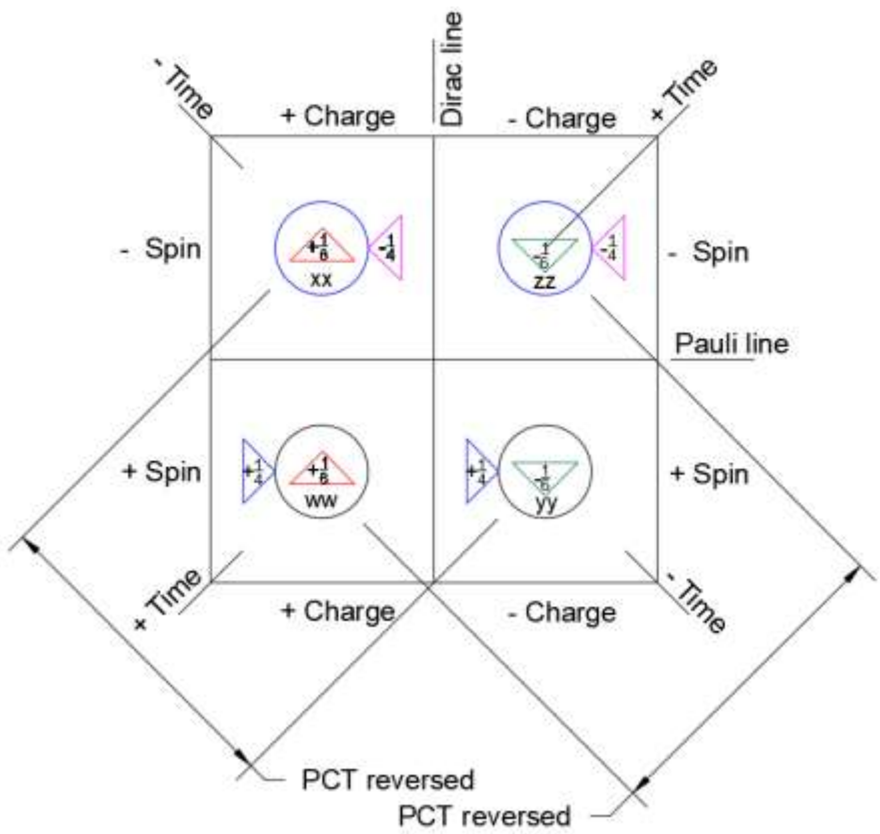

extra xx
charm or
strange
extra yy


extra xx
extra ww
top or
bottom
extra yy
extra zz



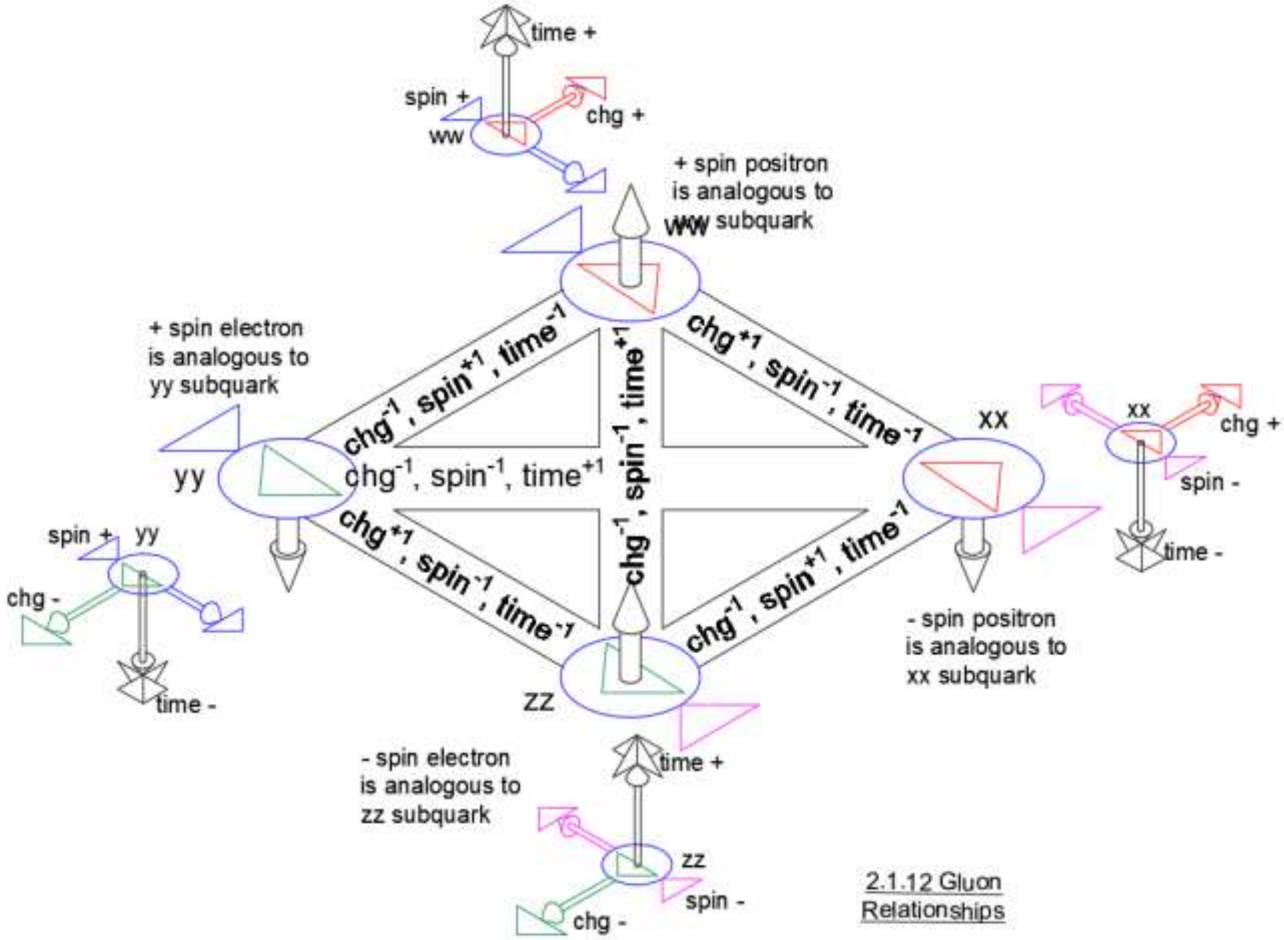
2.1.10 Higher Mass Quarks

2.1.11 Gluon Complex



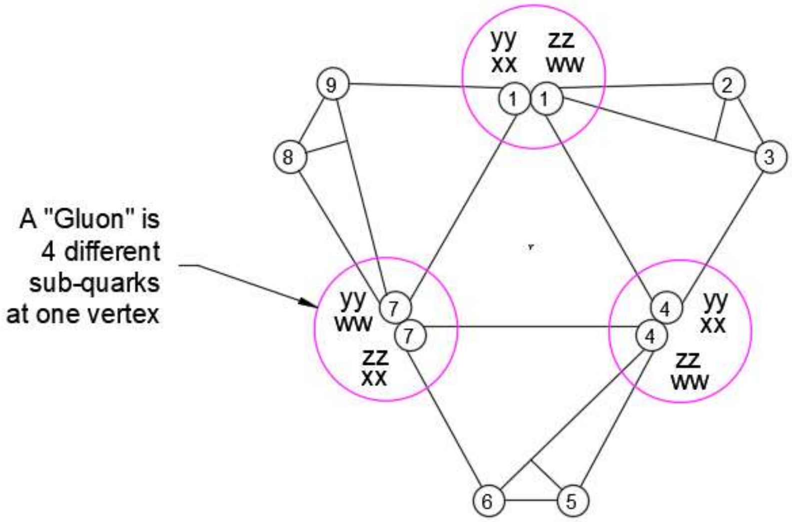
2.1.11 Gluon Complex

2.1.12 Gluon Relationships



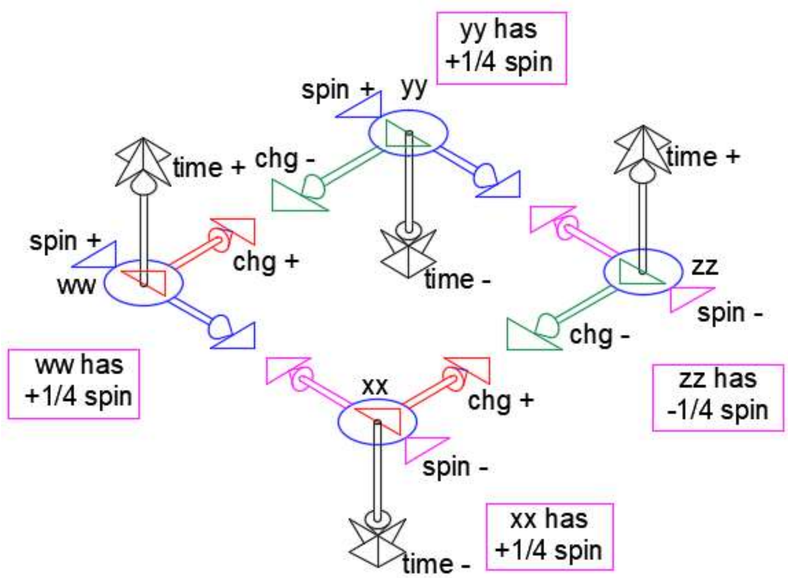
2.2 Spin Cancellation in Gluons

2.2.1 Example Matter and Anti-matter Particle has Three Gluons



2.2.1 Example Matter and Anti-matter Particle has Three Gluons

2.2.2 The Four Different Sub-Quarks Cancel Charge, Spin and Time

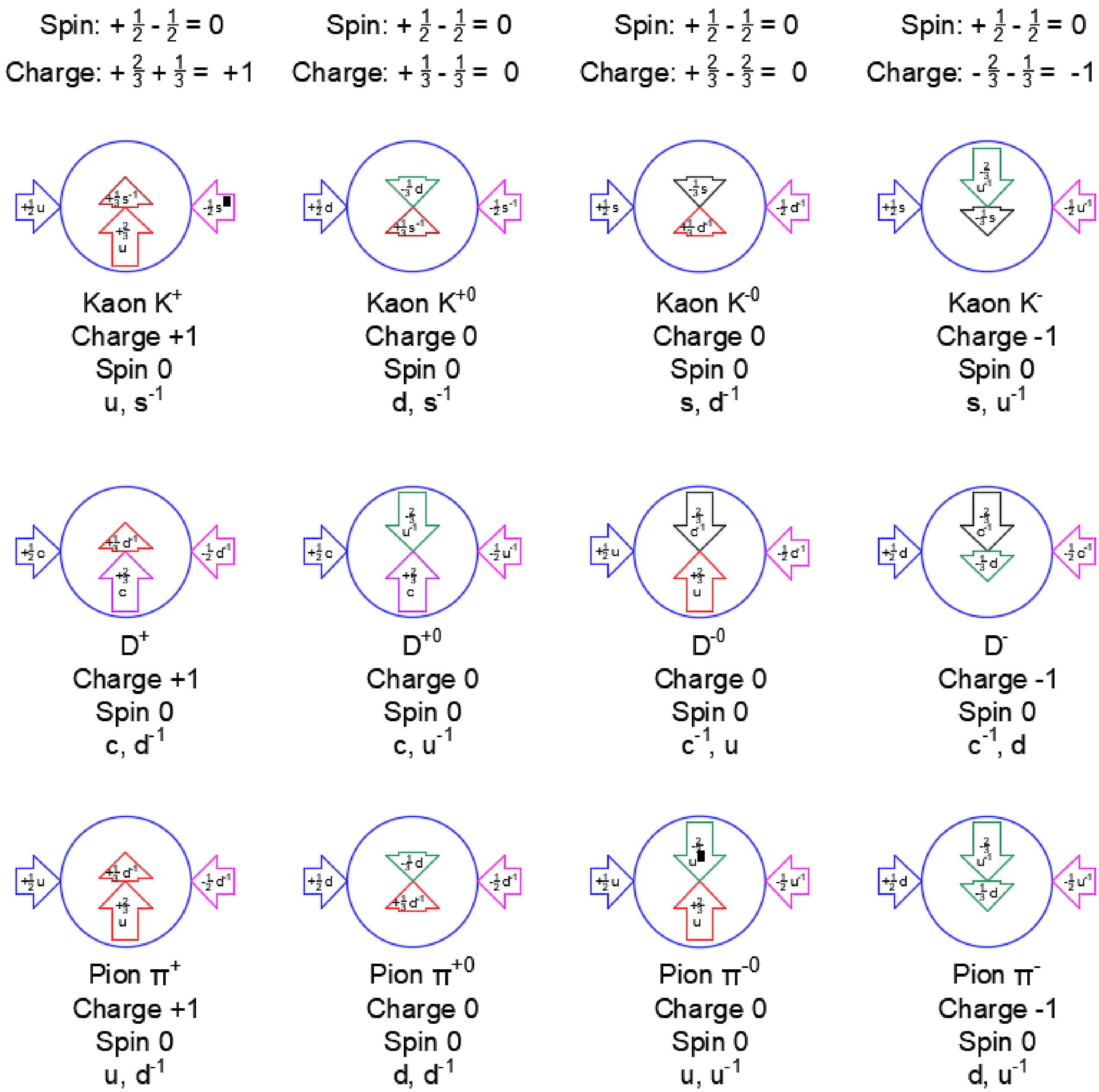


2.2.2 The Four Different Sub-quarks Cancel Charge, Spin and Time

2.3 Mesons, Baryons and Leptons

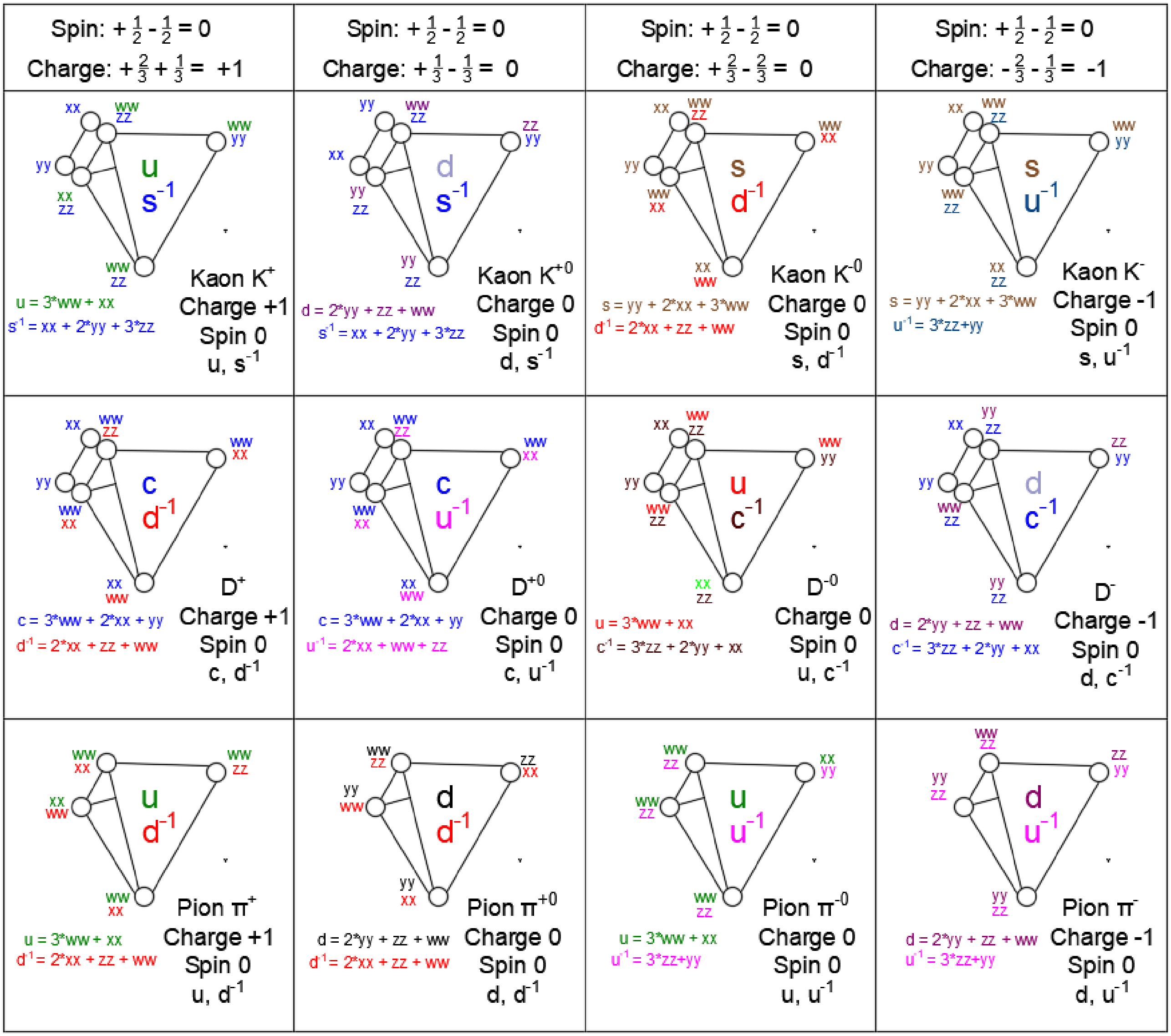
2.3.1 Mesons

2.3.1.1 Pion, Kaon, D Particles



2.3.1.1 Pion, Kaon, D Particles

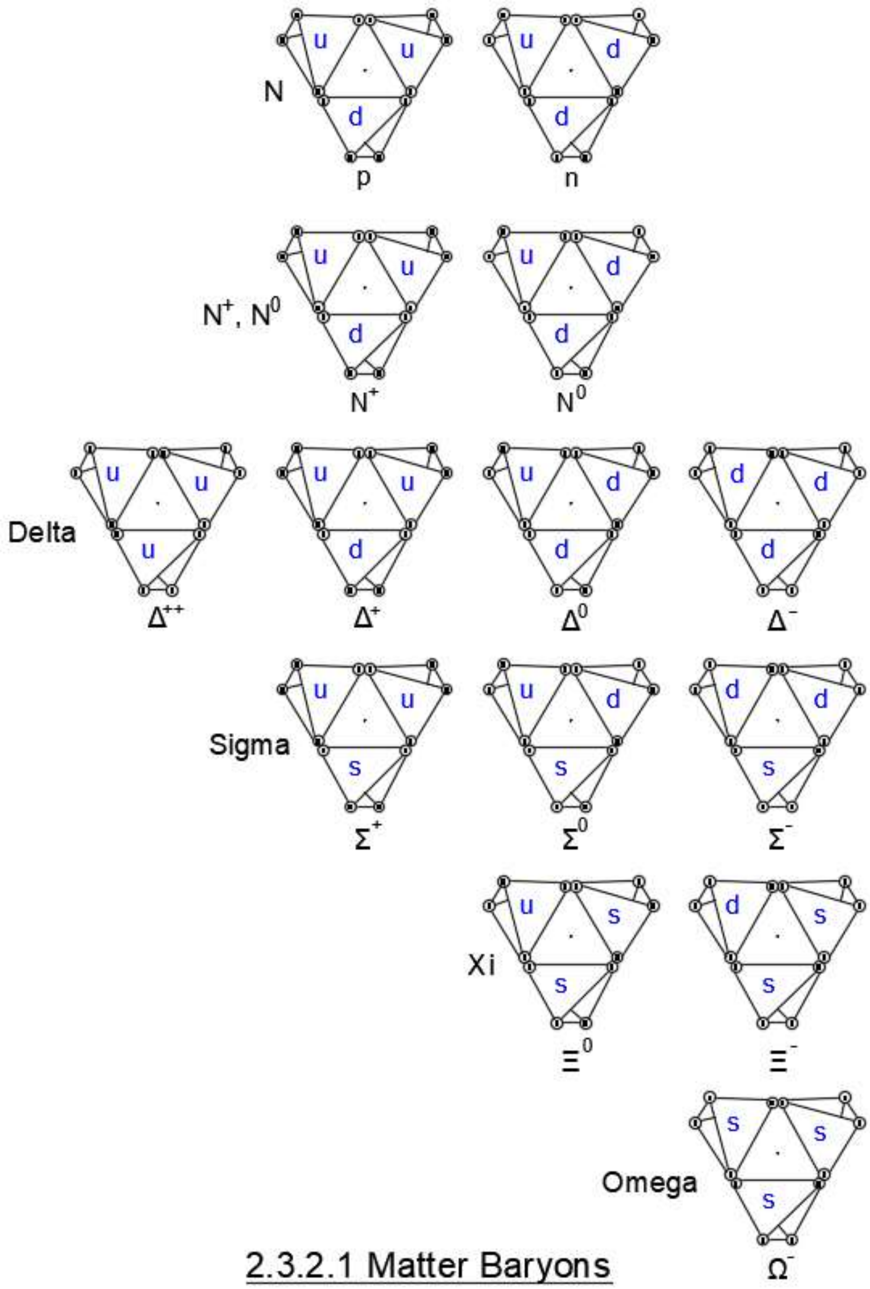
2.3.1.2 Pion, Kaon & D Mesons' Sub-quarks



2.3.1.2 Pion, Kaon & D Mesons' Subquarks

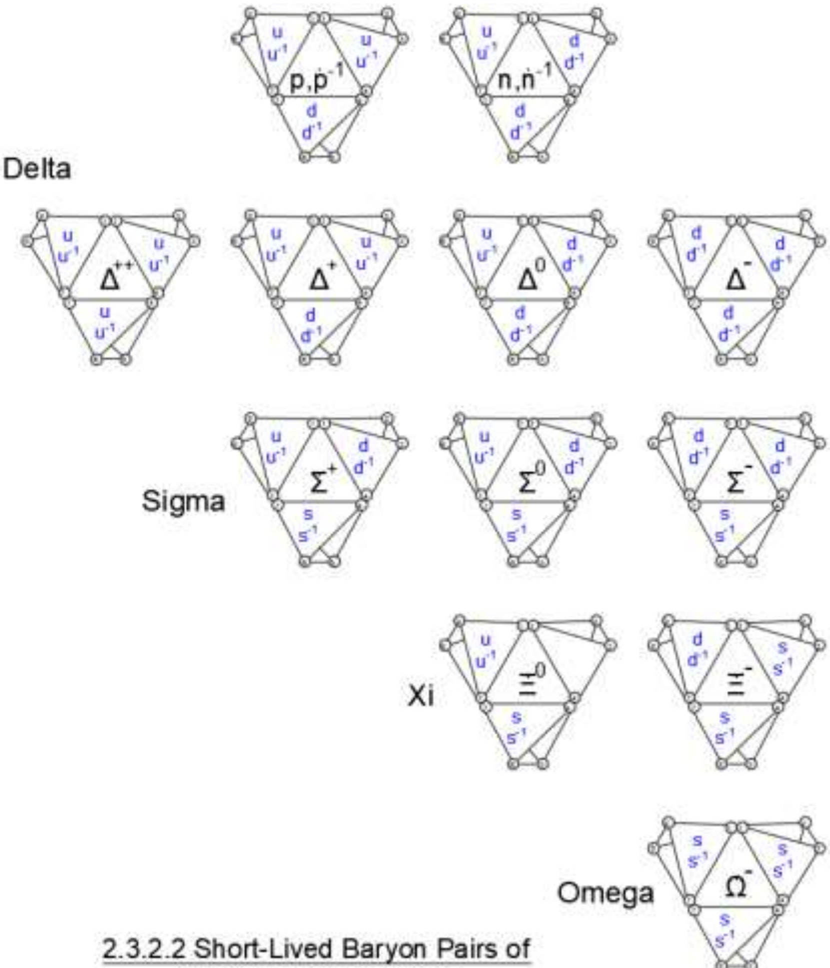
2.3.2 Baryons

2.3.2.1 Matter Baryons



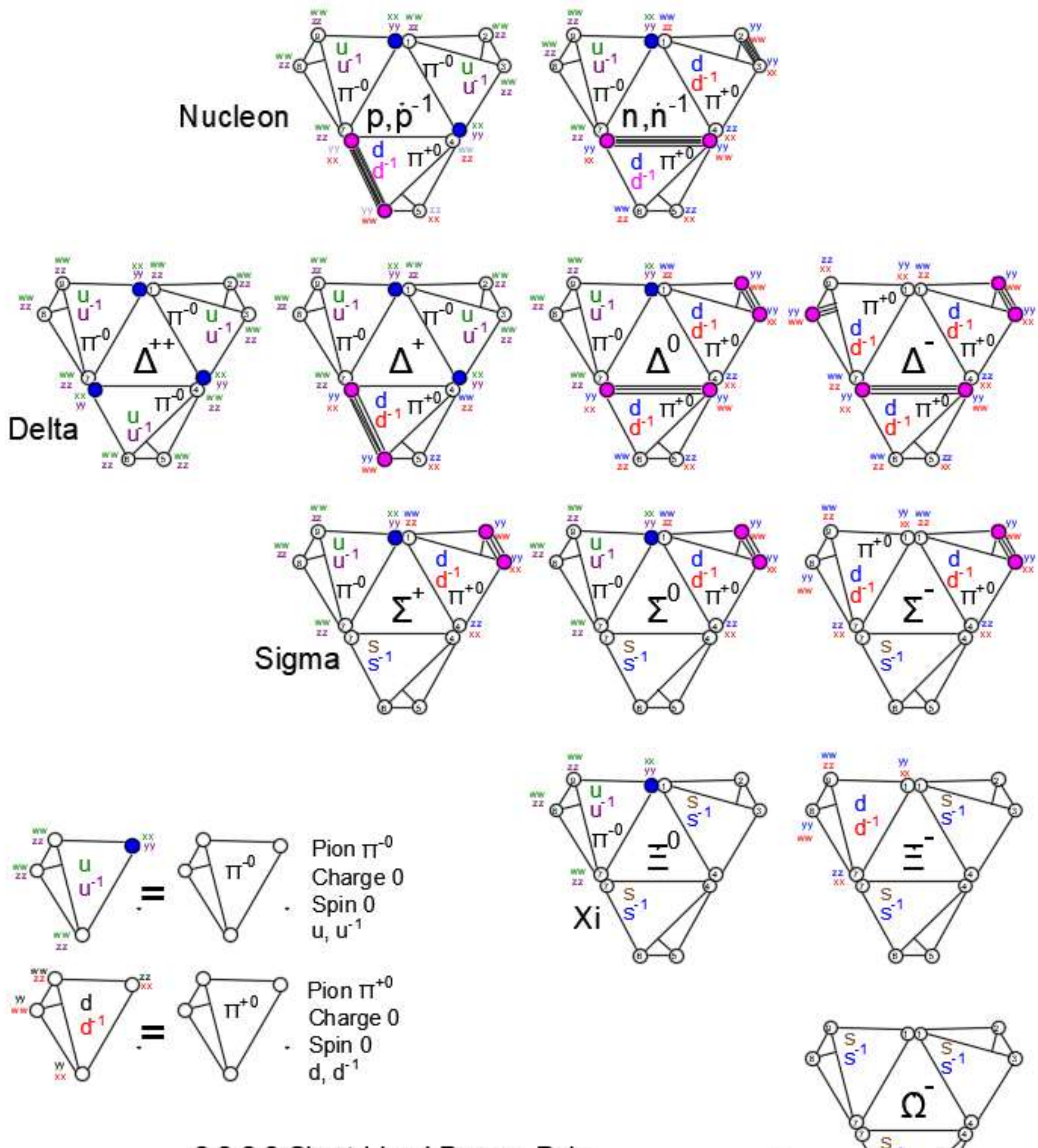
2.3.2.1 Matter Baryons

2.3.2.2 <u>Short-Lived Baryon Pairs of Matter and Anti-matter</u>



2.3.2.2 Short-Lived Baryon Pairs of Matter and Anti-matter

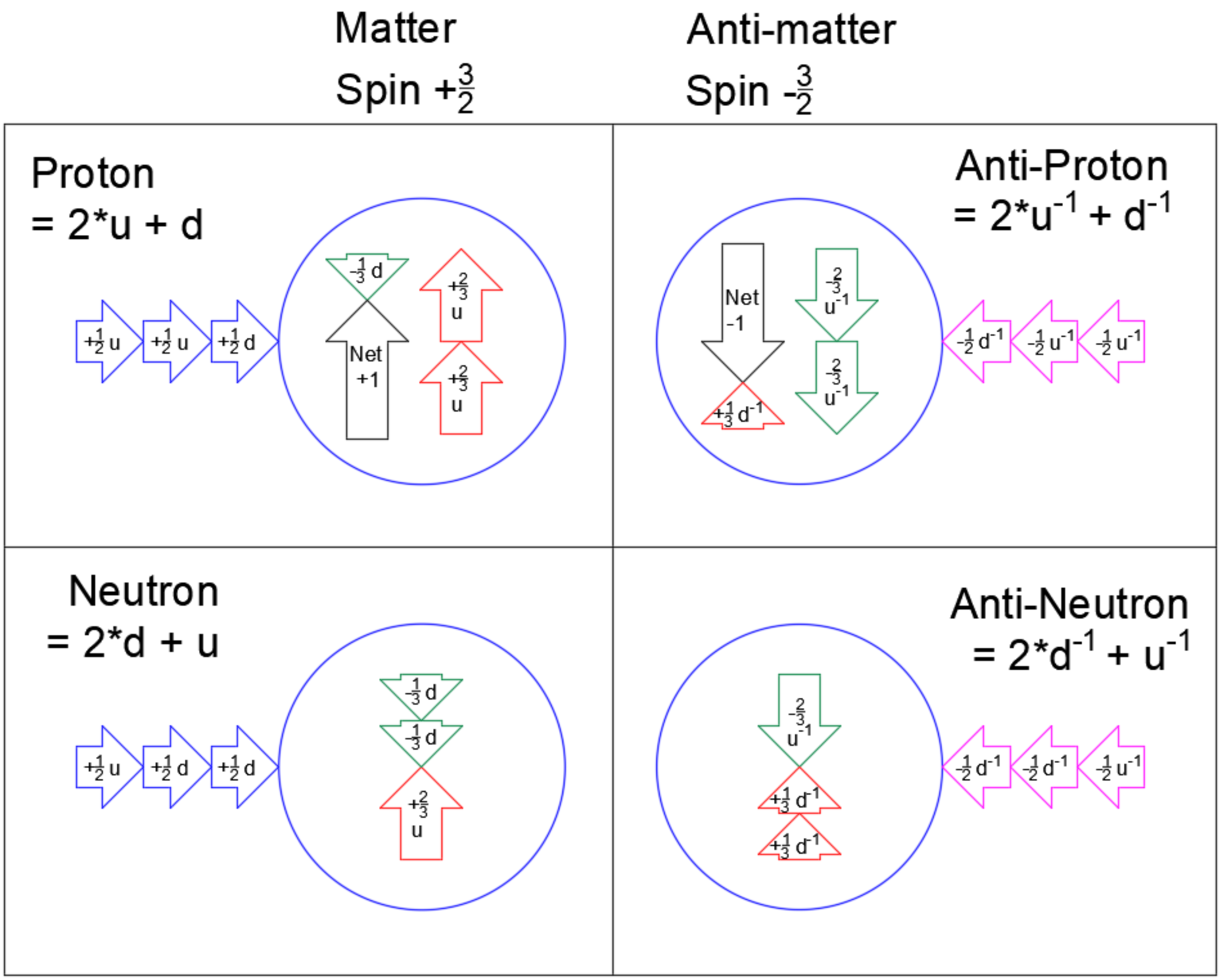
2.3.2.3 Short-Lived Baryon Pairs Composed of Neutral Pions



2.3.2.3 Short-Lived Baryon Pairs Composed of Neutral Pions

2.3.3 Nucleons & Gluons

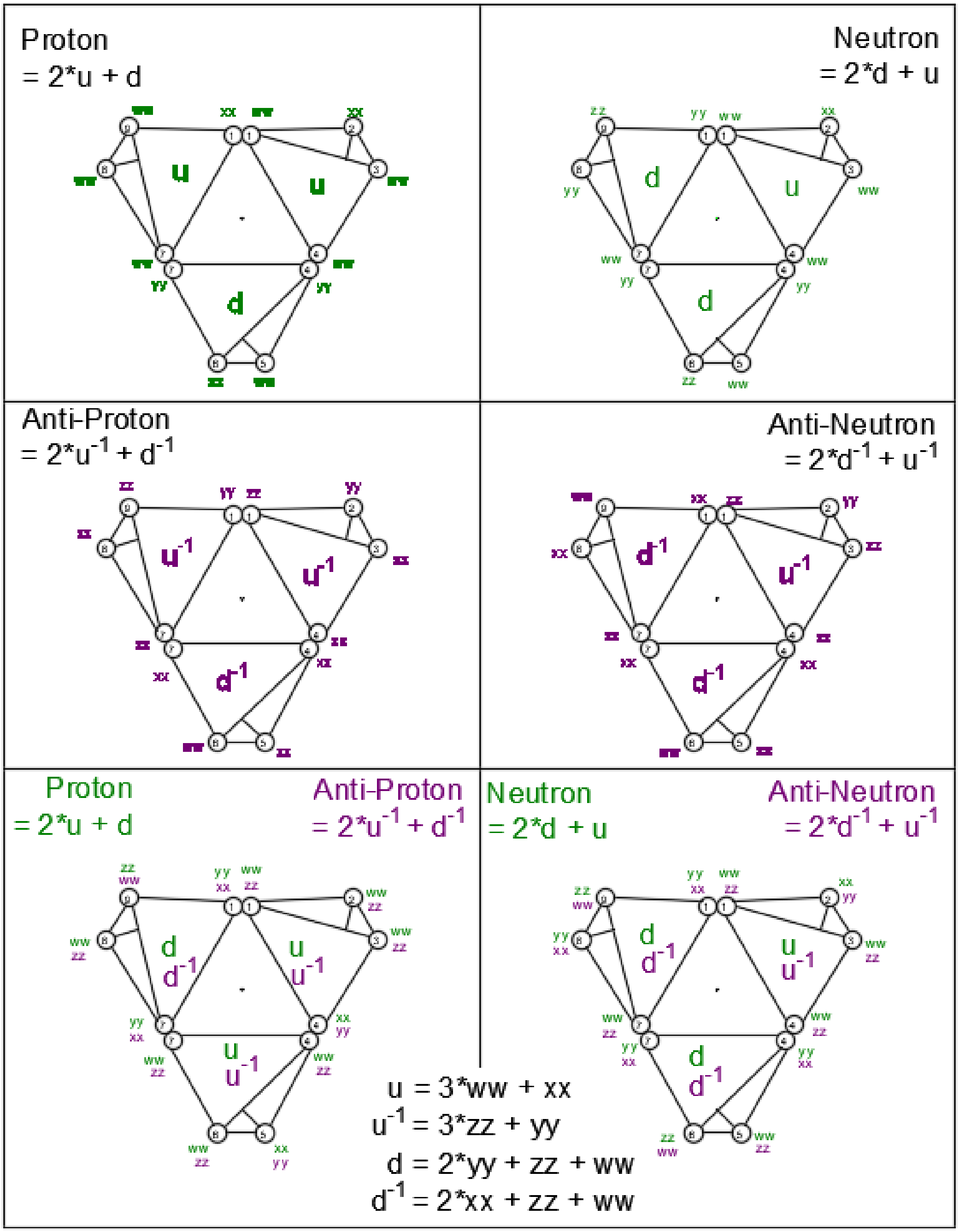
2.3.3.1 Nucleons



2.3.3.1 Nucleons

2.3.3.3 Particle Pairs

Matter particles and their anti-matter 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

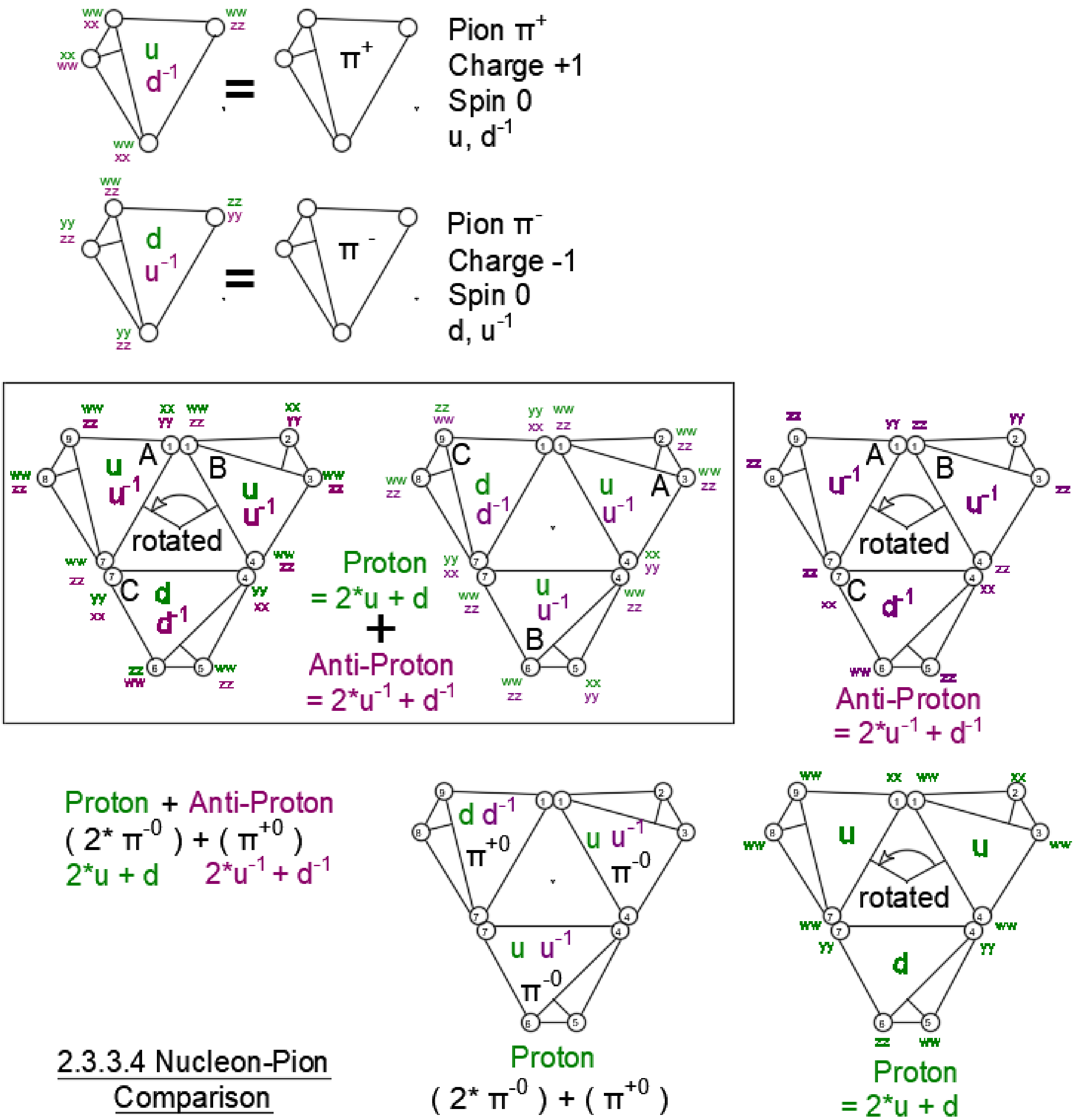


Proton congruent with anti-proton

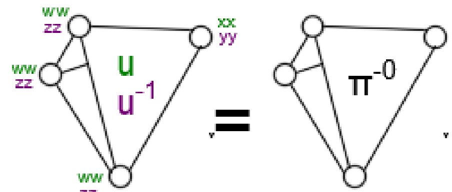
Neutron congruent with anti-neutron

2.3.3.3 Particle Pairs

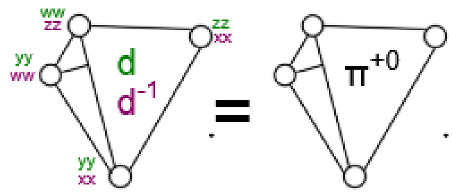
2.3.3.4 <u>Nucleon-Pion Comparison</u>

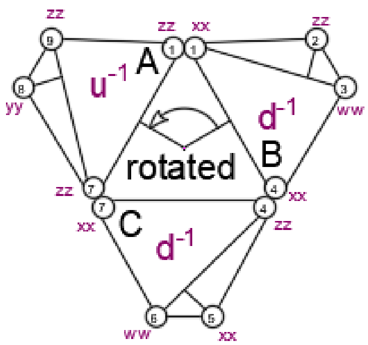


Pion π^{-0}
Charge 0
Spin 0
u, u^{-1}

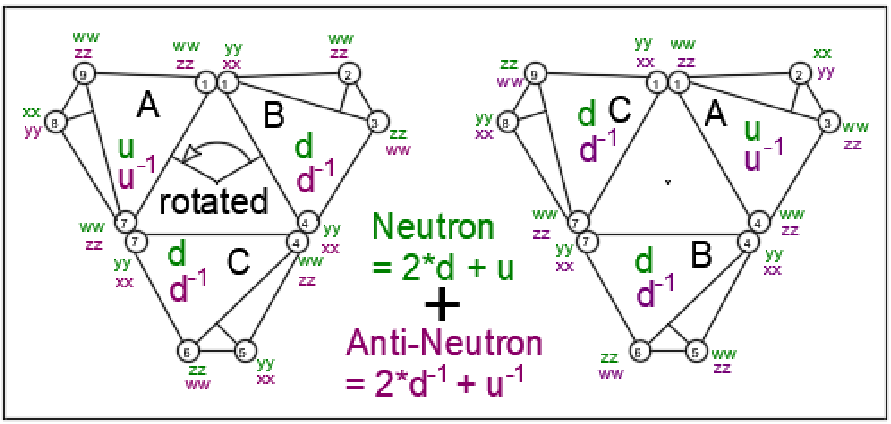


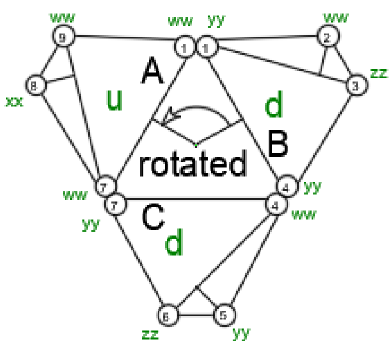
Pion π^{+0}
Charge 0
Spin 0
d, d^{-1}



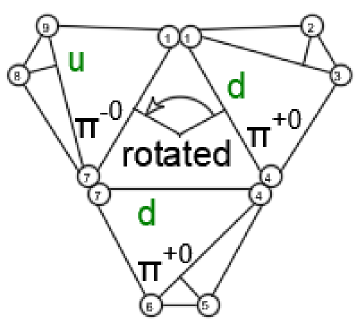


Anti-Neutron
= 2*d^{-1} + u^{-1}





Neutron
= 2*d + u

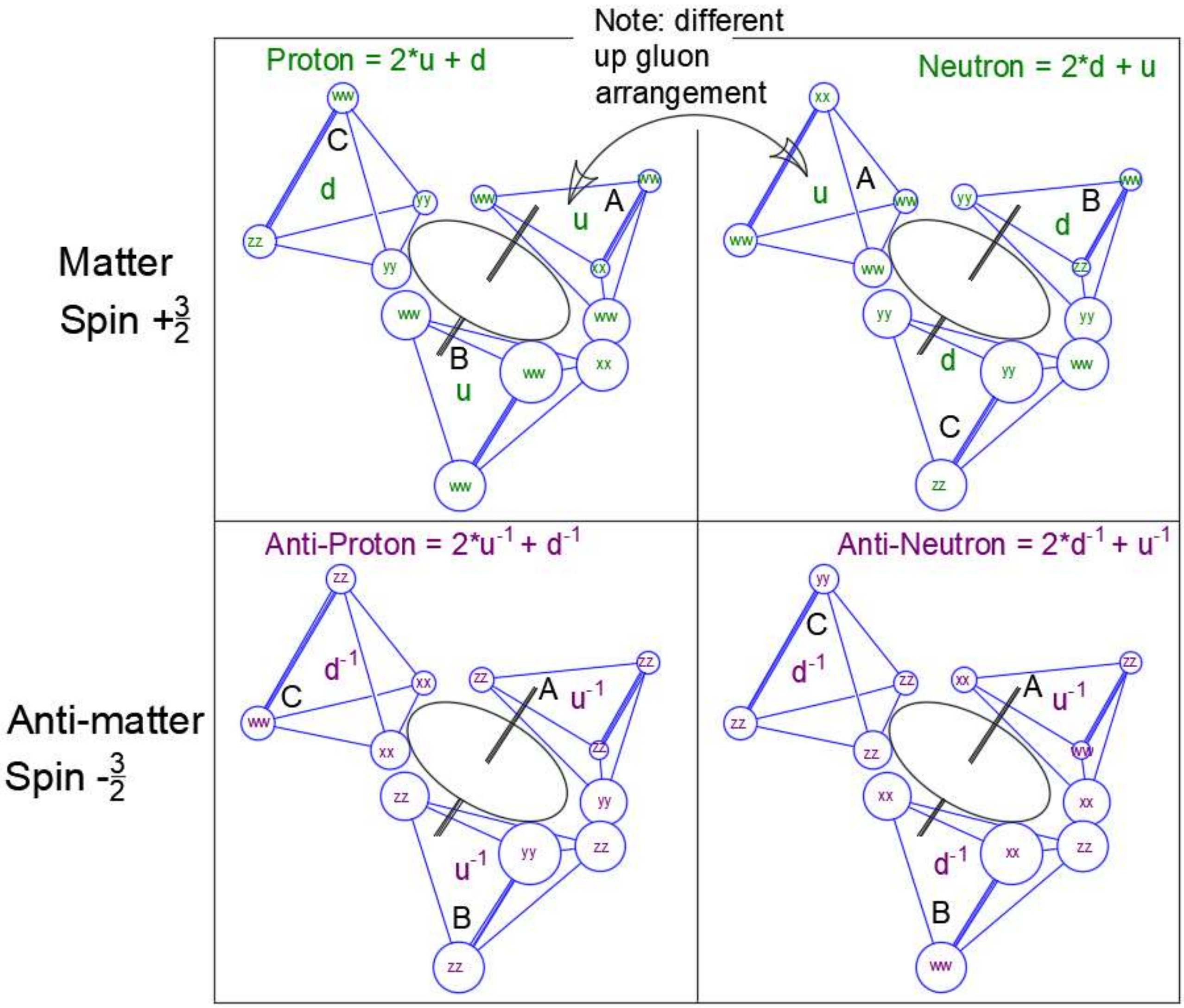


Neutron
(2* π^{+0}) + (π^{-0})

Neutron + Anti-Neutron
(2* π^{+0}) + (π^{-0})
2*d + u 2*d^{-1} + u^{-1}

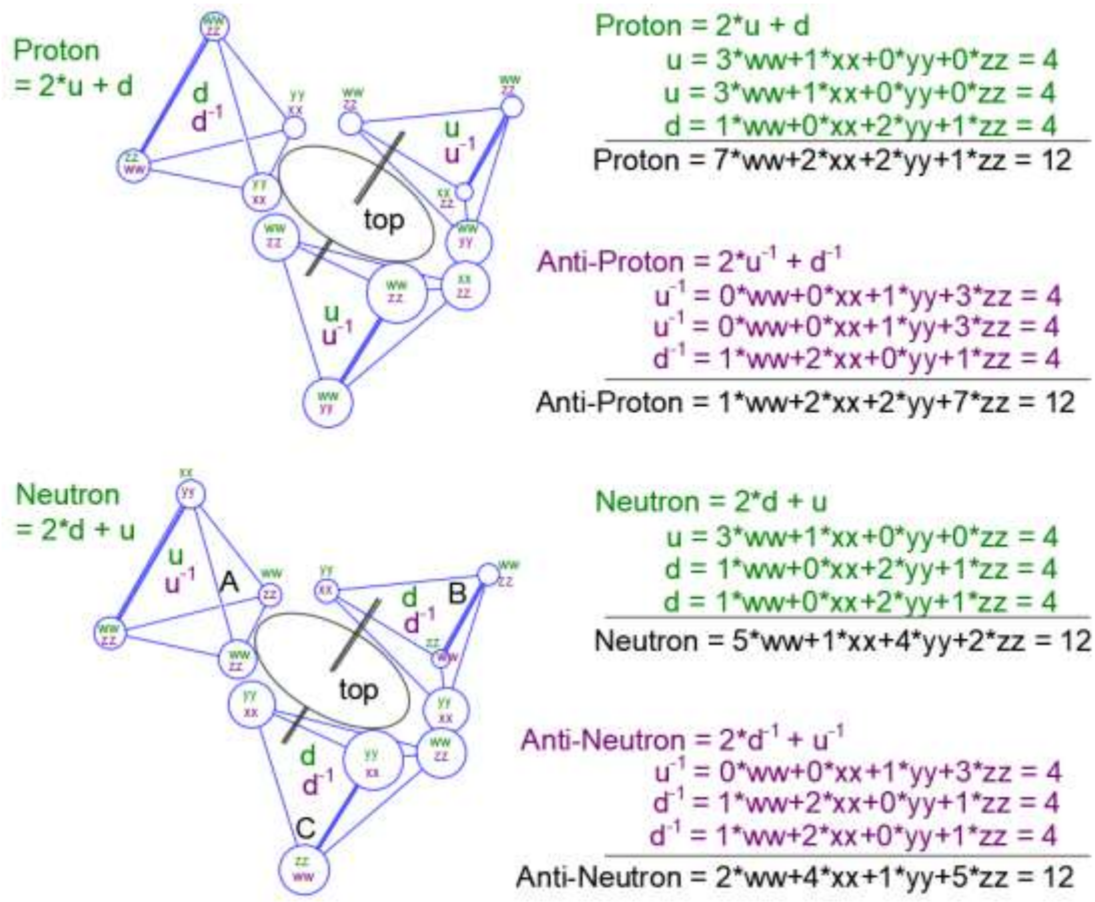
2.3.3.4 Nucleon-Pion Comparison

2.3.3.5 Nucleons Pictorial



2.3.3.5 Nucleons Pictorial

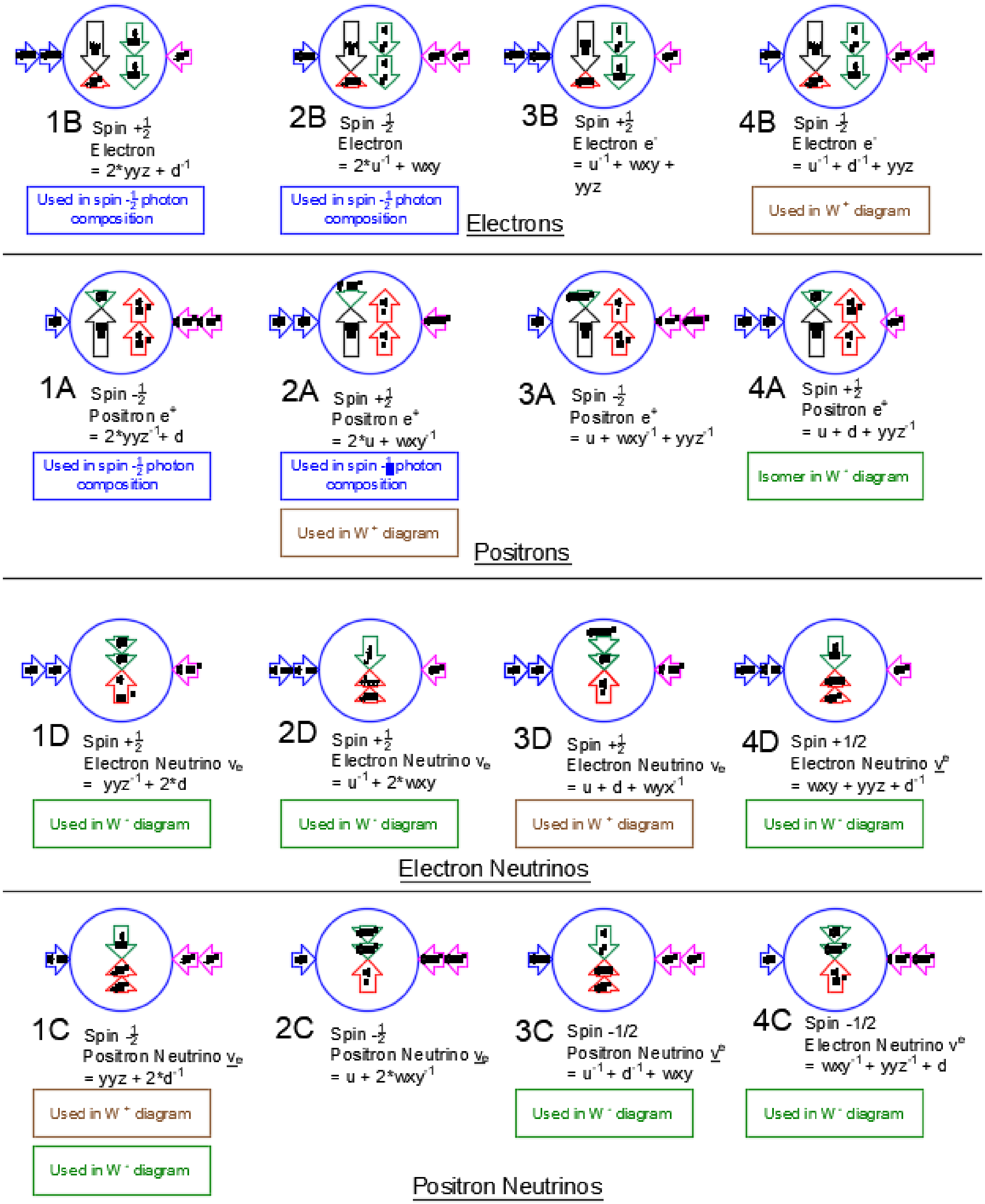
2.3.3.6 Nucleon Matter and Anti-matter Pairs



2.3.3.6 Nucleon Matter and Anti-matter Pairs

2.3.4 Lepton Isotopes and Isomers

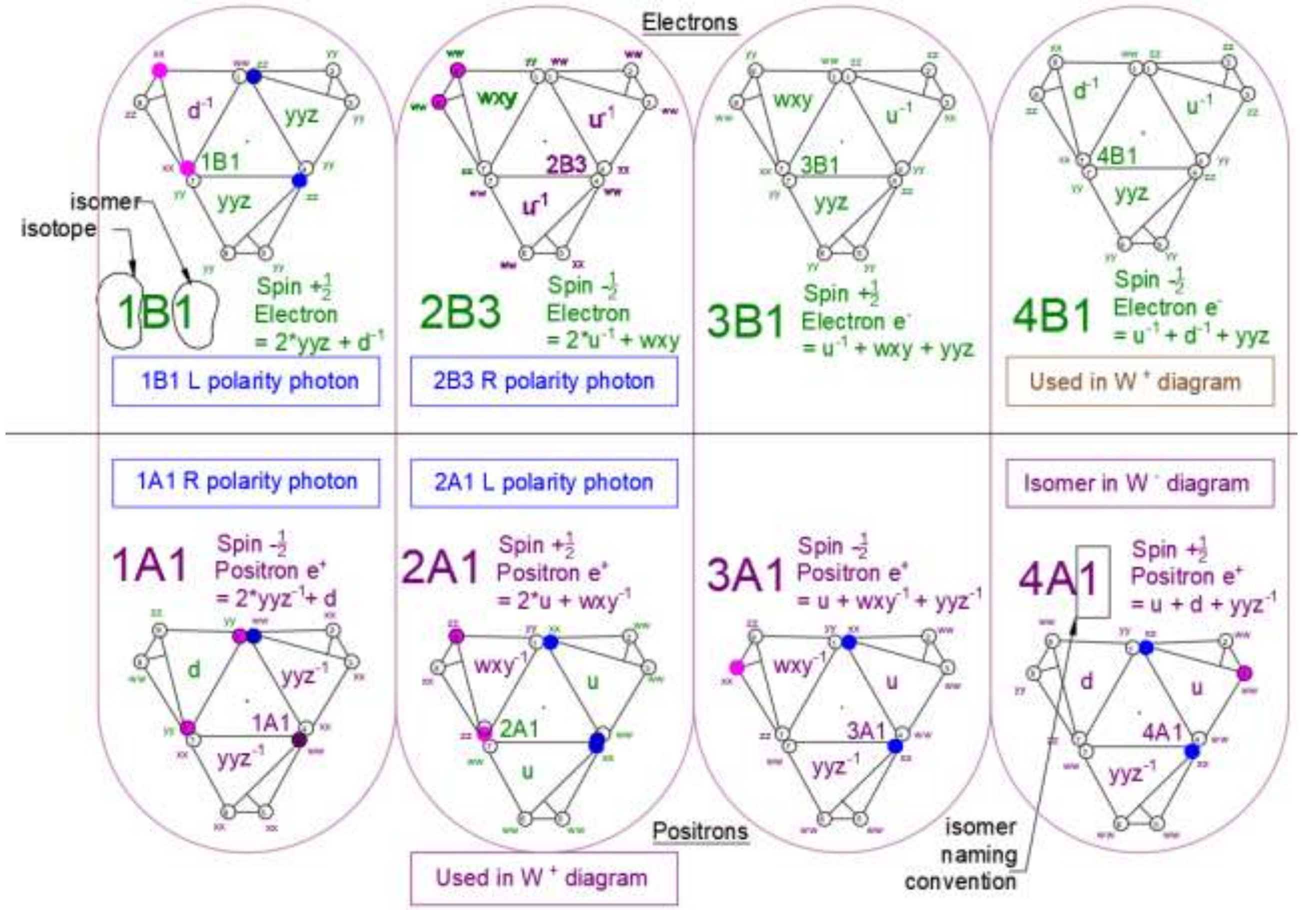
2.3.4.1 Example Lepton Isotopes

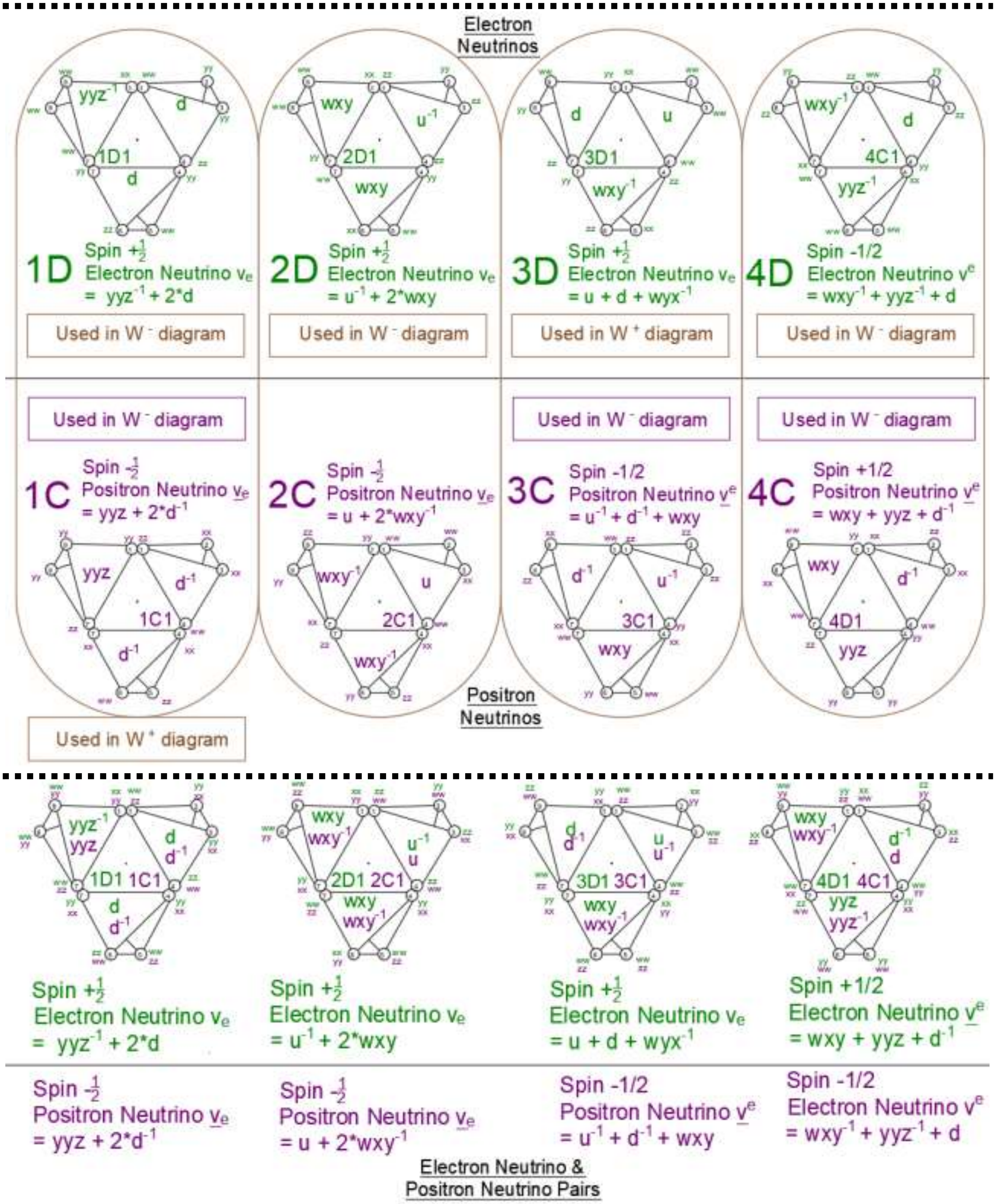


2.3.4.1 Example Lepton Isotopes

2.3.4.2 Example Lepton Isotopes with Sub-quark Positions

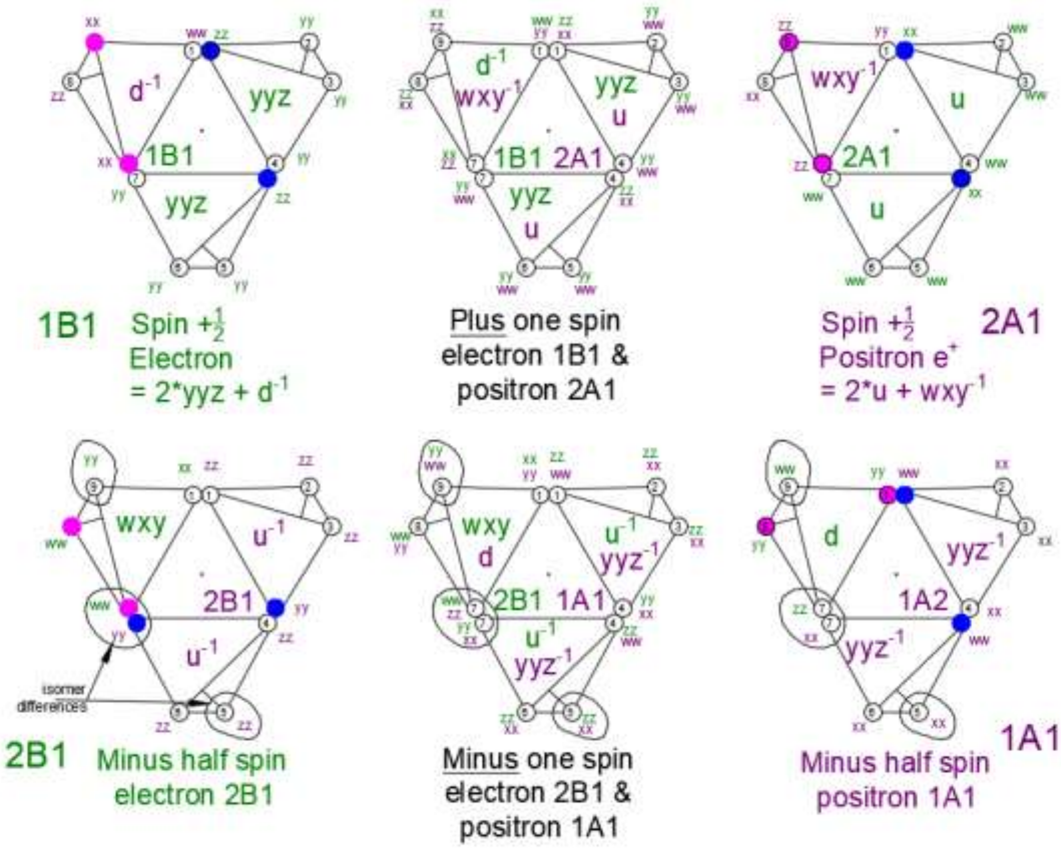
Electrons and positrons work in same spin pairs that occupy 1/2 of an electron orbit. The opposite spin pair occupies the other 1/2 of the orbit. Neutrinos work in opposite spin pairs that cancel one another's spin and charge so they can pass thru space without interacting with matter or anti-matter particles. Although the matter and anti-neutrinos are electrically neutral, they need to be spin zero in a pair to not have its sub-quarks interact with nearby sub-quarks to form a gluon. The exception to this is the beta reaction, discussed later.

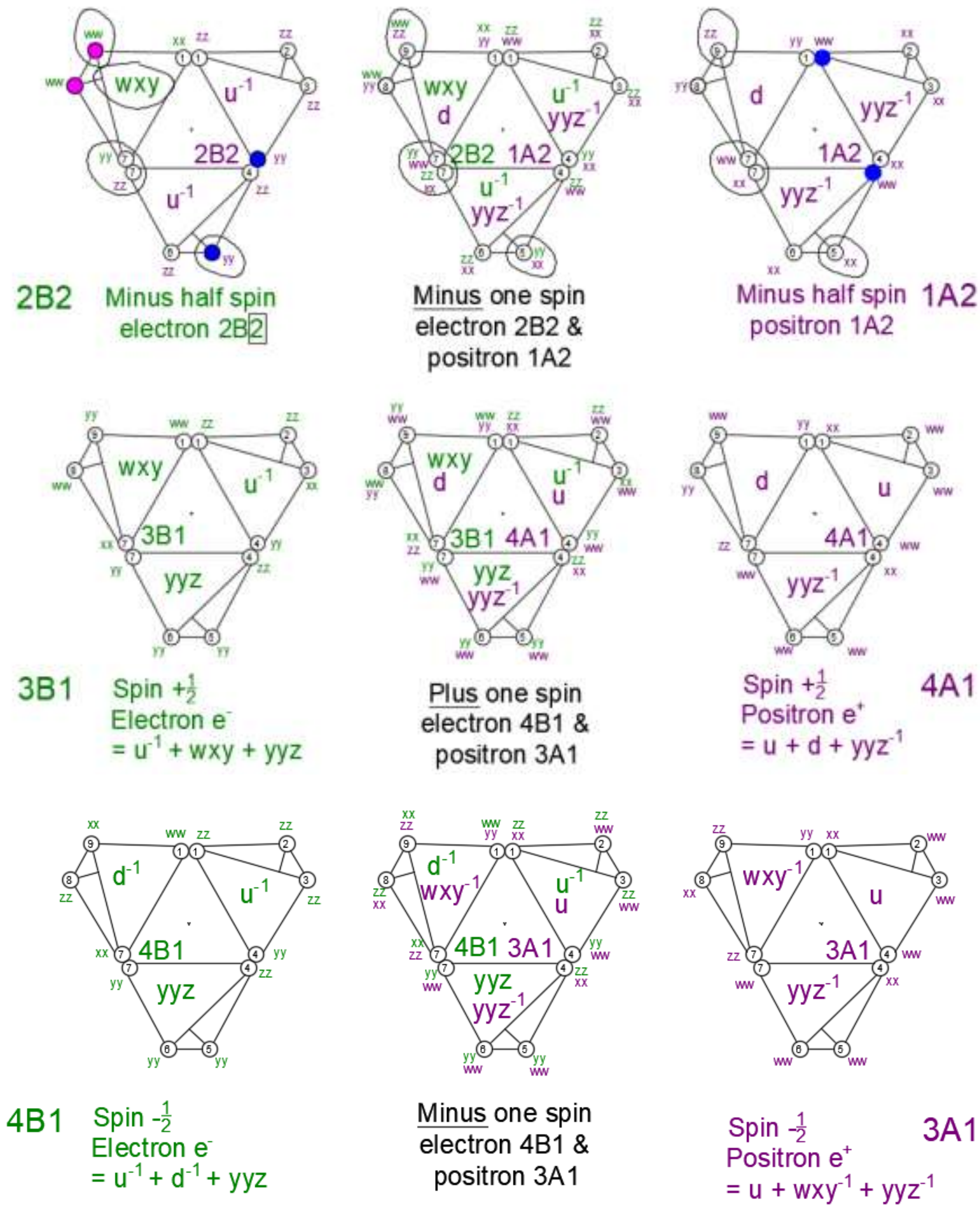




2.3.4.2 Example Lepton Isotopes With Sub-quark Positions

2.3.4.3 Example Non-Mirror Pairs of Electron and Positron

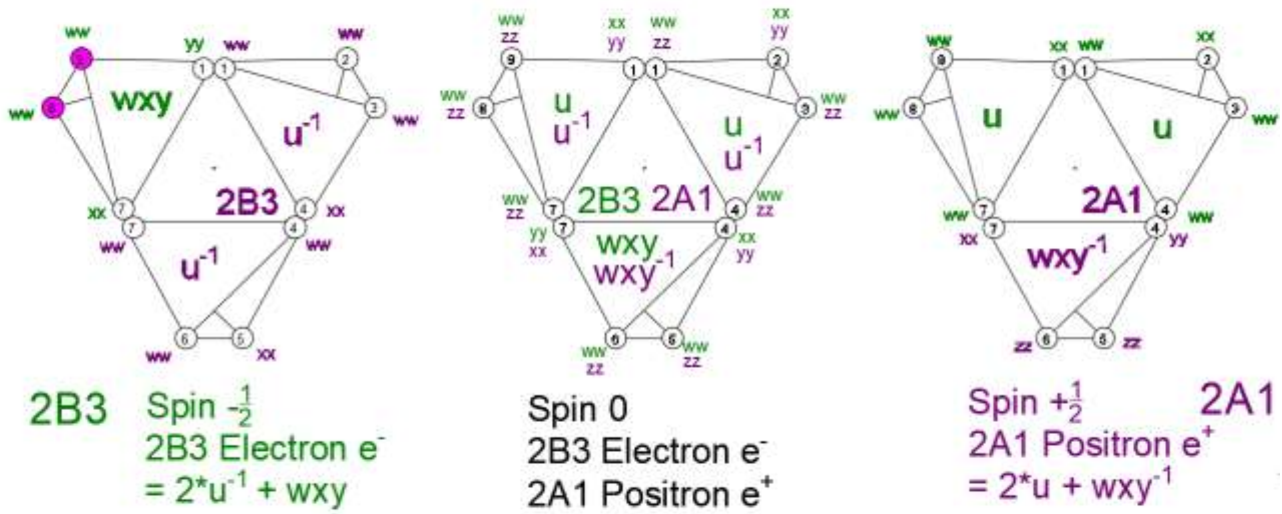




2.3.4.3 Example Non-Mirror Pairs of Electron and Positron

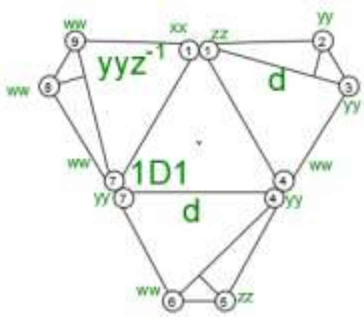
2.3.4.4 Example Mirror Pair of Electron and Positron

The beta reaction (discussed later) requires spin of electron plus positron be zero, such as this pair

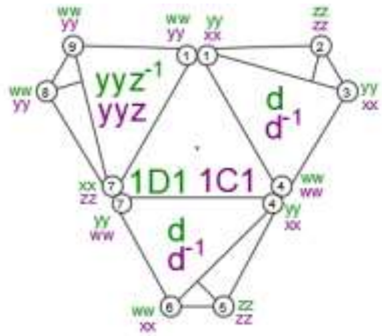


2.3.4.4 Example Mirror Pair of Electron and Positron

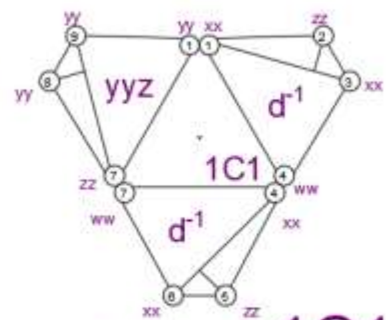
2.3.4.5 Electron + Positron Neutrino Pair Isomers



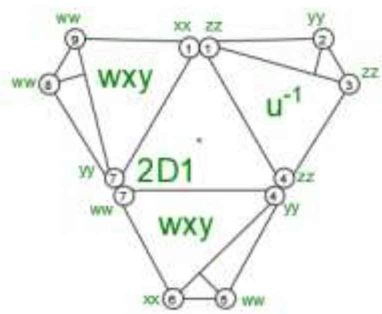
1D1 Spin $+\frac{1}{2}$
Electron Neutrino ν_e
$= yyz^{-1} + 2*d$



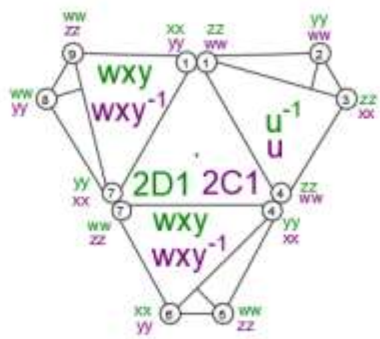
Spin 0
Electron Neutrino ν_e
Positron Neutrino $\underline{\nu}_e$



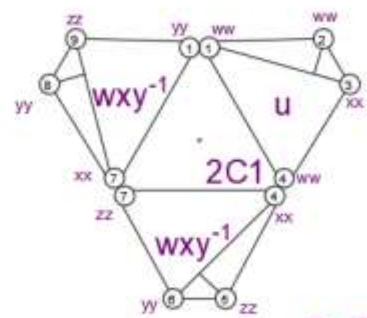
Spin $-\frac{1}{2}$ 1C1
Positron Neutrino $\underline{\nu}_e$
$= yyz + 2*d^{-1}$



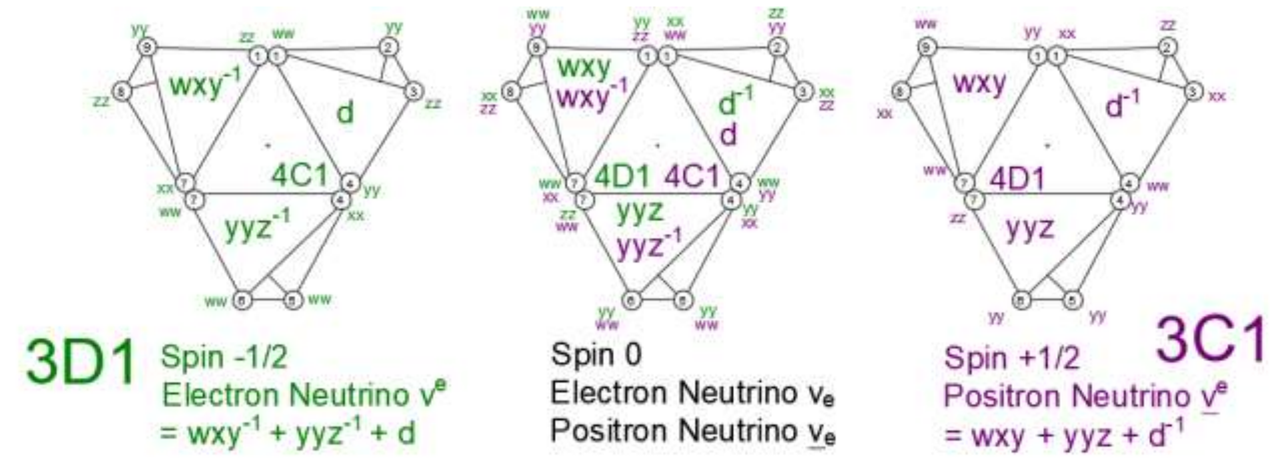
2D1 Spin $+\frac{1}{2}$
Electron Neutrino ν_e
$= u^{-1} + 2*wxy$

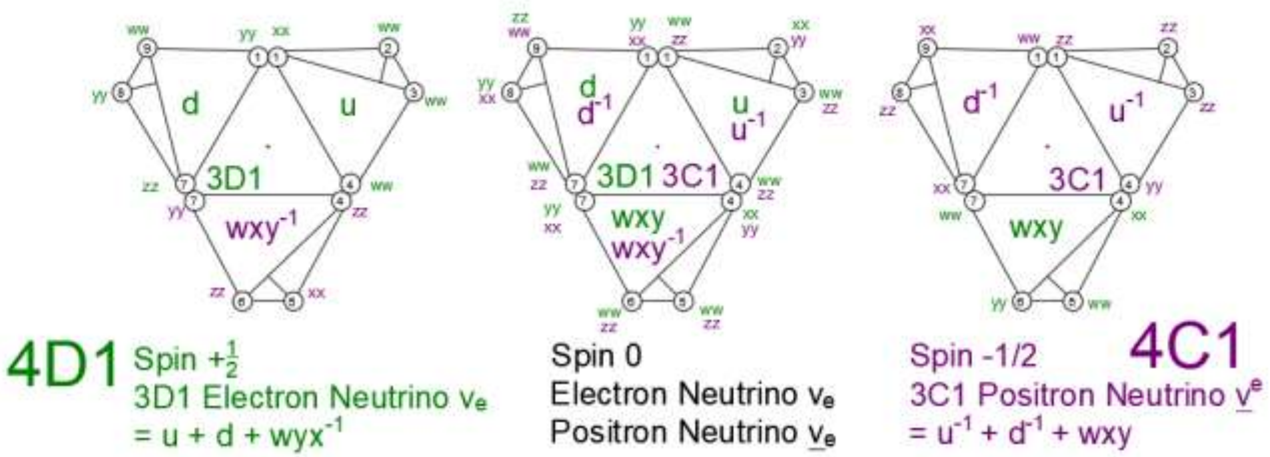


Spin 0
Electron Neutrino ν_e
Positron Neutrino $\underline{\nu}_e$



Spin $-\frac{1}{2}$ 2C1
Positron Neutrino $\underline{\nu}_e$
$= u + 2*wxy^{-1}$





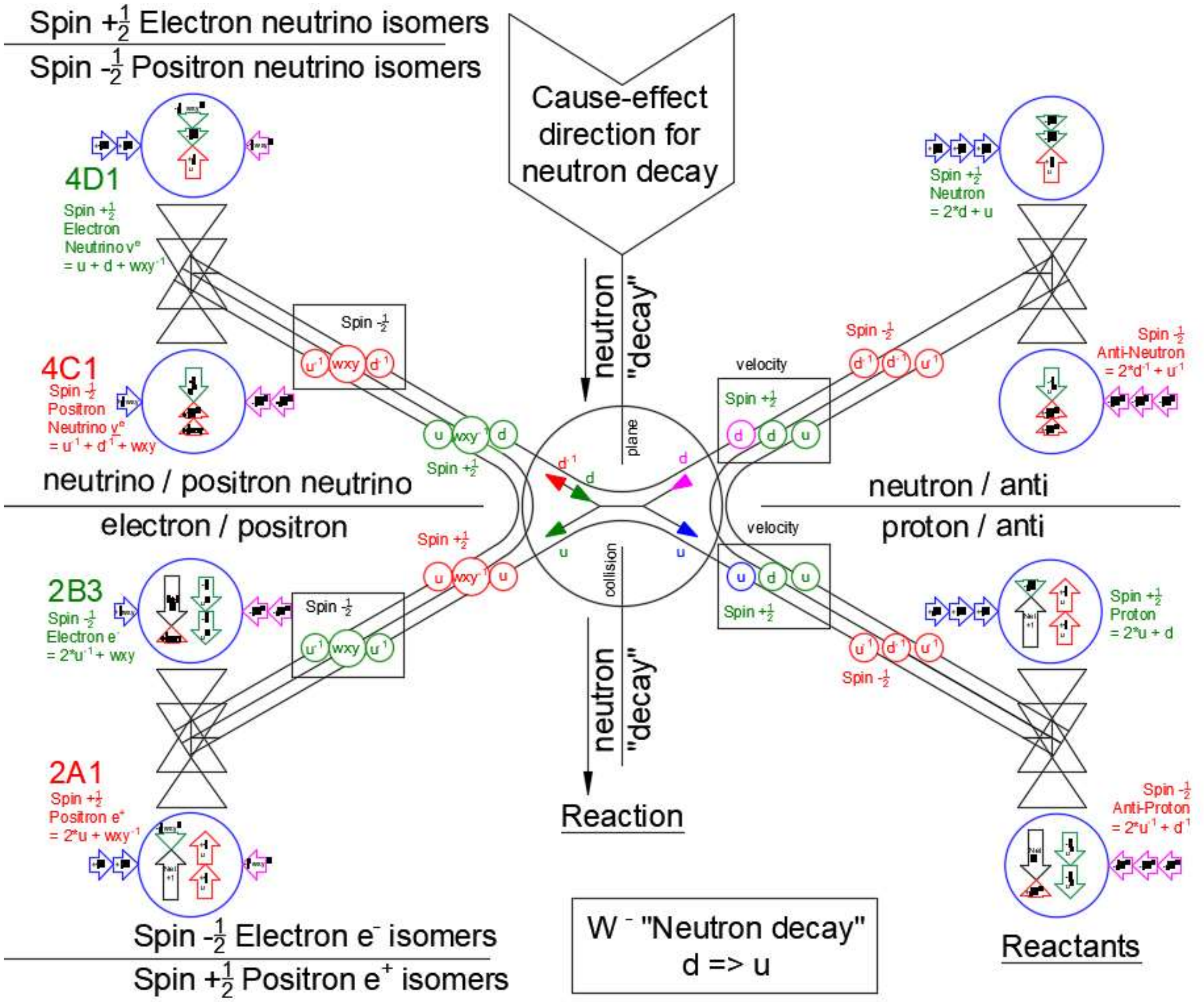
The example 2B3 electron and 2A1 positron pair used as one solution for the beta reaction (discussed later) most closely matches this 4D1 v_e and 4C1 $\underline{v}_e$ pair

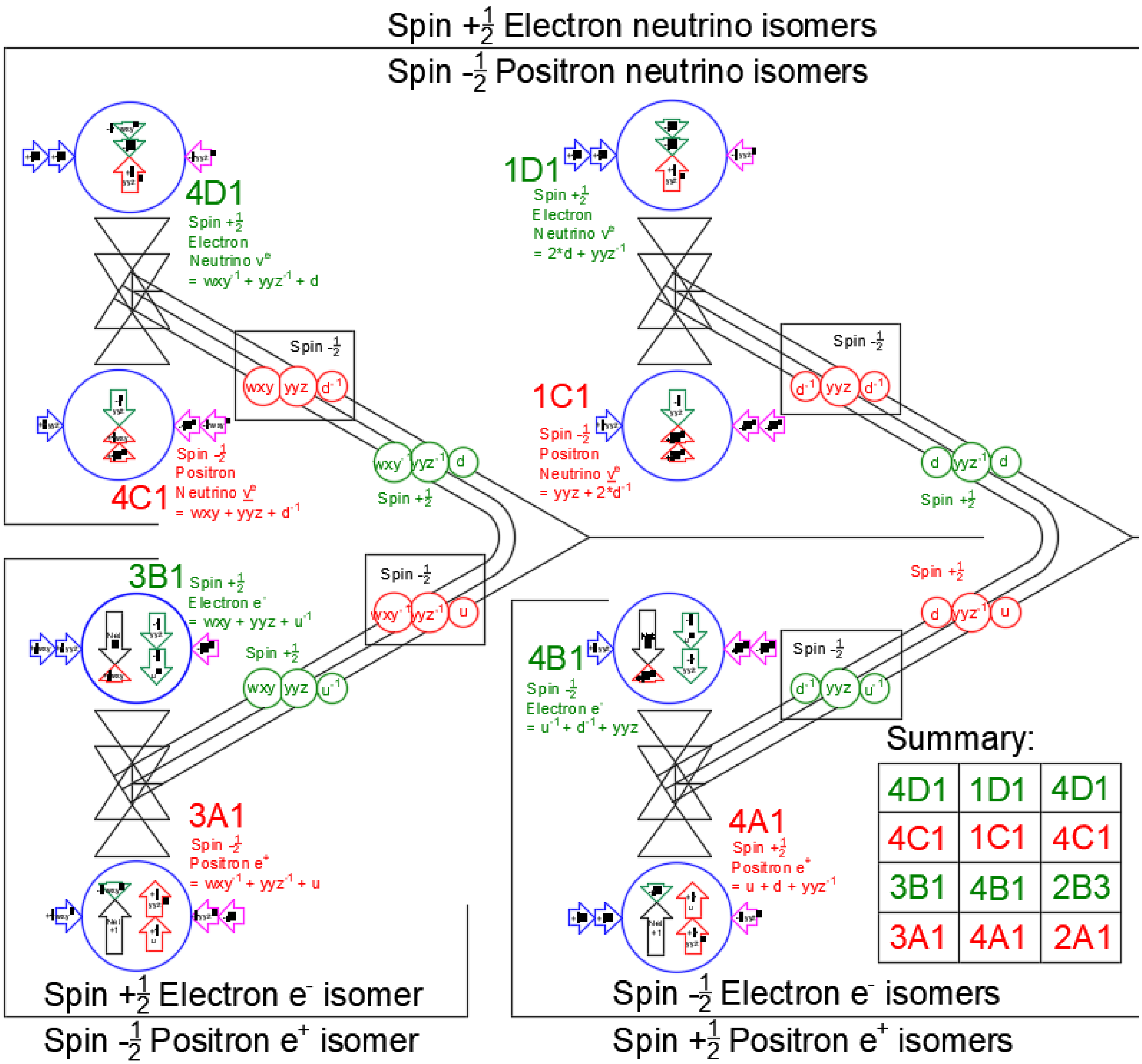
2.3.4.5 Electron + Positron Neutrino Pair Isomers

2.4 The Beta Reaction in Symbols

2.4.1 Beta Reaction Analysis

2.4.1.1 Candidate Isotopes on Trigger Side of Beta Reaction

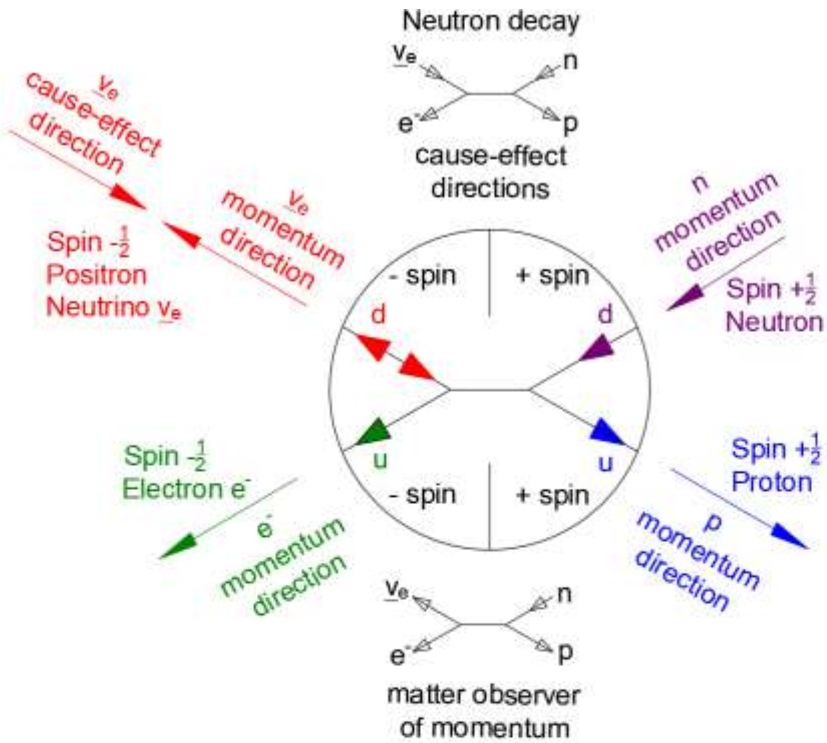




2.4.1.1 Candidate Isotopes on Trigger Side of Beta Reaction

2.4.1.4 Detail of the Neutron to Proton Reaction

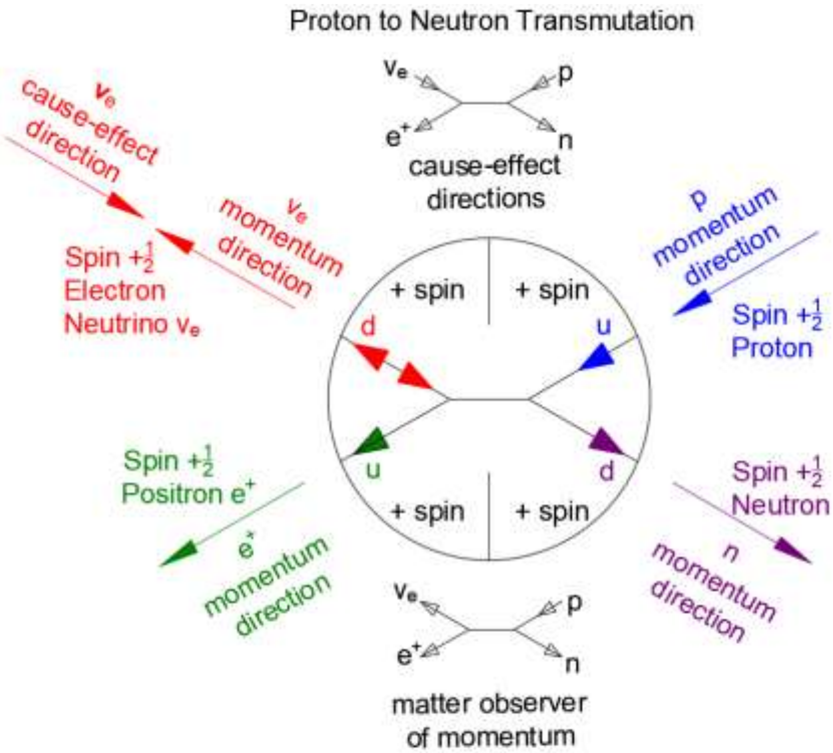
The negative spin of the positron neutrino is the source of the negative spin electron resulting from the neutron decay process. Predicted experimental observation is the electron exiting neutron decay is always negative spin



2.4.1.4 Detail of the Neutron to Proton Reaction

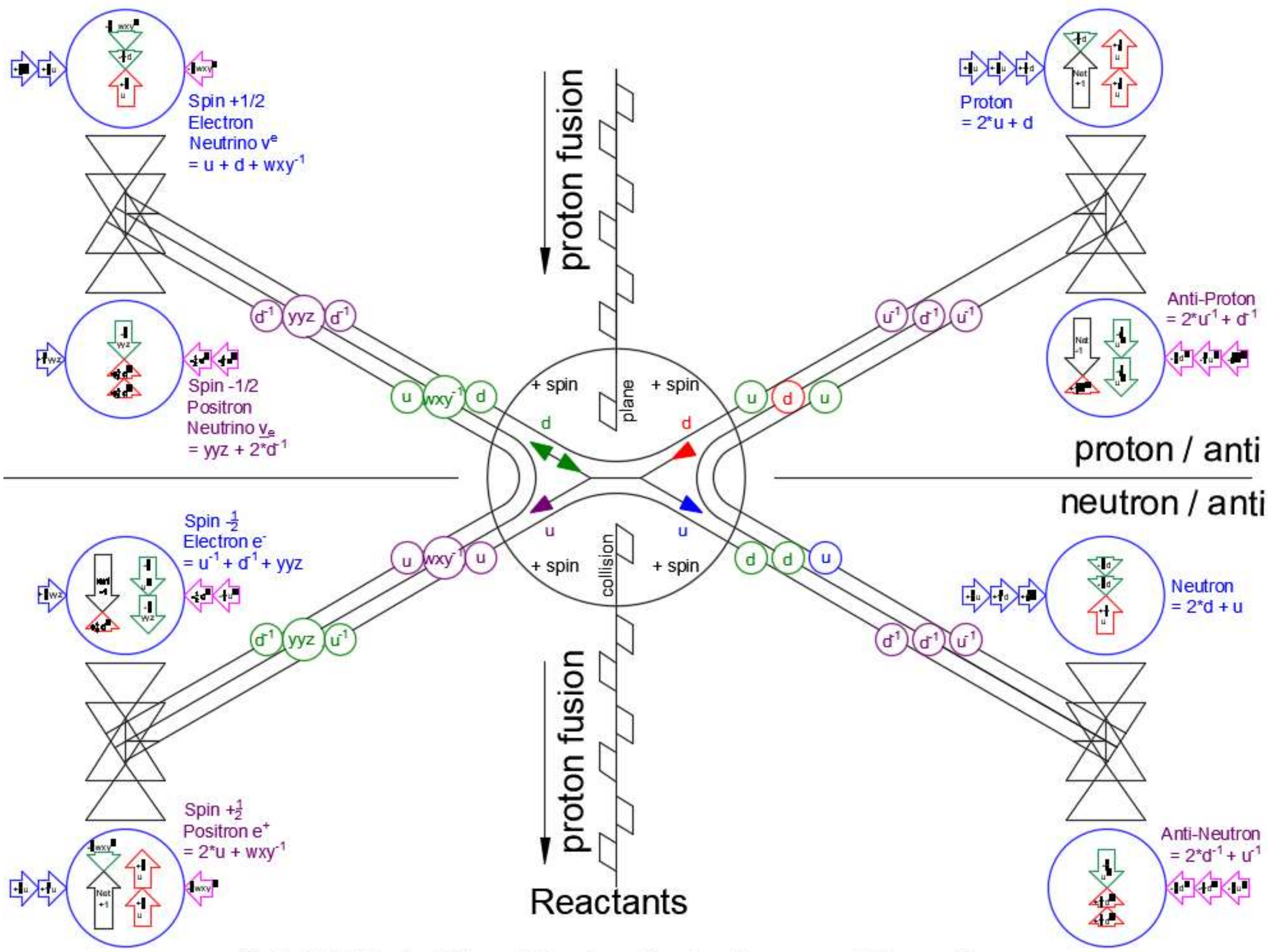
2.4.1.5 Detail of Proton to Neutron Reaction

The negative spin of the positron neutrino is the source of the negative spin positron resulting from the proton to neutron transmutation. Predicted experimental observation is electron exiting proton to neutron transmutation is always negative spin



2.4.1.5 Detail of Proton to Neutron Reaction

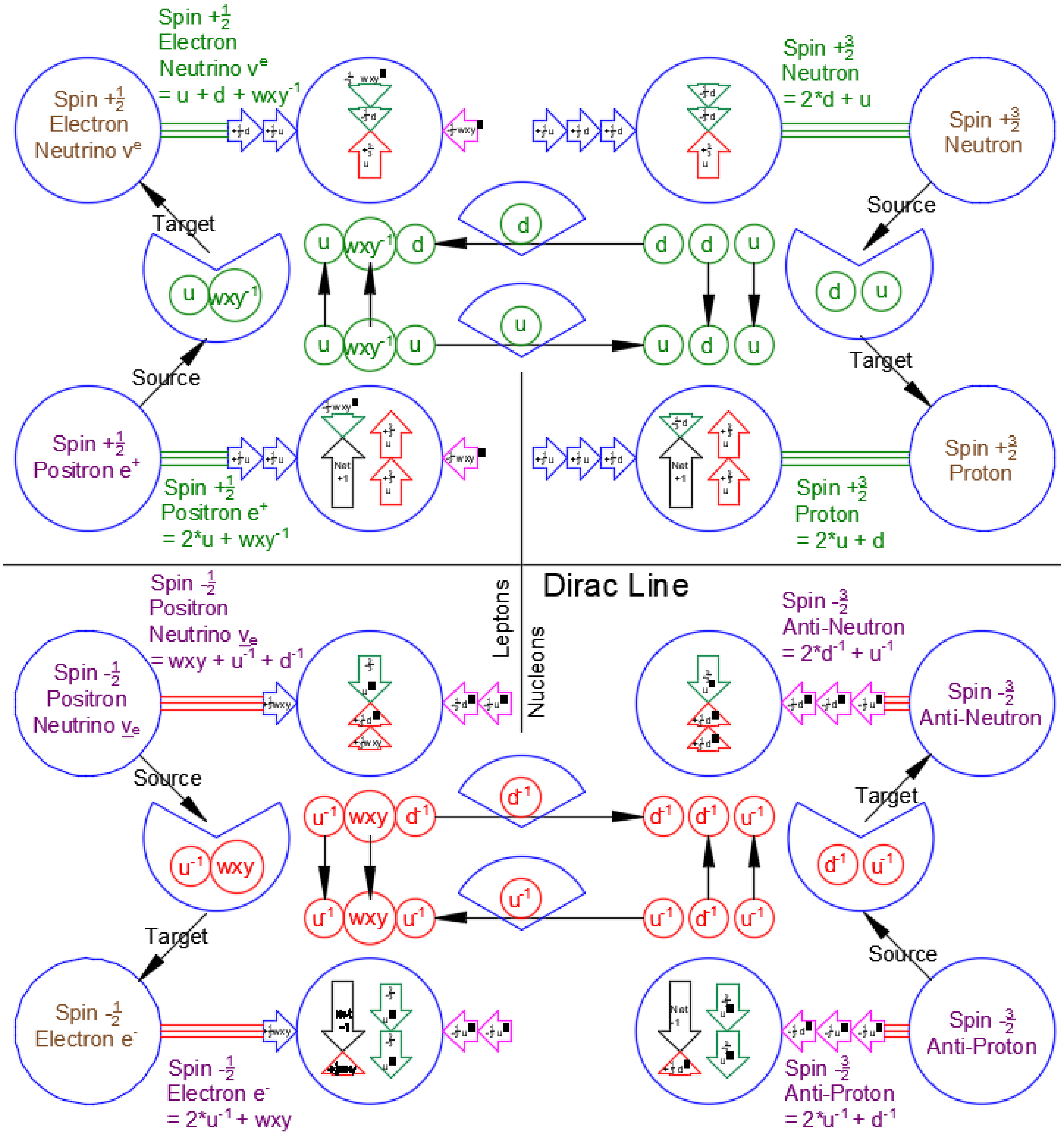
2.4.1.6 <u>Beta Plus Proton fusion u => d Reaction</u>



2.4.1.6 Beta Plus "Proton fusion" u => d Reaction

2.4.1.7 <u>Cause-Effect of Neutron to Proton Reaction</u>

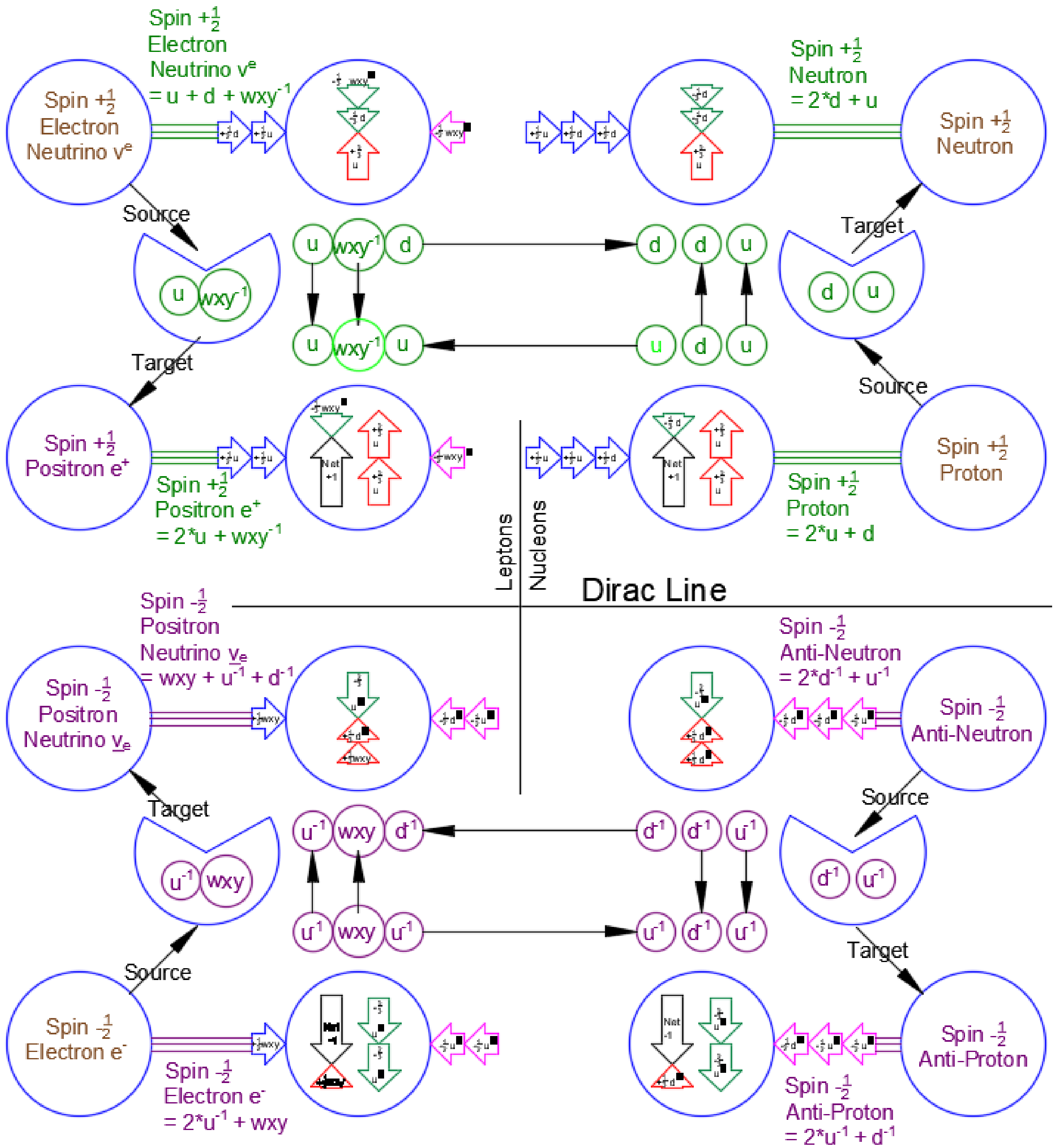
Cause-effect direction (source to target direction) is independent of the direction of movement. The spin -1/2 positron neutrino has direction of movement away from the reaction, but the cause-effect is towards the reaction. This positron neutrino is the cause of the reaction. The observation of the positron neutrino leaving the reaction is misleading, causing this reaction to be mislabeled as the neutron decay. Common sense tells us a particle leaving a reaction did not cause the reaction. Common sense does not govern the nature of anti-matter. Experimental prediction is the electron output of "neutron decay" is spin -1/2



2.4.1.7 Cause-Effect of Neutron to Proton Reaction

2.4.1.8 Cause-Effect of Proton to Neutron Reaction

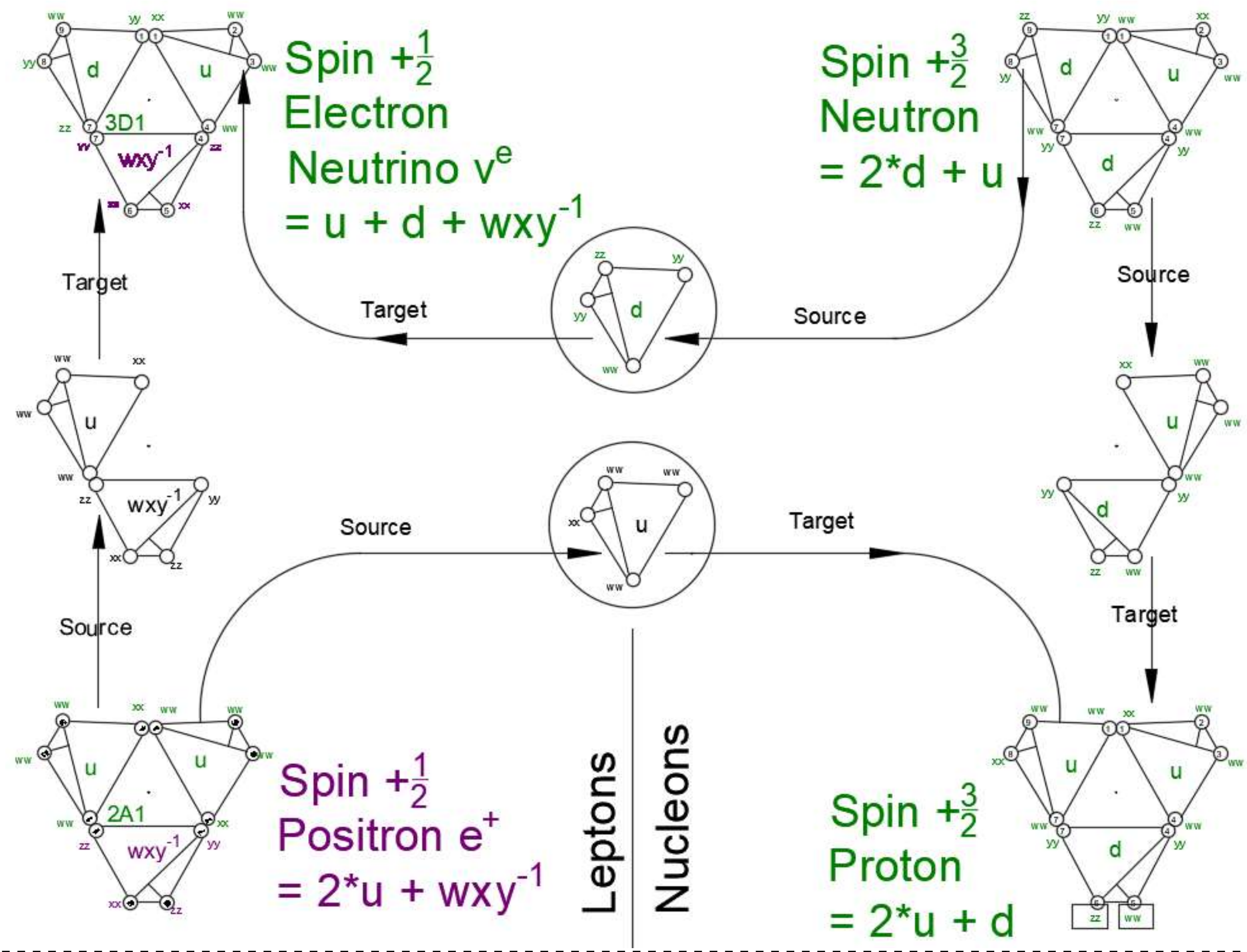
Cause-effect direction (source to target direction) is independent of the direction of movement. The spin -1/2 positron neutrino has direction of movement away from the reaction, but the cause-effect is towards the reaction. This positron neutrino is the cause of the reaction. The observation of the positron neutrino leaving the reaction is misleading, causing this reaction to be mislabeled as the neutron decay. Common sense tells us a particle leaving a reaction did not cause the reaction. Common sense does not govern the nature of anti-matter.

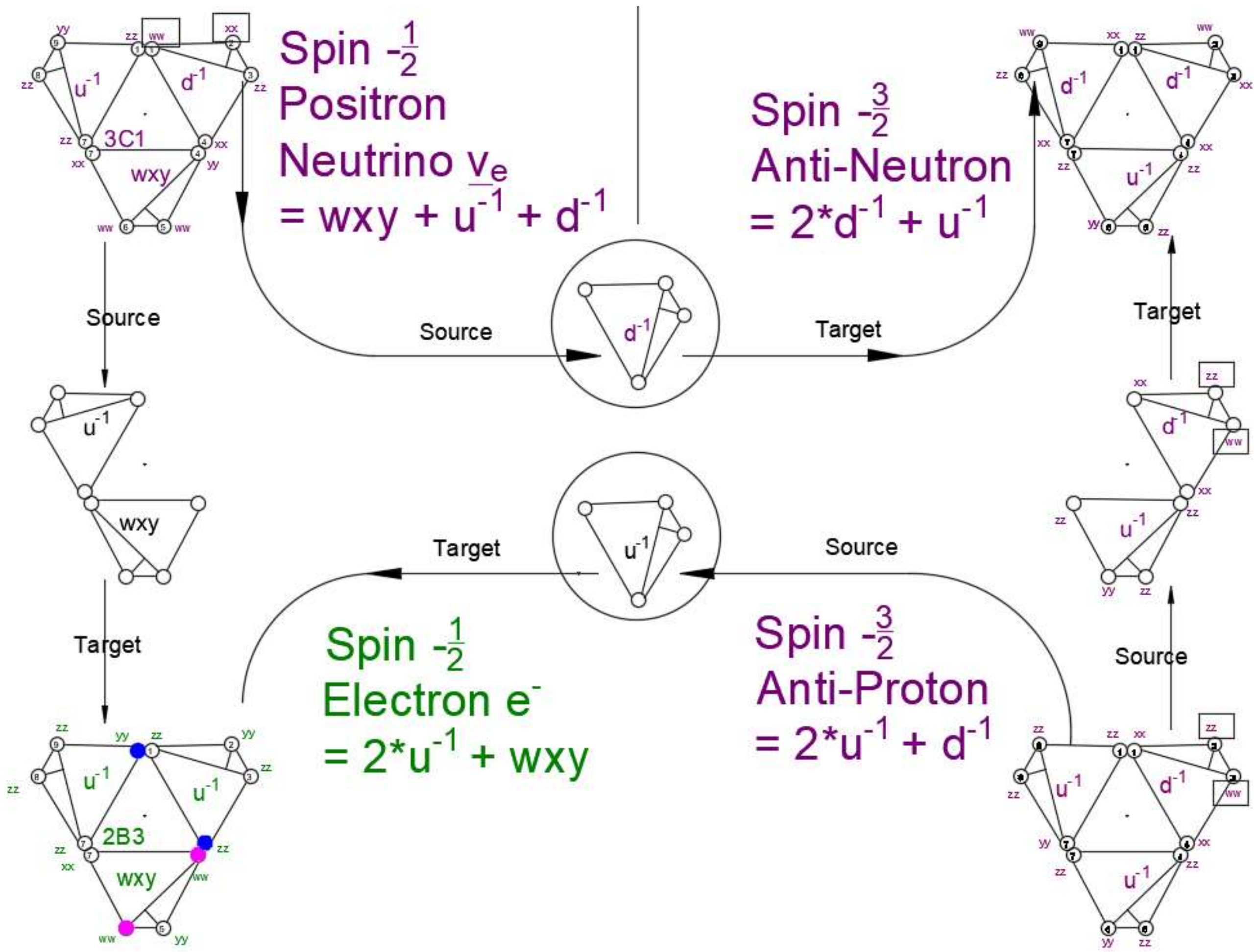


2.4.1.8 Cause-Effect of Proton to Neutron Reaction

2.4.1.9 Flat Symbol Version of Neutron to Proton Reaction

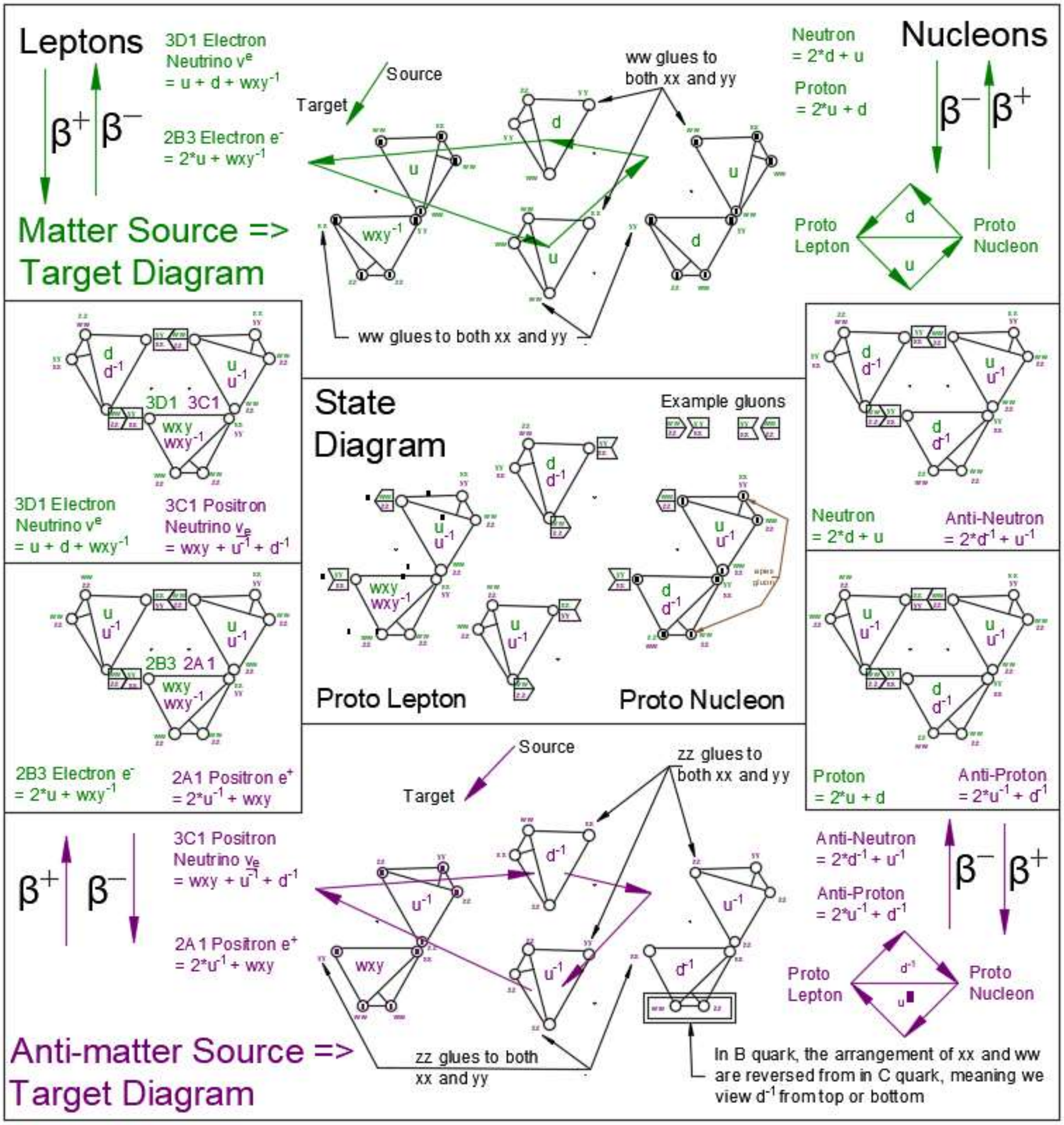
The quarks do not move in this reaction. They just change grouping into different particles. For a given pair, it is both a source and a target, which balances cause-effect.

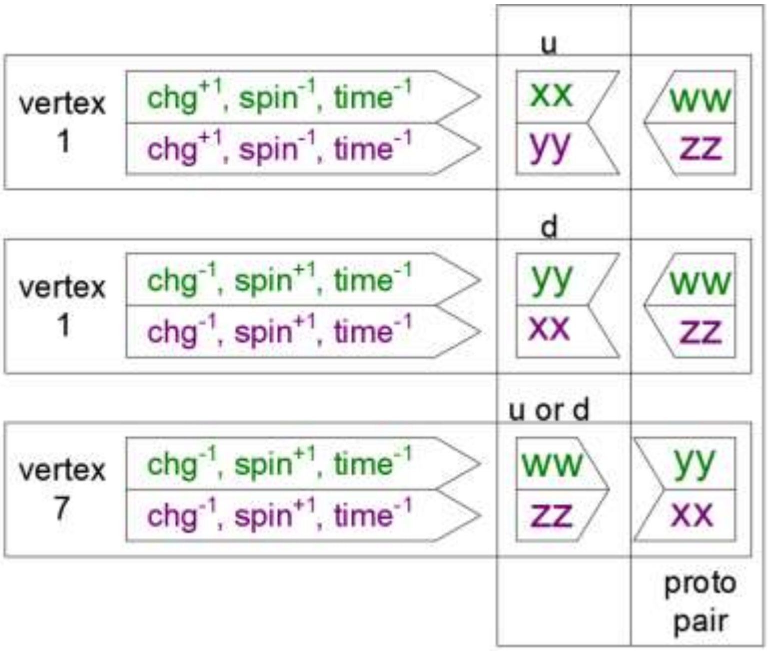




2.4.1.10 Beta Reaction State Diagram

By combining the upper matter and lower anti-matter source => target diagrams, we obtain a state diagram where source and target characteristics cancel. This state diagram is timeless because no movement or momentum exists. The state diagram also cancels the plus and minus nature of beta reactions. Besides being valid for other isomers of these particles, this pattern of fitting timeless quarks into gluons applies to any quark occupant of that position.


Leptons
3D1 Electron Neutrino ve = u + d + wxy-1
2B3 Electron e- = 2*u + wxy-1
Source
Target
ww glues to both xx and yy
Neutron = 2*d + u
Proton = 2*u + d
Nucleons
Proto Lepton
Proto Nucleon
Matter Source =>
Target Diagram
ww glues to both xx and yy
State Diagram
Example gluons
3D1 3C1
3D1 Electron Neutrino ve = u + d + wxy-1
3C1 Positron Neutrino ve = wxy + u-1 + d-1
2B3 2A1
2B3 Electron e- = 2*u + wxy-1
2A1 Positron e+ = 2*u-1 + wxy
Proto Lepton
Proto Nucleon
Neutron = 2*d + u
Anti-Neutron = 2*d-1 + u-1
Proton = 2*u + d
Anti-Proton = 2*u-1 + d-1
Source
Target
zz glues to both xx and yy
3C1 Positron Neutrino ve = wxy + u-1 + d-1
2A1 Positron e+ = 2*u-1 + wxy
Anti-Neutron = 2*d-1 + u-1
Anti-Proton = 2*u-1 + d-1
Proto Lepton
Proto Nucleon
Anti-matter Source =>
Target Diagram
zz glues to both xx and yy
In B quark, the arrangement of xx and ww are reversed from in C quark, meaning we view d-1 from top or bottom



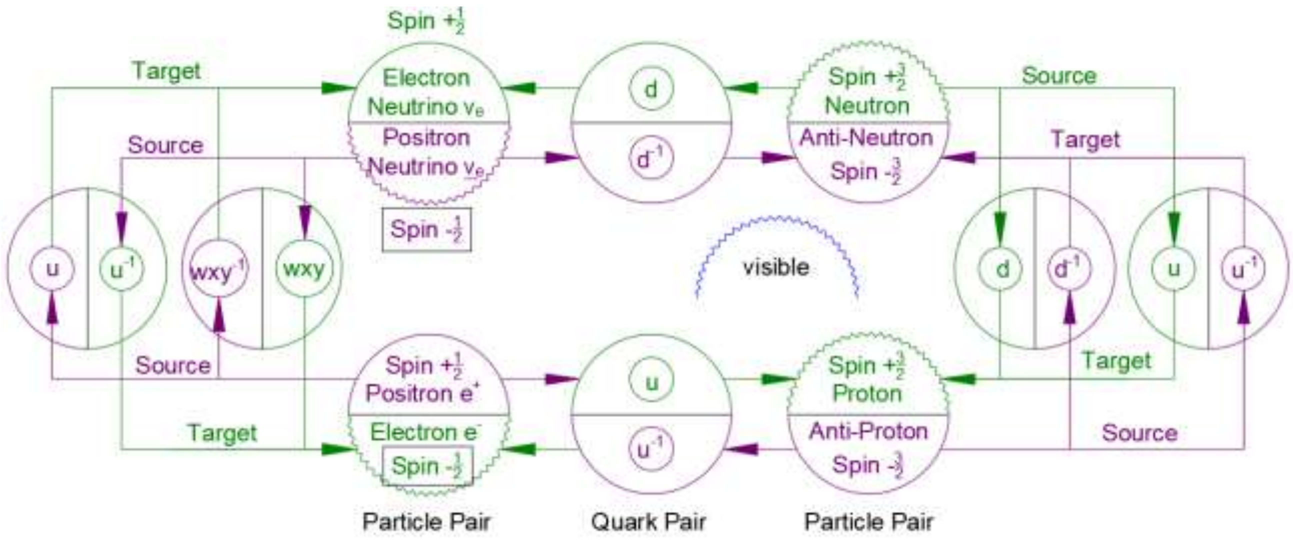
2.4.1.10 Beta Reaction
State Diagram

2.4.2 Simplified Beta Reactions Leading to Cause-Effect

2.4.2.1 Particle Summary of Neutron to Proton Reaction

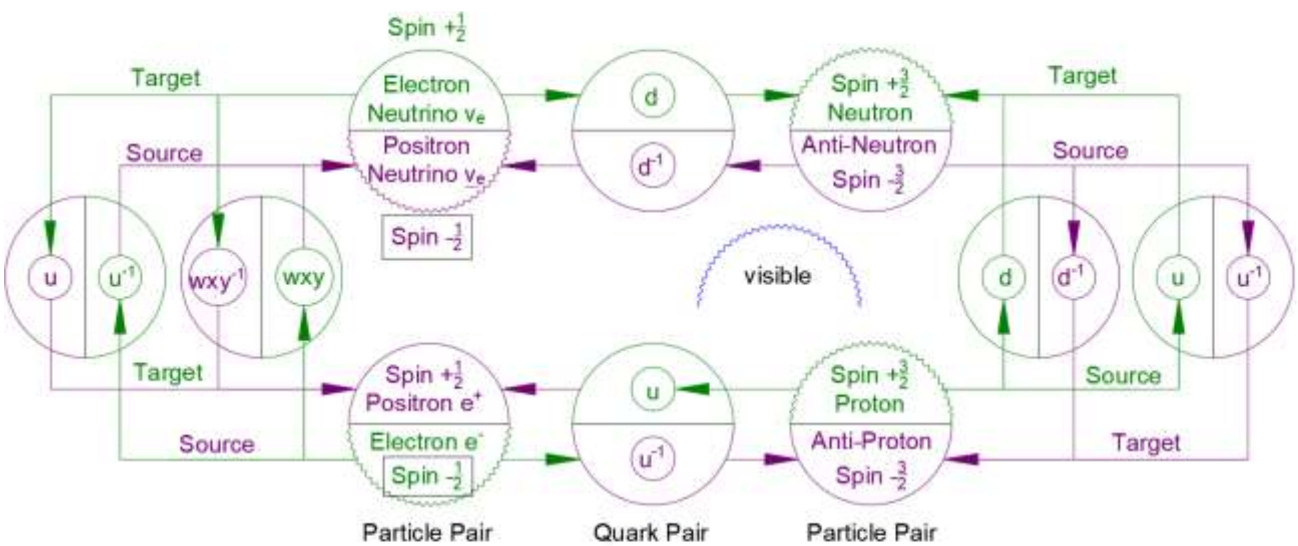
1. Sources and targets are in pairs of a matter and an anti-matter particle
2. A matter quark transferred from a matter source to a matter target is mirrored by an anti-quark transferred from an anti-matter source to an anti-matter target.
3. For nucleons and neutrinos, spin determines whether matter or anti-matter
4. For electrons and positrons, charge determines whether a particle is matter or anti-matter

Because electron output is spin negative, the neutrino must also be spin negative. This makes the anti-matter positron neutrino move in reverse of the cause-effect direction. Cause-effect direction (source to target direction) is independent of the direction of movement. The spin -1/2 positron neutrino has direction of movement away from the reaction, but the cause-effect is towards the reaction. This positron neutrino is the cause of the reaction. The observation of the positron neutrino leaving the reaction is misleading, causing this reaction to be mislabeled as the neutron decay. Common sense tells us a particle leaving a reaction did not cause the reaction. Common sense does not govern the nature of anti-matter.



2.4.2.1 Particle Summary of Neutron to Proton Reaction

2.4.2.2 Particle Summary of Proton to Neutron Reaction



2.4.2.2 Particle Summary of Proton to Neutron Reaction

2.4.2.3 Commonality and Differences of Neutron to/from Proton Reaction

1 Quark pairs are net zero spin, charge and time, so they are unaffected by other quarks or particles
2 In Proton to Neutron:
2.1 The positron is exiting the reaction, so its momentum direction is opposite to direction of source to target.
2.2 The electron neutrino is entering the reaction, so its momentum direction matches the direction of source to target.
3 In Neutron to Proton:

3.1 The electron is exiting the reaction, so its momentum direction matches the direction of source to target.

3.2 The positron neutrino is exiting the reaction, so its momentum direction is <u>opposite</u> to direction of source to target. This is as expected for anti-matter.

4 This is a generic 4 particle reaction where each particle has 3 quarks. Isomers of the left side can be substituted where they match the isomers of the right side.

5 Similar reactions exist for 2 particles.

6 Similar reactions exist for particles with 2 quarks such as kaons, pions, D particles.

7 There are no particles with more than 3 quarks because that arrangement is geometrically unstable. Gluons are ball joints, and form a hinge with another gluon

8 Particle pairs are composed of quark pairs.

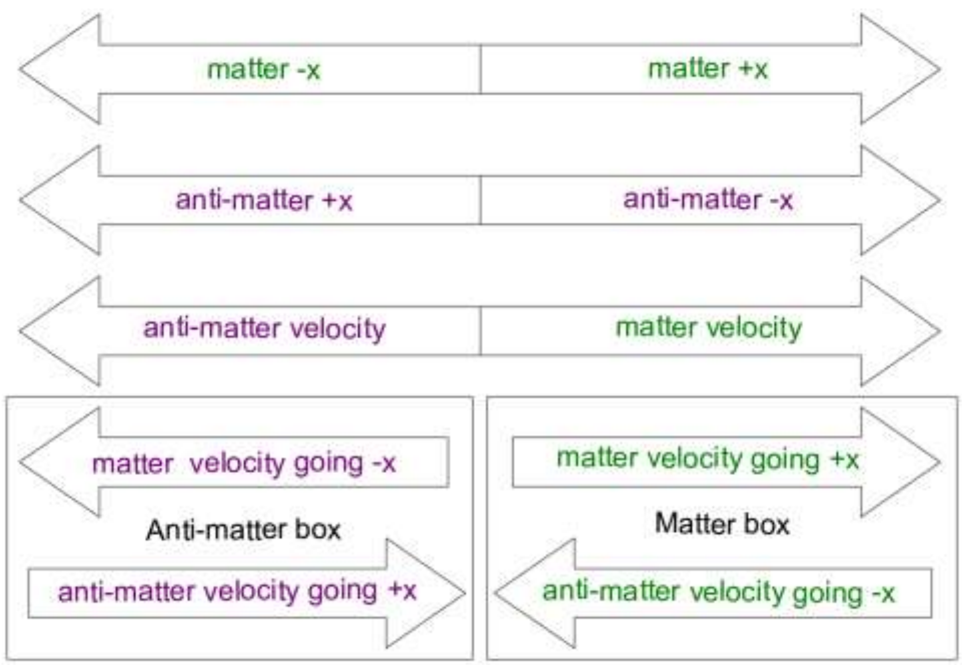
9 There are no solitary quarks. They always exist in quark pairs of matter and anti-matter.

10 There are no solitary sub-quarks. They always exist in a quark.

11 A reaction always has a mirror reaction where the components are the same but the directions of source and target are reversed.

2.4.2.4 <u>Anti-matter Velocity Opposite of Cause-Effect Direction</u>

Both observers see what they are made of (matter or anti) as moving the same direction as cause-effect. Both observers see the PCT opposite of what they are made of (matter or anti) as having velocity opposite of cause-effect direction. Matter observer cannot see outside the matter box. Matter observer sees anti-matter velocity backwards from cause-effect. Anti-matter observer cannot see outside the anti-matter box. Anti-matter observer sees matter velocity backwards from cause-effect



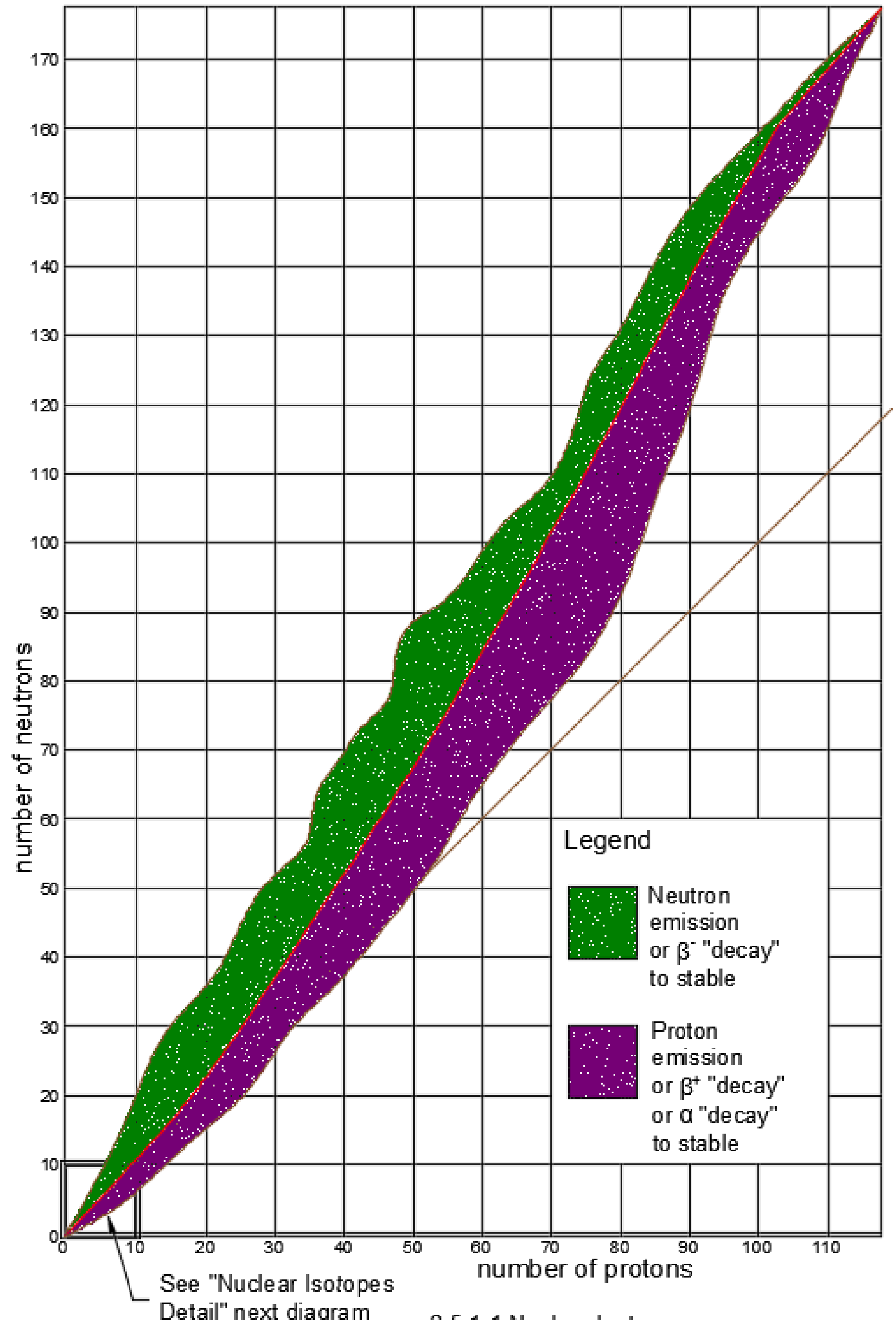
2.4.2.4 <u>Anti-matter Velocity Opposite of Cause-Effect Direction</u>

2.5 <u>Nucleus</u>

2.5.1 <u>Nuclear Isotopes</u>

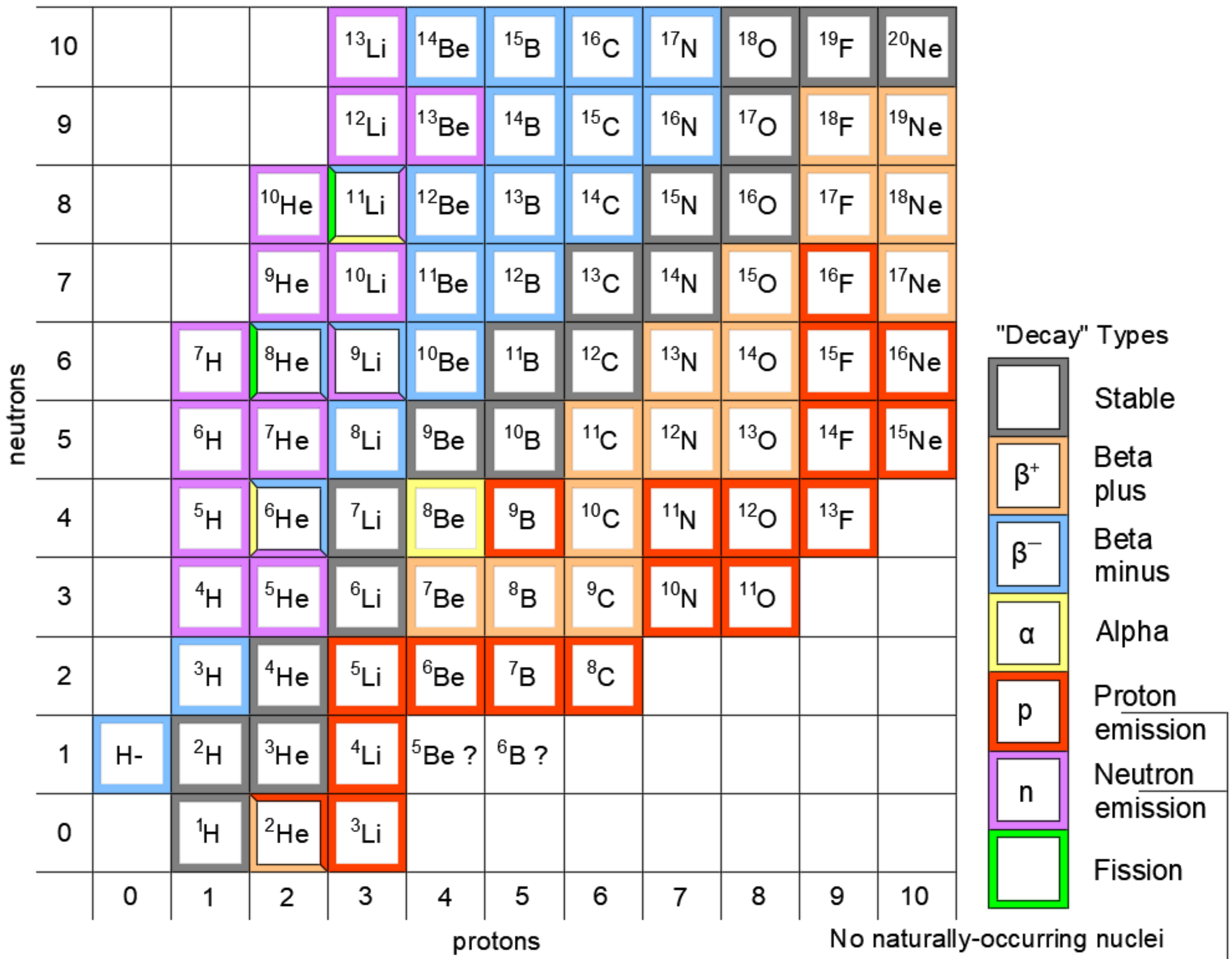
2.5.1.1 Nuclear Isotopes

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.



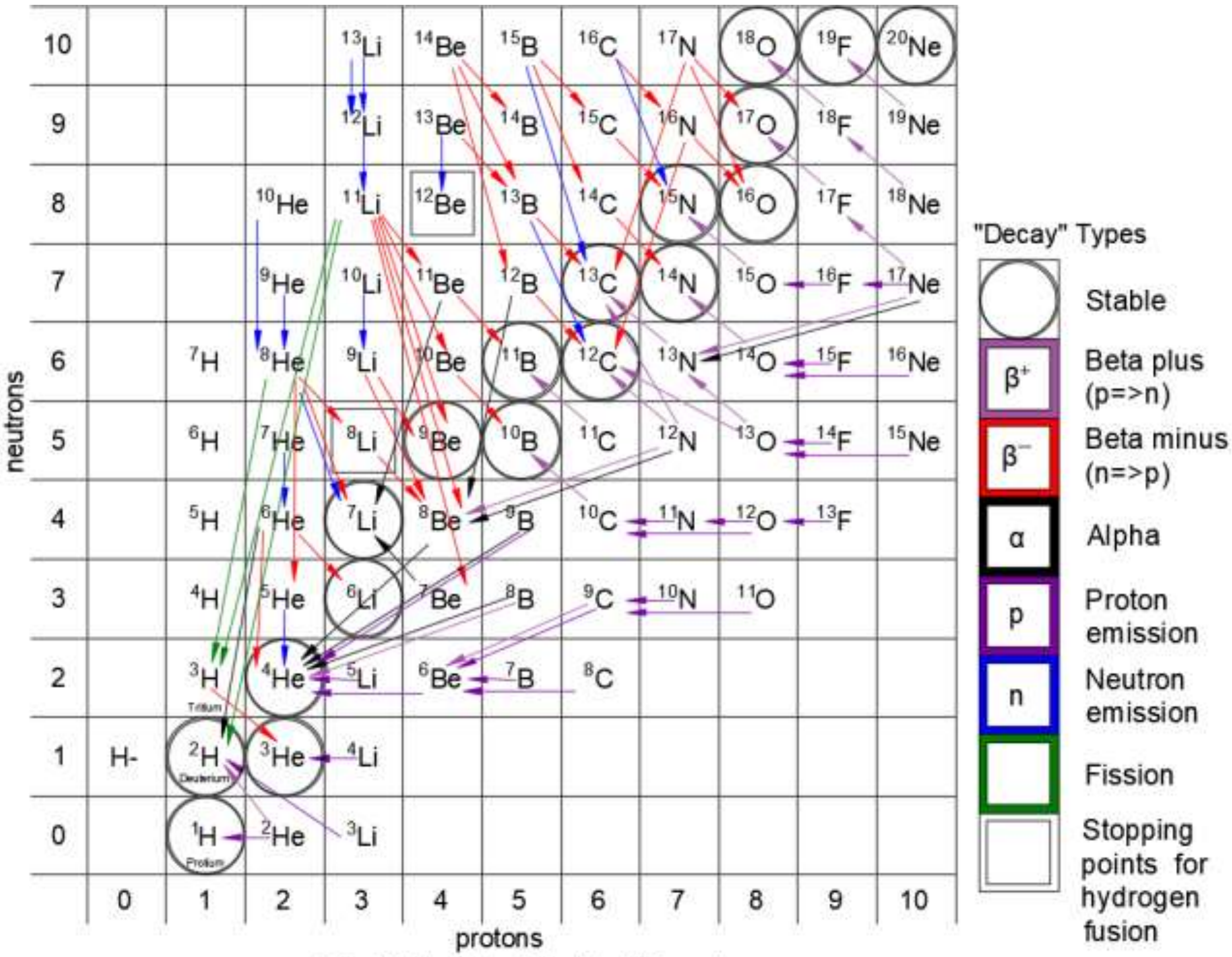
2.5.1.1 Nuclear Isotopes

2.5.1.2 Nuclear Isotopes Detail



2.5.1.2 Nuclear Isotopes Detail

2.5.1.3 Nuclides Drip Line "Decay"

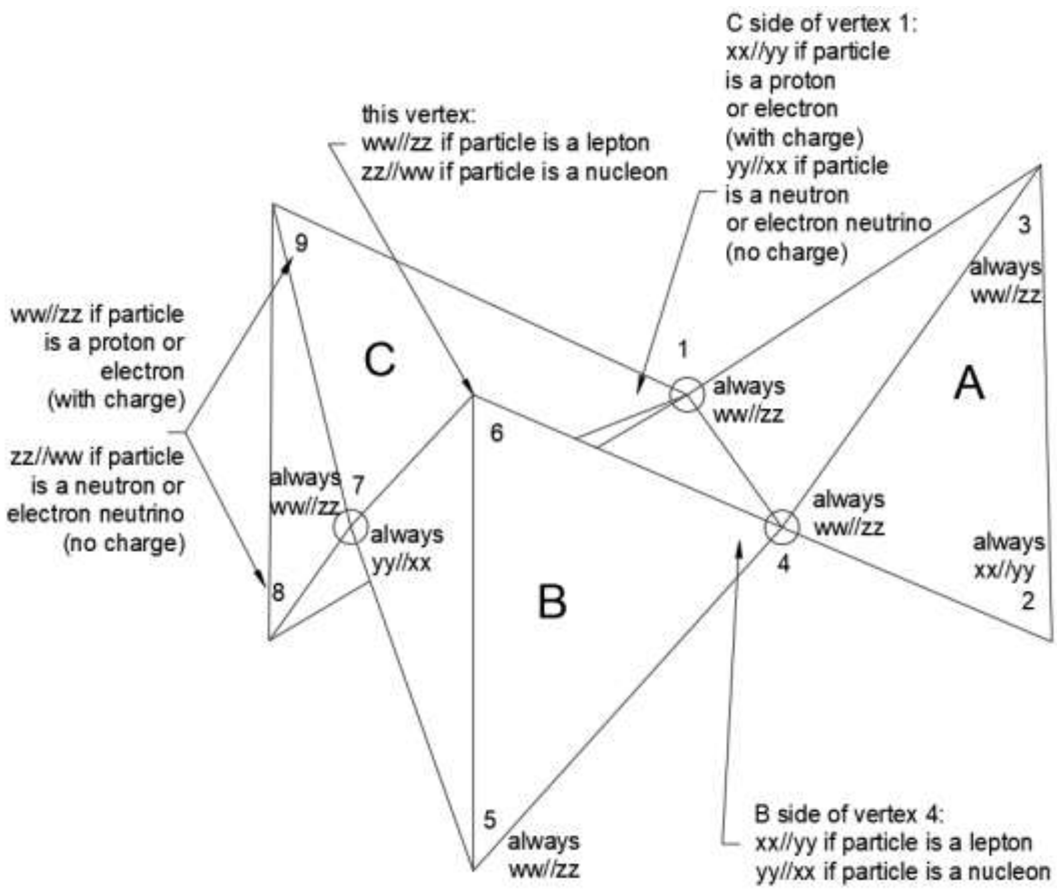


2.5.1.3 Nuclides Drip Line "Decay"

2.5.2 The Apex Gluon in Free 3 Quark Particles

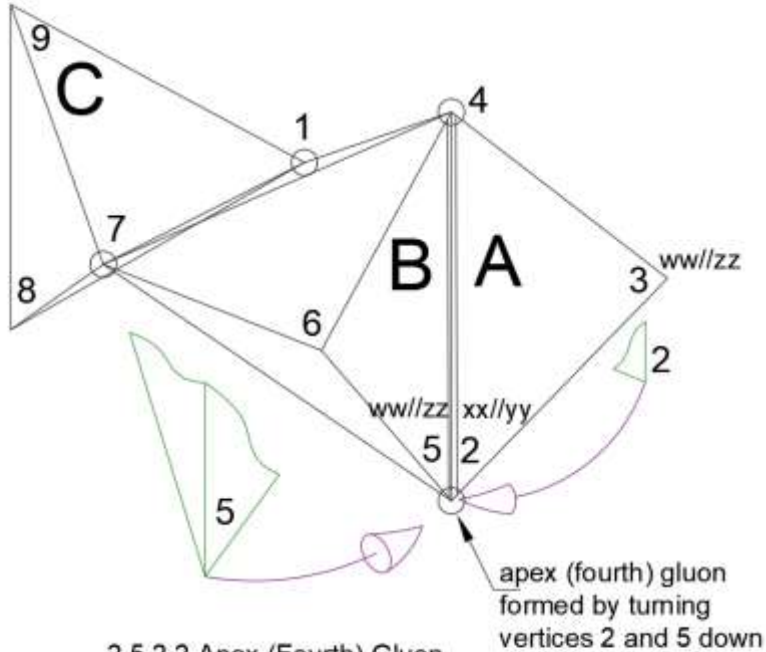
2.5.2.1 Common Properties in Particle State Diagrams

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 sub-quarks. Protons have only ww//zz valence sub-quarks left if an apex (fourth) gluon is formed. Neutrons have one remaining xx//yy valence sub-quark left after forming an apex (fourth) gluon. This leaves neutrons in the nucleus with more gluon possibilities than protons.



2.5.2.1 Common Properties in Particle State Diagrams

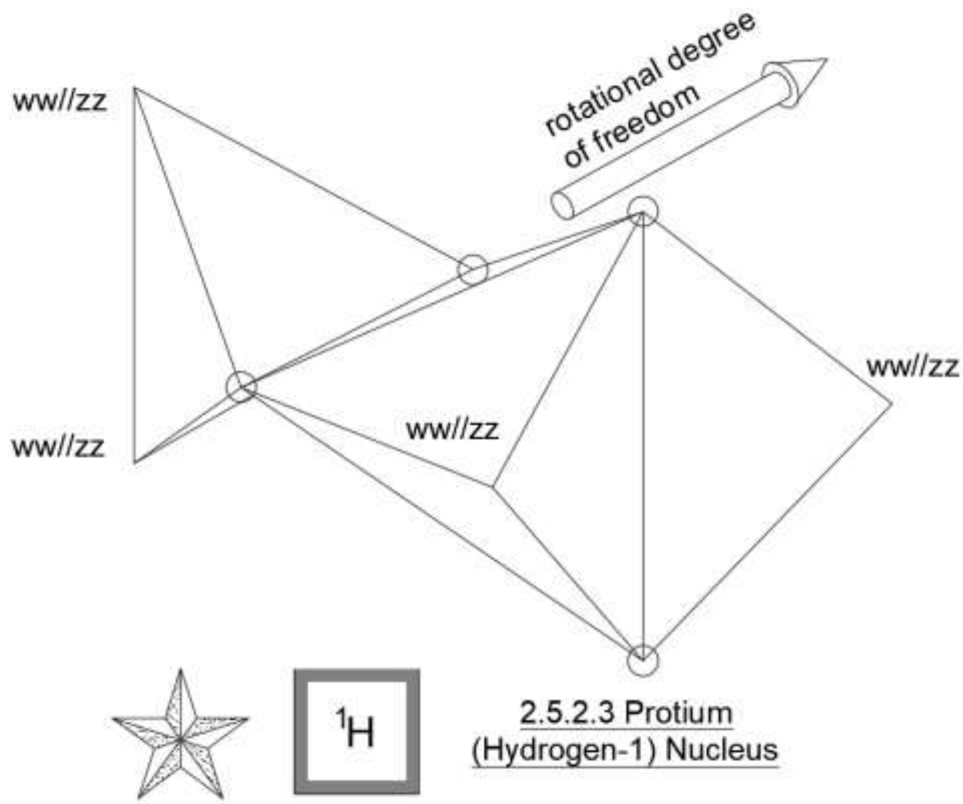
2.5.2.2 Apex (Fourth) Gluon Formation Between Quarks A & B



2.5.2.2 Apex (Fourth) Gluon Formation Between Quarks A & B

2.5.2.3 Protium (Hydrogen-1) Nucleus

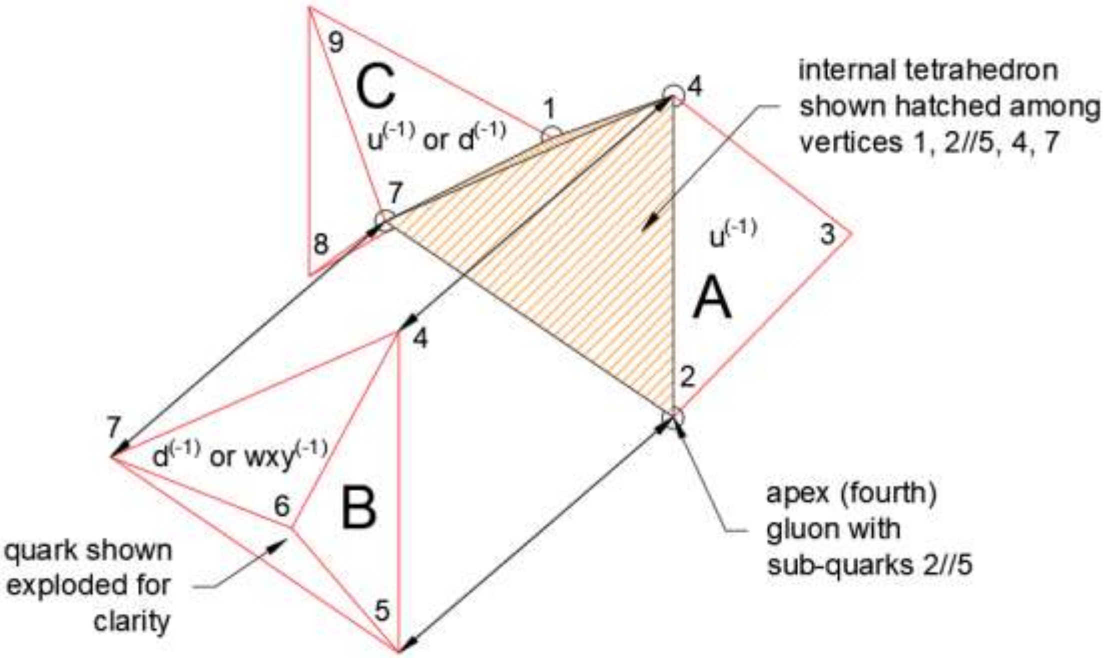
4 gluons
1 rotational degree of freedom
4 ww//zz sub-quarks (exposed vertices) that are
non-reactive with ww//zz vertices of other particles
This is the only possible arrangement



2.5.2.3 Protium
(Hydrogen-1) Nucleus

2.5.2.4 Internal Tetrahedron in Particle with Apex (Fourth) Gluon

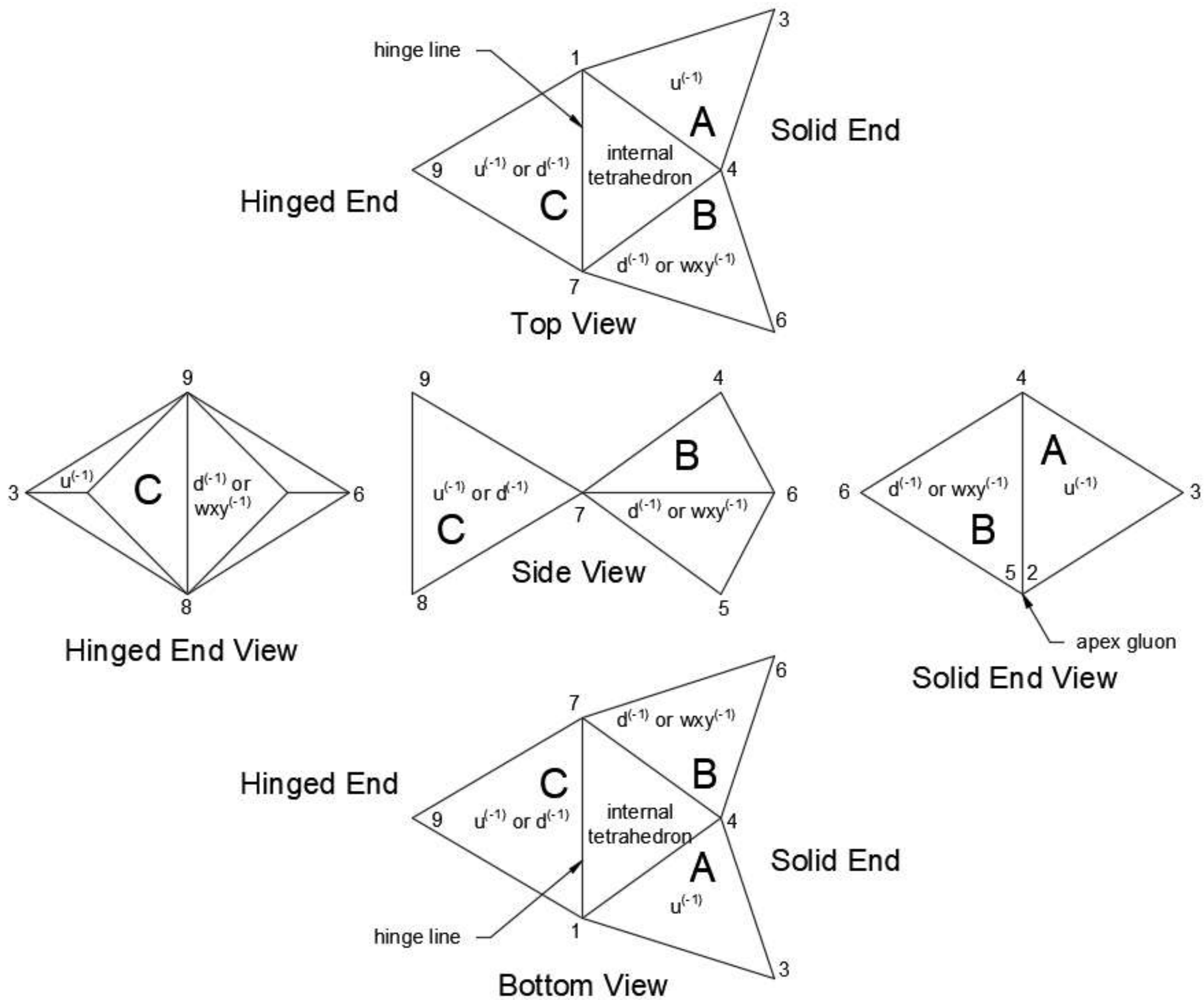
The reason for forming an internal tetrahedron with sub-quarks 2 & 5 is to have a rigid structure and reduce spin by forming the apex (fourth) gluon



2.5.2.4 Internal Tetrahedron in Particle with Apex (Fourth) Gluon

2.5.2.5 Orthogonal Views of 3 Gluon Particle

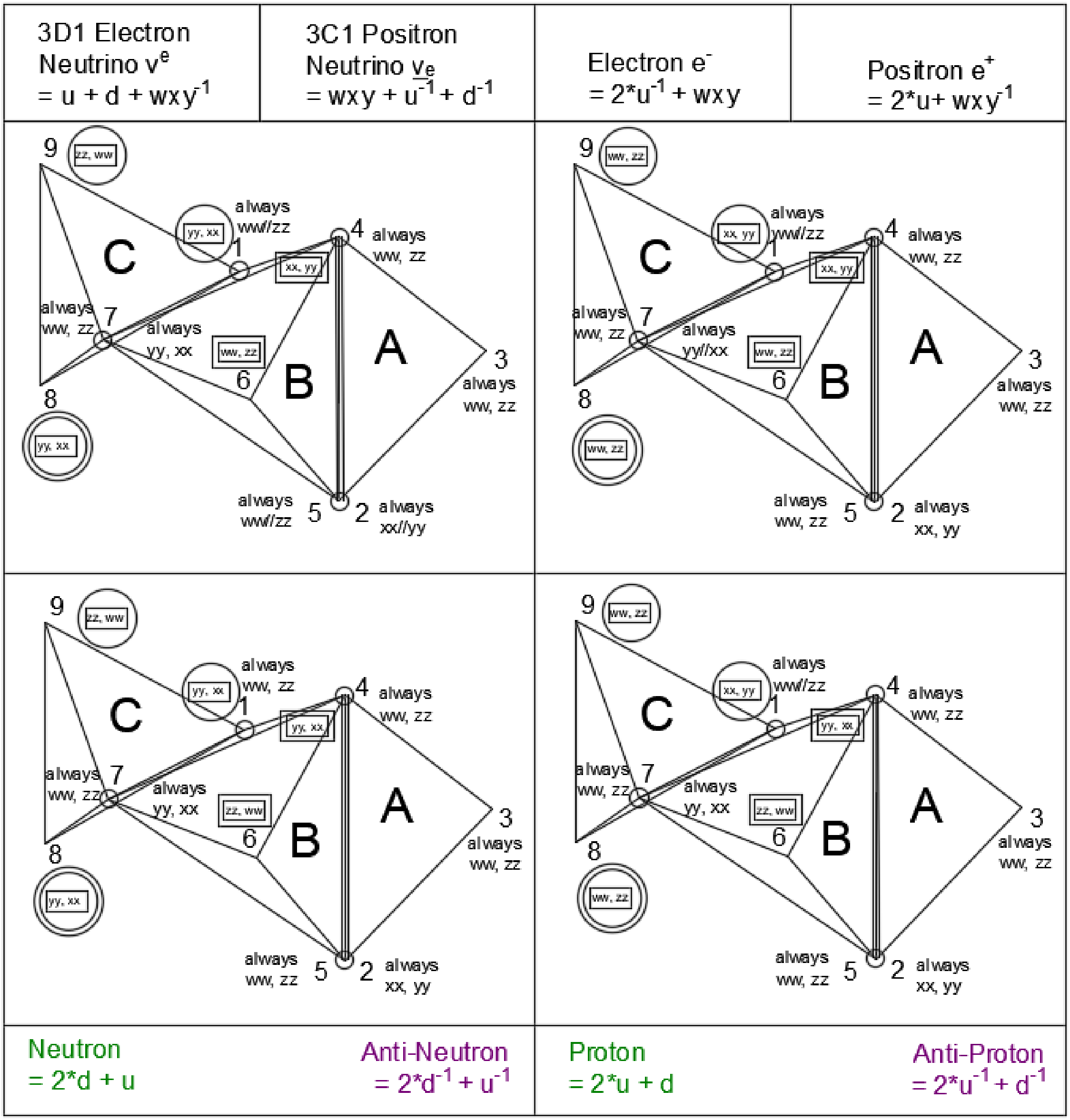
Example is single proton nucleus of hydrogen-1 (protium)



2.5.2.5 Orthogonal Views of 3 Gluon Particle

2.5.2.6 <u>Four Gluon Formation</u>

Note:
In this diagram, "gg, hh" has a specific meaning: gg is matter and hh is anti-matter



◎ Sub-quark differs (lepton vs nucleon) [opposite charge]

○ Which sub-quark has role of matter or anti-matter (lepton vs nucleon)

☐ Which sub-quark occupies this position (neutral charge vs charged)

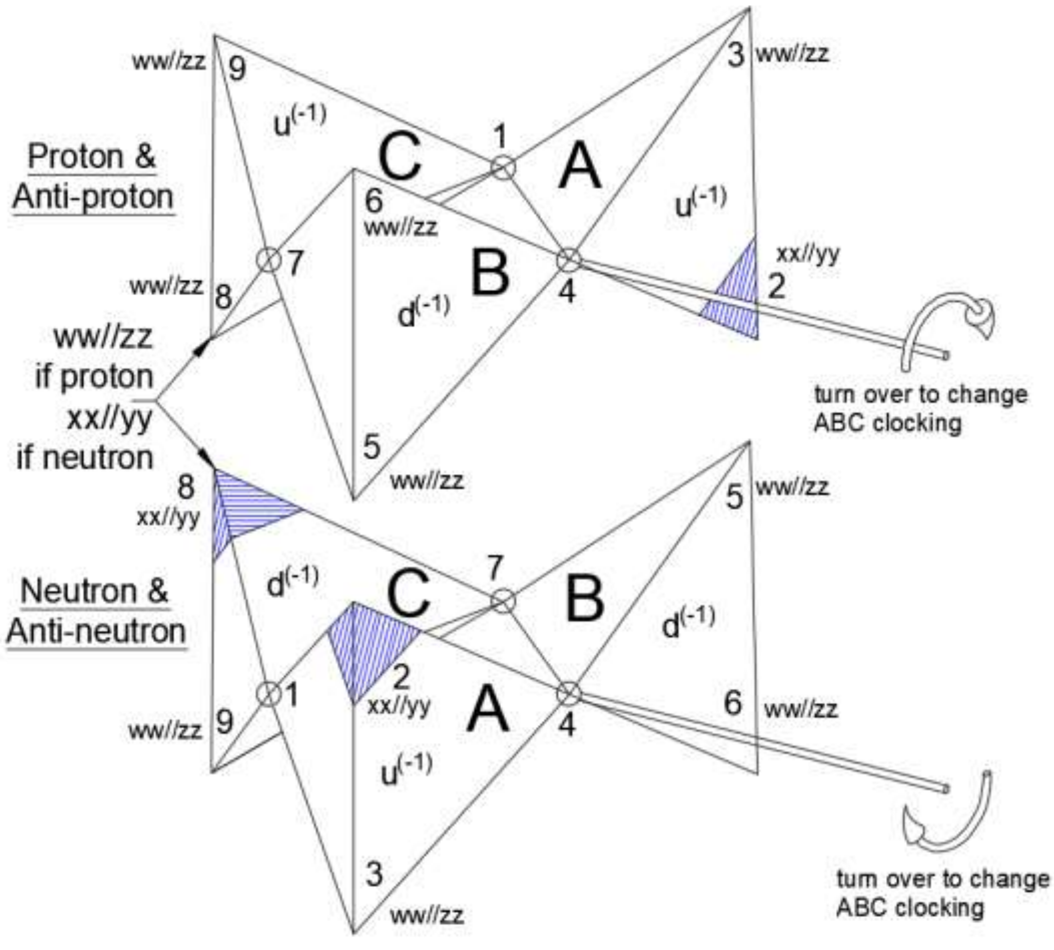
<u>2.5.2.6 Four Gluon Formation</u>

2.5.3 Hydrogen

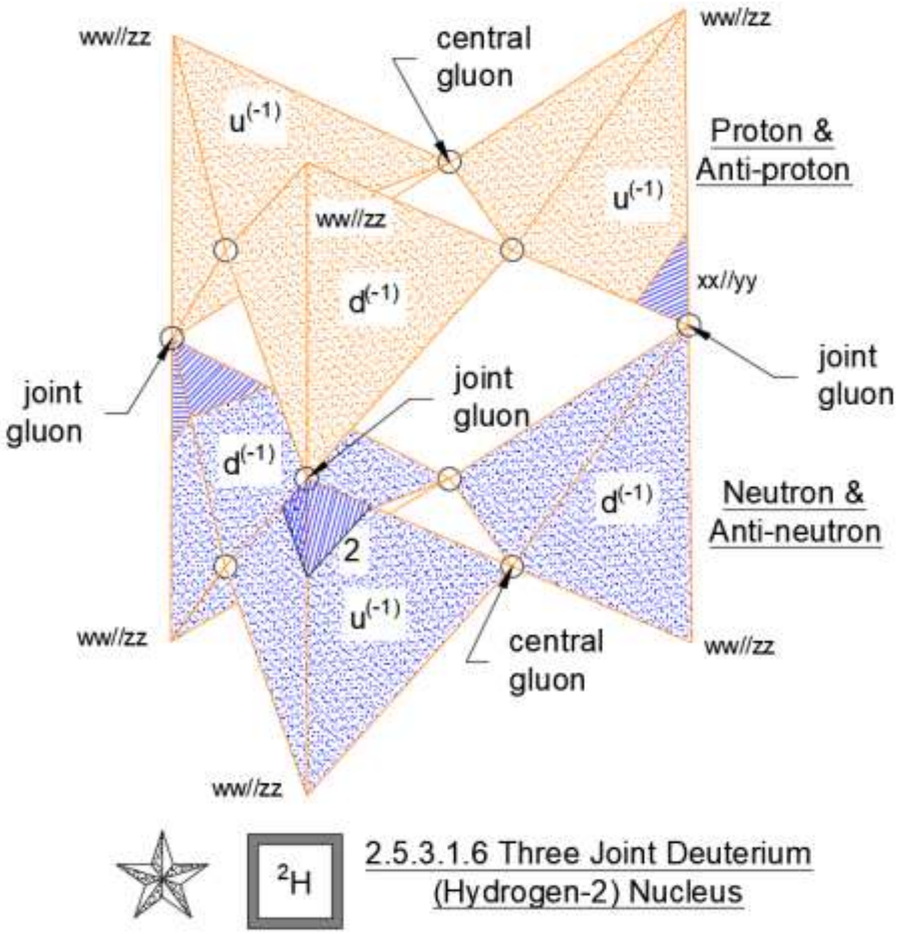
2.5.3.1 Deuterium

2.5.3.1.6 Three Joint Deuterium (Hydrogen-2) Nucleus

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



Deuterium Nucleons

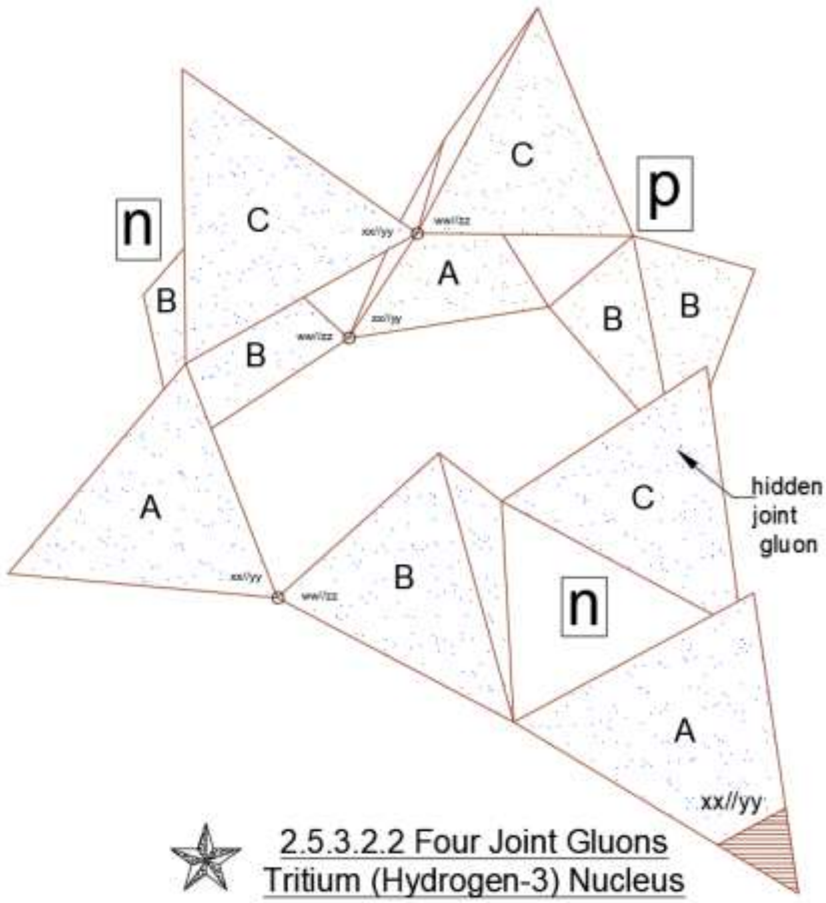


2.5.3.1.6 Three Joint Deuterium (Hydrogen-2) Nucleus

2.5.3.2 Tritium

2.5.3.2.2 Four Joint Gluons Tritium (Hydrogen-3) Nucleus

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



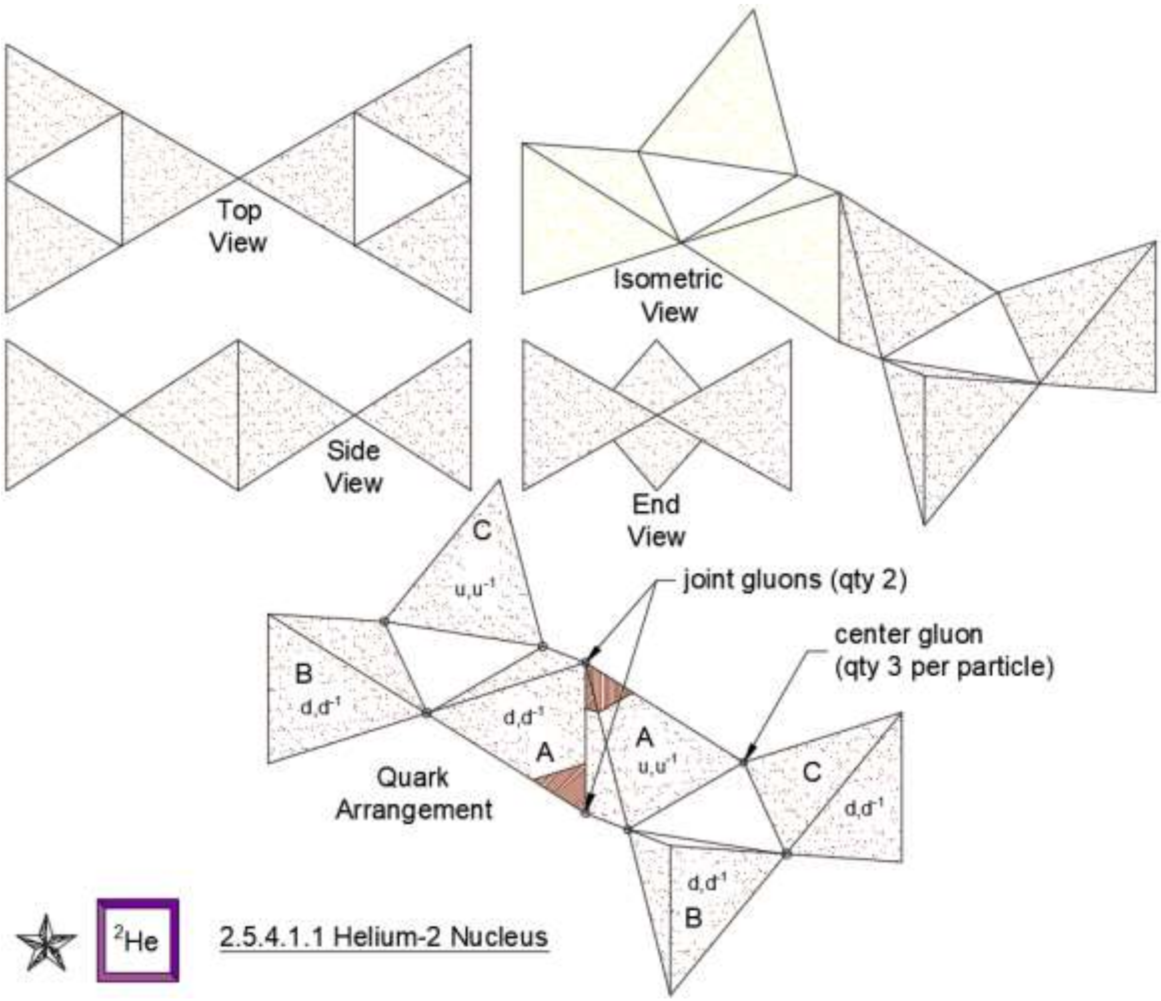
2.5.3.2.2 Four Joint Gluons
Tritium (Hydrogen-3) Nucleus

2.5.4 Helium

2.5.4.1 Helium-2

2.5.4.1.1 Helium-2 Nucleus

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



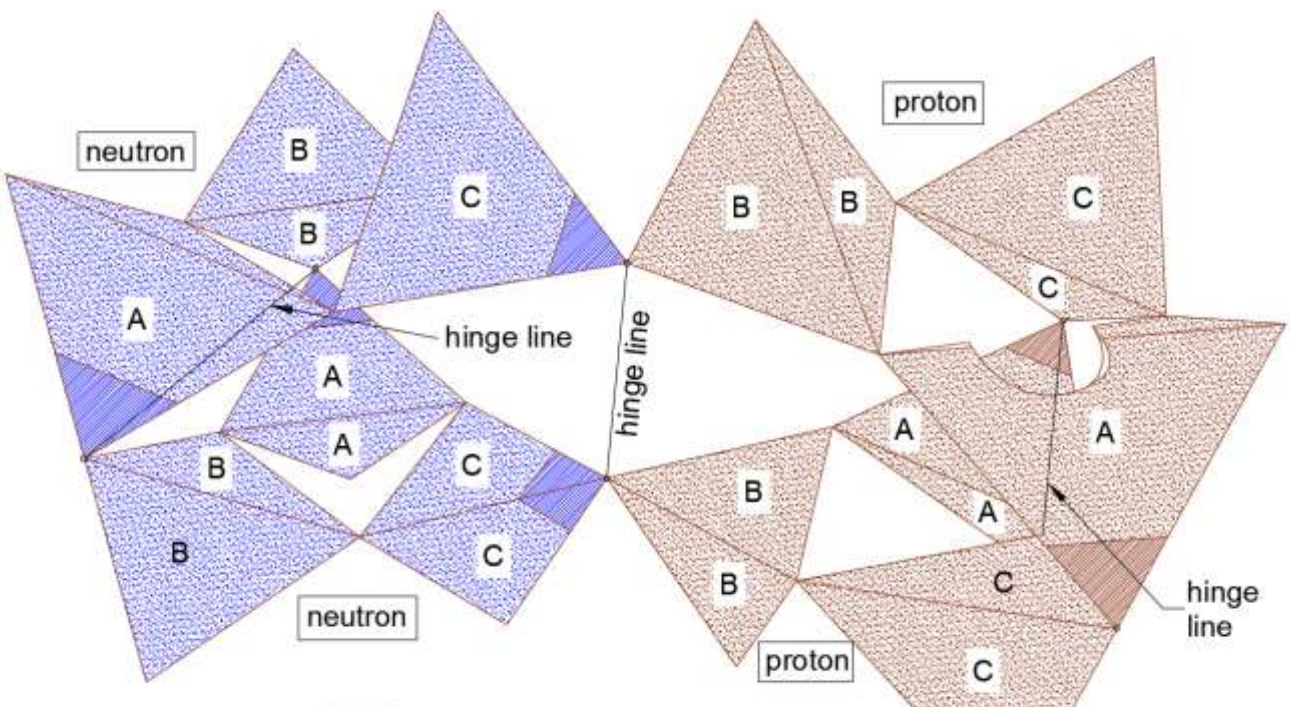
2.5.4.3 Helium-4 Model Selected

2.5.4.3.1 Perspective View of Six Joint Gluons Helium-4 Nucleus

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

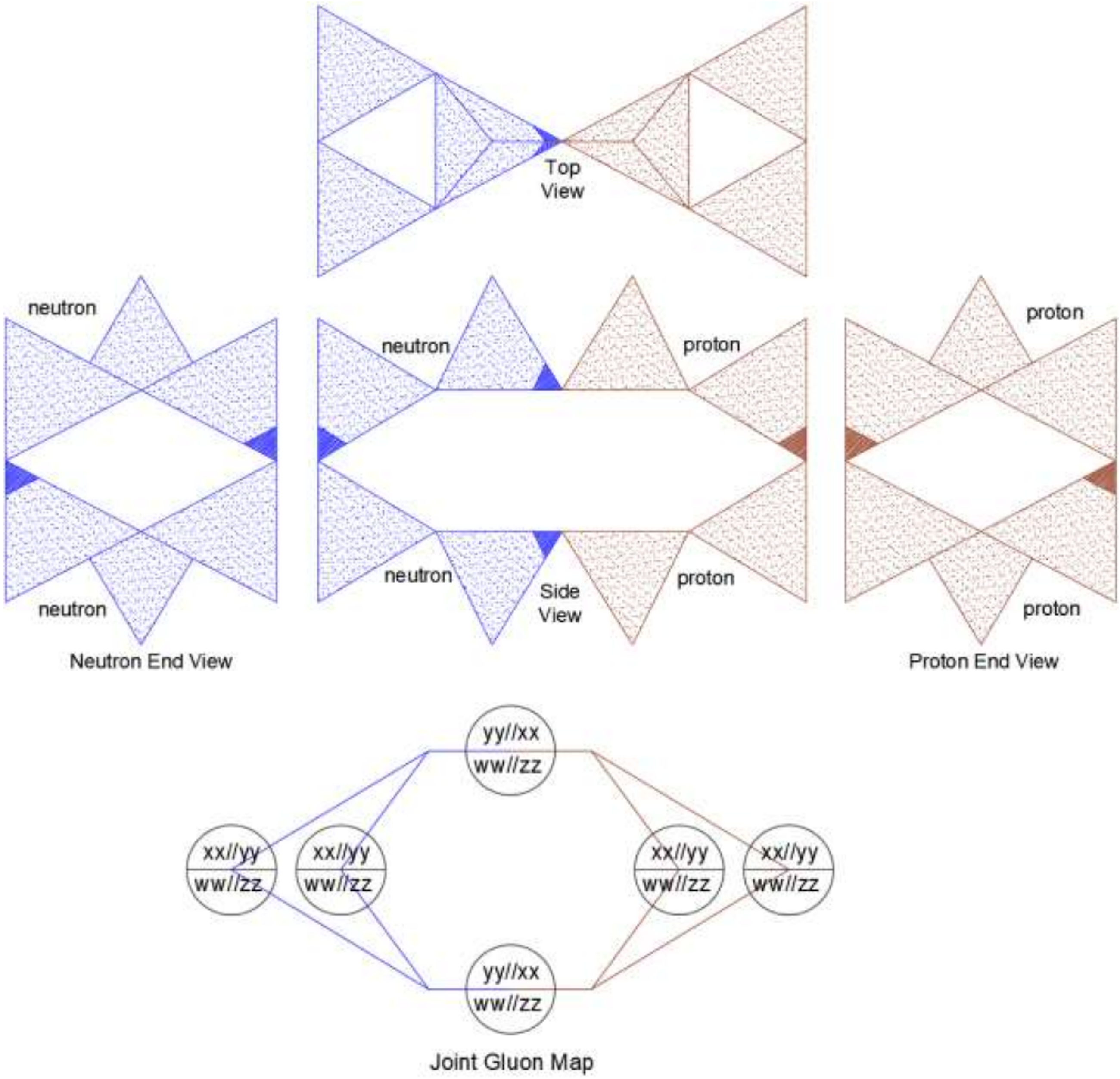
Selected for helium-4 nucleus because:

- 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)

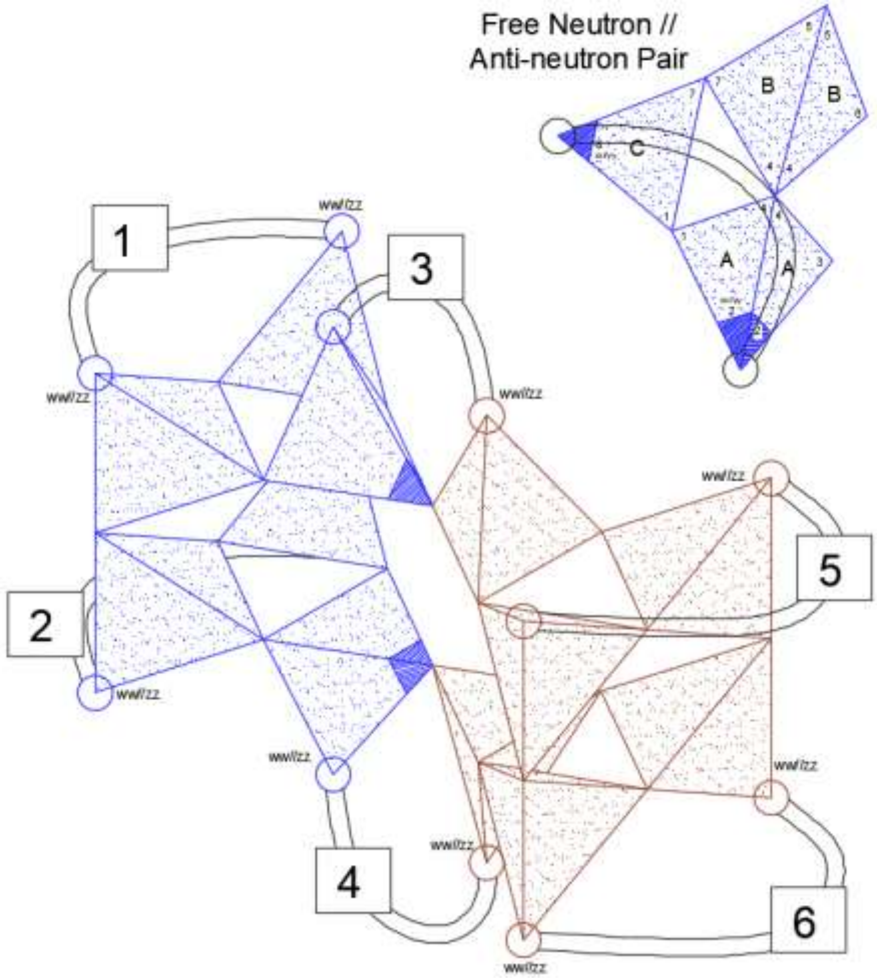


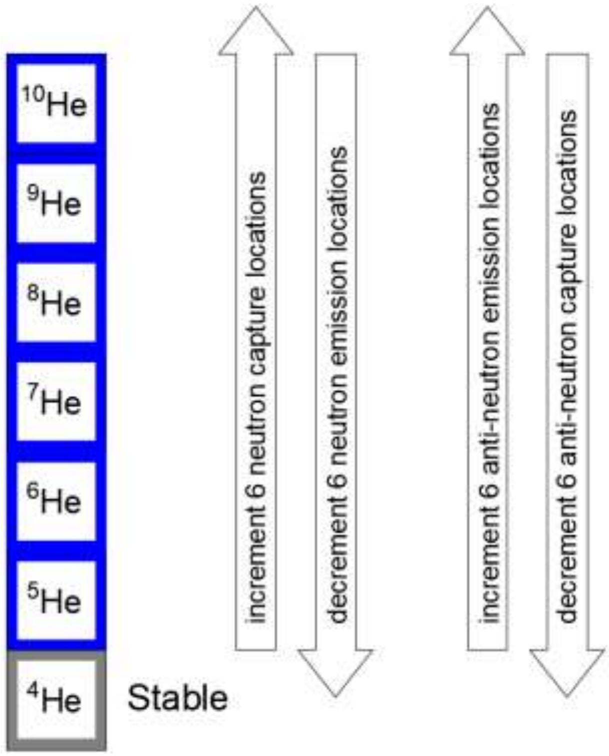
★ ^{4}He 2.5.4.3.1 Perspective View of Six Joint Gluons Helium-4 Nucleus

2.5.4.3.2 Orthogonal Views of Six Joint Gluons Helium-4 Nucleus



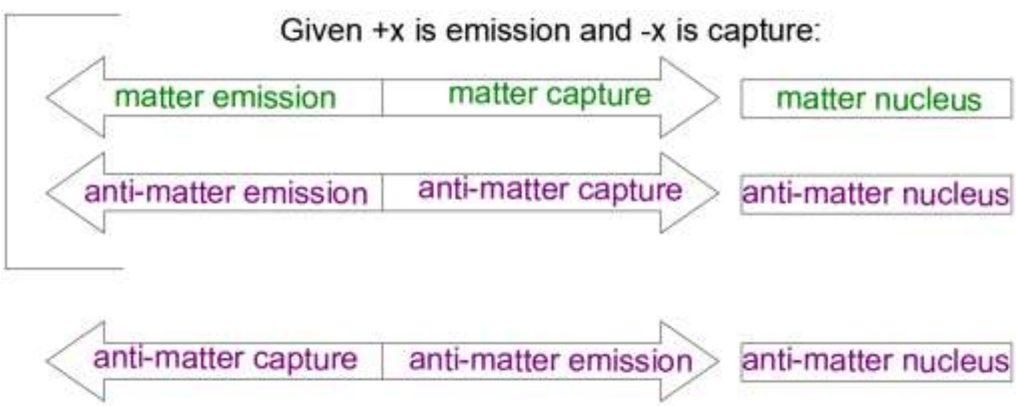
2.5.4.3.3 Helium-4 Attachment Positions for Free Neutron // Anti-neutron Pairs





Summary:

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

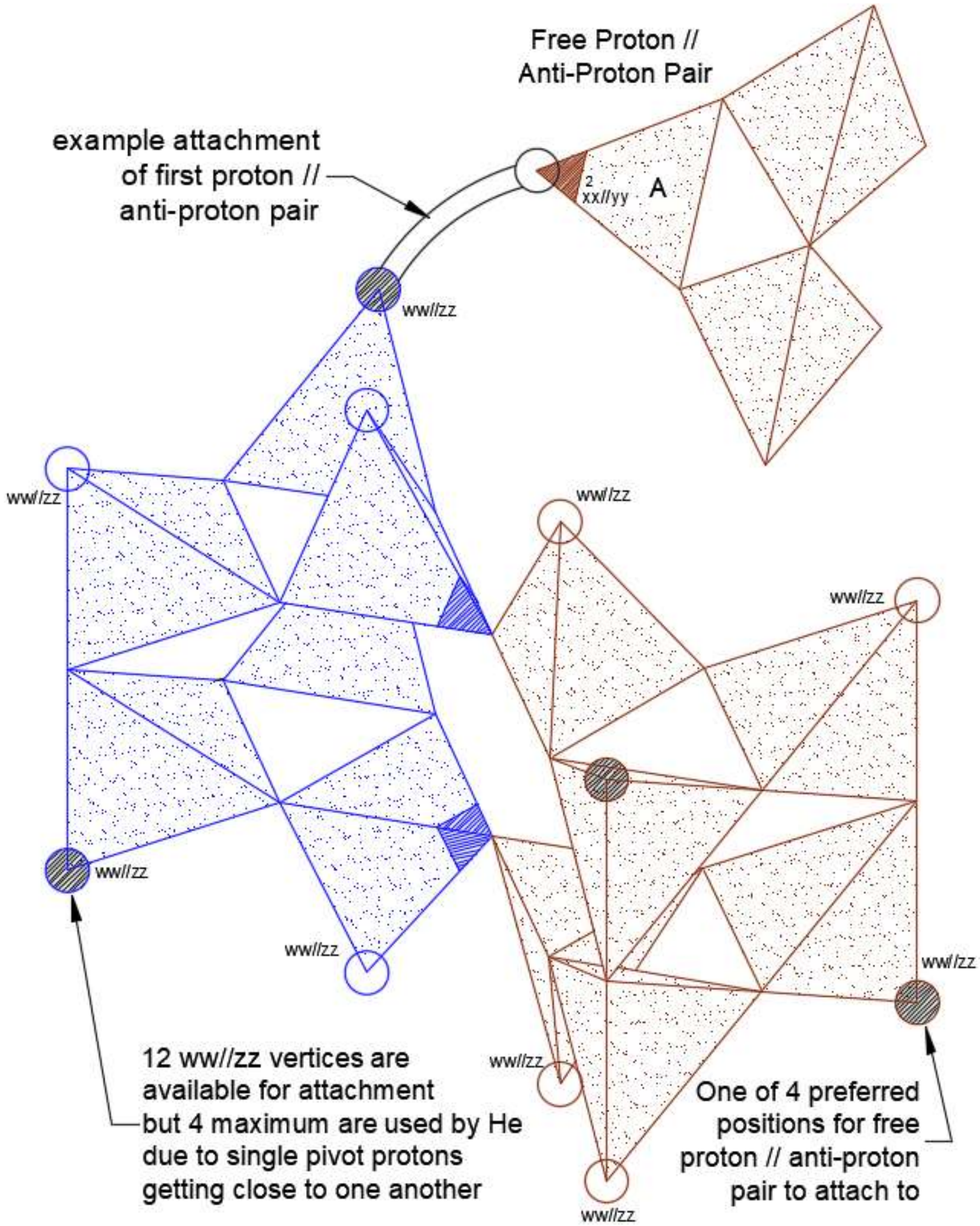


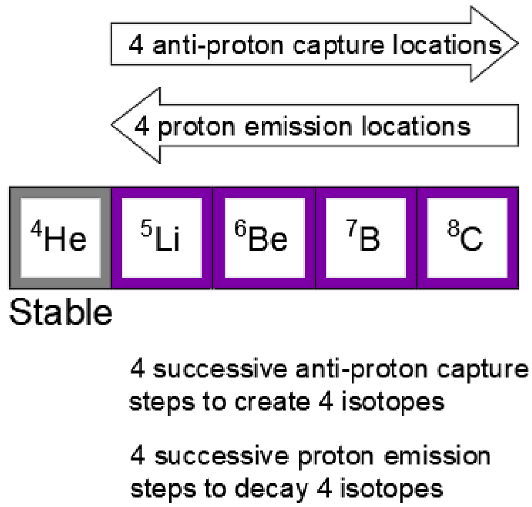
Findings from beta minus reaction extended to neutron emission & capture:
To matter observer:

- Cause-effect direction is the same as matter velocity direction
- Anti-matter velocity direction is opposite of cause-effect direction

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

2.5.4.3.4 <u>Helium-4 Attachment Positions for Free Proton // Anti-proton Pairs</u>

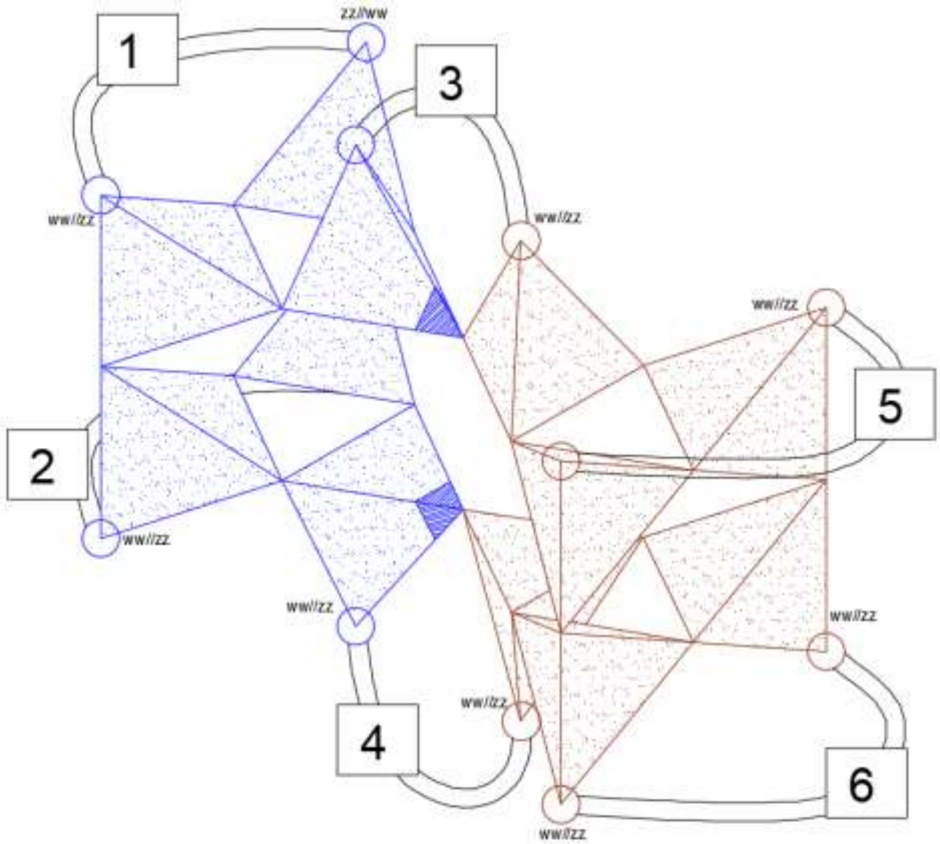




2.5.4.3.4 Helium-4 Attachment Positions for Free Proton // Anti-proton Pairs

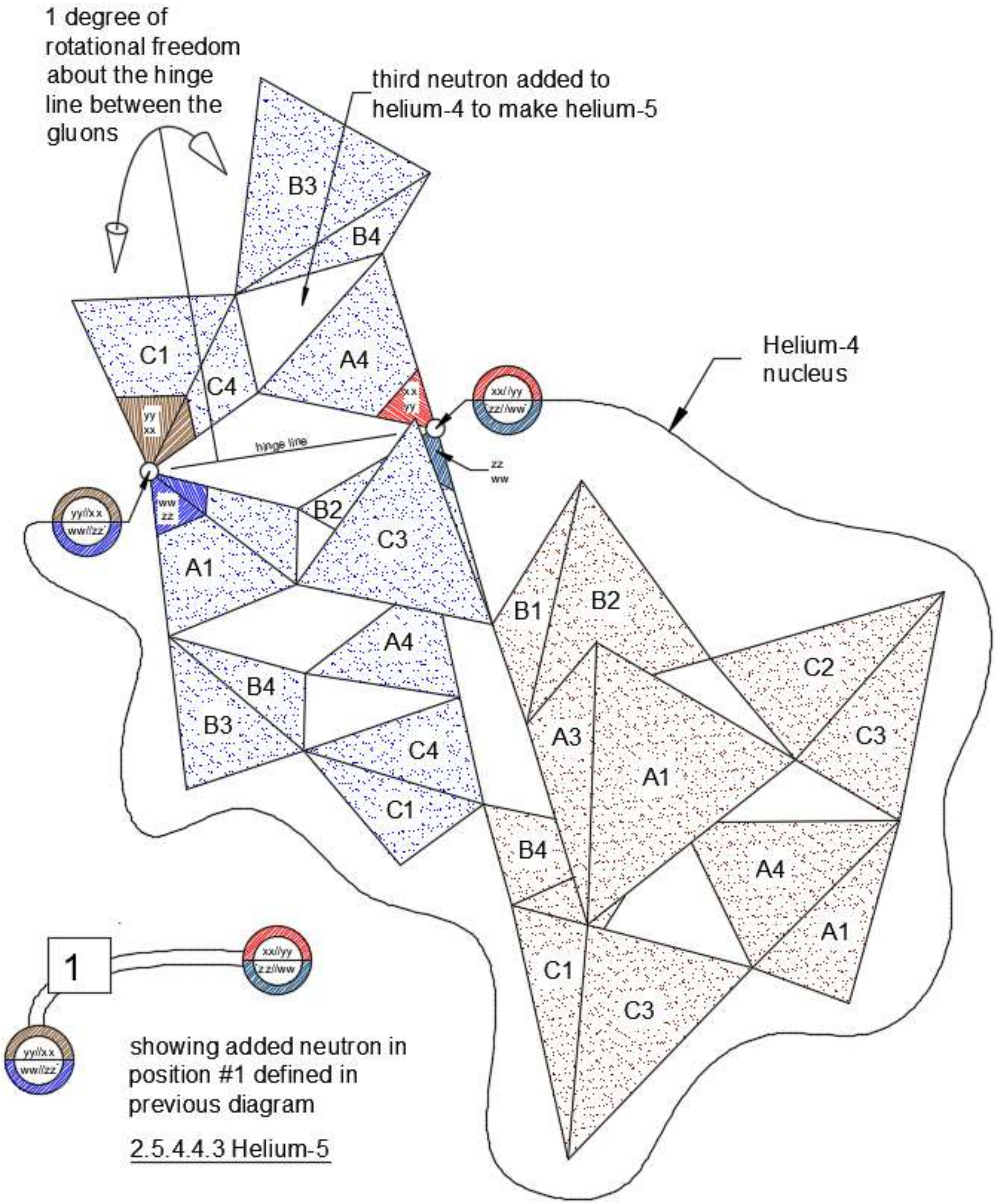
2.5.4.4 <u>Helium Isotopes</u>

2.5.4.4.2 <u>Alpha Particle Attachment Positions for Attachment of Neutron // Anti-neutron Pairs</u>

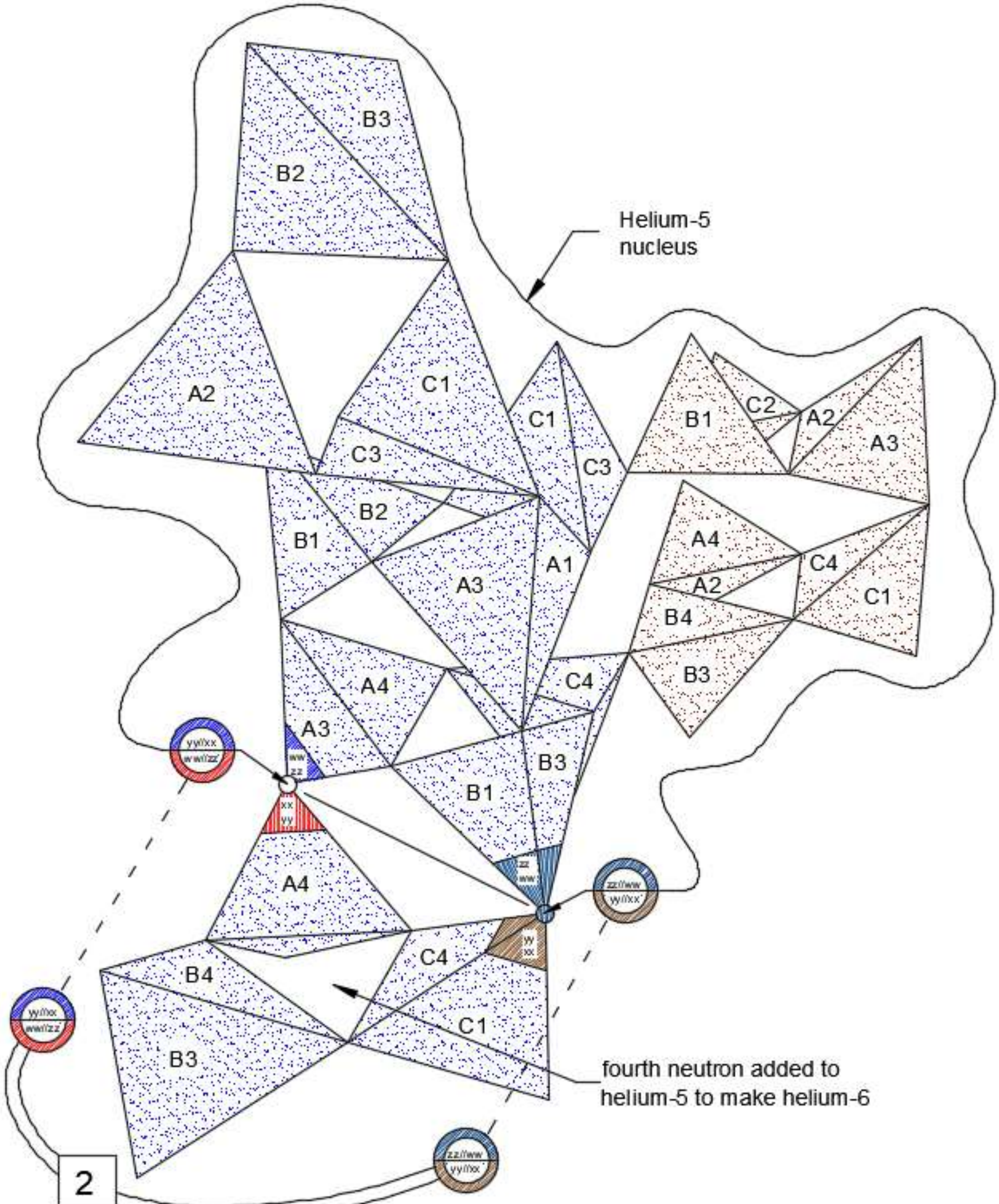


2.5.4.4.2 Alpha Particle Attachment Positions for Attachment of Neutron // Anti-neutron Pairs

2.5.4.4.3 <u>Helium-5</u>



2.5.4.4.4 Helium-6

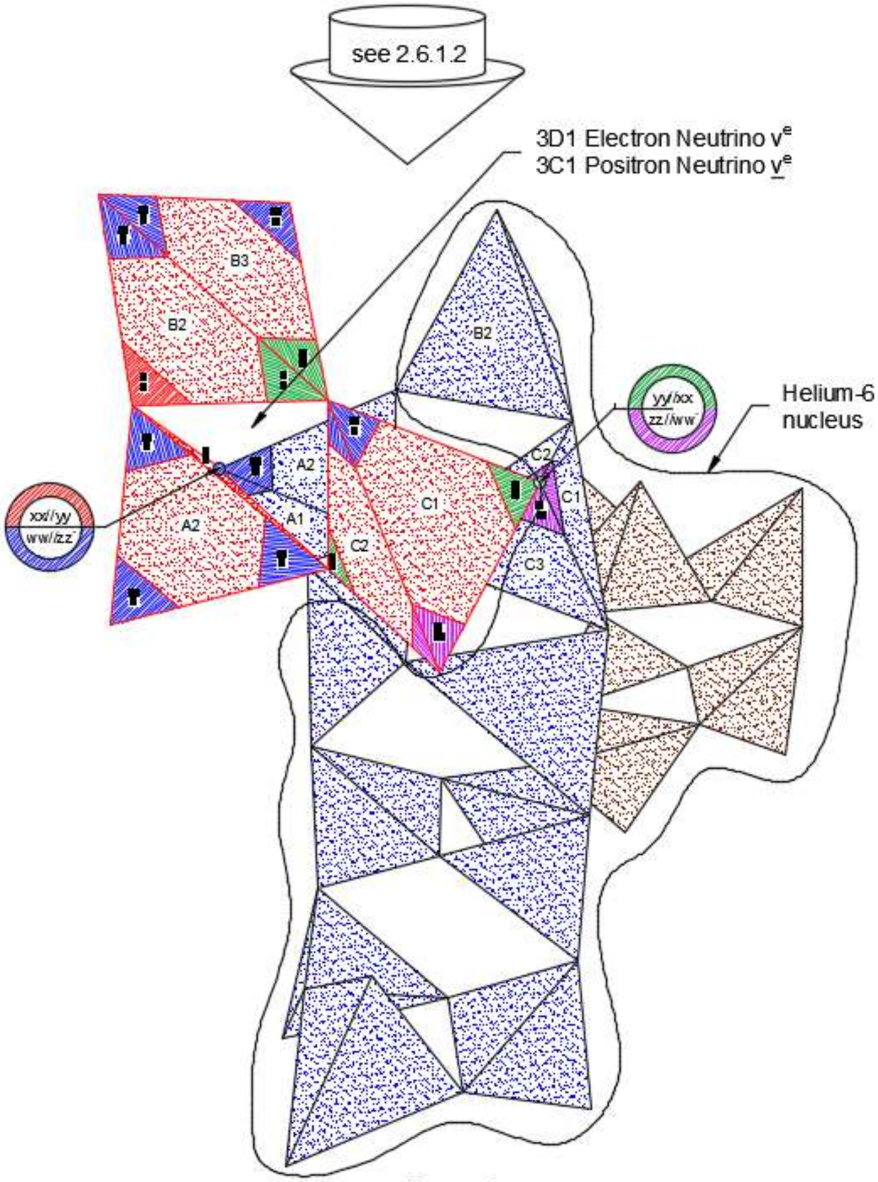


2.5.4.4.4 Helium-6

2.6 Beta Reaction Details

2.6.1 Overview of the Beta Reaction

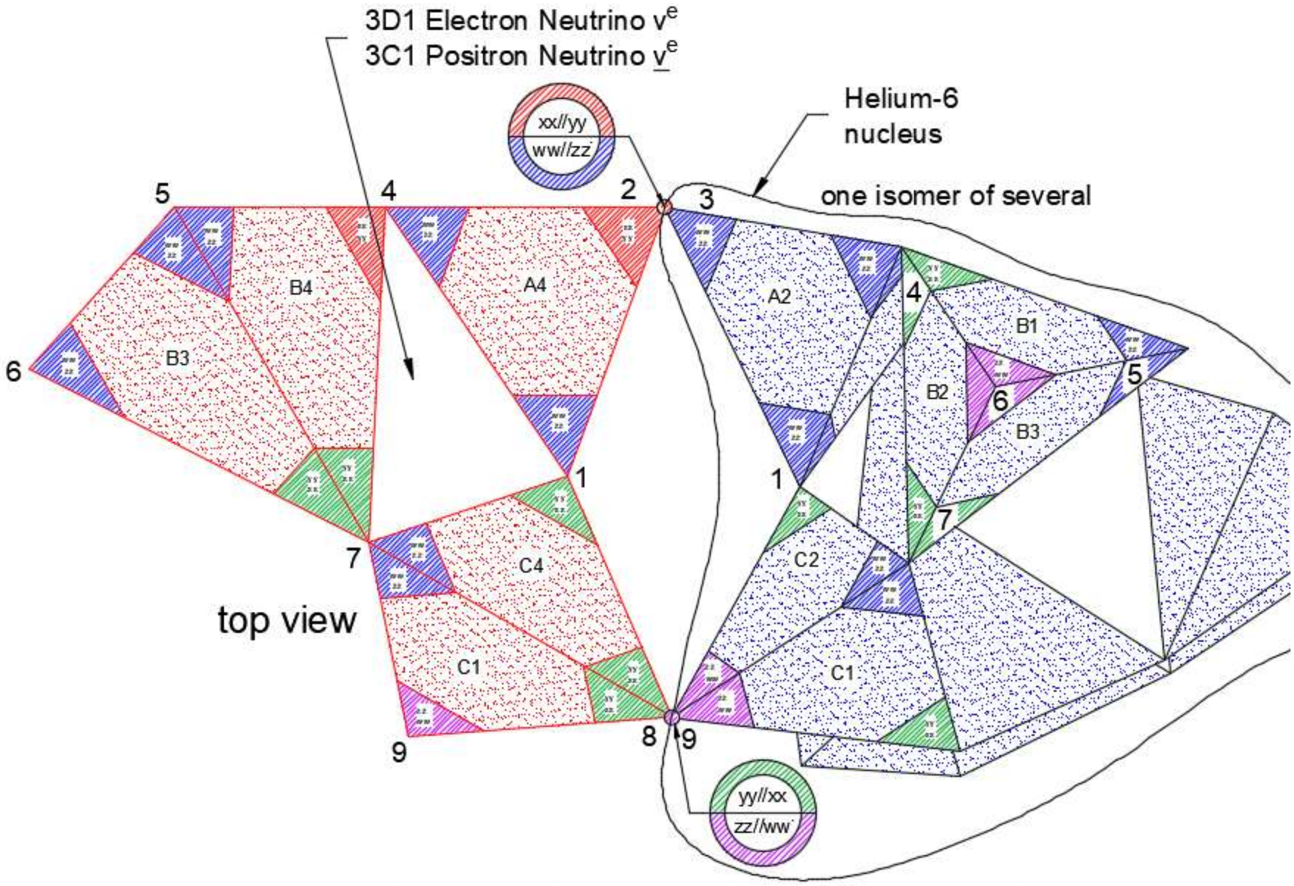
2.6.1.1 Side View of Beta Reaction Between Helium-6 and Electron Neutrino // Positron



one isomer of several

2.6.1.1 Side View of Beta Reaction Between Helium-6 and Electron Neutrino v_e // Positron Neutrino $\underline{v}_e$

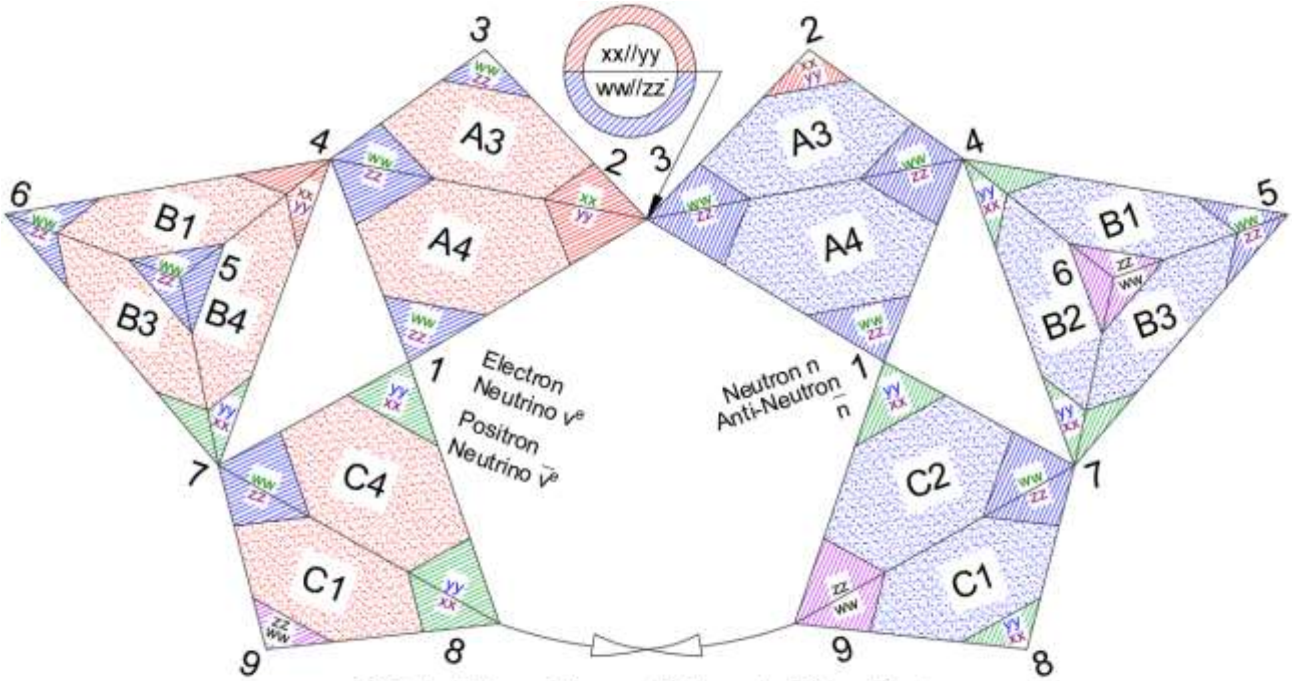
2.6.1.2 Top View Beta Reaction Between Helium-6 and Electron Neutrino // Positron Neutrino



2.6.1.2 Top View Beta Reaction Between Helium-6 and Electron Neutrino v^e // Positron Neutrino $\underline{v}^e$

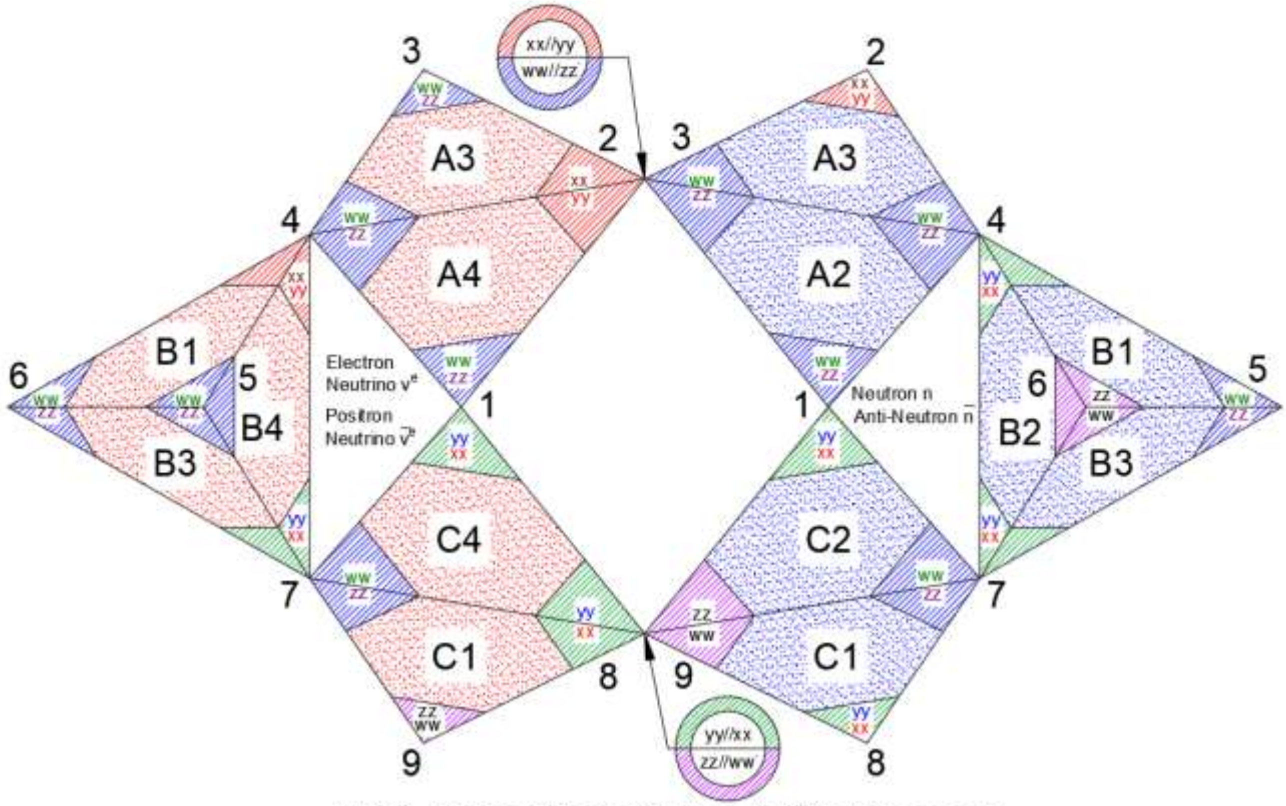
2.6.1.4 Top View of Step 1 After First Gluon is Formed at Vertices #2 & #3

#9 zz//ww and #8 yy//xx attraction is motivated by quenching opposite charge and spin (zz cancels yy and ww cancels xx)



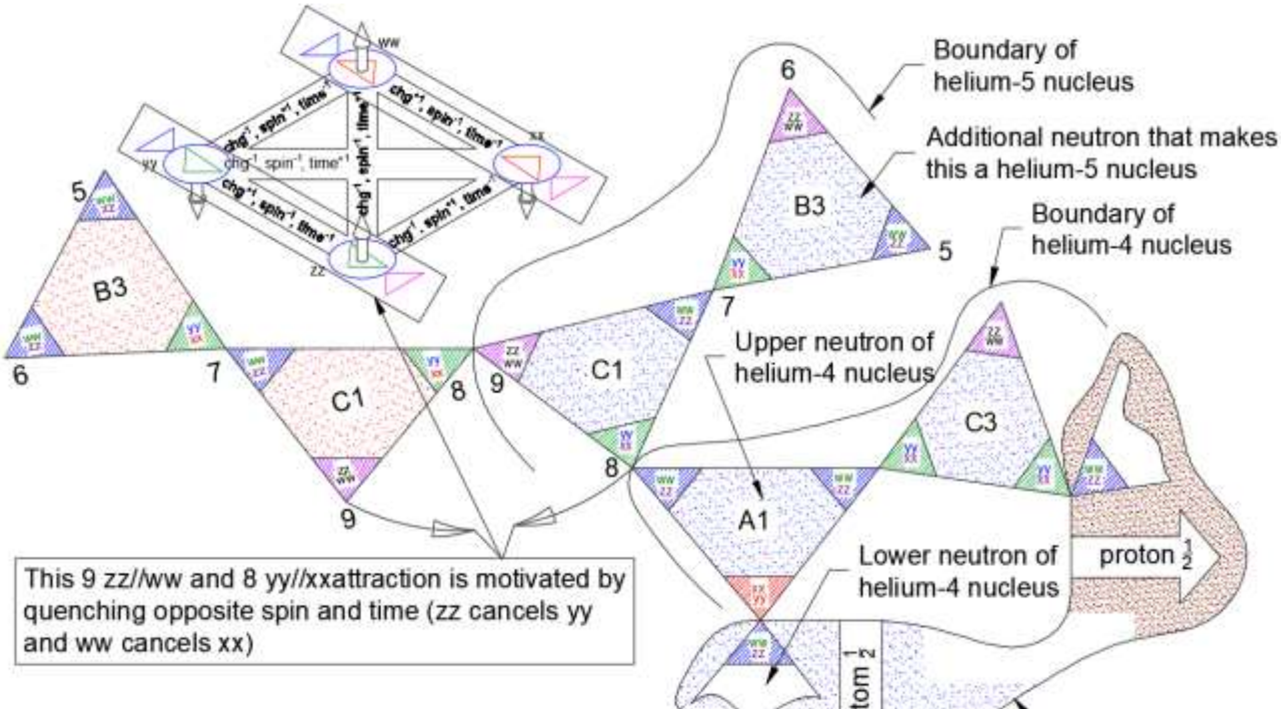
2.6.1.4 Top View of Step 1 After First Gluon is Formed at Vertices #2 & #3

2.6.1.5 Top View of Step 2 After Second Gluon is Formed at Vertices #8 & #9



2.6.1.5 Top View of Step 2 After Second Gluon is Formed at Vertices #8 & #9

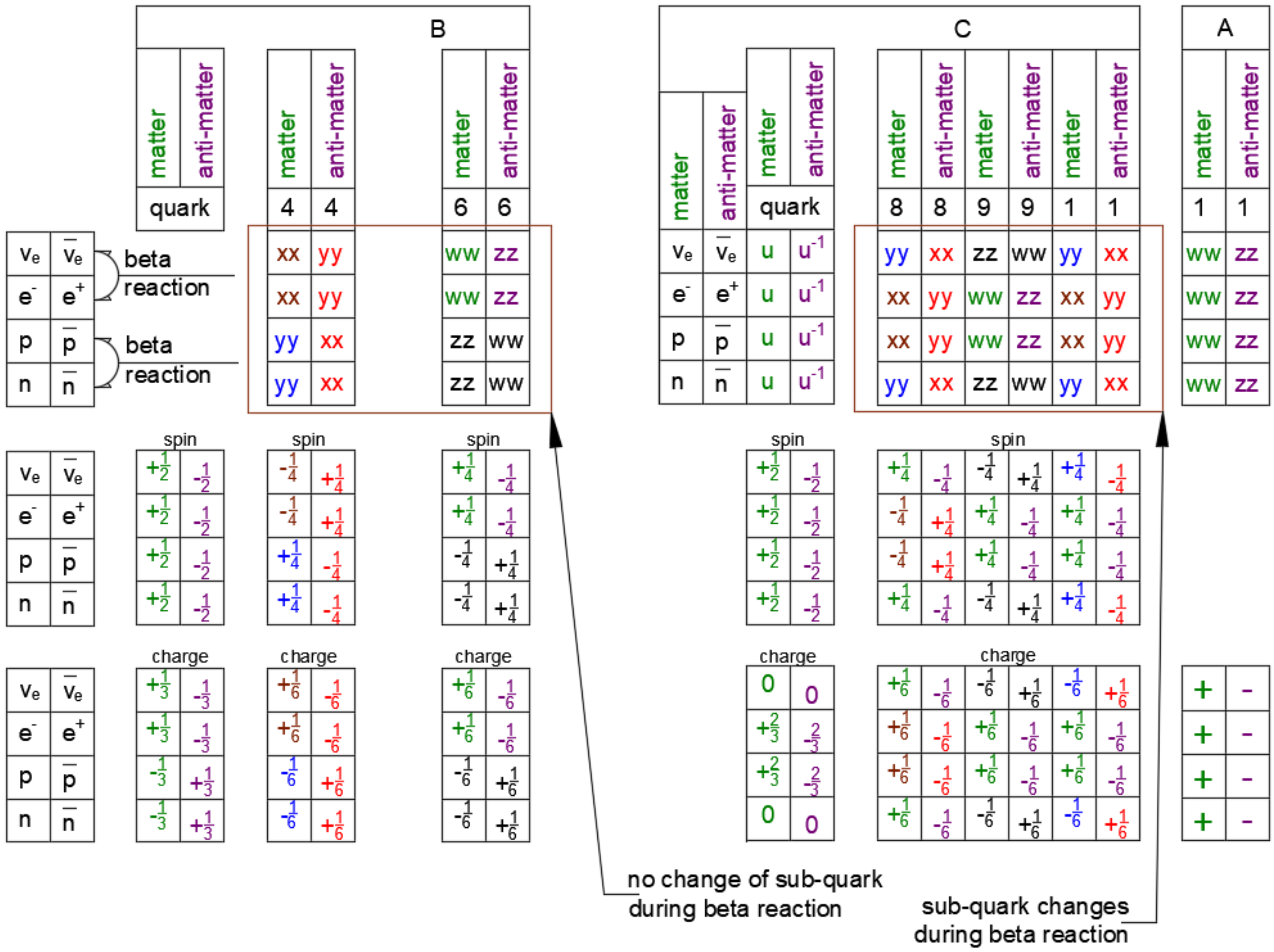
2.6.1.6 <u>Side View of Step 2 After Second Gluon is Formed at Vertices #8 & #9</u>



2.6.1.6 Side View of Step 2 After Second Gluon is Formed at Vertices #8 & #9

2.6.2 Summary of the Beta Reaction

2.6.2.1 Beta Reaction Table of Spin and Charge Differences

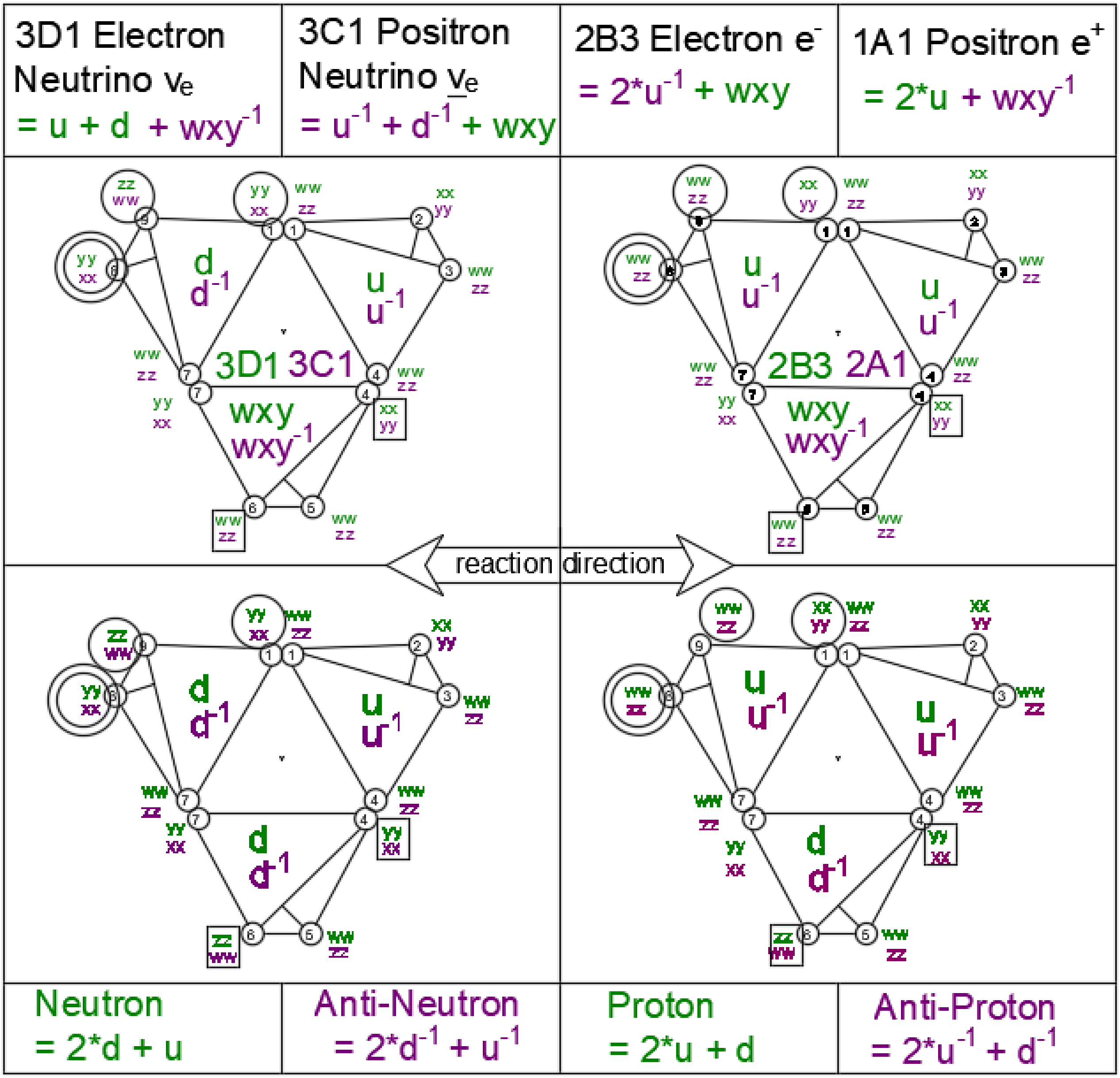


2.6.2.1 Beta Reaction Table of Spin and Charge Differences

2.6.3 Sub-quarks of the Beta Reaction

2.6.3.1 Beta Reaction State Diagram

Regardless of differing left to right or top to bottom, which is whether the originating quark is considered matter or anti-matter, gluons are formed by the combination xx, yy, ww, zz



Originating quark differs top to bottom (lepton to nucleon)

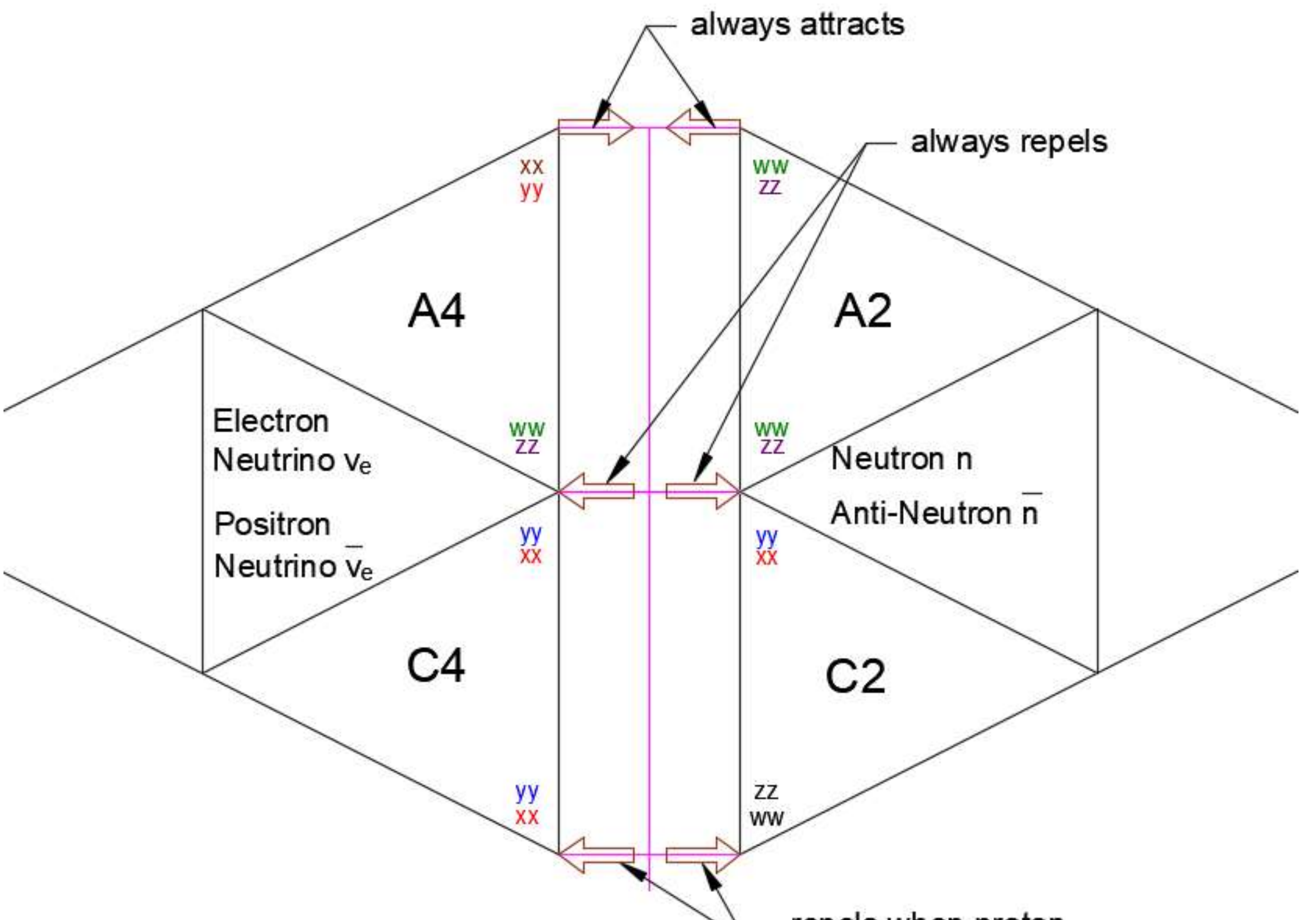
Originating quark differs left to right (neutral charge to charged)

Identity of sub-quark differs from uncharged particle with #8 vertex as yy//xx to charged particle with #8 vertex as ww//zz

2.6.3.1 Beta Reaction State Diagram

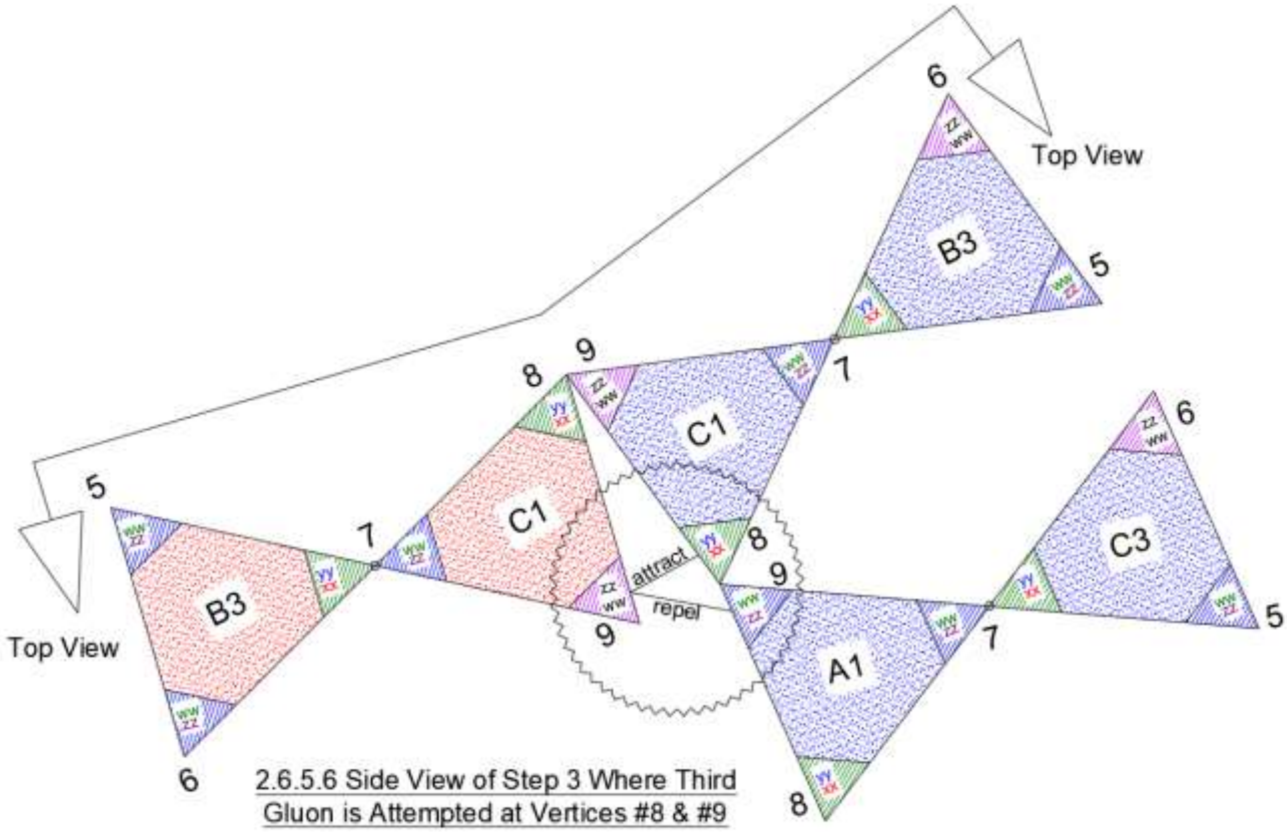
2.6.5 Steps of the Beta Reaction

2.6.5.1 Beta Reaction Attraction and Repulsion in Isolated Nucleon



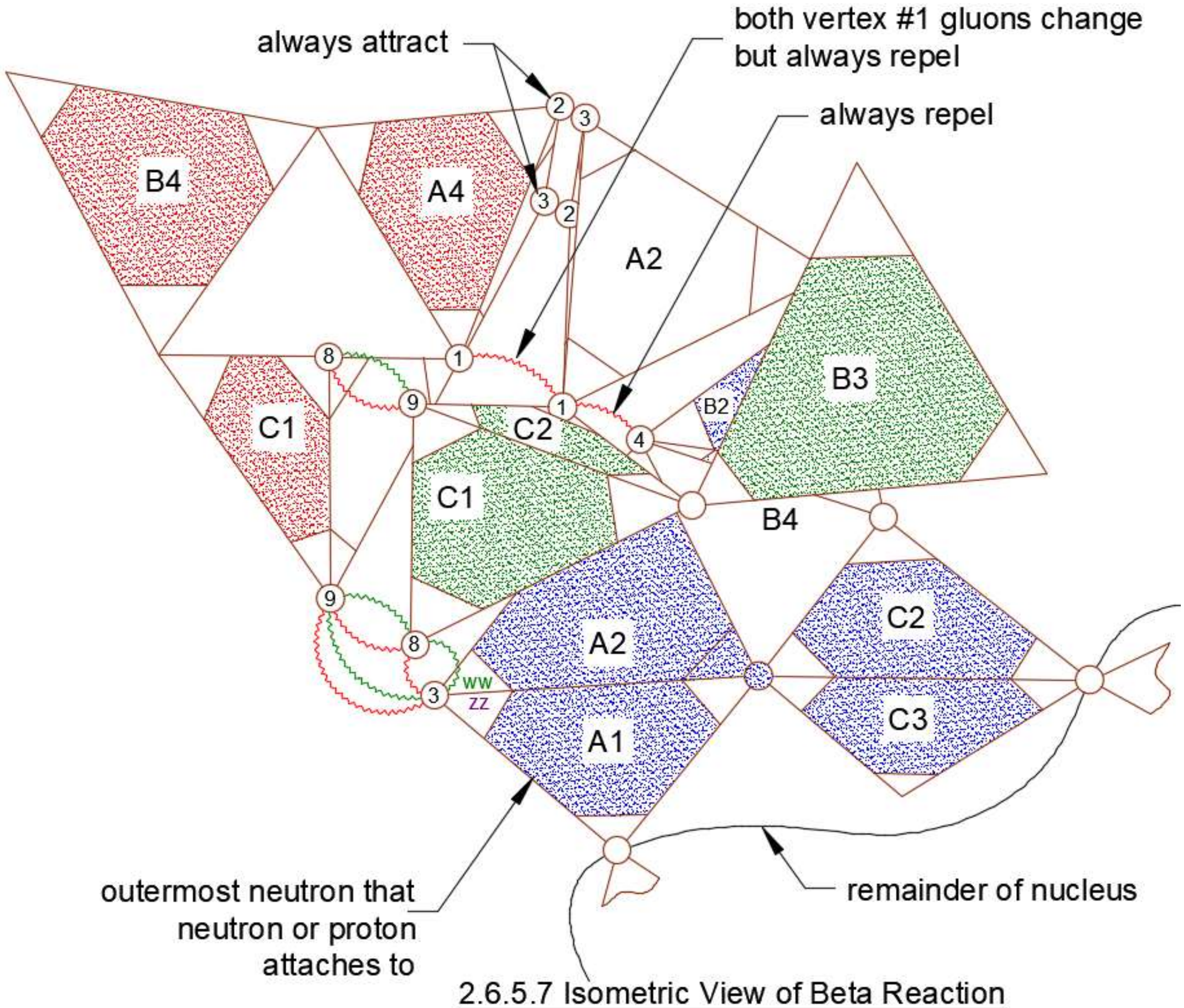
2.6.5.1 Beta Reaction Attraction and Repulsion in Isolated Nucleon

2.6.5.6 Side View of Step 3 Where Third Gluon is Attempted at Vertices #8 & #9



2.6.5.6 Side View of Step 3 Where Third Gluon is Attempted at Vertices #8 & #9

2.6.5.7 Isometric View of Beta Reaction

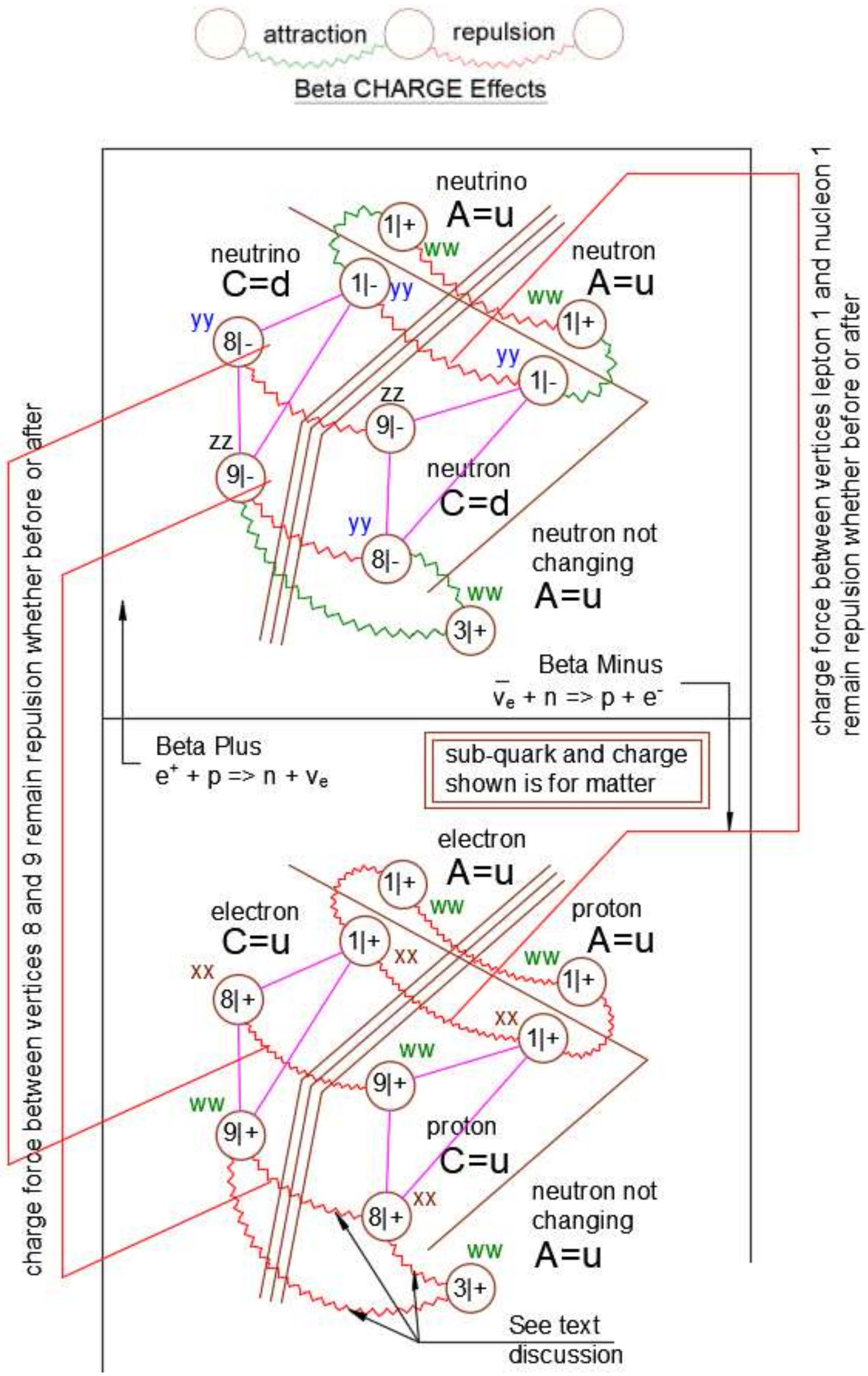


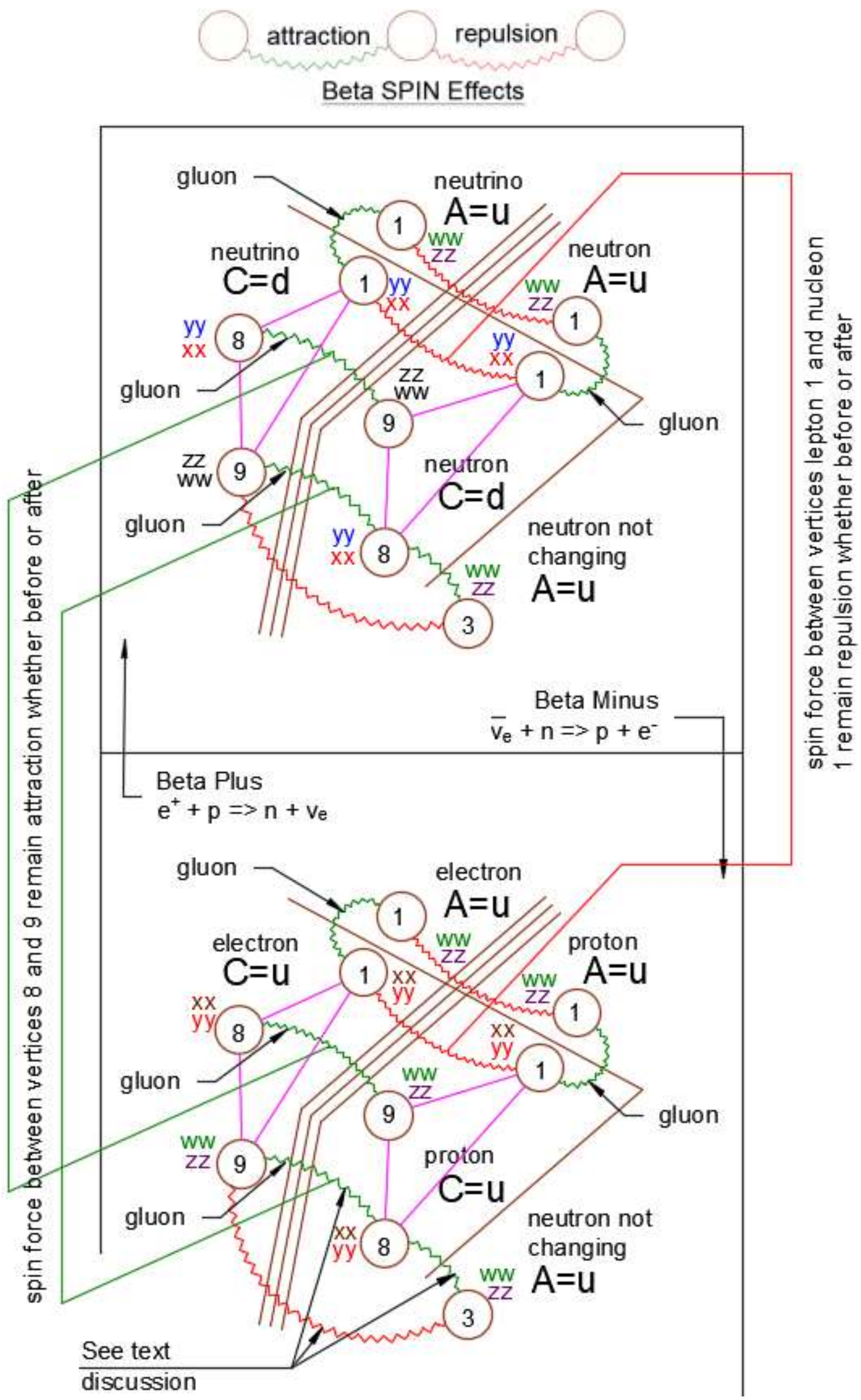
2.6.7 Repulsion and Attraction

2.6.7.1 Repulsion and Attraction Changing

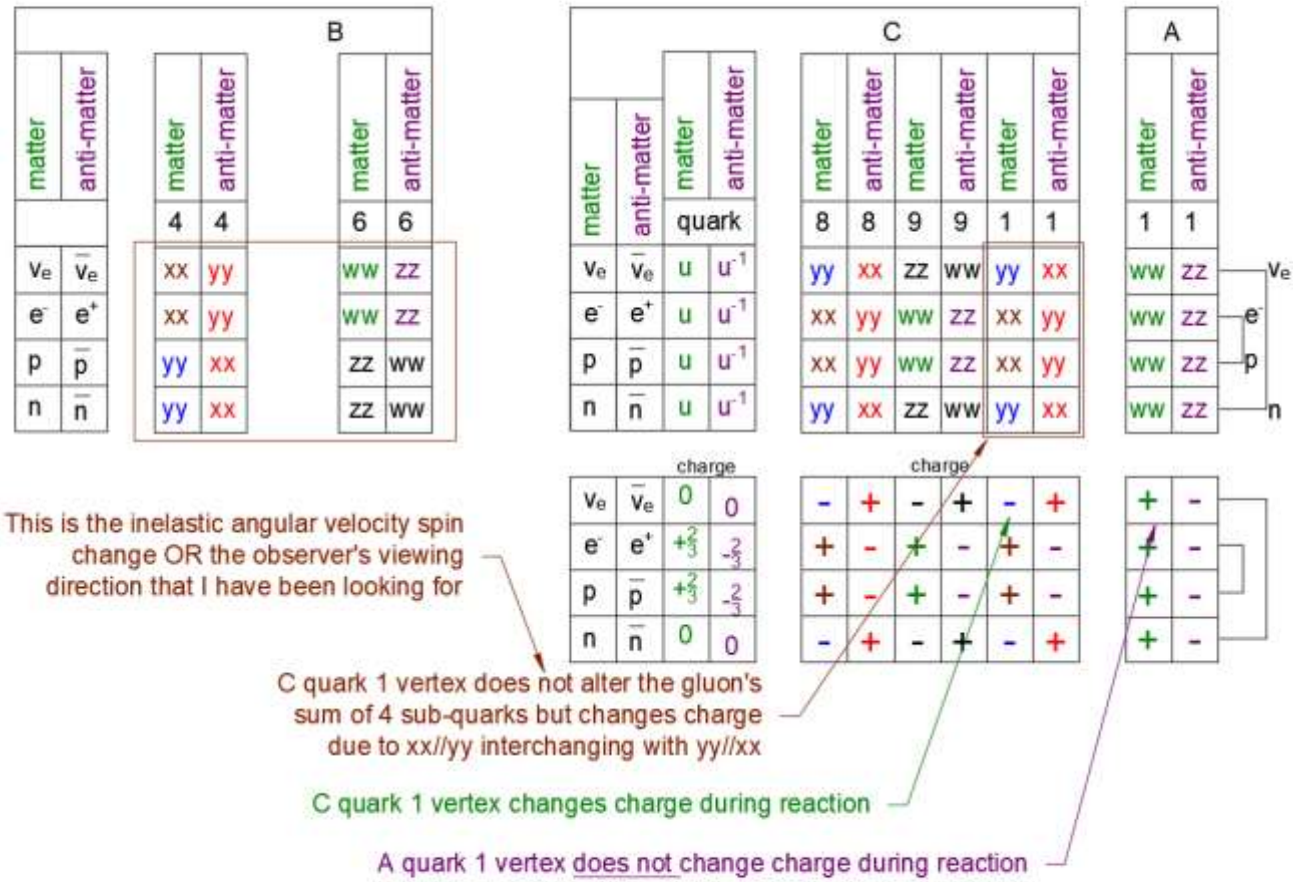
The charge in vertex #8 in the "neutron not changing" always repels the charge in vertex #9 in the lepton, but the spin between those vertices always attracts. The difference is the charges are repulsion between vertices #3 and #8 are at the beginning of beta plus when the proton is disconnected on this 3-8-9 end, and are attraction at the conclusion of beta plus when the nucleon is a neutron.

In the beta minus direction, before the incoming lepton arrives, the exterior neutron is bonded to the "neutron not changing". The sub-quark change that occurs after the lepton arrival causes the charge between #3 and #8 to reverse to repulsion. This causes the 1-8-9 end of the newly converted proton to disengage from the "neutron not changing". In addition to this being the description of the beta reaction, it is also an example of an inelastic collision of any two particles. The particles bounce off one another due to charge and/or spin being the same. The beta reaction is special in that spin reversal occurs in certain sub-quarks, which changes the identity of the both particles.


attraction
repulsion
Beta CHARGE Effects
neutrino
A=u
1|+
ww
neutrino
C=d
1|-
yy
neutron
A=u
ww
1|+
yy
8|-
yy
1|-
zz
9|-
zz
9|-
neutron
C=d
yy
8|-
neutron not changing
ww
A=u
3|+
Beta Minus
$\bar{v}_e$ + n => p + e$^-$
Beta Plus
e$^+$ + p => n + v$_e$
sub-quark and charge shown is for matter
electron
A=u
1|+
ww
electron
C=u
1|+
xx
proton
A=u
xx
8|+
ww
1|+
xx
1|+
ww
9|+
ww
9|+
proton
C=u
8|+
xx
neutron not changing
ww
A=u
3|+
See text discussion
charge force between vertices 8 and 9 remain repulsion whether before or after
charge force between vertices lepton 1 and nucleon 1 remain repulsion whether before or after

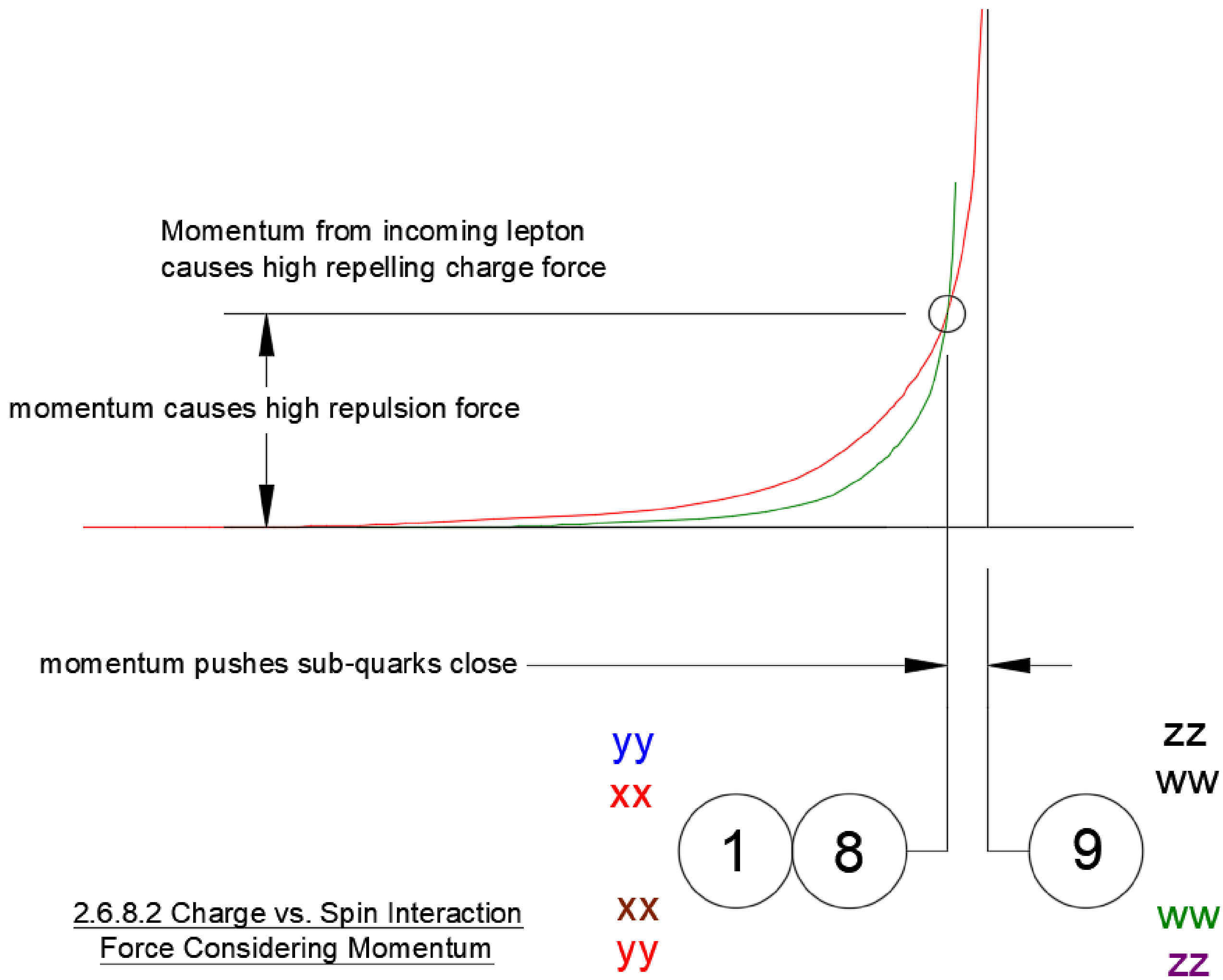

attraction
repulsion
Beta SPIN Effects
gluon
neutrino
A=u
neutrino
C=d
neutron
A=u
gluon
gluon
neutron
C=d
gluon
neutron not changing
A=u
Beta Minus
$\bar{v}_e + n \Rightarrow p + e^-$
Beta Plus
$e^+ + p \Rightarrow n + v_e$
gluon
electron
A=u
electron
C=u
proton
A=u
gluon
gluon
proton
C=u
gluon
neutron not changing
A=u
See text discussion
spin force between vertices 8 and 9 remain attraction whether before or after
spin force between vertices lepton 1 and nucleon 1 remain repulsion whether before or after

2.6.7.2 Tabulation of Repulsion and Attraction Changes

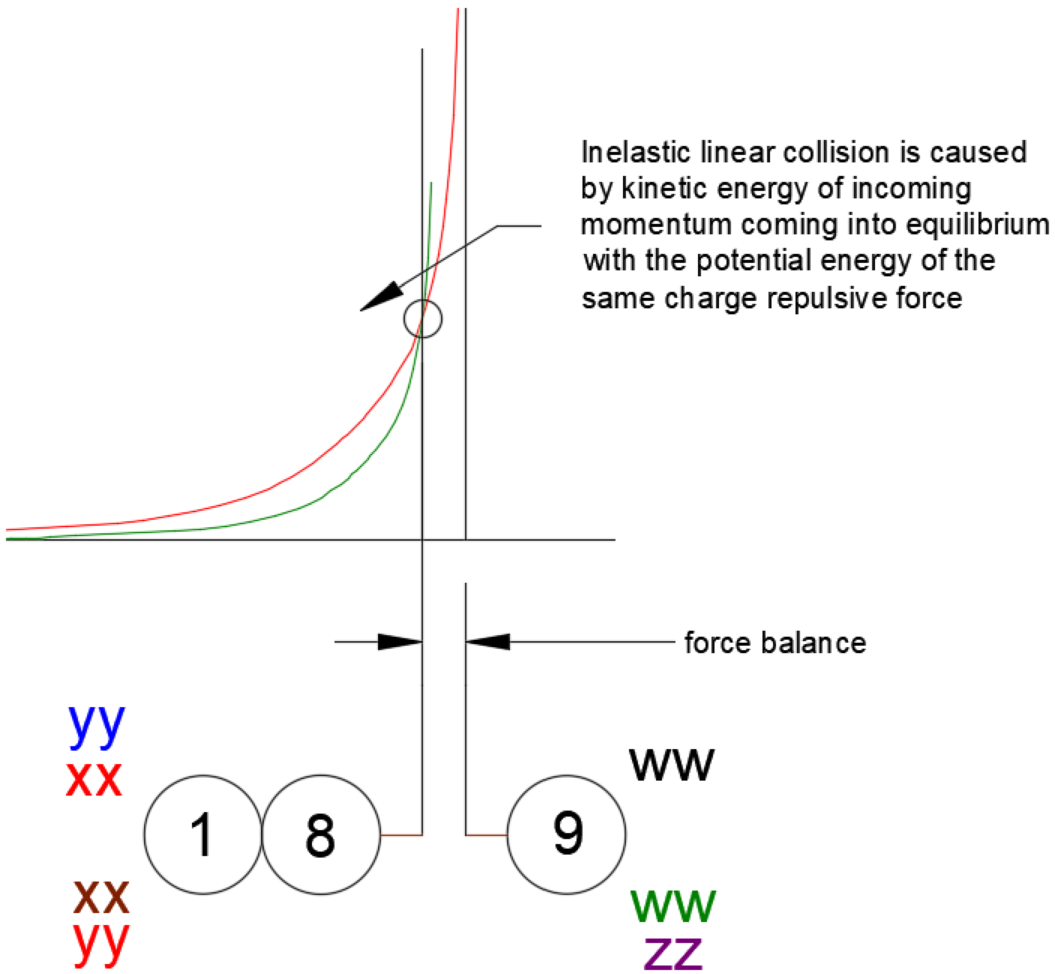


2.6.8 Momentum Forces Identity Change

2.6.8.2 Charge vs. Spin Interaction Force Considering Momentum

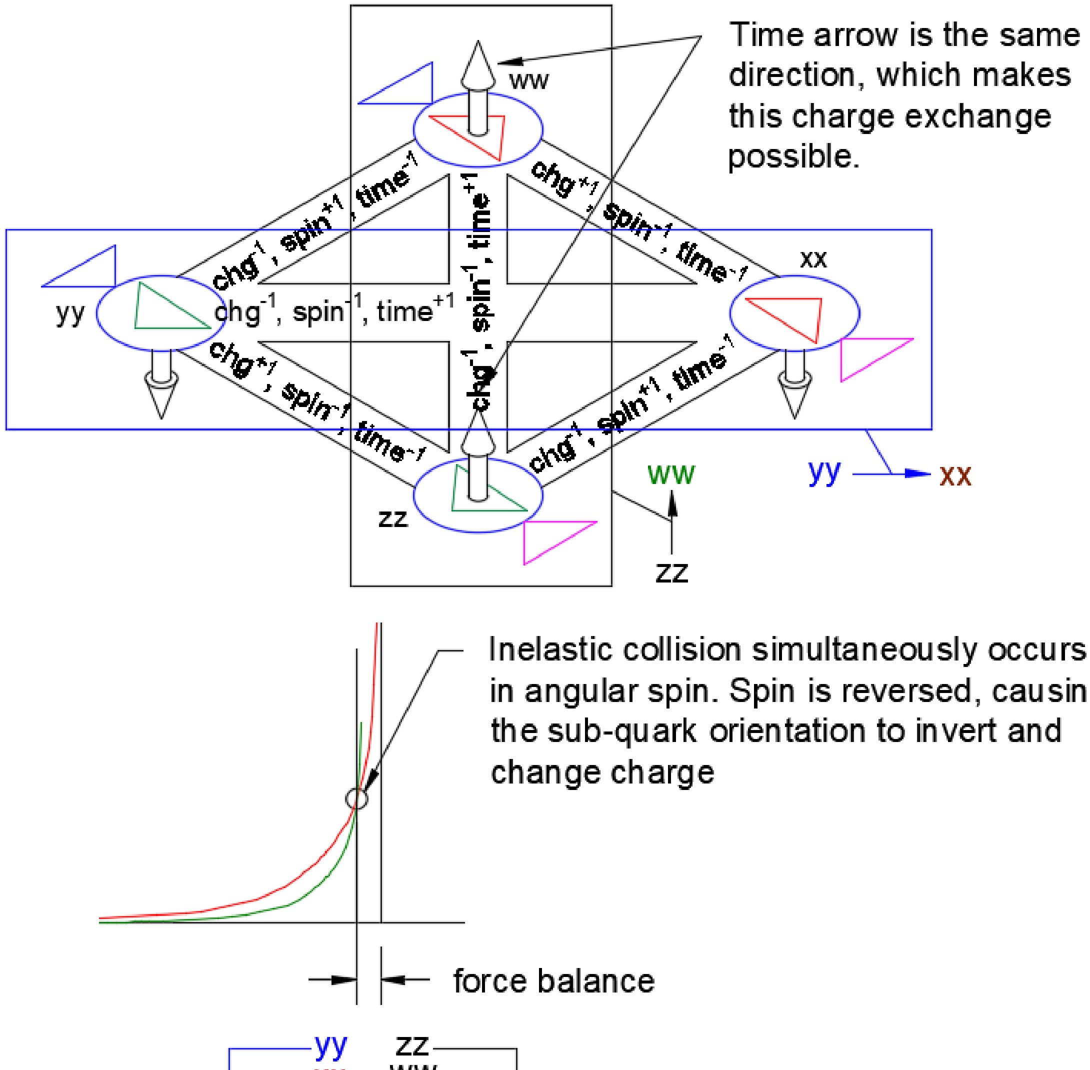


2.6.8.3 Incoming Lepton Travels to Point of Force Balance



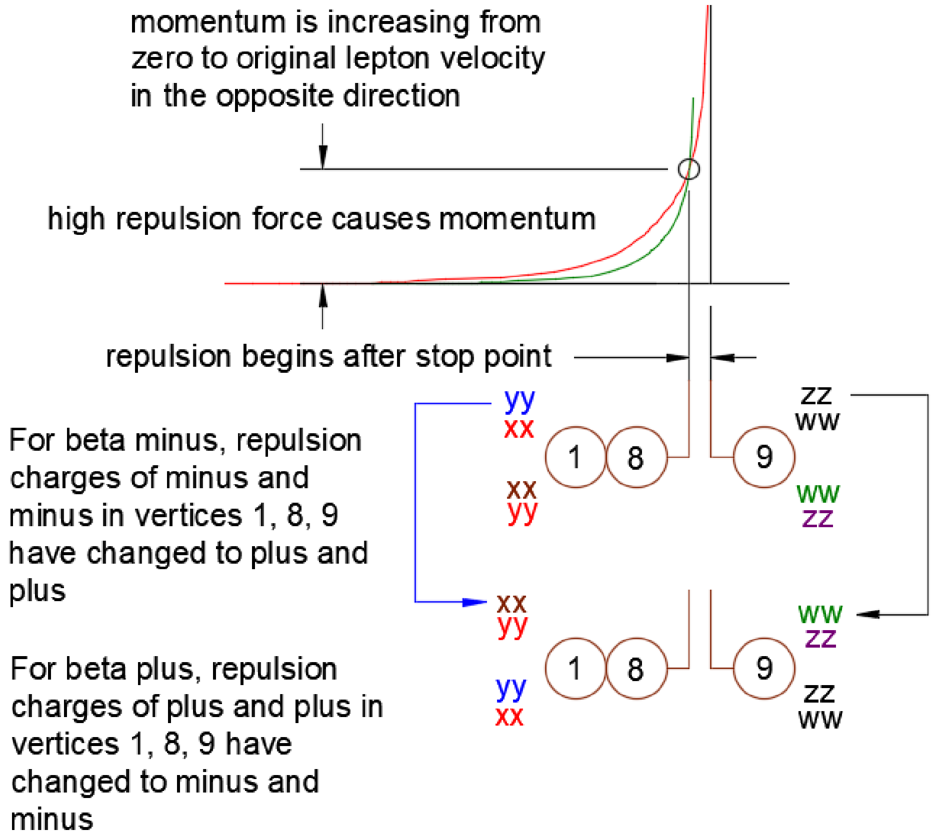
2.6.8.3 Incoming Lepton Travels
To Point of Force Balance

2.6.8.4 Inelastic Angular Collision Causes Spin and Charge Inversion



2.6.8.4 Inelastic Angular Collision Causes Spin and Charge Inversion

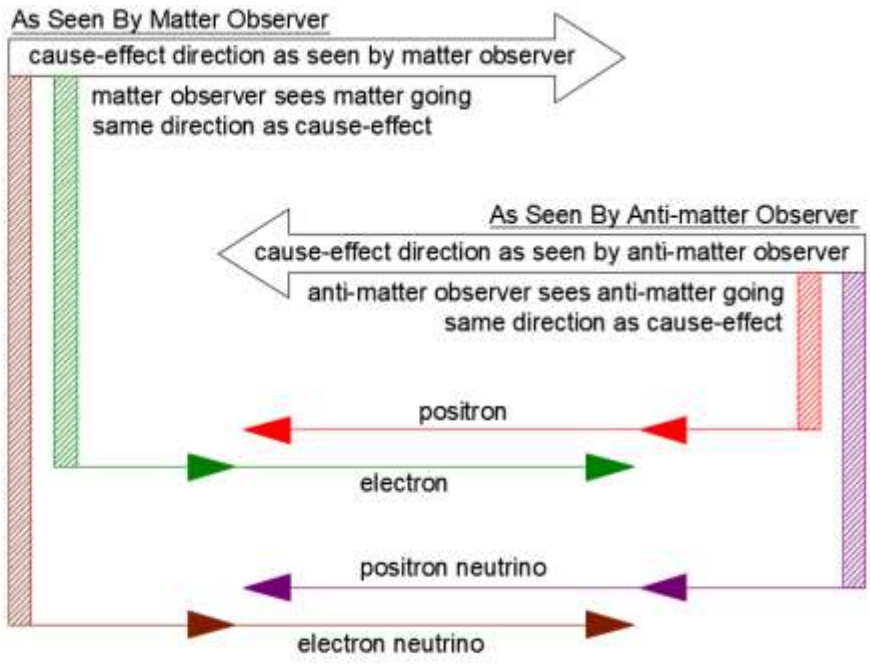
2.6.8.5 <u>Charge vs. Spin After Lepton Velocity is Reversed</u>



2.6.8.5 Charge vs. Spin After
Lepton Velocity is Reversed

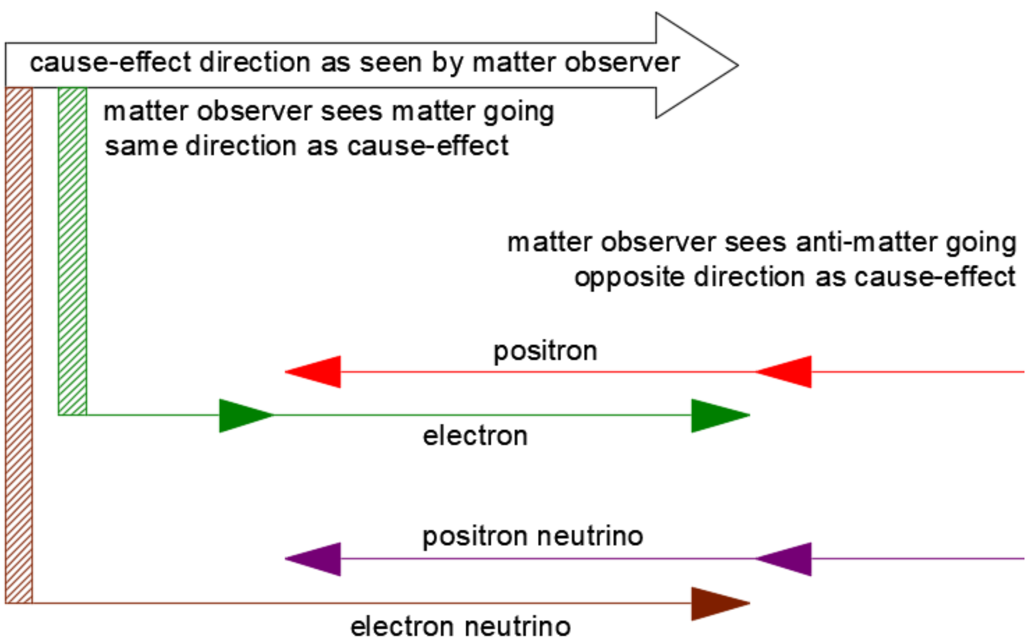
2.6.9 Diagram of the Identity Change

2.6.9.1 As Seen by Opposite Observers



2.6.9.1 As Seen By Opposite Observers

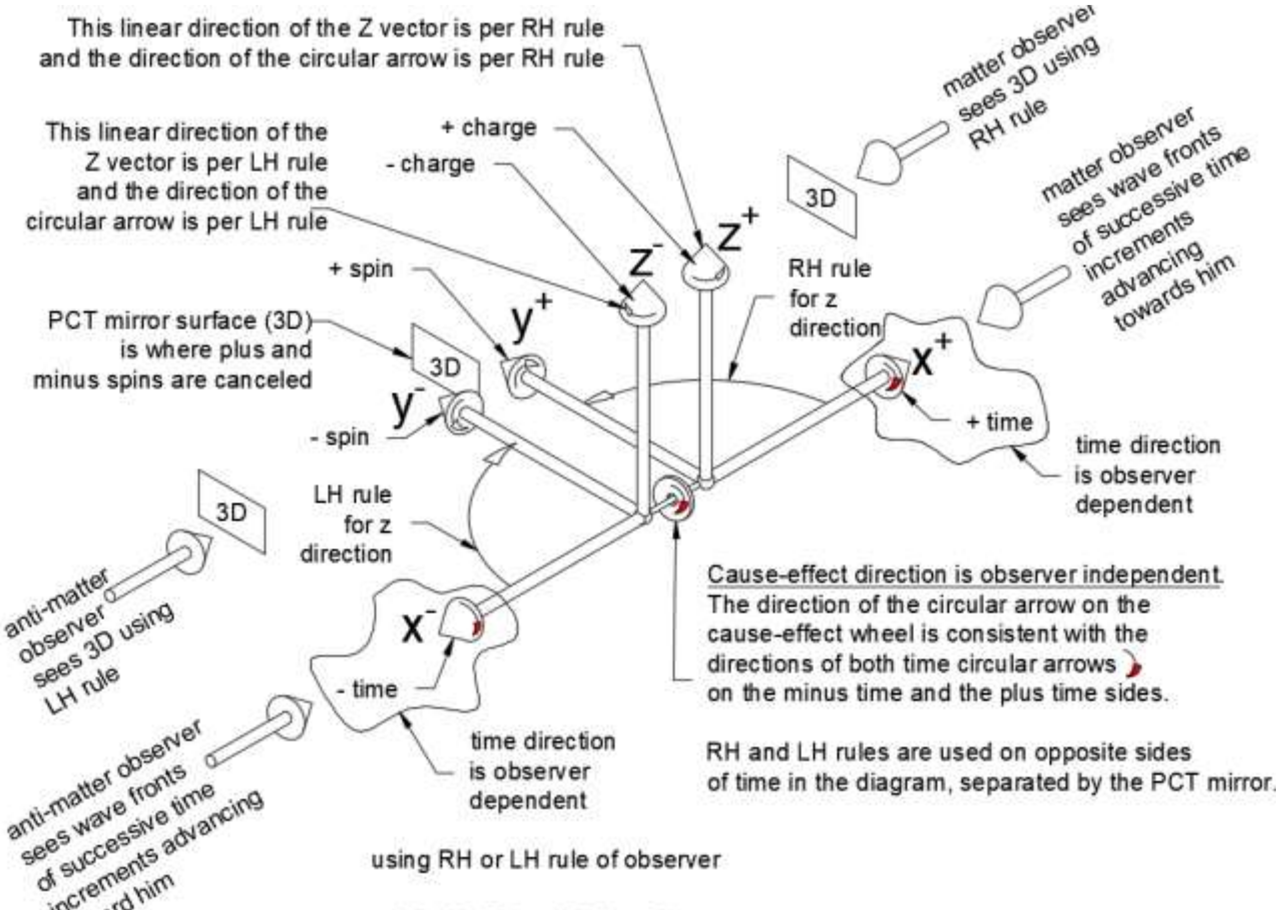
2.6.9.2 As Seen by Matter Observer



2.6.9.2 As Seen By Matter Observer

2.6.10 Cause-Effect of the Beta Reaction

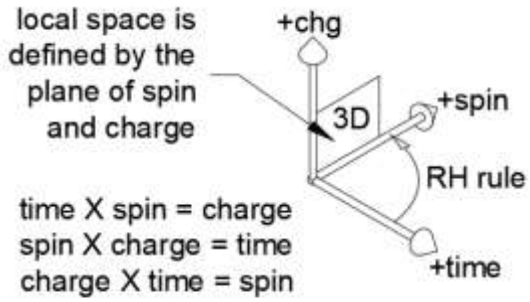
2.6.10.1 Time X Spin = Charge



2.6.10.1 Time X Spin = Charge

2.6.10.2 RH Rule Relationships Among Spin, Charge and Time

Spin crossed with charge yields time, which is always orthogonal to local space. Unit charge and unit spin are constant in local space. Unit time is constant, but its measurement varies with acceleration of local space with respect to global space.

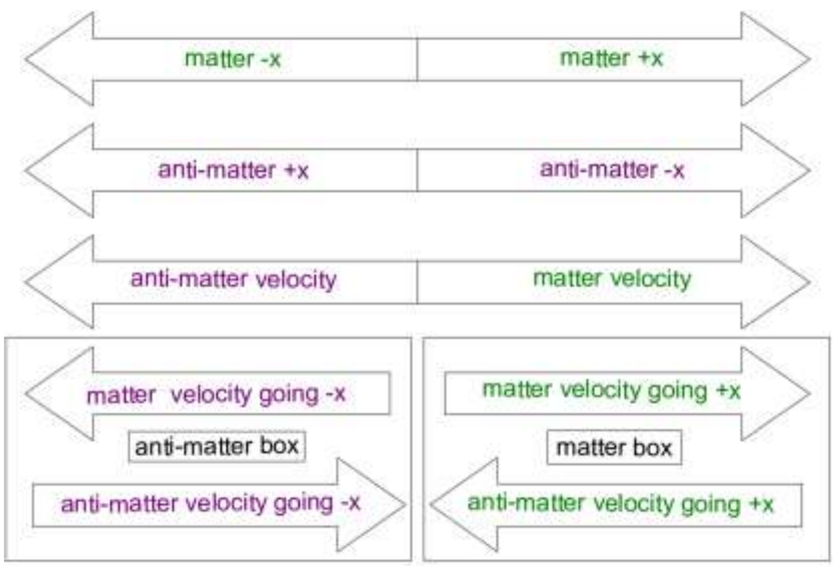


2.6.10.2 RH Rule Relationships Among Spin, Charge and Time

2.6.10.3 Anti-matter Velocity Opposite of Cause-Effect Direction

Both observers see what they are made of (matter or anti) as moving the same direction as cause-effect. Both observers see the PCT opposite of what they are made of (matter or anti) as having velocity opposite of cause-effect direction.

- Matter observer cannot see outside the matter box
- Matter observer sees anti-matter velocity backwards from cause-effect
- Anti-matter observer cannot see outside the anti-matter box
- Anti-matter observer sees matter velocity backwards from cause-effect



2.6.10.3 Anti-matter Velocity Opposite of Cause-Effect Direction

2.7 <u>Cause-Effect</u>

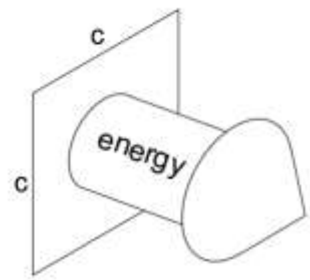
2.7.1 <u>Cause-Effect Findings</u>

2.7.1.1 <u>Mass = Energy Flux Thru Velocity Area</u>

$e = mc^2$

$e/c^2 = m$

energy / geometrized area = mass



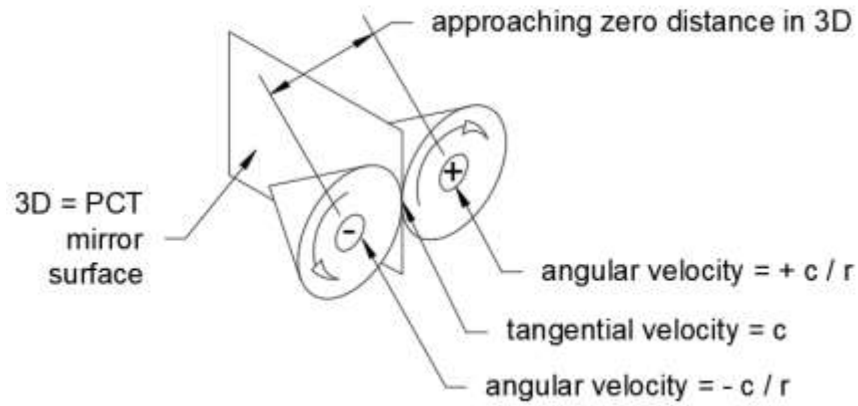
c^2 = geometrized area

mass = energy per geometrized area

2.7.1.1 Mass = Energy Per Geometrized Area

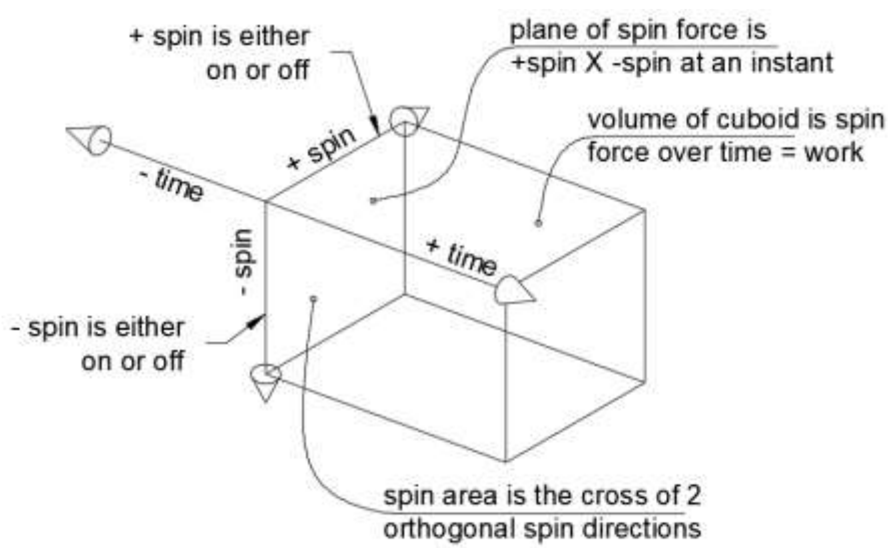
2.7.1.2 Spin Angular Velocity Approaches Infinity

- linear velocity at radius r = angular spin velocity * r
- linear velocity / r = angular spin velocity
- c / r = angular spin velocity
- c / approaching zero = angular spin velocity
- approaching infinity = angular spin velocity



2.7.1.2 Spin Angular Velocity Approaches Infinity

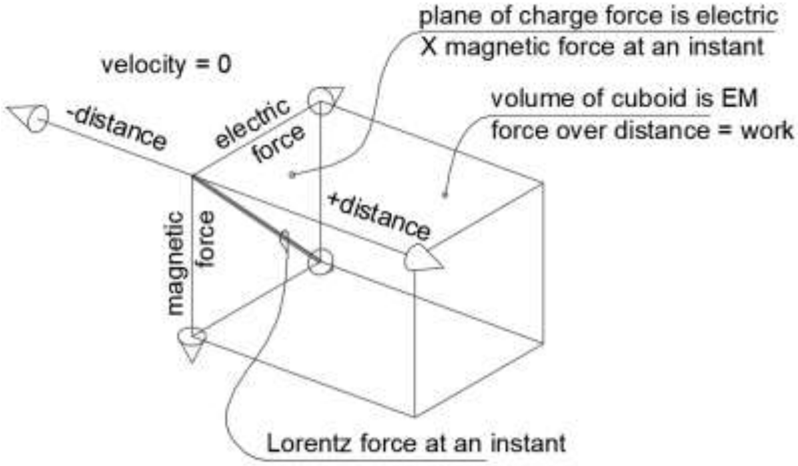
2.7.1.3 Spin Work is the Cross of Plus and Minus Spin Over Time



2.7.1.3 Spin Work is the Cross of Plus and Minus Spin Over Time

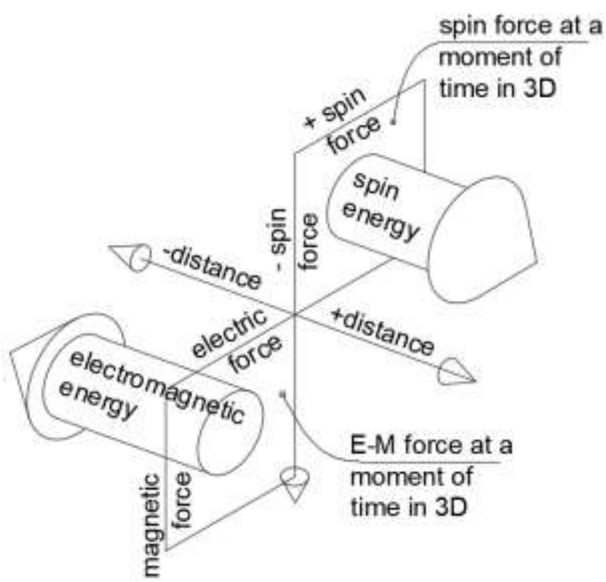
2.7.1.4 Electromagnetic Work is the Cross of Electric and Magnetic Over Distance

Velocity at an instant is zero.



2.7.1.4 Electromagnetic Work is the Cross of Electric and Magnetic Over Distance

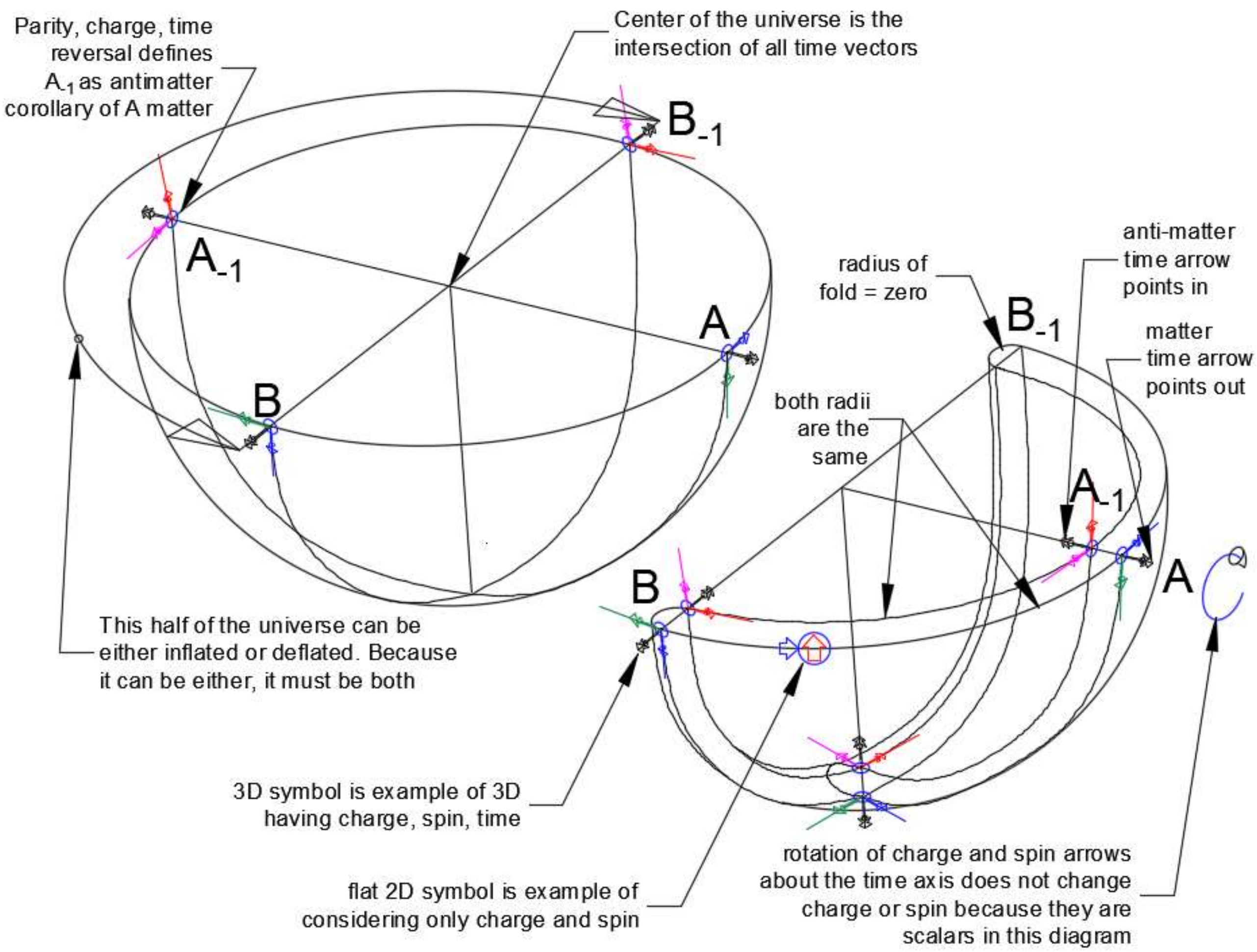
2.7.1.5 Each Point in Time in 3D Has E-M Force and Spin Force



2.7.1.5 Each Point in Time in 3D Has E-M Force and Spin Force

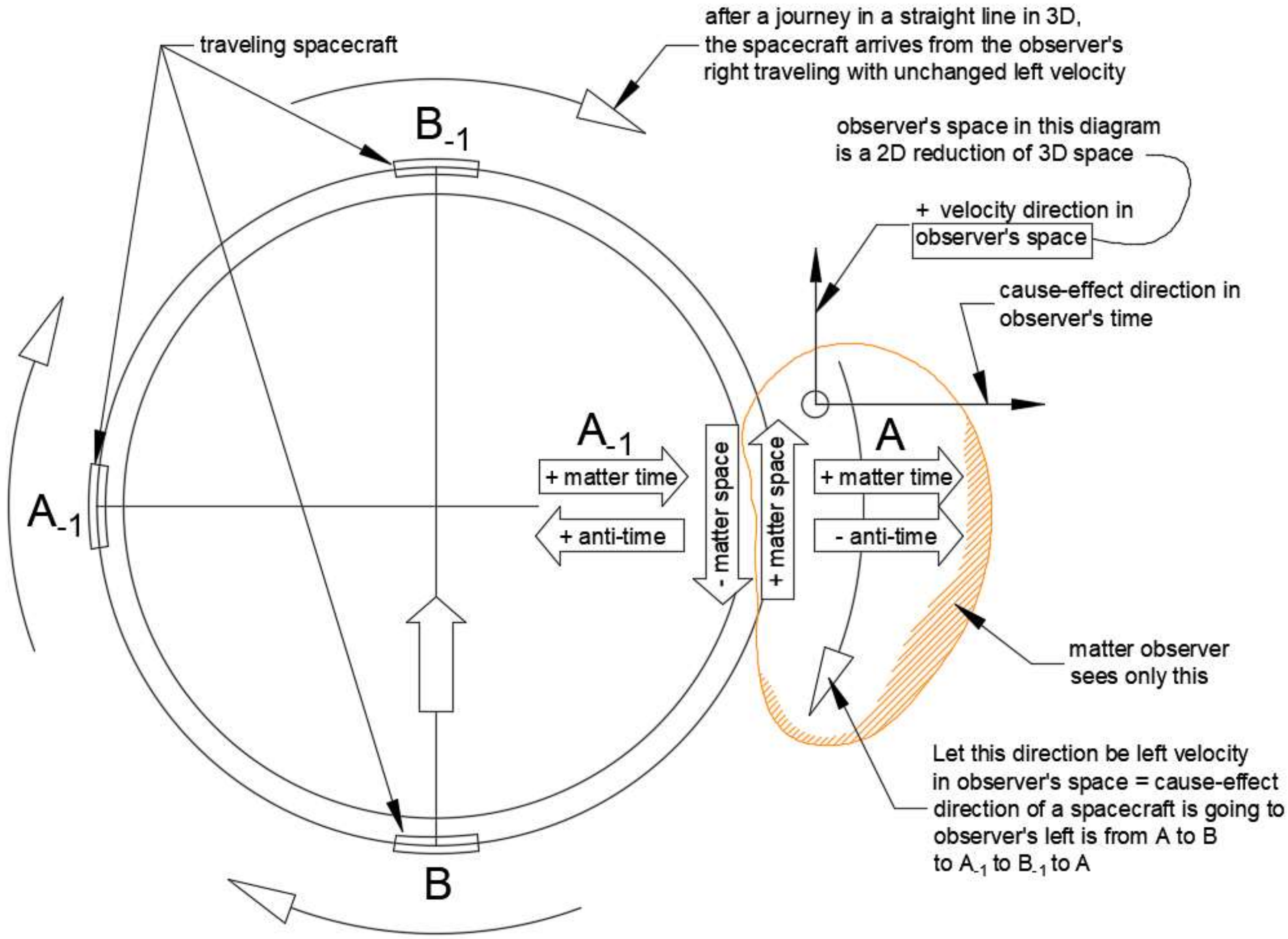
2.7.2 Cause-Effect in Cosmology

2.7.2.1 Matter and Anti-matter in the Universe and Quarks



2.7.2.1 Matter and Anti-matter in the Universe and Quarks

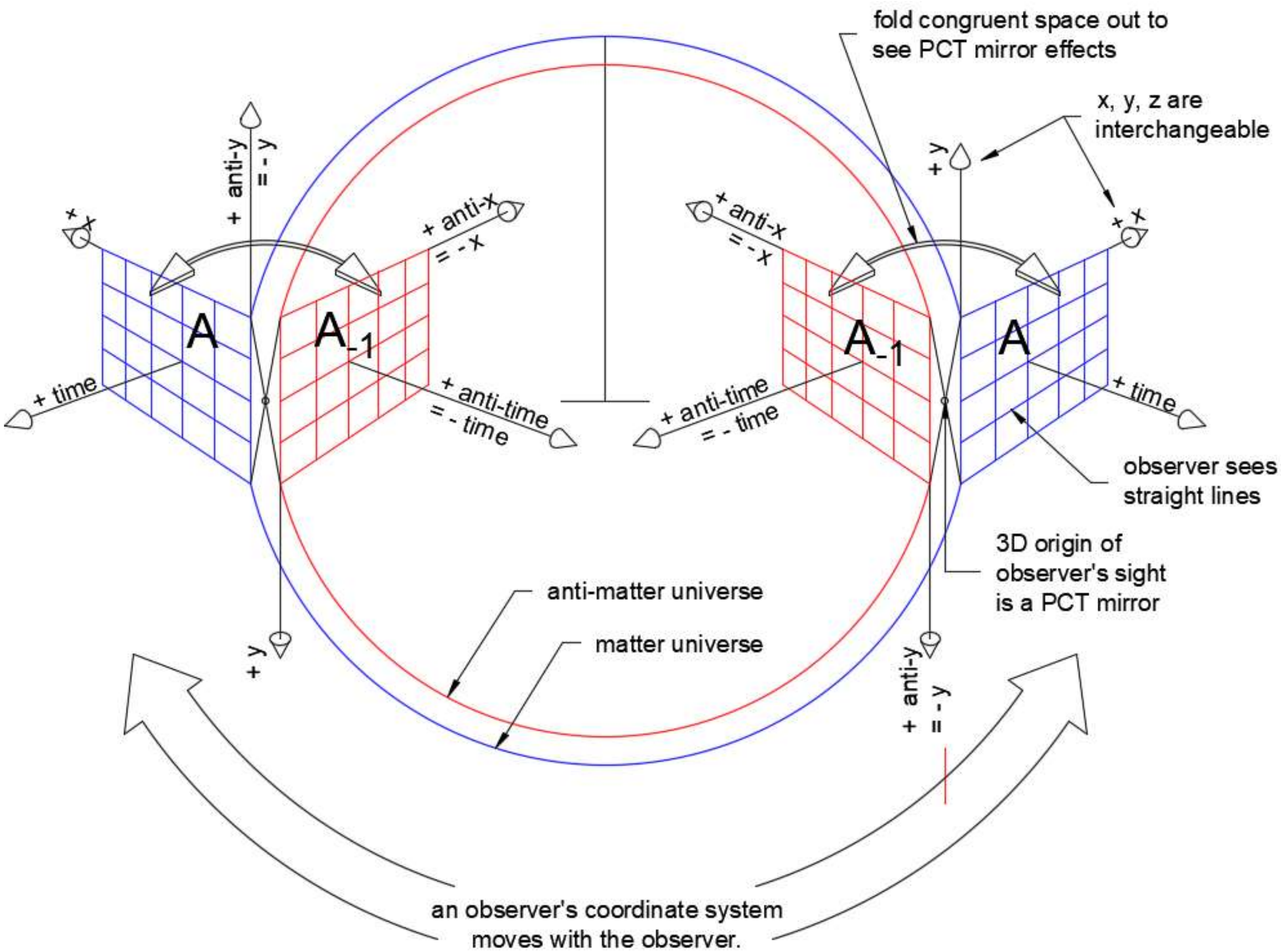
2.7.2.2 Section Thru the Universe Showing Cause-Effect Direction



2.7.2.2 Section Thru the Universe Showing Cause-Effect Direction

2.7.2.3 An Observer's View of the Universe

No matter where the observer travels, the observer never reaches the edge of the universe because center and edges move with the observer.



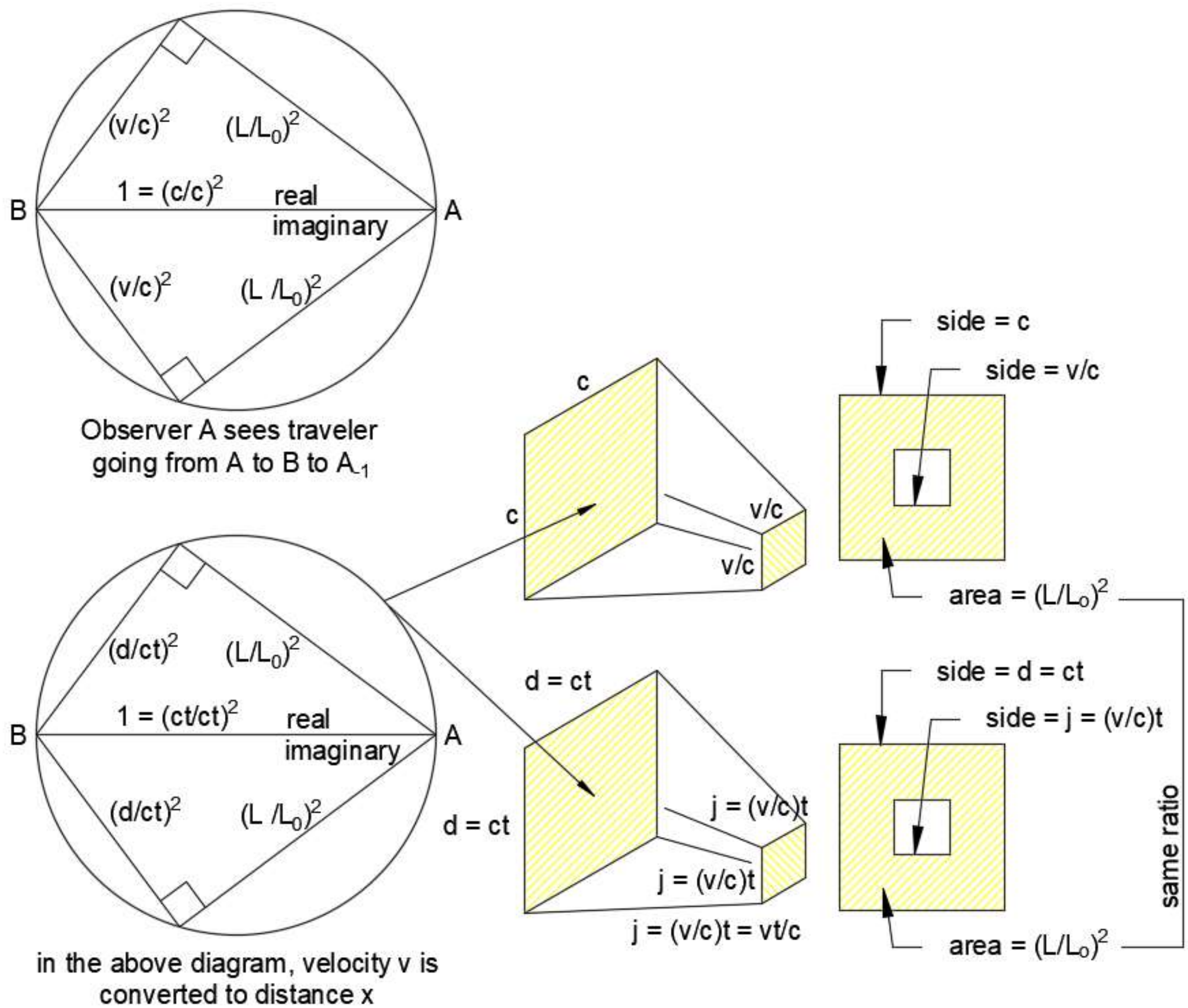
2.7.2.3 An Observer's View of the Universe

2.7.2.4 Red Shift is Due to Distance of the Observed Light Source

1) During the observation of distant galaxies, let the frequency of observed light with respect to expected frequency f/f_0 be the length contraction ratio L/L_0
2) Let the distance to that distant galaxy be estimated as distance d, based on an astronomical ladder
3) Let t be the time to travel distance d at velocity c
4) In the lower diagram to the left, the value of t in (ct/ct)2/ does not matter
5) Similarly, the expression d/t is equal to v, so for the purpose of evaluating what variable affects (L/L_0), only v=d/t matters since the hypotenuse is always 1
6) Regardless of the various velocities traveled, the end result depends on total distance and total time

7) If a spacecraft goes the distance d at various velocities, its length contraction as seen by the observer will depend on the total distance it travels and not various length contractions experienced during segments of the journey
8) Similarly, light frequency is length contracted because it is the reciprocal of wavelength, which is a distance
9) The light frequency is length contracted based on the total distance traveled and not on instantaneous velocity. The velocity of light as a constant does not change its comparison to the velocity of a spacecraft. Average velocity of light is constant by definition, so distance is what determines the length contracted frequency. This is equivalent to saying red shift is not due to velocity, but to distance of the observed light source

By similar triangles, variables in the Lorentz-Pythagorean triangle can be represented as either velocities or distances (given a global elapsed time measure):



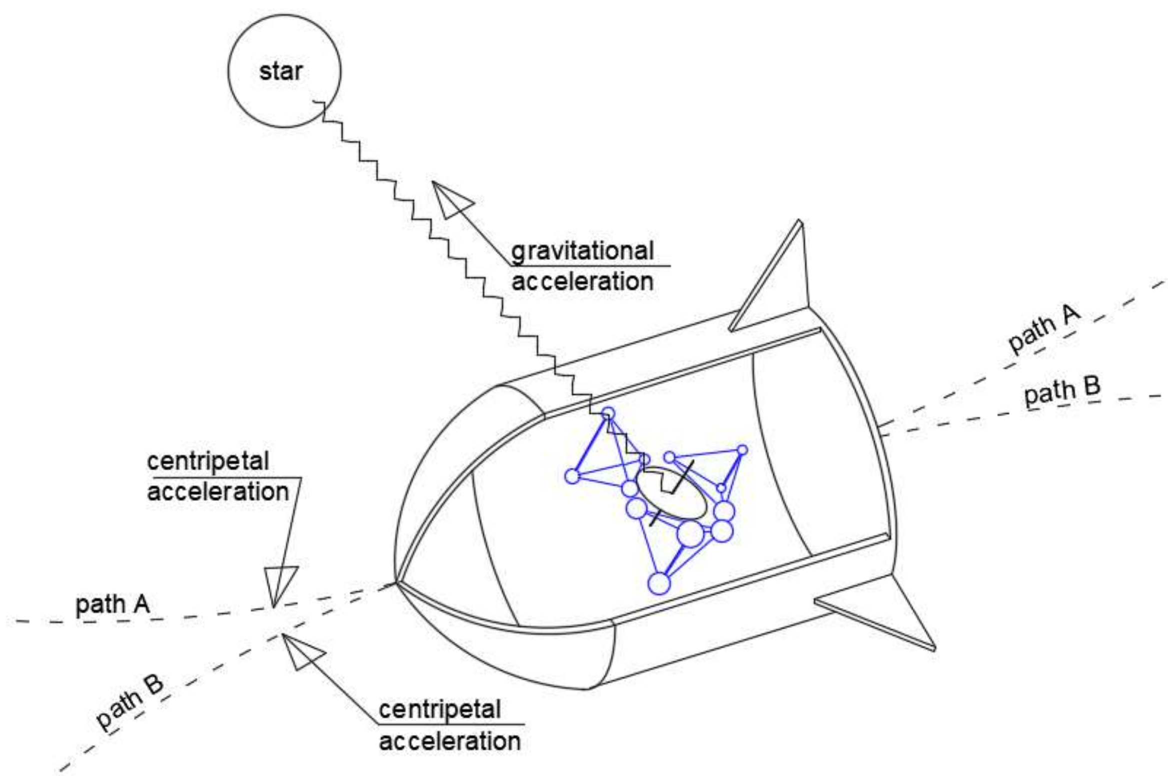
2.7.2.4 Red Shift is Due to Distance of the Observed Light Source

2.7.2.5 Comparing Paths of Rocket

A rocket with a particle inside is traveling either path A or B. Path A is a slingshot around a star. Path B is an approach to a star, then leaving. The centripetal force performing a slingshot around the star exactly counterbalances the gravitational force of that star. The particle is prevented from moving laterally away from the path centerline by the rocket's particle container.

Does the gravitational acceleration of the particle due to the star's mass exactly counterbalance the centripetal acceleration of the particle? We know the particle's time rate is slowed by gravitational acceleration. We also know the particle's time rate is slowed by centripetal acceleration. Is the total time rate slowing the sum of the two? Yes, because time is a scalar in 3D. Once directional acceleration is converted to directionless time rate, you cannot perform a directional vector sum.

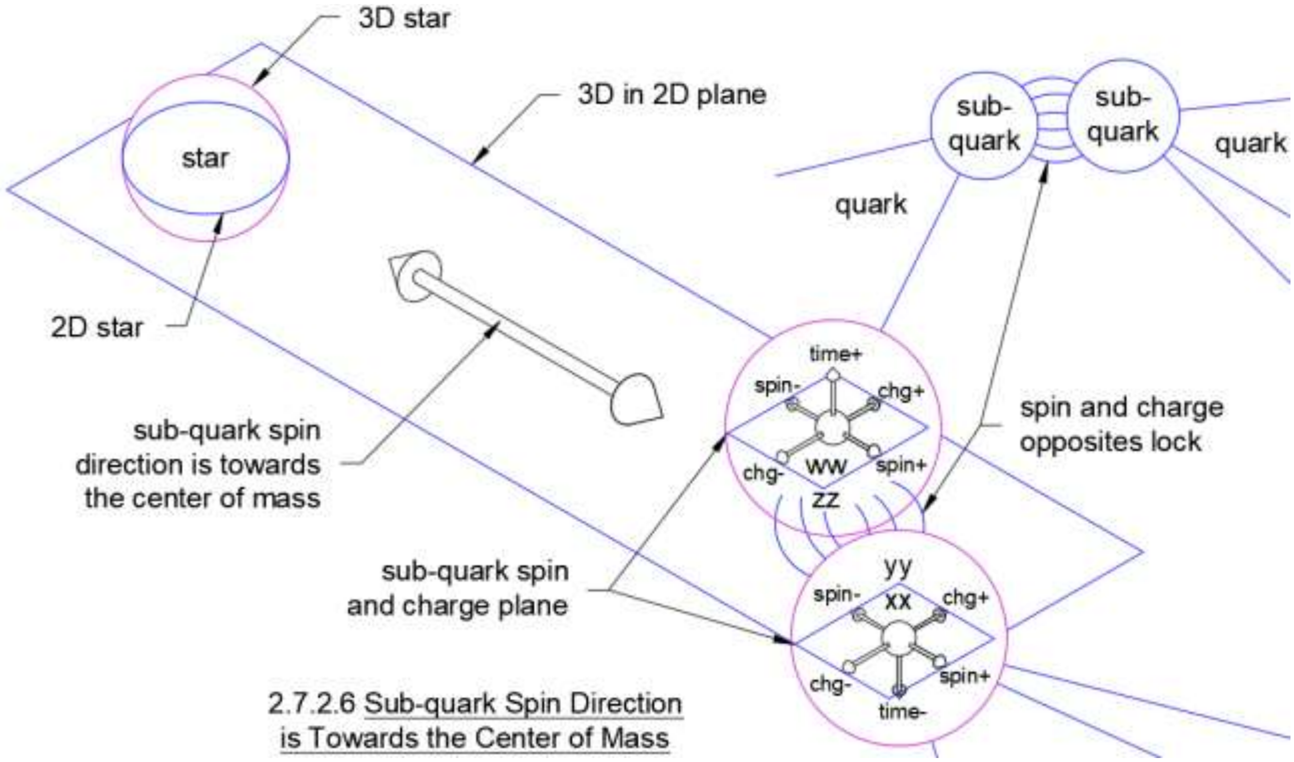
This means the time rate is slowed the same whether the rocket is traveling on path A or B. Opposing gravitational and centripetal forces may add or subtract, but time rate slowing due to gravitational or centripetal acceleration always adds. The question remains about acceleration. If forces may subtract and acceleration is proportional to force, then acceleration may subtract also. Time rate slowing is additive regardless of direction of acceleration.



2.7.2.5 Comparing Paths of Rocket

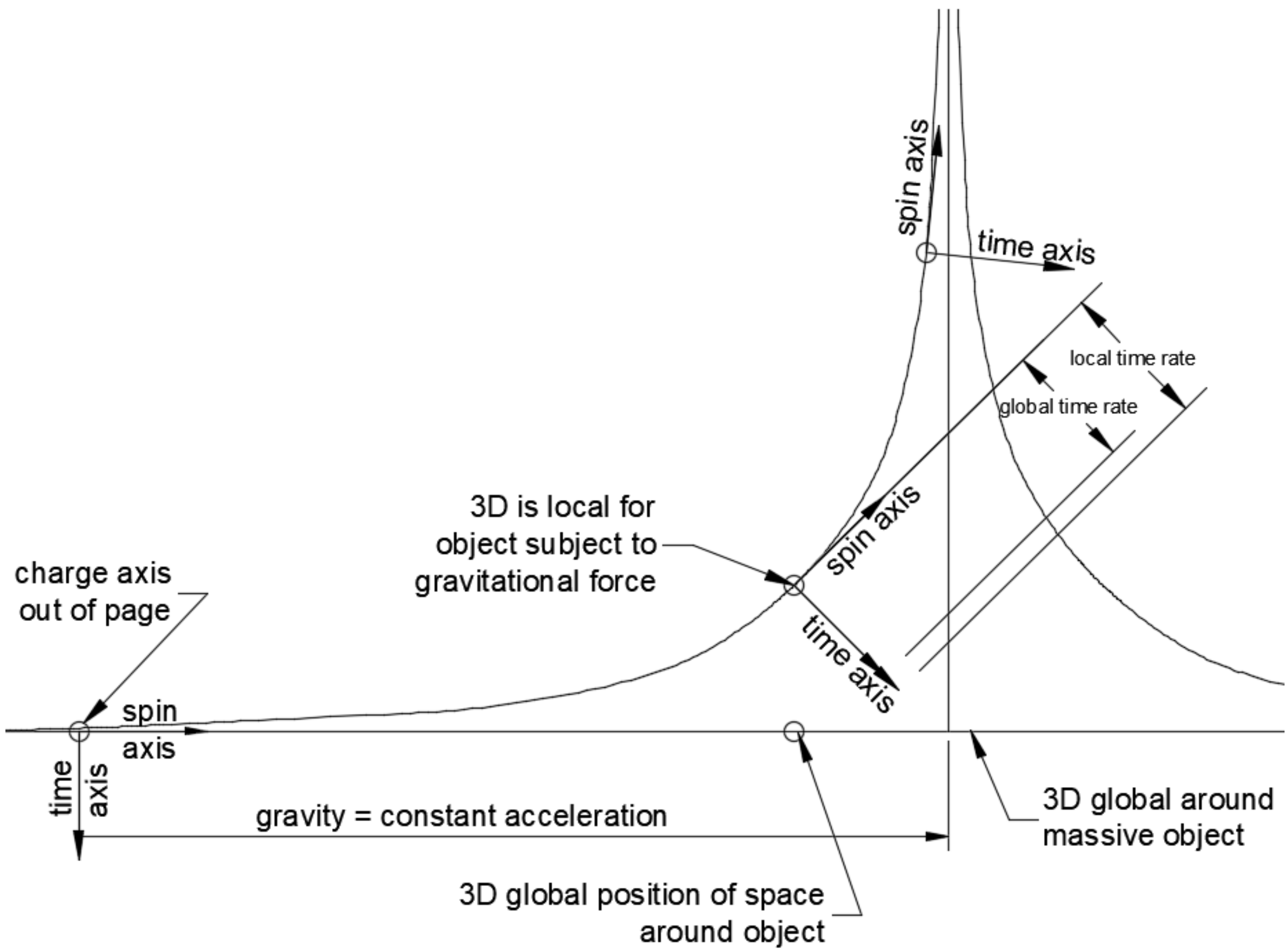
2.7.2.6 <u>Sub-quark Spin Direction is Towards the Center of Mass</u>

If the spin in a sub-quark is considered as a compass, the direction to magnetic north would be along the gravitational gradient. Even if the universe has isotropic mass distribution on average, there still is a predominant gravity direction locally.



2.7.2.7 How Time Rate is Slowed (Dilated) by Gravity (Acceleration)

The same time dilation and length contraction present in special relativity as seen in 1.2.5 "Acceleration Length Contraction and Time Dilation" holds true for all matter and anti-matter as seen in the below diagram. Local time rate dilation (lengthening) occurs in the presence of gravity (acceleration).

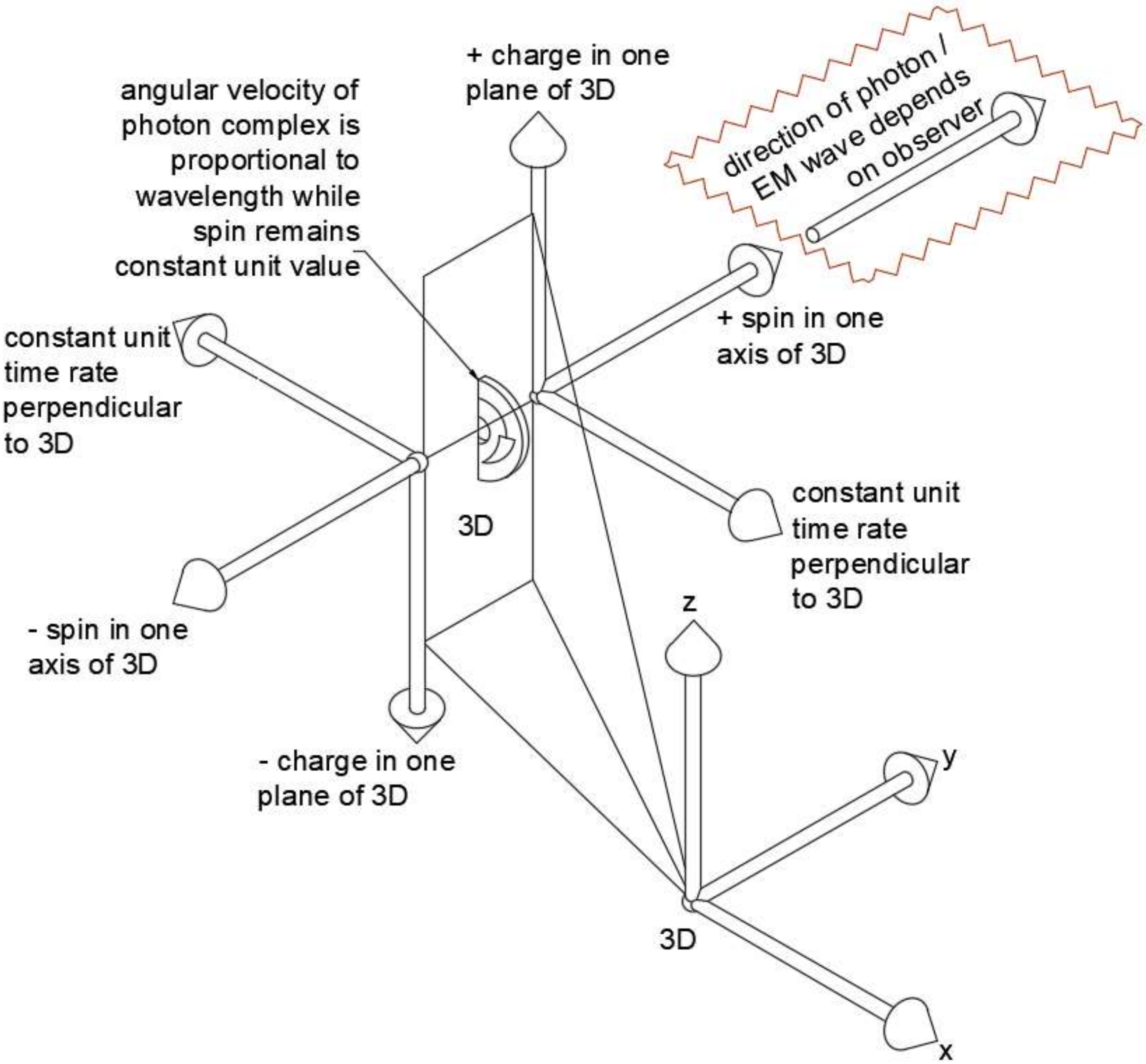


2.7.2.7 How Time Rate is Slowed (Dilated) by Gravity (Acceleration)

2.8 The Photon

2.8.1 Particles in the Photon Complex

2.8.1.1 Photon Polarity is Equivalent to Electron Spin

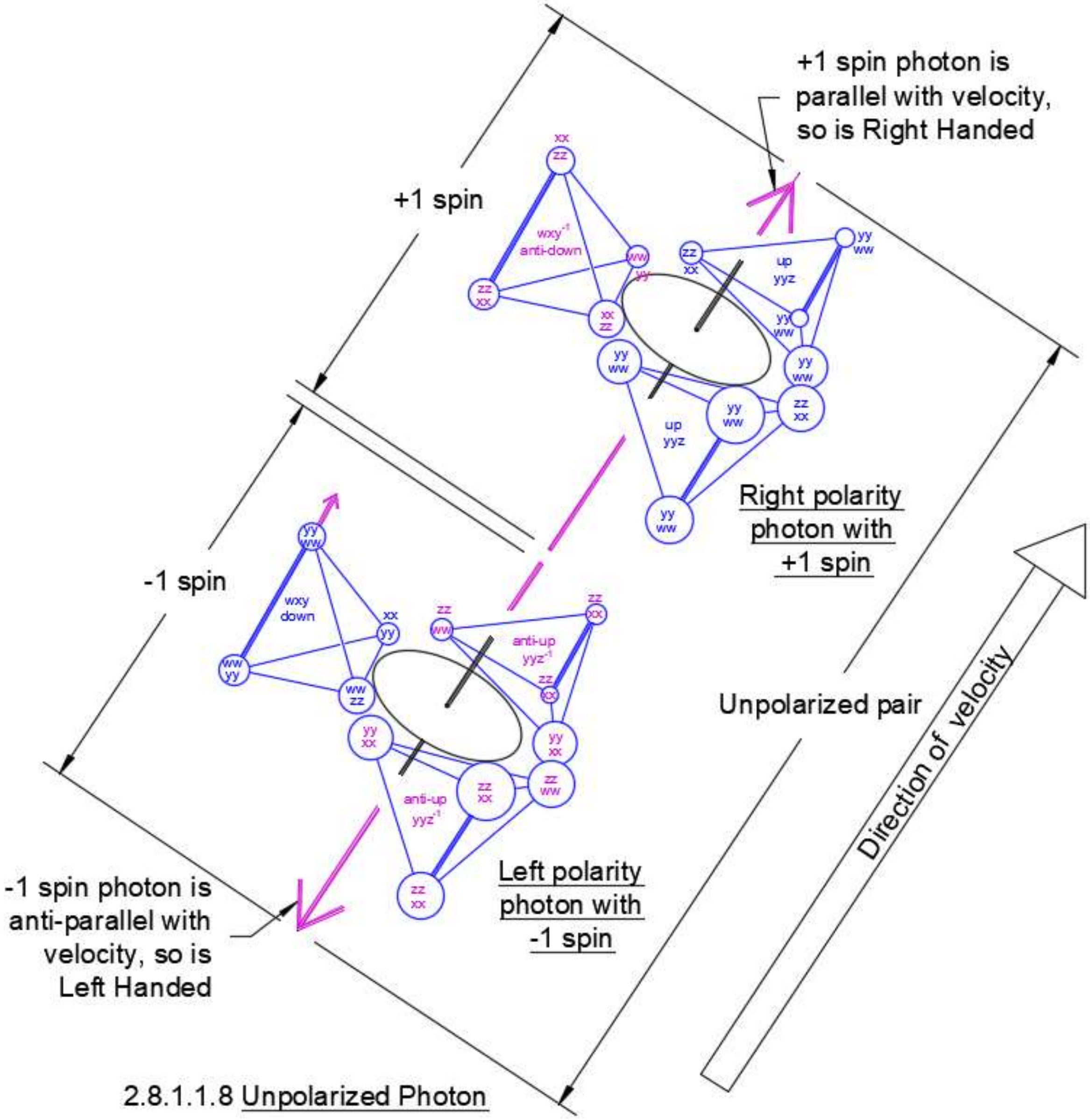


2.8.1.1.1 Components of the Photon

Left + right polarity photon = un-polarized photon. Un-polarized photon is spin and charge balanced, so is unaffected by gravity, magnetism or charge. Six spin-pair bound sub-quarks are in the binding plane, and are of opposite spin, considered to be held in spin abeyance as potential energy. Each quark of a fermion has 2 spin-pair bound sub-quarks. These 2 sub-quarks are in an interior corner of the quark, lie on the quark plane, and are bound to a neighbor quark's sub-quark.

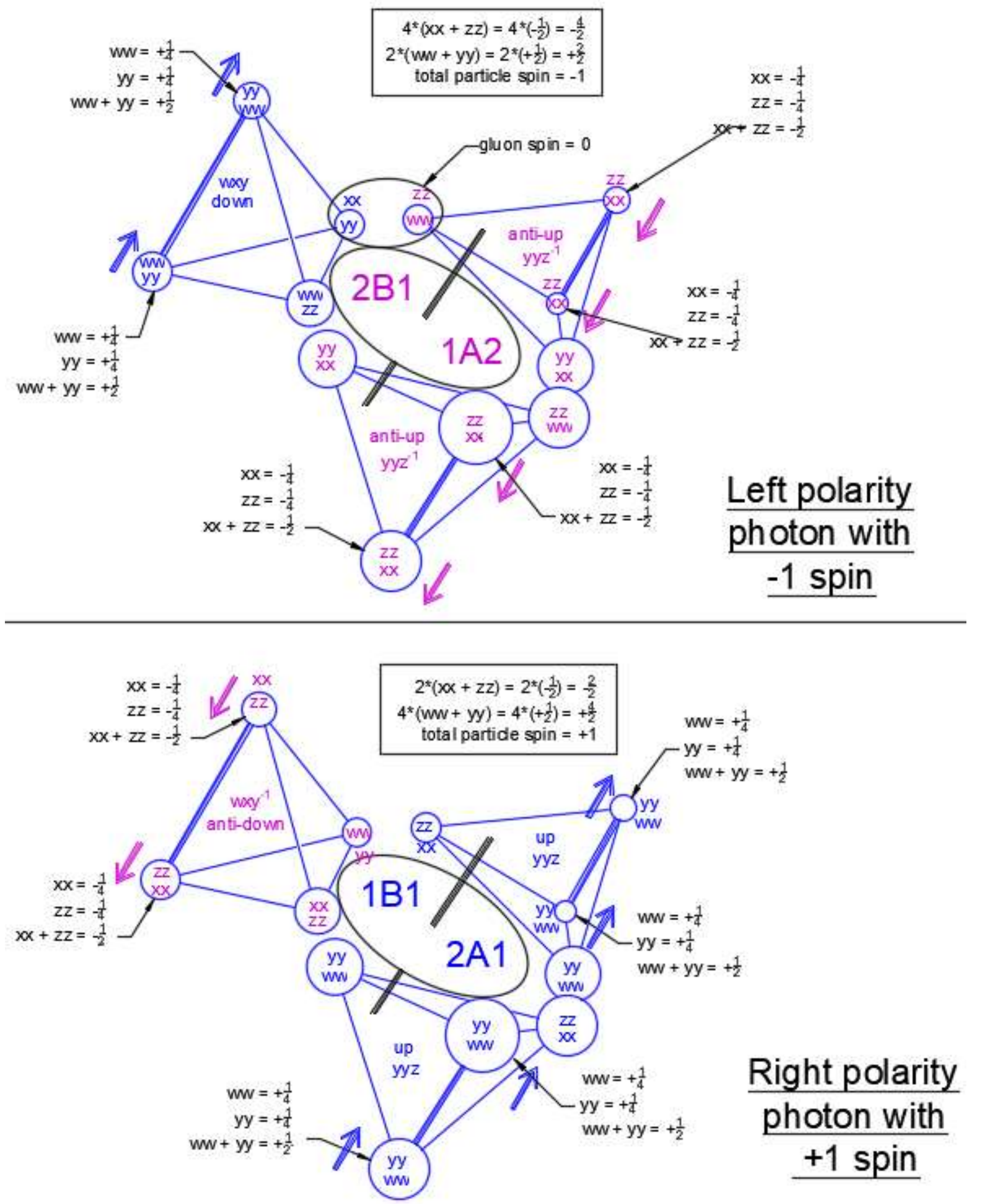
The spin-pair binding energy between quarks could be considered to be a 'gluon' of binding energy. All 3 generations of fermions (matter and anti-matter) have 3 quarks of this same structure. The spins of the 4 sub-quarks in each quark tetrahedron are parallel and sum 1/4 + 1/4 + 1/4 - 1/4 = - 1/2. The exterior spin axes of the 3 pairs of un-bound sub-quarks are parallel and sum 1/2 - 1/2 - 1/2 = - 1/2.

2.8.1.1.8 Unpolarized Photon



2.8.1.1.8 Unpolarized Photon

2.8.1.7 Two Polarities of Photon as Isometric Symbols



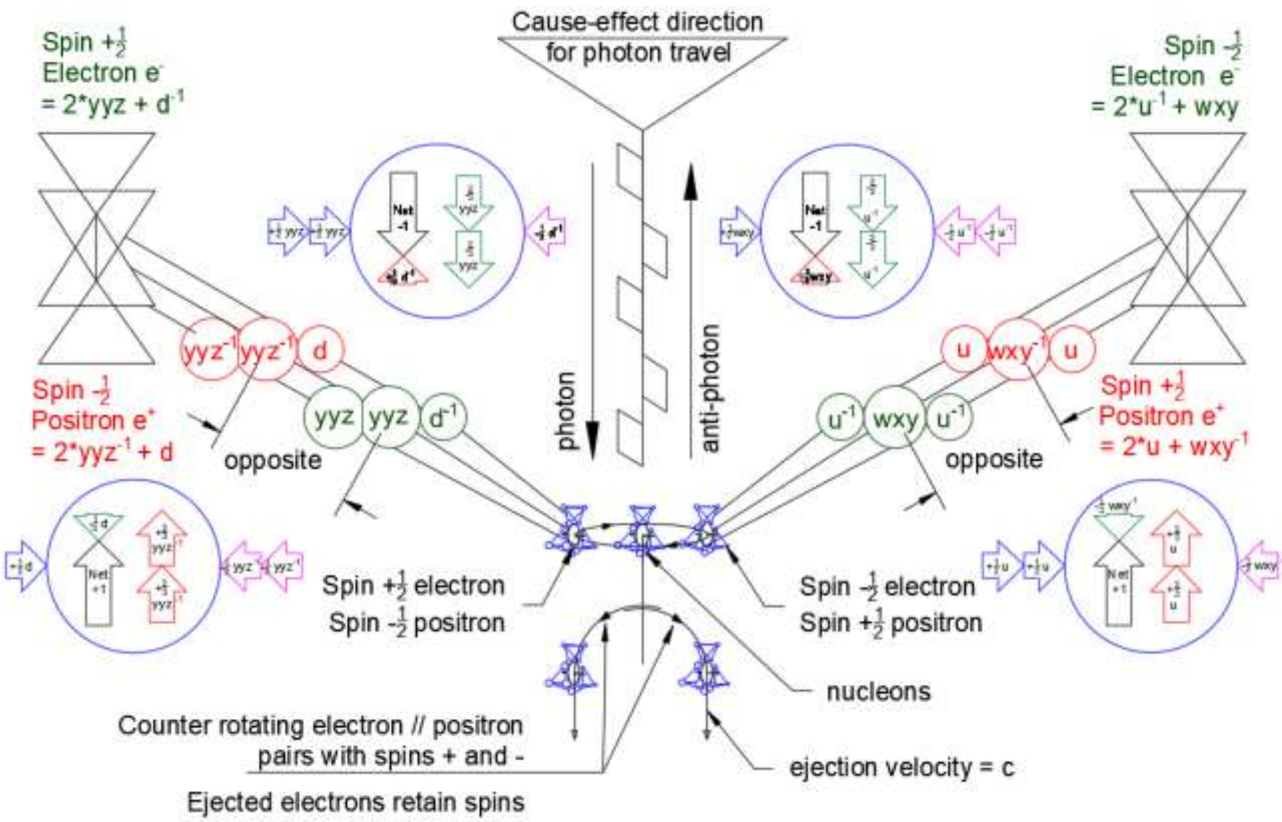
2.8.1.7 Two Polarities of Photon as Isometric Symbols

2.8.2 Electron Emits as a Photon

2.8.2.1 Creation of the Photon

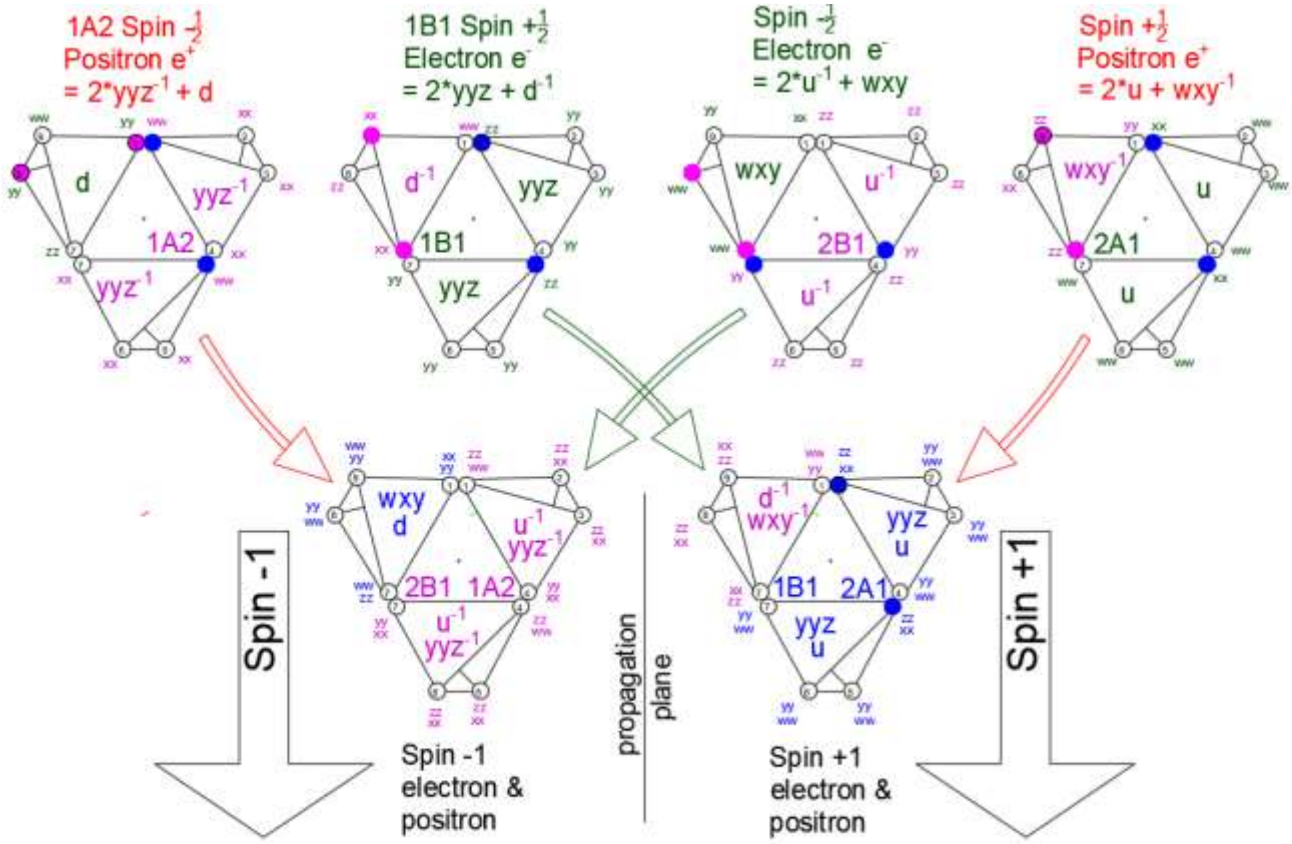
The spin +1/2 positron occupies half of the +1/2 spin space in the s1 shell. The spin +1/2 electron occupies the other half of the +1/2 spin space in s1 shell. In the shell, the electron and positron form a pair as congruent PCT opposites.

2.8.2.1.1 Photon Leaves // Enters s1 Shell



2.8.2.1.1 Photon Leaves // Enters s1 Shell

2.8.2.1.2 <u>Electrons and Positrons Combine to Form Photon Halves</u>

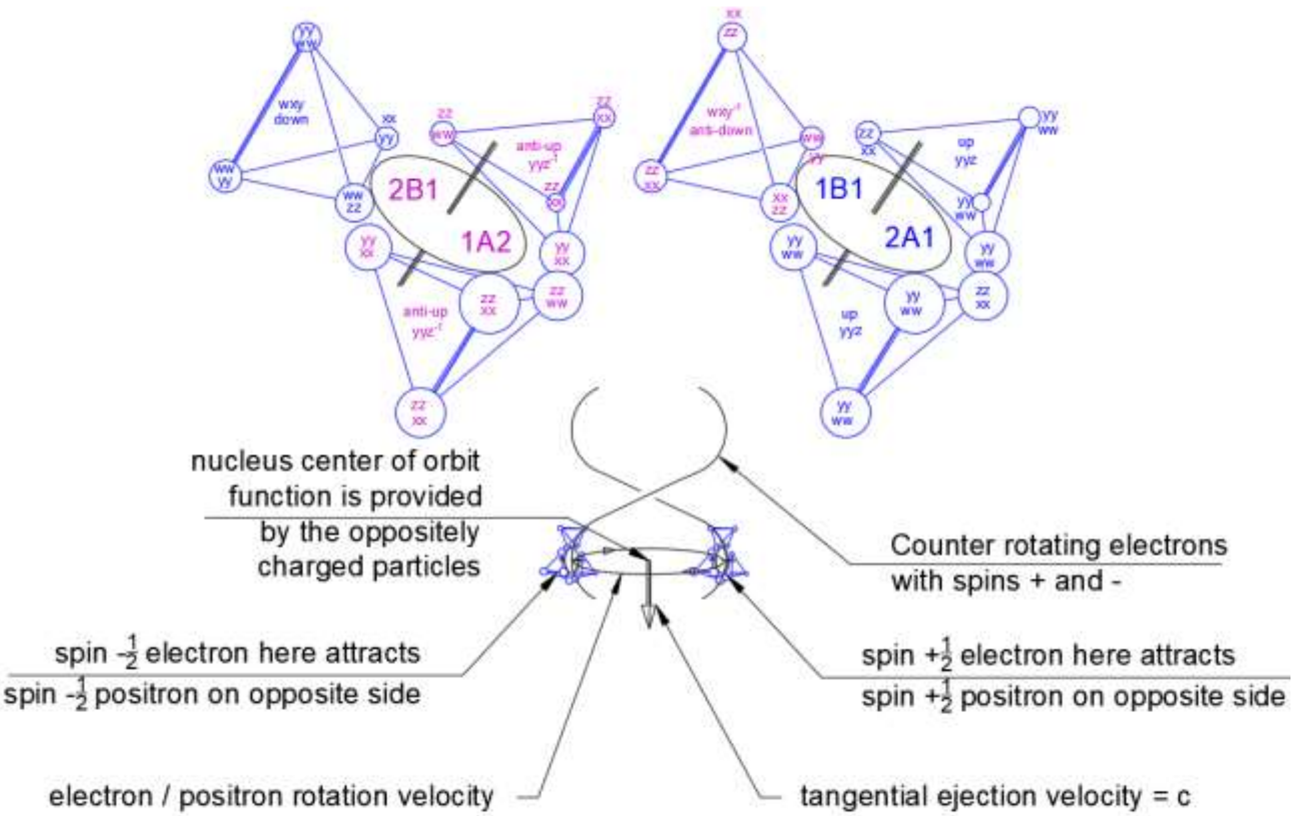


2.8.2.1.2 Electrons and Positrons Combine to Form Photon Halves

2.8.2.1.3 <u>Separated Pair of Mutually Rotating and Attracting Particles</u>

The iso-spin of positive and negative spin is balanced. The centripetal force of each spin side separately balances its half of the 'strong force' spin reduction energy. The 'strong force', which would be spin reduction energy if it were stationary like a fermion nucleus, is what keeps velocity going in a photon. Centripetal force in an orbiting electron is linear force in a tangent direction. The distance between the electron and positron in a matter/anti-matter pair collapses to zero and the circular motion is converted at the tangent point to linear motion. The tangential velocity of the lowest electron level is always c. All entrances and exits of the photon to and from the atom are via the lowest level s orbit.

Outside the shell, the same spin electron and positron form a separated pair of mutually rotating and attracting particles. Photons move for the same reasons mass particles move - they are going down the energy level gradient. A photon by itself creates a moving curvature of space, which it follows. After photon passage, the space curvature returns to its previous state.

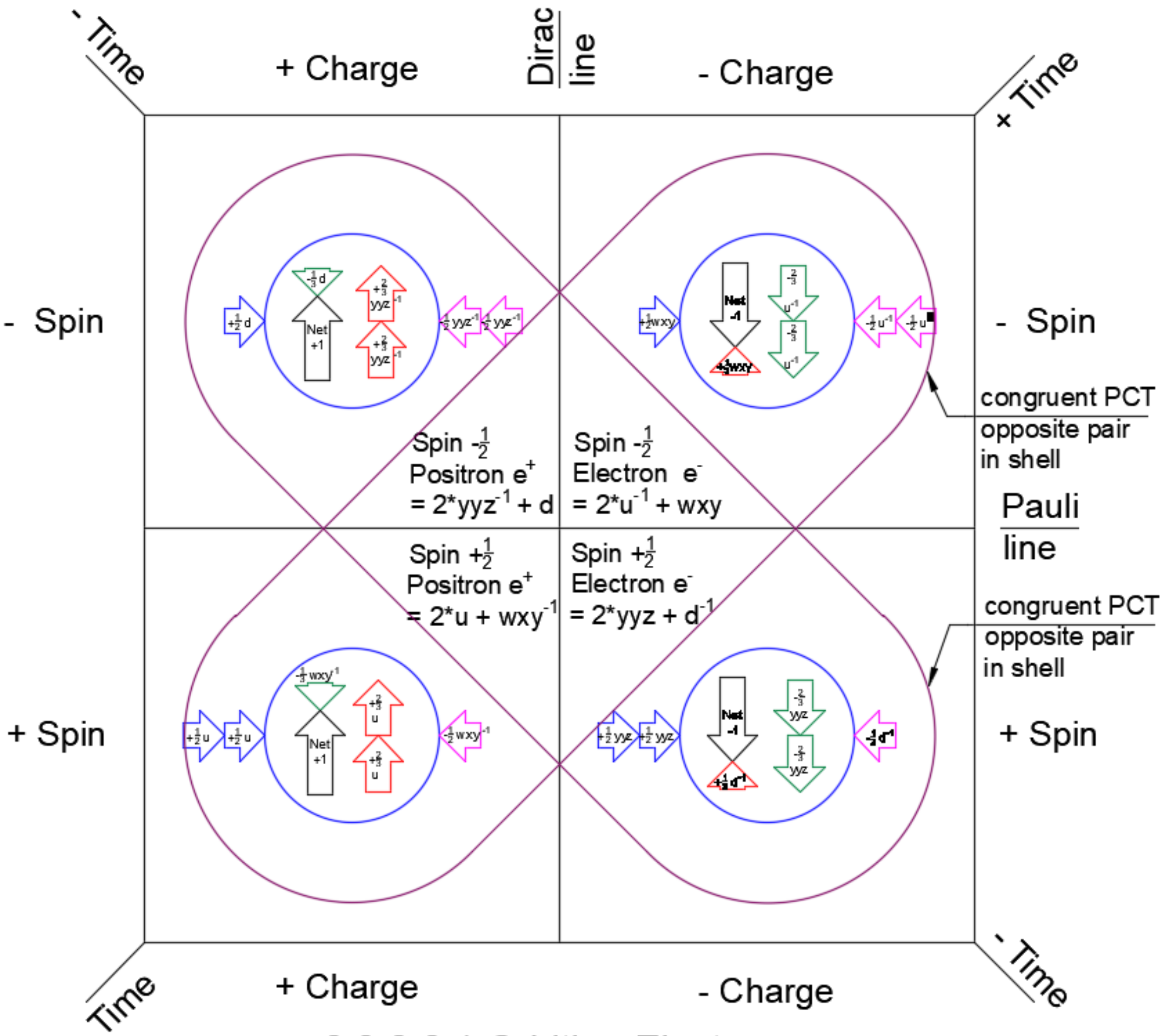


2.8.2.1.3 Separated Pair of Mutually Rotating and Attracting Particles

2.8.2.2 Congruence of Pairs Changes

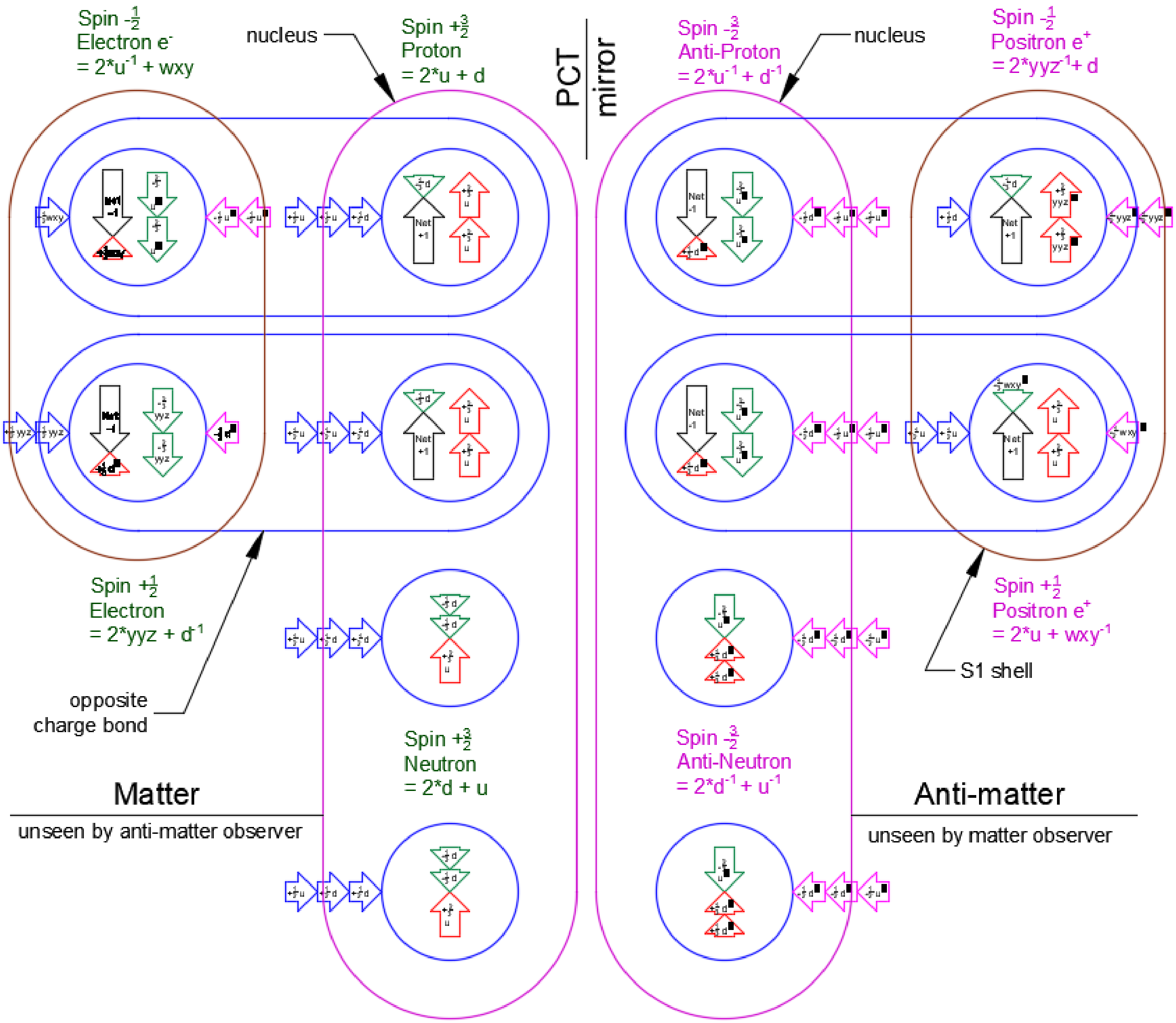
2.8.2.2.1 Orbiting Electron

While orbiting, electron and positron spins are opposite.



2.8.2.2.1 Orbiting Electron

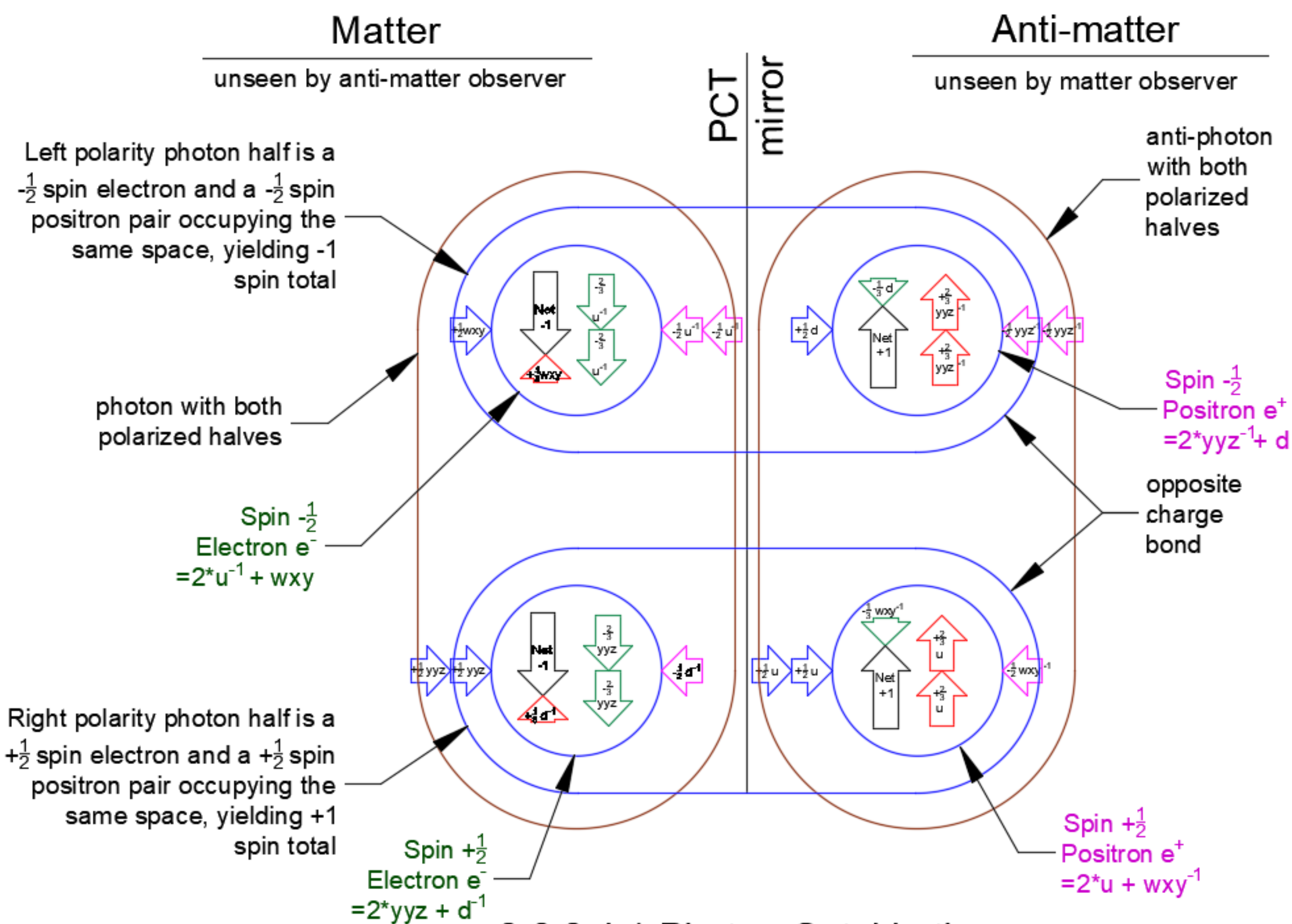
2.8.2.3 <u>Photon Precursors in Helium-4 Atom</u>



2.8.2.3 Photon Precursors in Helium-4 Atom

2.8.2.4.1 Photon Outside the Ionized Helium-4 Atom

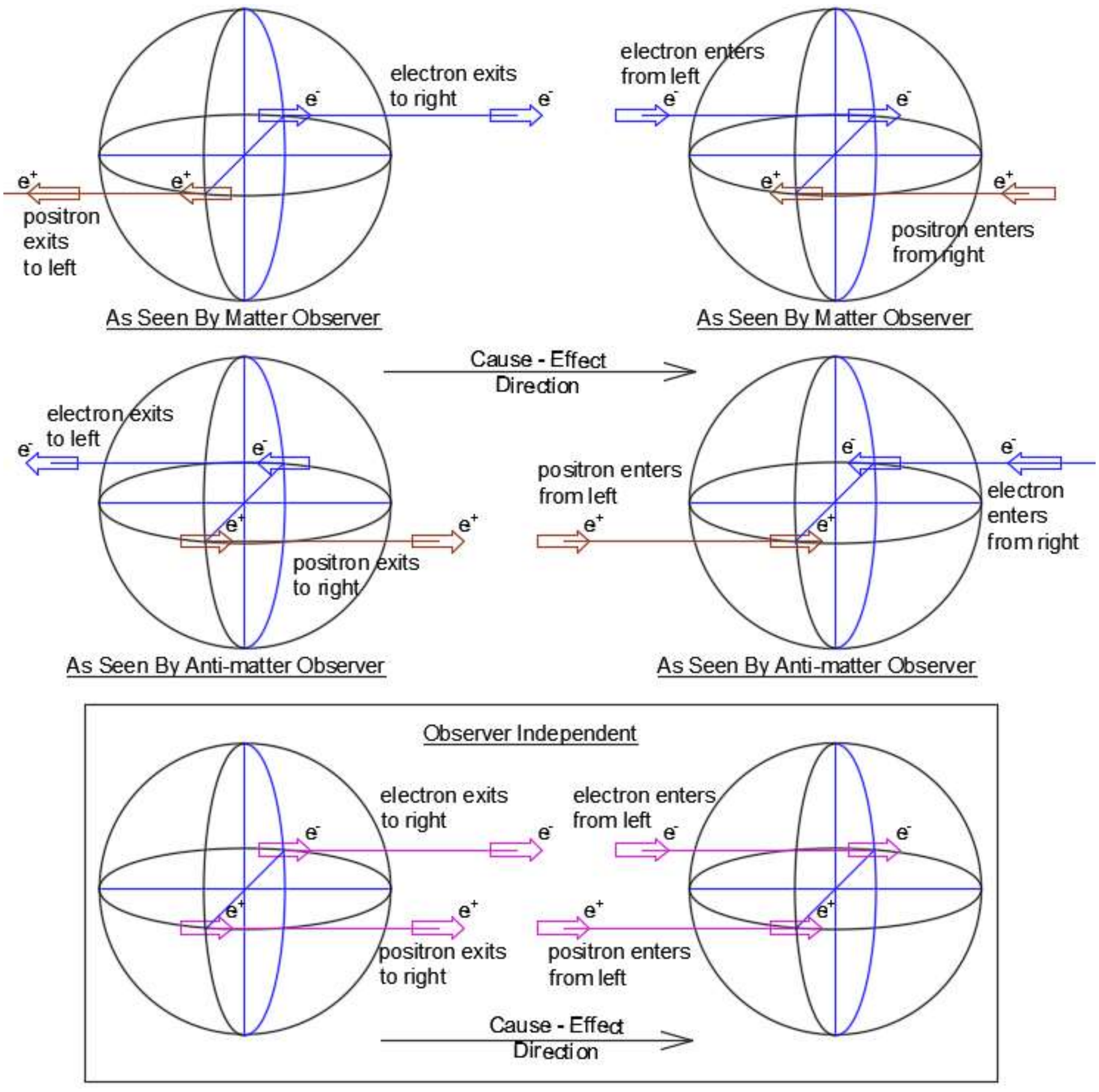
Co-rotating polarized photon halves have the same mutual opposite charge attraction between electron and positron as a complete photon with both halves.



2.8.2.4.1 Photon Outside the Ionized Helium-4 Atom

2.8.3 Two Spins of Electron Are Two Polarities

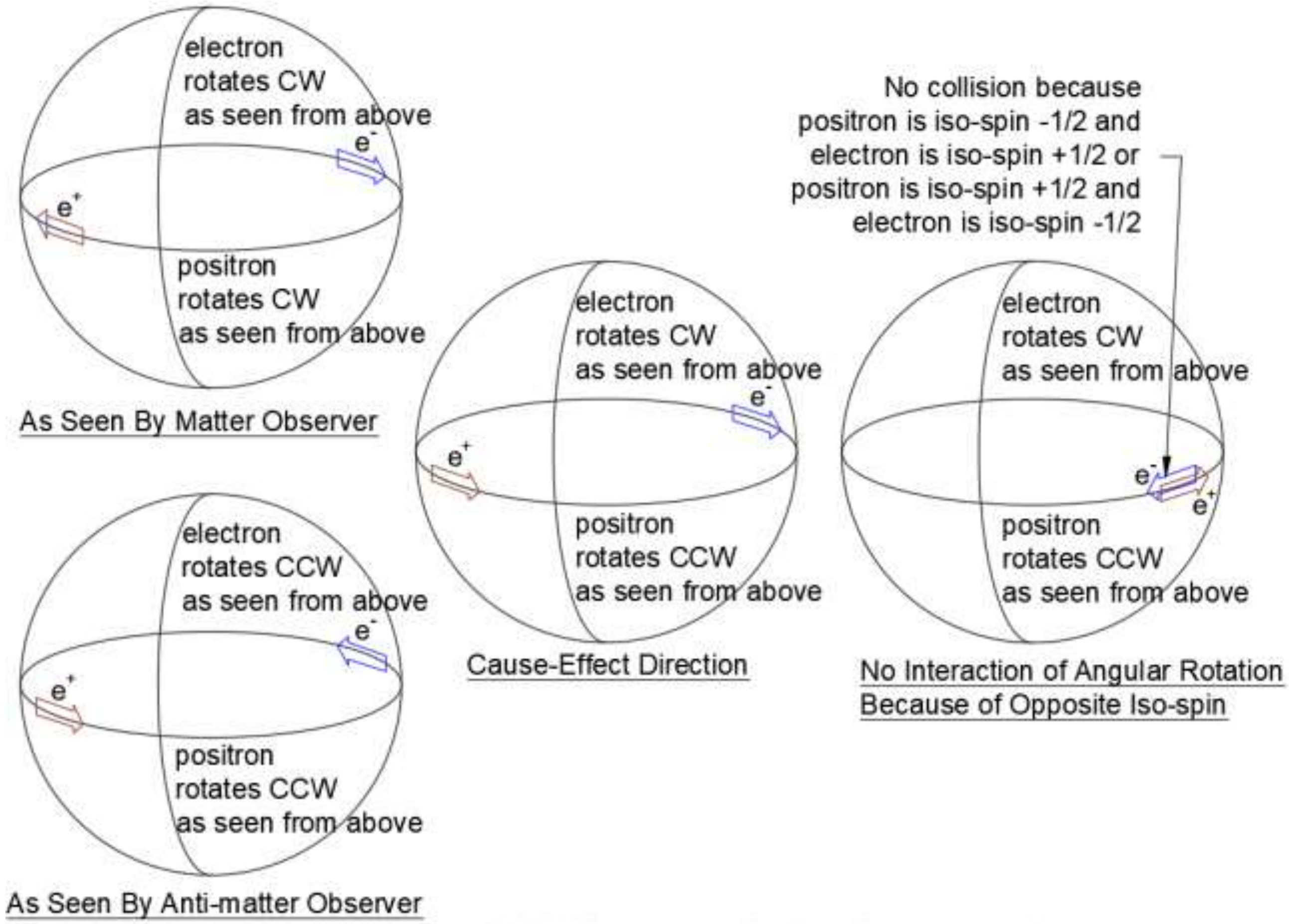
2.8.3.1 Electron and Positron Exit and Entry to/from s1 Shell



2.8.3.1 Electron and Positron Exit from and Entry to s1 Shell

2.8.3.2 Electron and Positron Rotation in s1 Shell

Phrases such as, "electron rotates CW…" means angular rotation. Differentiate rotation from iso-spin such as, "…positron is iso-spin -1/2…". The point of this diagram is that no collision is possible between the rotating electron and positron because they exist in different spin spaces (positive and negative).

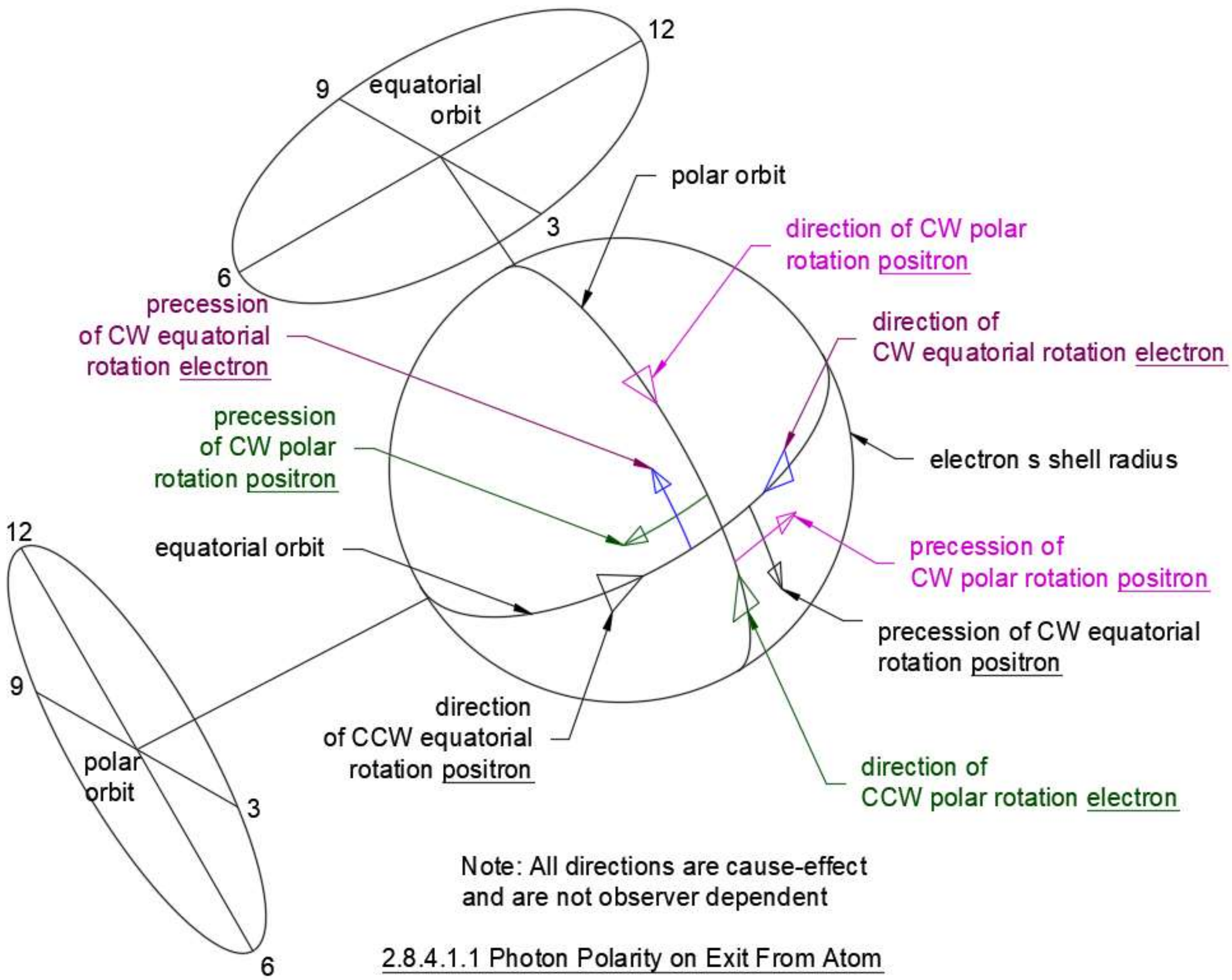


2.8.3.2 Electron and Positron Rotation in s1 Shell

2.8.4 Photons Have Constant Velocity, But Different Energy

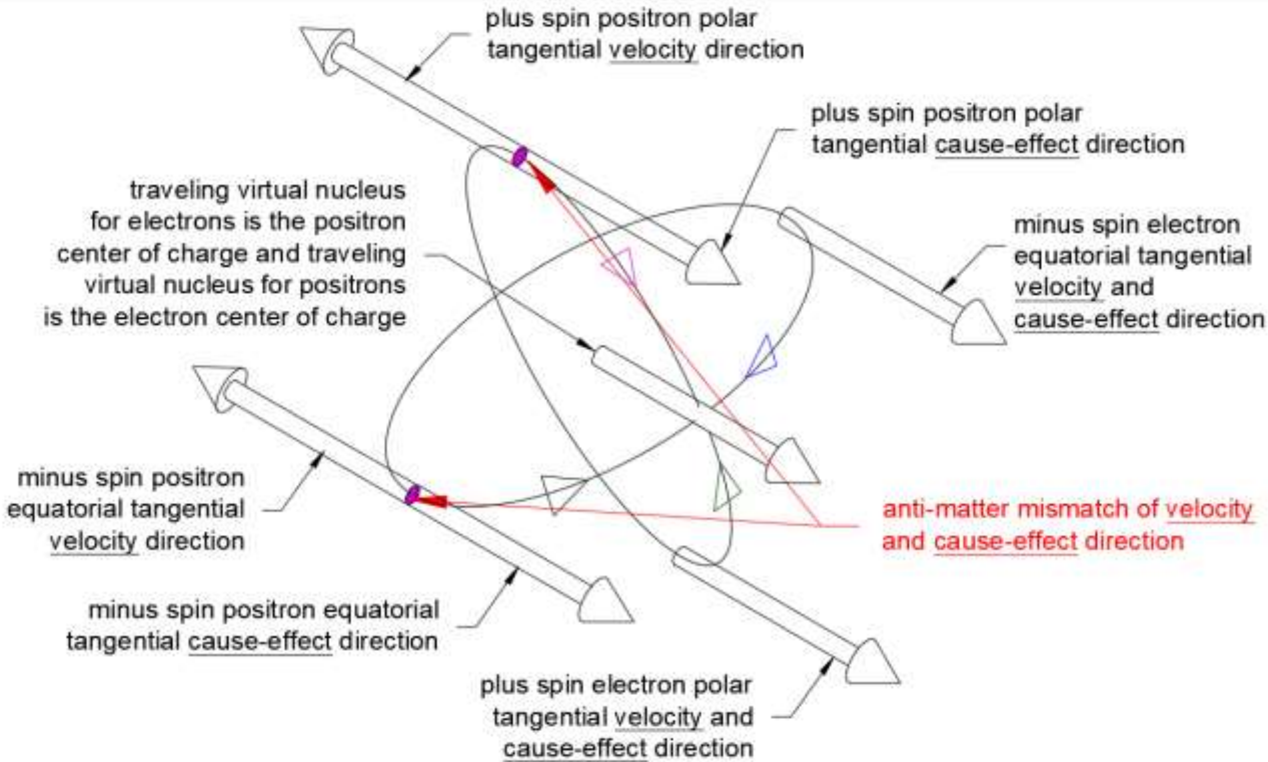
2.8.4.1.1 Electron Orbit Precession

Precession of the polar and equatorial orbits are proportional, and are proportional to the energy of the electron // positron pair. The word "precession" is used without identifying both necessary vectors for precession as in a gyroscope. Only the polar or equatorial circular path is given, which gives one of the two vectors necessary. The second vector is postulated but unidentified as to source.



2.8.4.1.1 Photon Polarity on Exit From Atom

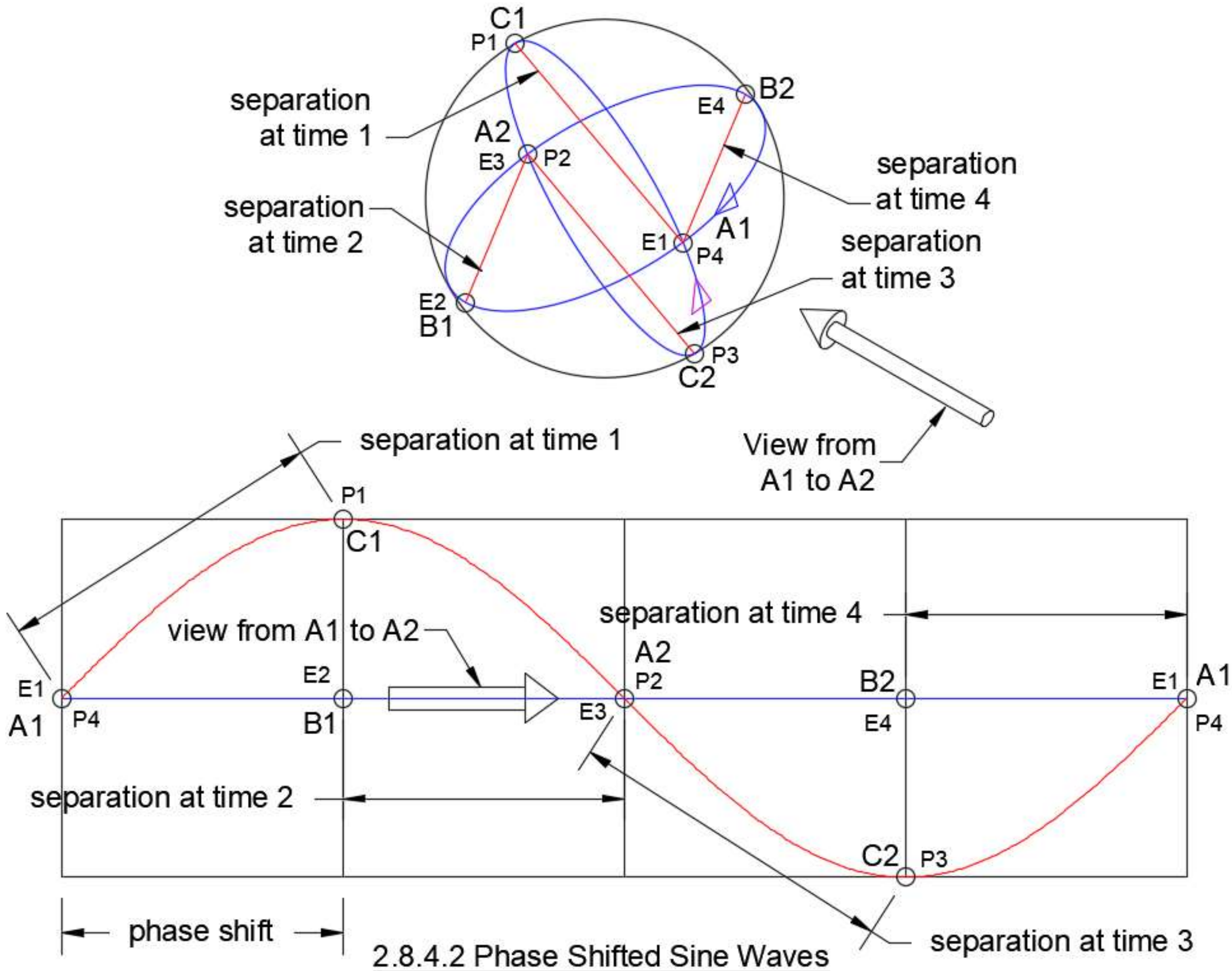
2.8.4.1.2 Traveling Photon



2.8.4.1.2 Traveling Photon

2.8.4.2 Phase Shifted Sine Waves

Orthogonal circular orbits and quarter wave phase shift keeps electron and positron pairs with plus and minus spin separate.



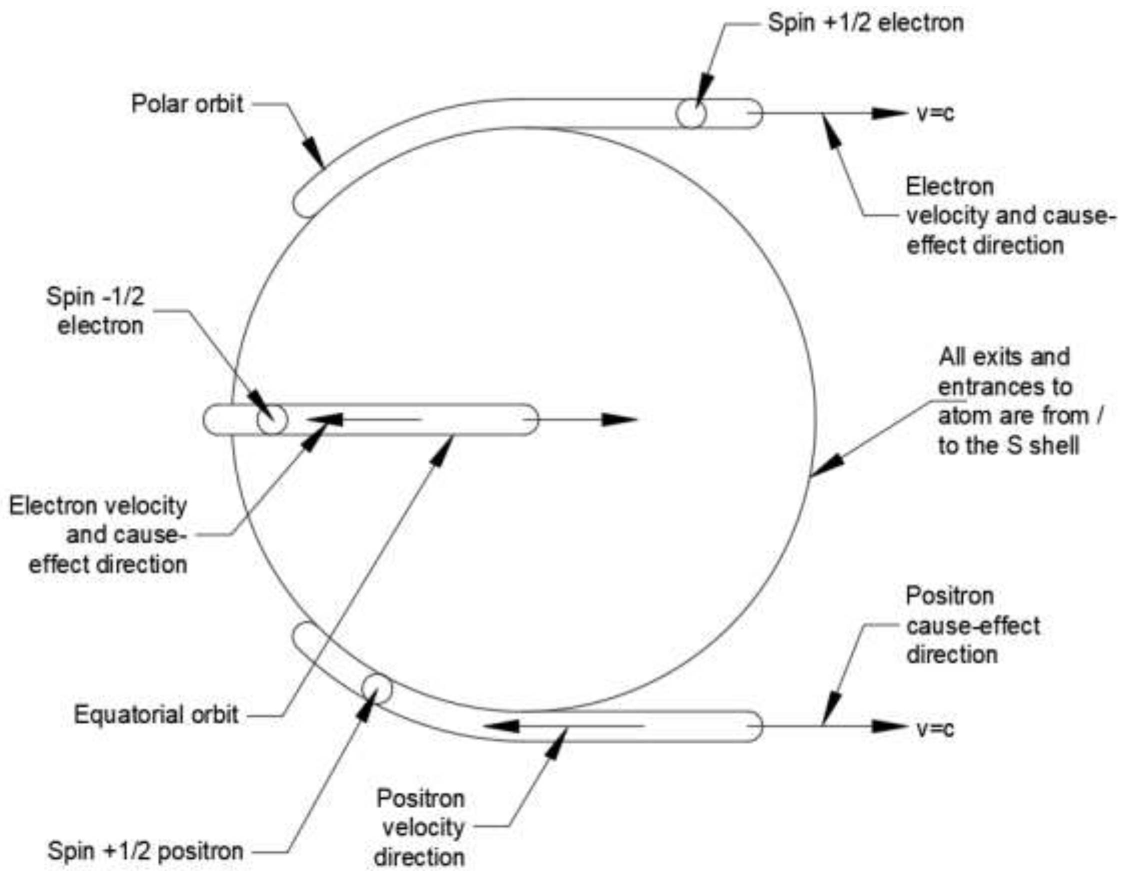
2.8.4.3 Photoelectric Effect as Seen by Matter Observer

- Spin +1/2 electron and positron orbit on opposite sides of the polar orbit.
- Spin -1/2 electron and positron orbit on opposite sides of the equatorial orbit.

Electron and positron cause-effect rotations are opposite in orbit and the same linear direction when exiting / entering the electron shell.

- Electron velocity directions are the same as cause-effect directions.
- Positron velocity directions are opposite from cause-effect directions.

A matter observer sees matter cause-effect direction the same as velocity direction and anti-matter cause-effect direction opposite from velocity direction. An anti-matter observer sees anti-matter cause-effect direction the same as velocity direction and matter cause-effect direction opposite from velocity direction. Both observers see what they are made of with cause-effect direction the same as velocity direction. This allows both observers to be the same observer.



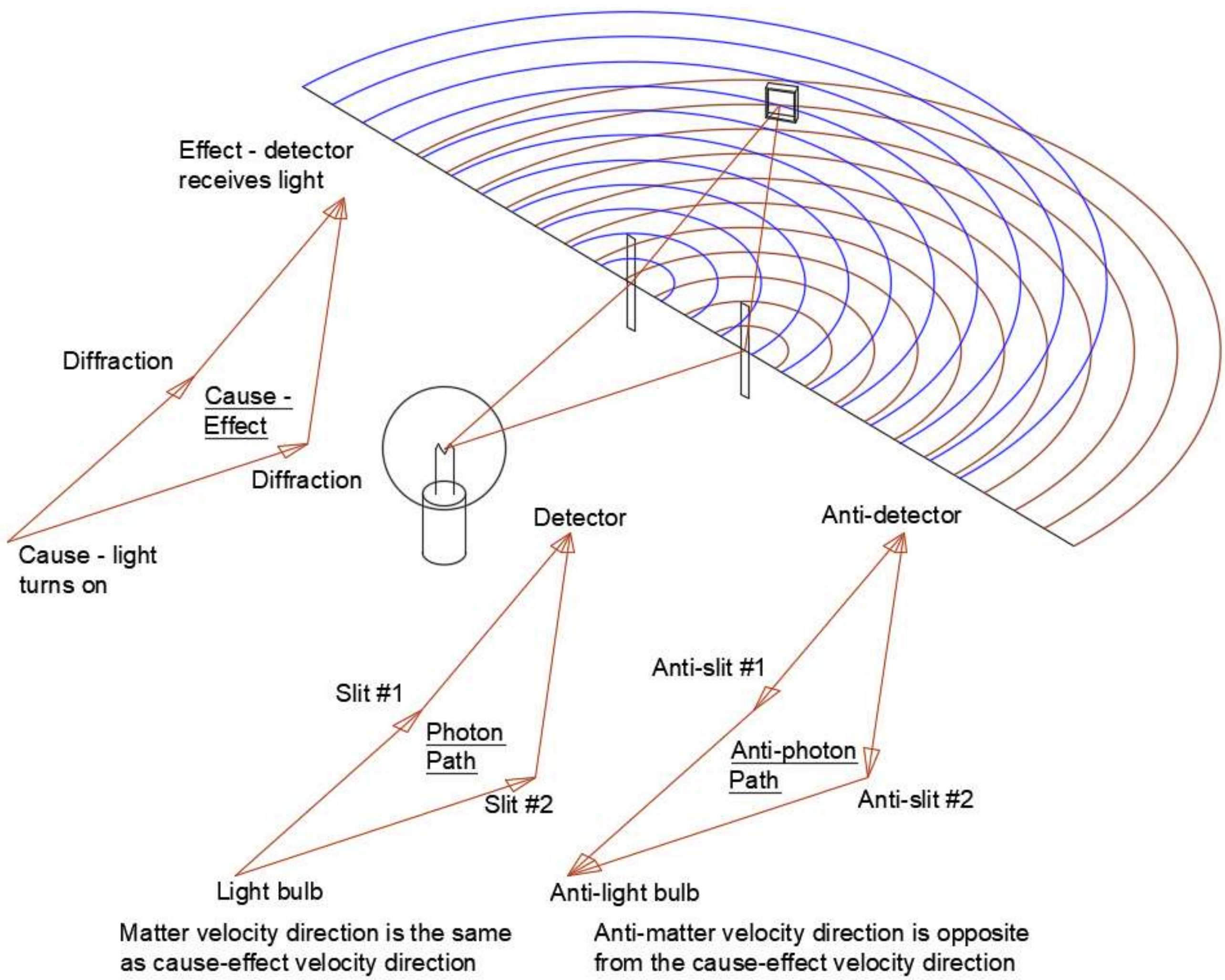
2.8.4.3 Photoelectric Effect As Seen By Matter Observer

2.9 Cause-Effect and Uncertainty

2.9.1 Single Photon Going Thru Two Slits

In a double slit experiment where the bulb emits a single photon, the detector at the wave crest location receives a single photon. The question is, "Why did one photon behave as if in a large group of photons?" One consideration is an anti-photon must have a single location where its velocity begins, which is the same location where the photon velocity ends.

Because the photon and anti-photon travel congruently along a cause-effect path as a matter and anti-matter pair, they cannot have different paths. Since all possible wave crests could have been a destination for the single photon, those same wave crests could have been an origin for the single anti-photon. Conservation rules that the photon // anti-photon pair must have only one path.



2.9.1 Single Photon Going Thru Two Slits

2.9.2 State Diagram of the Bulb-Slit-Detector System

Using a specific time example as shown in the diagram below: Energy of some origin builds up in an electron shell in the bulb and causes photon #1 to be emitted at 12:00. Photon #1 arrives at slit at 12:01 and atom on the knife edge of the slit absorbs photon #1 and emits photon #2 at a diffracted angle. Photon #2 arrives at detector at 12:02. Concurrently, anti-photon #2, which has been traveling congruently with photon #2, is emitted. Anti-photon #2 arrives at anti-slit at 12:01 and the anti-matter atom on the knife edge of the anti-slit absorbs anti-photon #2 and emits anti-photon #1 at the same diffracted angle. Anti-photon #1 is absorbed, which builds up thermal vibration energy in the anti-bulb positron shell.

Thermal vibration completes the path because it is shared by matter and anti-matter. The state diagram of a single bulb-slit-detector path is in the below diagram with four segments of the state diagram.

- Segment 1: photon 1 going bulb to slit
- *Pass thru slit at 12:01*
- Segment 2: photon 2 going slit to detector
- Segment 3: anti-photon 2 going detector to slit
- *Pass thru slit at 12:01*
- Segment 4: anti-photon 1 going slit to bulb

Per the web page, https://en.wikipedia.org/wiki/Double-slit_experiment, "…versions of the experiment that include detectors at the slits find that each detected photon passes through one slit (as would a classical particle), and not through both slits (as would a wave). However, such experiments demonstrate that particles do not form the interference pattern if one detects which slit they pass through...".

Two slit experiment versions with detectors at the slits do not make any special conditions that would change if a photon went thru a slit and an anti-photon came back thru the same slit *at the same time (12:01)*. The photon // anti-photon model is not invalidated by the referenced experiment results.

2.9.3 Cause-Effect is a Step-Wise Process

Consider a photon emitted by some atomic process that travels for several billion years of Earth observer time from points A to B. Compare this to the two-slit experiment. It is intuitively obvious by this comparison that event separation has the largest influence on cause and effect. It is safe to postulate that cause-effect is very certain for nearby events and less certain with increasing distance.

It would be only a step further to postulate the certainty varies by the inverse square law because of the increasing dilution of any source event causing an effect on a far distant object. A "window of opportunity" for an event to cause an effect is an accurate saying. Let us name this inverse square law to uncertainty be a "step-wise cause and effect". The "drunken walk" is an example of uncertainty, but taken one step at a time, it is absolutely certain one moment to the next.

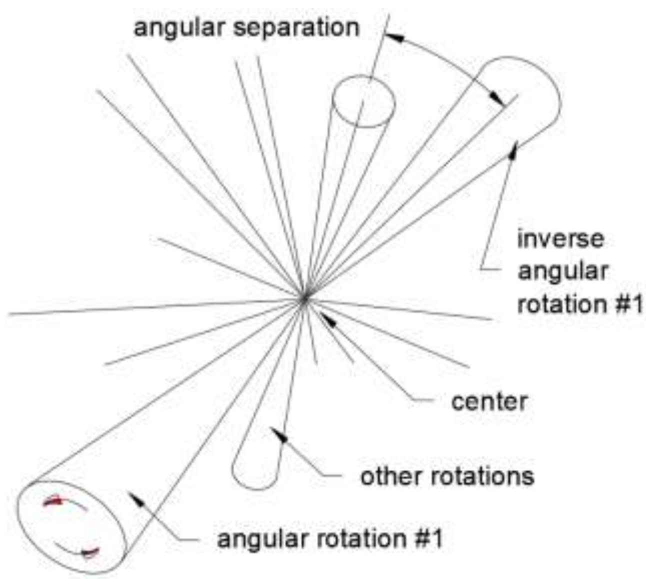
Next, we apply the step-wise certainty to the two-slit experiment. If the light bulb were left on for a long period of time, all the wave crests would be lit up for a detector to read. One photon behaves as if it is emitted in a bulk with other photons. The electron moving down a shell level getting ready to emit as a photon is known. What is unknown is which atom beyond the slit will have an incoming photon raise an electron a shell up, if the shell is full.

What appears to happen is the outgoing photon has information as to where to go. The next section builds the case for information at a distance.

2.9.3.1 Universe Center is the Root of Rotations

Postulate the universe has a center of angular rotations as well a center of its radius as described in section 1.1.5 All Observers are Correct in a Spherical Universe Containing Flat Worlds.

	What is the center of the universe?	Where is the center of the universe?	What is the center rotations?	Where is the center of rotations?
4D	one point	center of a 4D sphere	one point	center of a 4D sphere
Flatten 4D to 3D to visualize	one point	center of a 3D sphere	one point	center of a 3D sphere
3D	every point	everywhere	every sub-quark	every sub-quark

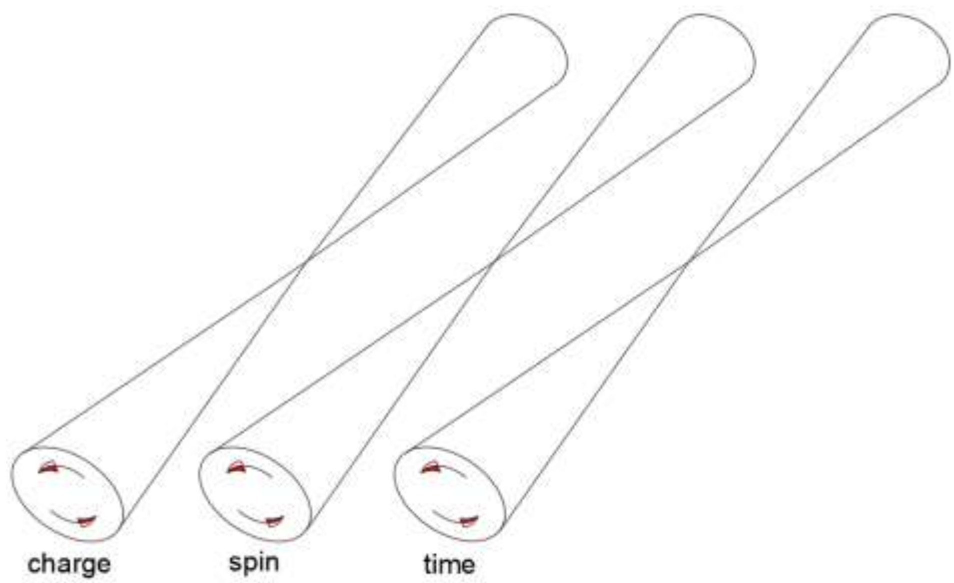


2.9.3.1 Universe Center is the Root of Rotations

2.9.3.2 Charge, Spin and Time are Instances of Universe Rotations

Unit charge, spin and time rate are instances of universe rotations, present at each sub-quark.

	rotations	units	range	causing	causing motion
4D rule	connected at zero distance	angular separation & direction			
3D inherits from 4D rule	connected at a distance	distance separation & direction			
spin in 3D	inverse square influence	+spin, -spin			
charge in 3D	inverse square influence	+charge, -charge			
time rate proportional to gravity in 3D	inverse square influence	attractive force	zero to near infinity	internal spin	acceleration
electric field in 3D	inverse square influence	+polarity, -polarity	near +infinity to near -infinity	external electric & magnetic fields	velocity
diamagnetic field in 3D	inverse square influence	north, south	near n. infinity to near s. infinity	external electric & magnetic field, temp, press	velocity



2.9.3.2 Charge, Spin and Time are Instances of Universe Rotations

2.9.3.4 Information at a Distance

Where a cluster of rotations exists at a 3D distance from a sub-quark, that cluster's existence is only known as a force and a direction. This is because those 3D rotations inherit angular separation but not distance information from their 4th dimension rotation parent. Neglecting an empirical constant, the inverse square law for a single sub-quark's attraction to a cluster of sub-quarks may be simplified because both attractors have the same unit vector:

Force = (quantity of units in the cluster) / (distance to cluster)^2

The distance is in 3D and does not matter. *Action at a distance* by force transferring vector bosons is not necessary. All that is necessary is *information at a distance* and *rules by which to act according to this information*. Information at a distance is provided by rotations at each sub-quark connected to the root rotation of the universe at zero 3D distance.

	information at a distance	rotation connection
3D properties	mass	time rate
	electric field	charge
	magnetic field	charge
	distance	angular separation of rotations
	direction	direction of source

2.9.3.4 Information at a Distance

2.9.3.5 How This Applies to the Two Slit Experiment Result

The existence of a detector for an incoming photon changes the nature of this experiment. A detector will have an atom that will absorb the photon and raise the energy level of the resulting electron. Among all the possible locations detectors could be located, why is this location where the photon arrives special?

Postulate this detector has a greater requirement to have another electron arrive. Perhaps because it is slightly different from all other detectors that might be put elsewhere. Perhaps the material has more pure crystalline structure and has an atom closer to the material surface. Perhaps the electron in the receiving end will more readily accept a Pauli inclusion pair partner. Of all the possible reasons for variation among a set of detectors, the most efficient detector information will be known to the emitting atom.

The emitting and absorbing atoms for this form a closed loop path with the congruent anti-photon which is traveling with the photon. The emission time for the anti-photon is synchronous with absorption of the photon, and is in the future of the photon.

The emitting atom's electron's quark's sub-quark that is dominant by its position in the orbit and on the quark has information about the proper place to send its electron surplus. The gradient between the electron surplus in the emitter and the electron deficit in the absorber is highest between these two locations. This gradient directs the emission of the photon and also will direct the emission of the anti-photon.

There are two paths from the emitter to the absorber. The law of inverse squares uses the principle of greater area at a distance is less density of photons. For bulk emission, this is true. In a single emission, the less the density of photons equates to a lower likelihood of hitting the detector. The existence of the second slit, even though not used, increased the likelihood of hitting the sensor *at the time the direction to the most receptive receptor was sensed*. The two-slit experiment has demonstrated the existence of *information at a distance*.

Two half steps are taken in each step. First half is detecting how best to minimize the local gradient of energy present as seen by the sub-quark. Second half is executing actions to cause a lower energy level of the system. As the limit of each time step shortens to zero, the entire path that seems uncertain becomes certain if done step-wise.

2.9.3.6 System Energy Levels

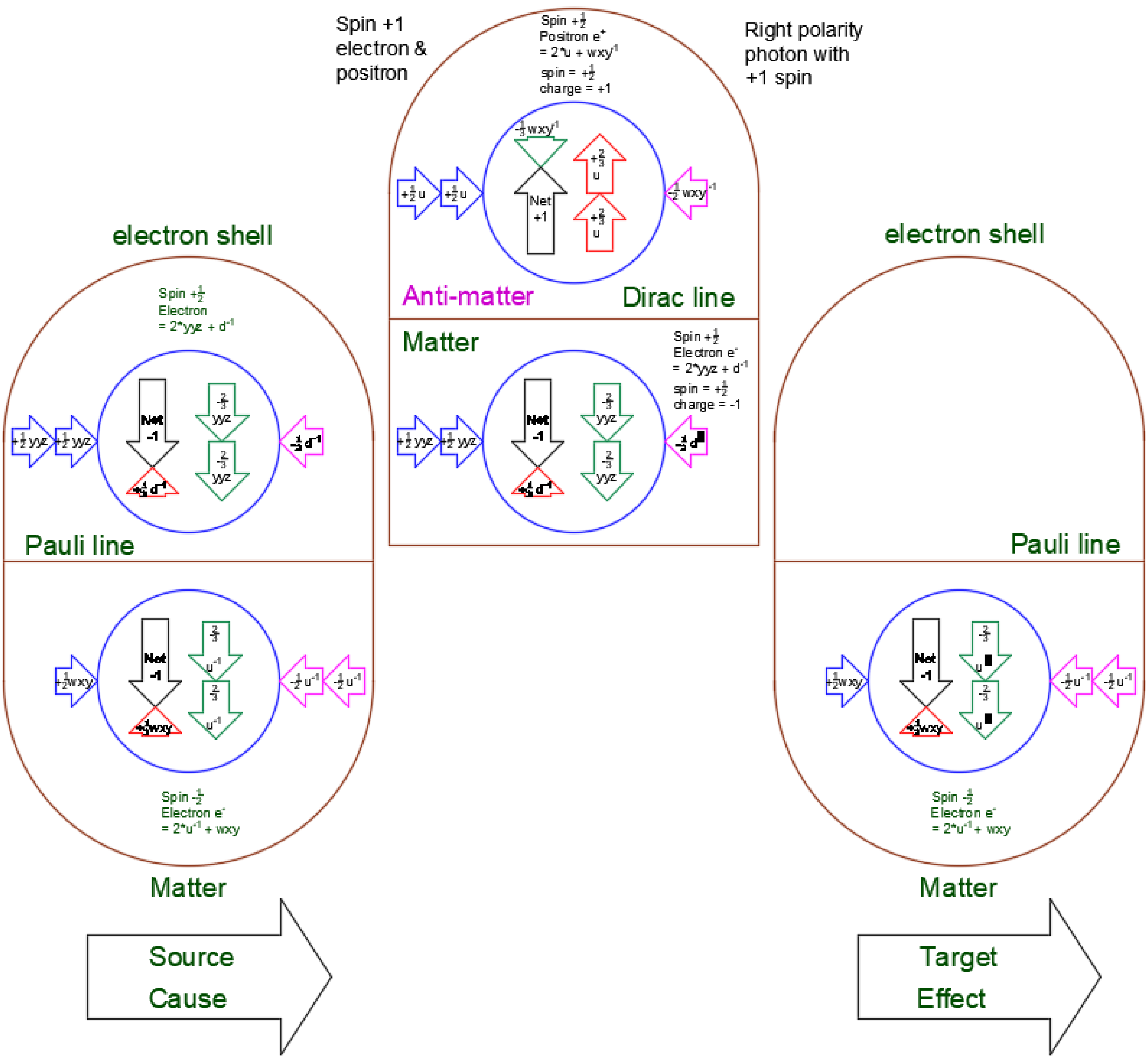
The previous section brought up the idea of minimizing the energy gradient in a path. Specifically, the direction of the charge gradient between the light bulb atom and light detector atom is how the light emission is pointed.

2.9.3.6.1 Matter Electron to Photon to Matter Electron

In the below diagram, anti-matter positrons are not shown in shell but they are shown in the photon halves, where they lose their distinction as anti-matter. The anti-matter shell version is similar but with positrons relacing electrons in the shell.

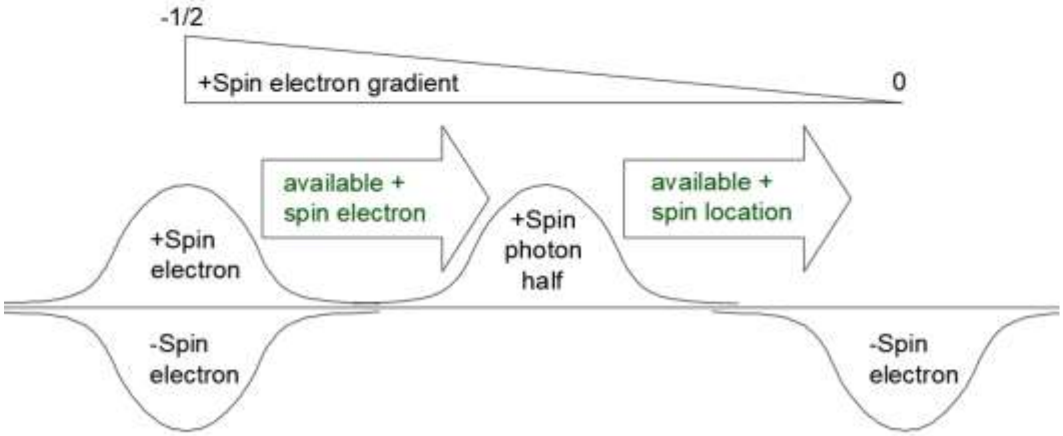
2.9.3.6.2 +Spin Electron to Right Polarity Photon to Target Shell

Half photon carries +spin electron from full shell to target shell where there is an available opening.



2.9.3.6.2 +Spin Electron to Right Polarity Photon to Target Shell

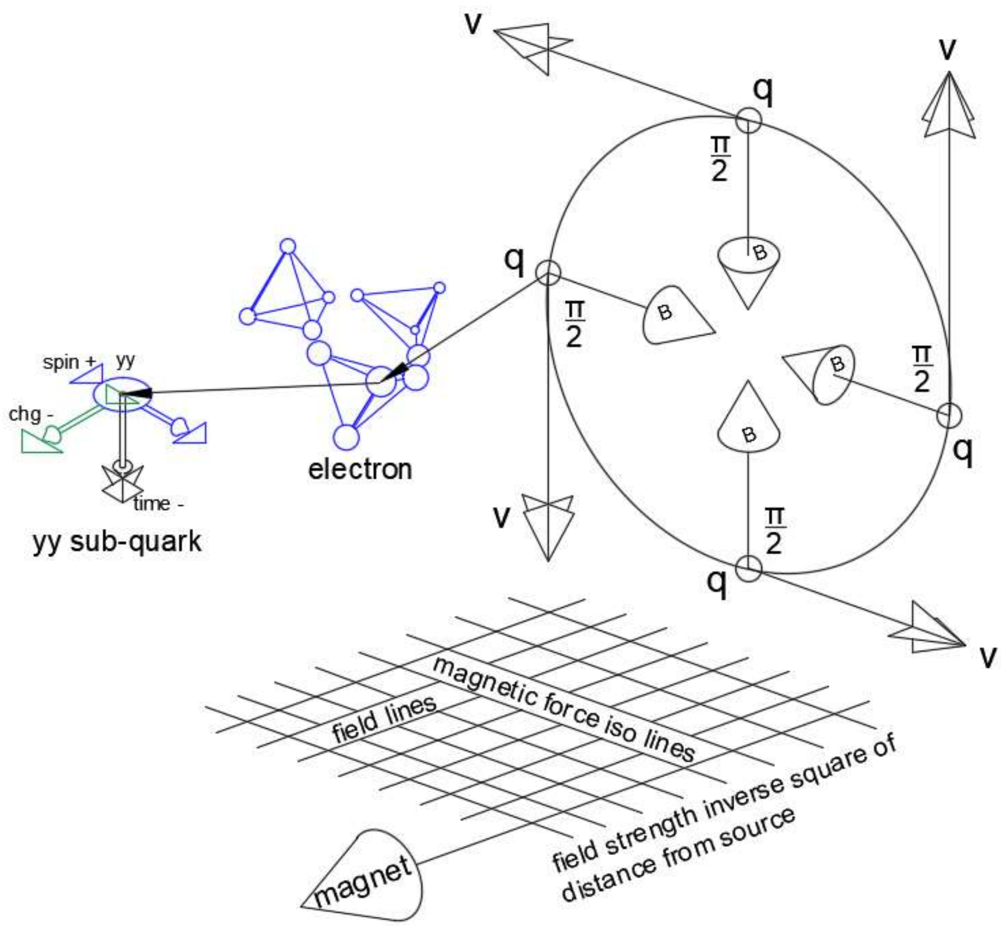
2.9.3.6.3 +Spin Electron Moving to Level the Gradient



2.9.3.6.3 +Spin Electron Moving to Level the Gradient

2.9.3.6.4 <u>Magnetically Induced Charge Rotation</u>

"If v is perpendicular to B…, the particle will follow a circular trajectory..."
(https://www.britannica.com/science/Lorentz-force)

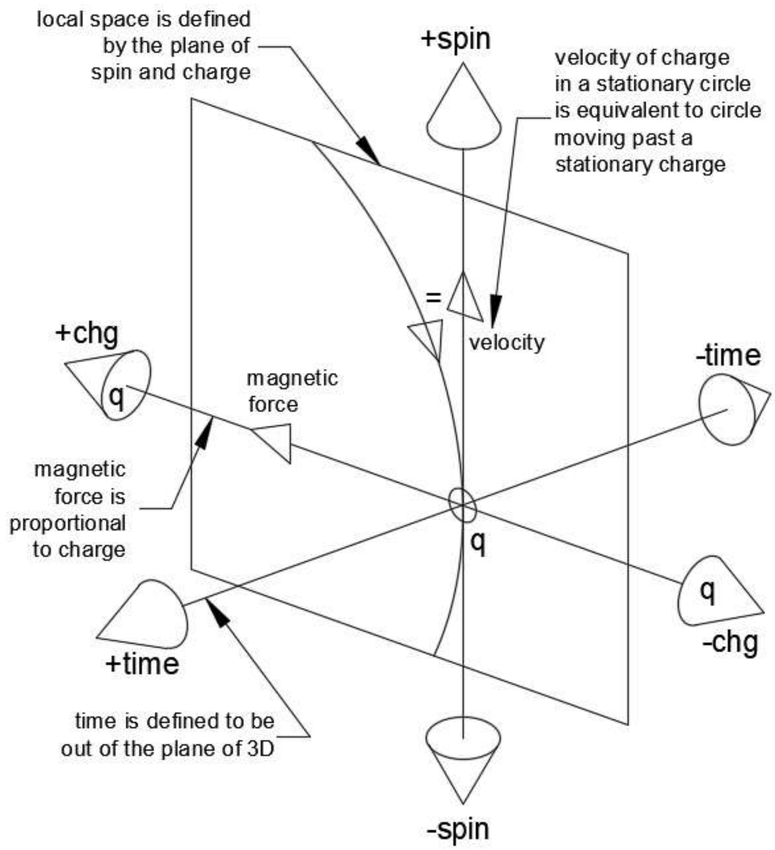


2.9.3.6.4 <u>Magnetically Induced Charge Rotation</u>

2.9.3.6.5 Magnetically Induced Charge Rotation Flattened to 2D

Although spin, charge and time don't have vector directions in 3D, they can be associated by similarity:

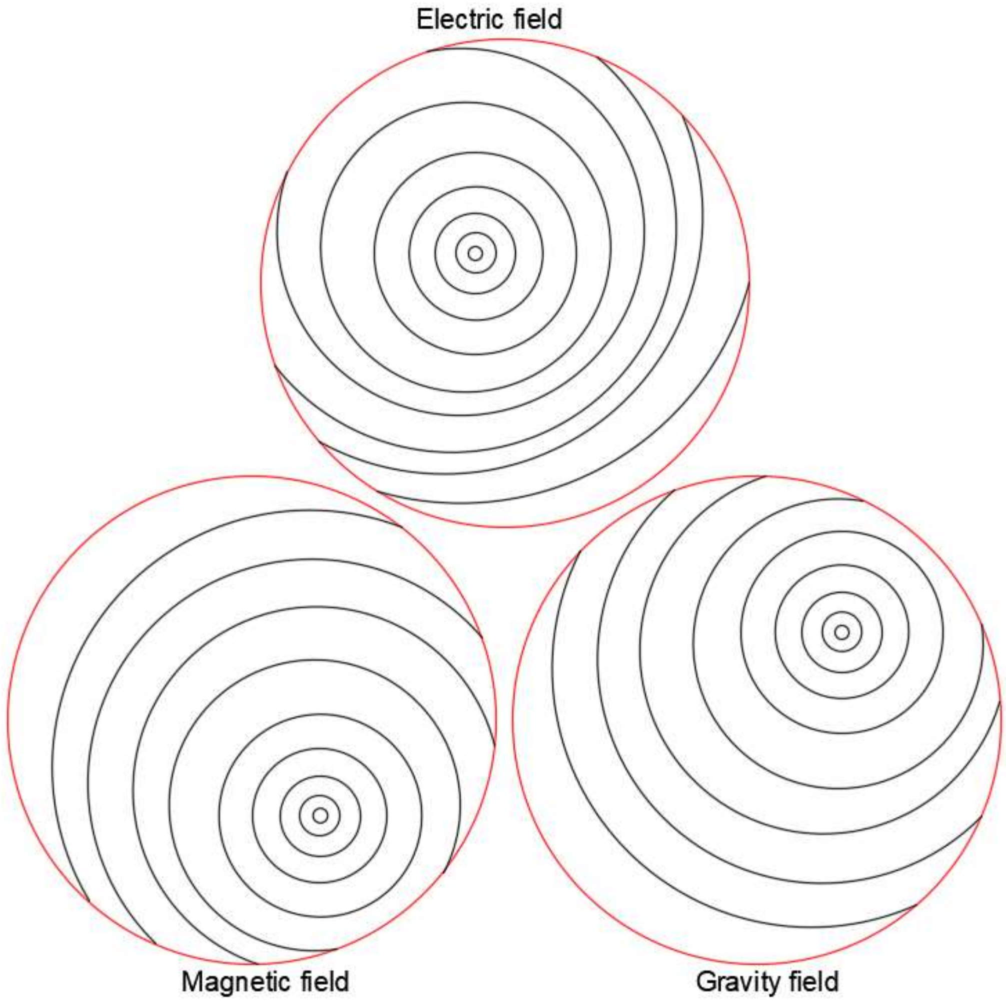
- Magnetic force is proportional to amount of charge
- Time is always defined to be perpendicular to all 3 space dimensions, so is normal to flattened 2D
- Spin remains to associate with velocity



2.9.3.6.5 Magnetically Induced Charge Rotation Flattened to 2D

2.9.3.6.6 A Sub-quark's View of the World

Information at a distance is available for each sub-quark about the electric, magnetic and gravitational fields around it. In all three cases, this information should be met with an action to move away or move toward the maximum value in the center of eccentric bull's eyes.

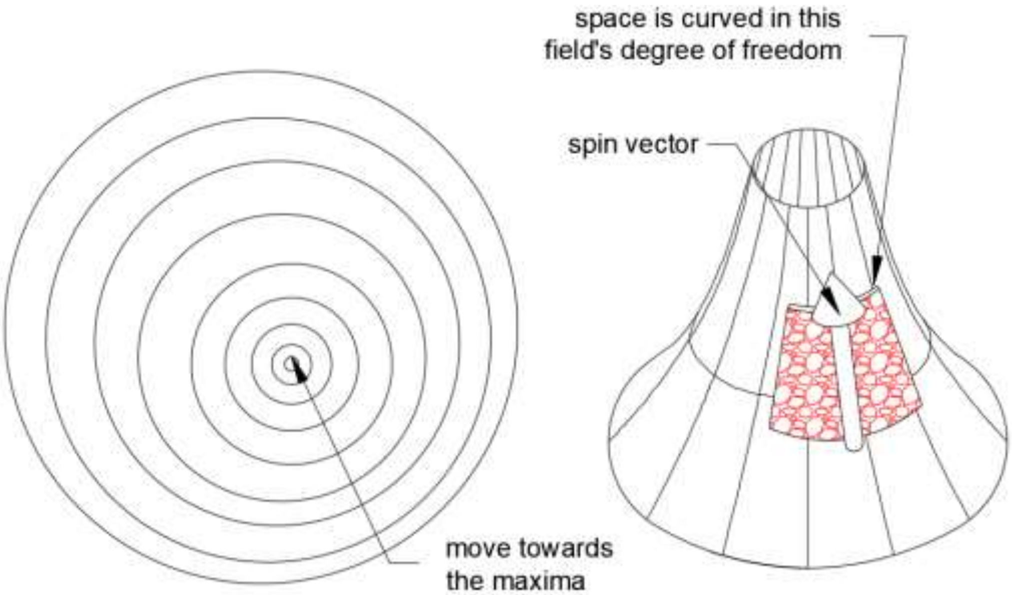


2.9.3.6.6 A Sub-quark's View of the World

2.9.3.6.7 Action to be Taken in the Presence of Gradients

Refer to section 1.6.1 How Spin Causes Curved Space. Space has separate degrees of freedom to curve for electric, magnetic and gravitational information at a distance. The curve fitting also described in section 1.6.1 is the same mechanism for the all three degrees of freedom. A gradient's steepness refers to how tightly a field source applies to space. Depending on polarity, the sub-quark's rotation 'saddle' will fit better either closer or further away. Particle moves toward or away from the cumulative field source.

The tighter the rotation curves space at the field source location, the better or worse the curve fits the sub-quark's saddle.

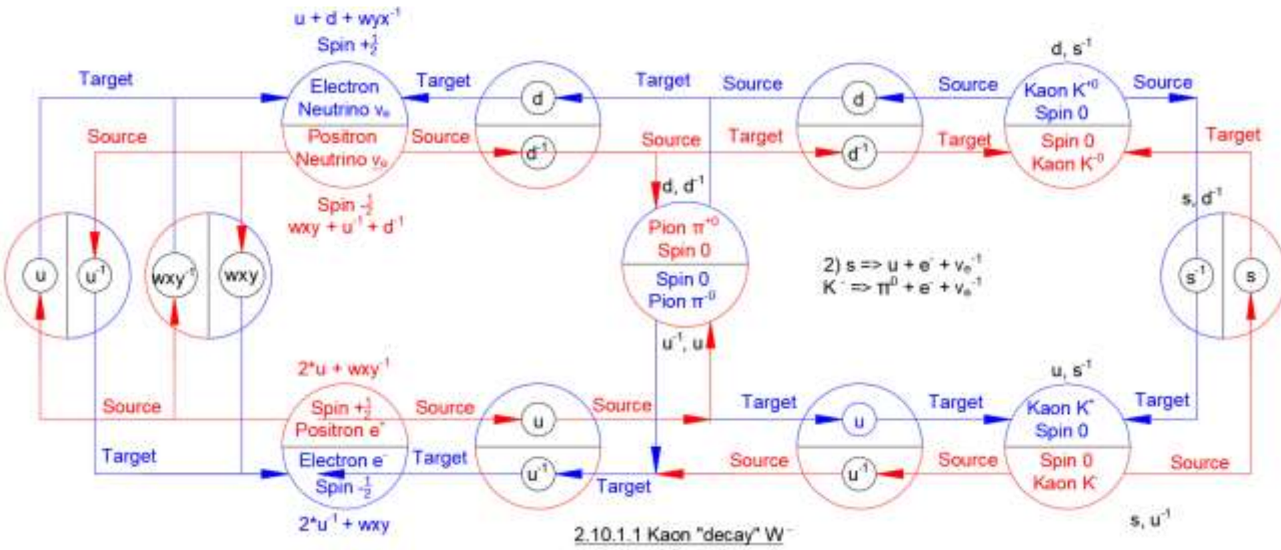


2.9.3.6.7 Action to be Taken in the Presence of Gradients

2.10 Related Reactions

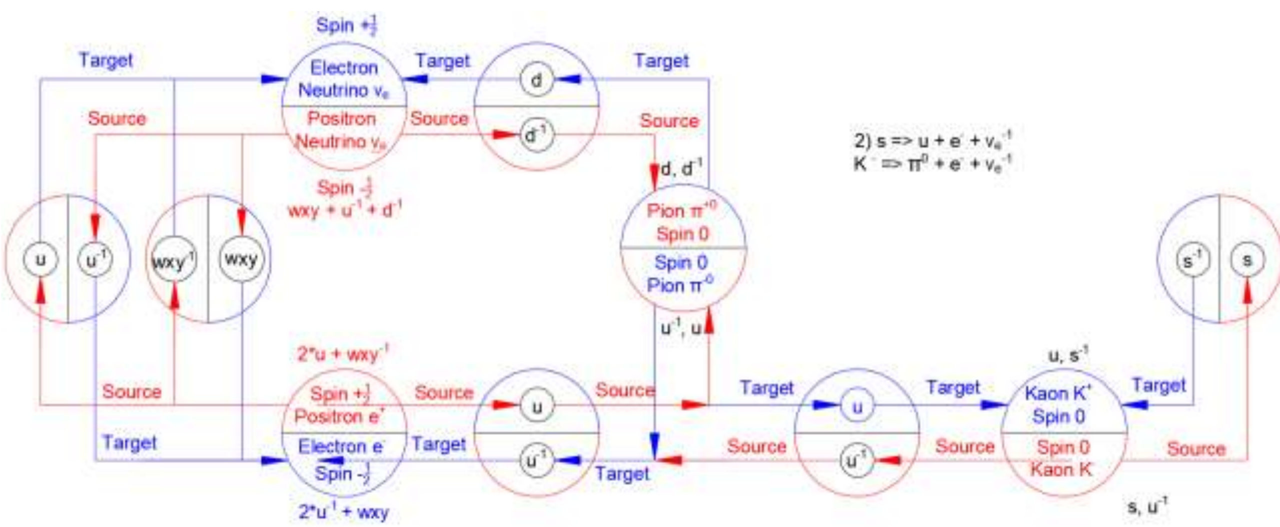
2.10.1 W and Z Reactions

2.10.1.1 Kaon "decay" W^-



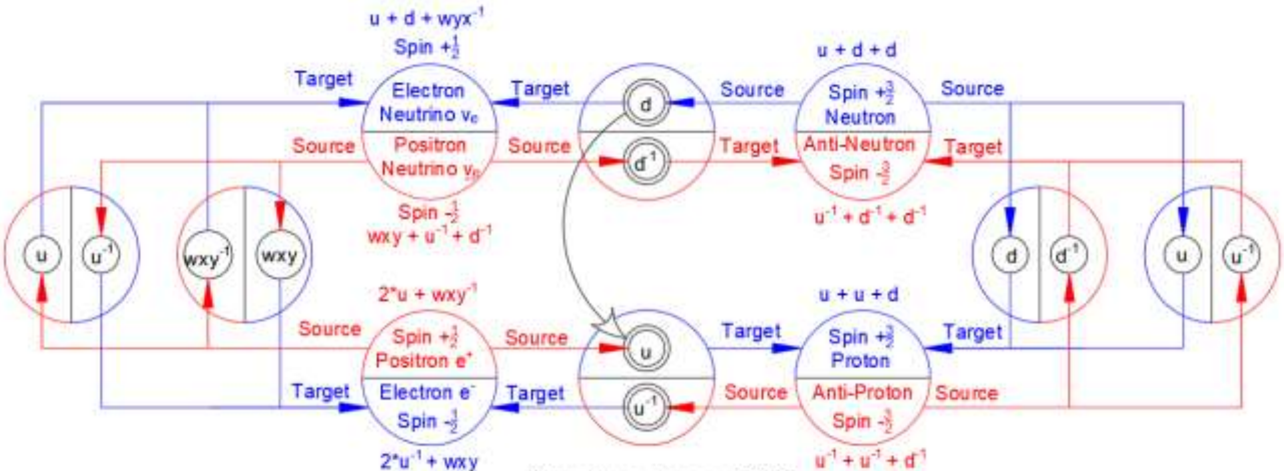
2.10.1.1 Kaon "decay" W^-

2.10.1.2 Kaon "decay" W^- with Strange and Anti-Strange Dead End



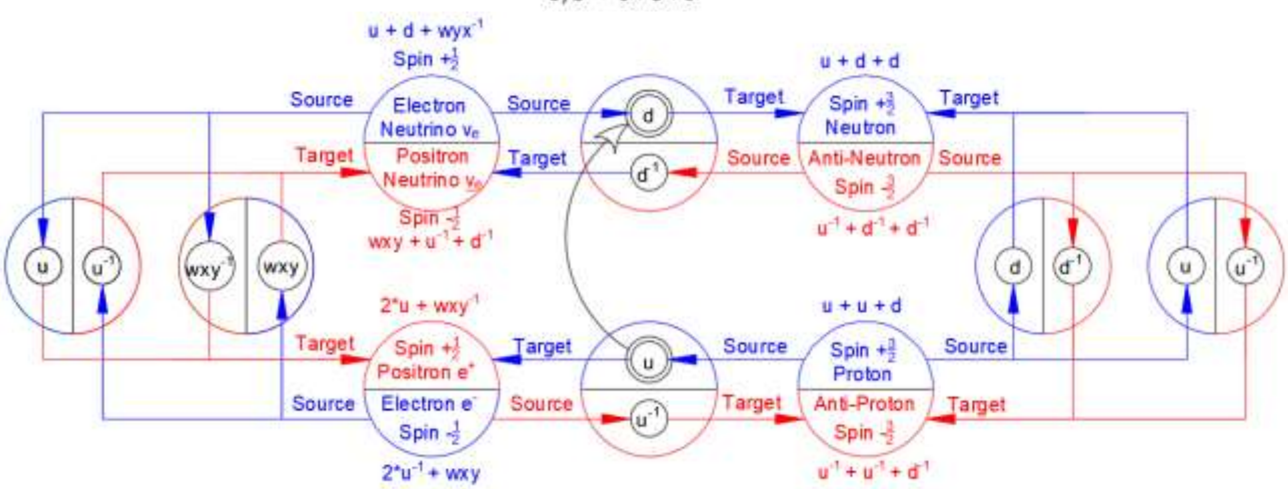
2.10.1.2 Kaon "decay" W^- with Strange and Anti-Strange Dead End

2.10.1.3 W Boson Pattern



"Neutron decay" W^-

This W^- pattern is typical of:
1) $d \Rightarrow u + e^- + v_e^{-1}$
2) $s \Rightarrow u + e^- + v_e^{-1}$
3) $s \Rightarrow u + d + u^{-1}$
4) $b \Rightarrow c + e^- + v_e^{-1}$
5) $b \Rightarrow c + \mu^- + v_\mu^{-1}$
6) $b \Rightarrow c + \tau^- + v_\tau^{-1}$
7) $b \Rightarrow c + d + u^{-1}$
8) $b \Rightarrow c + s + c^{-1}$

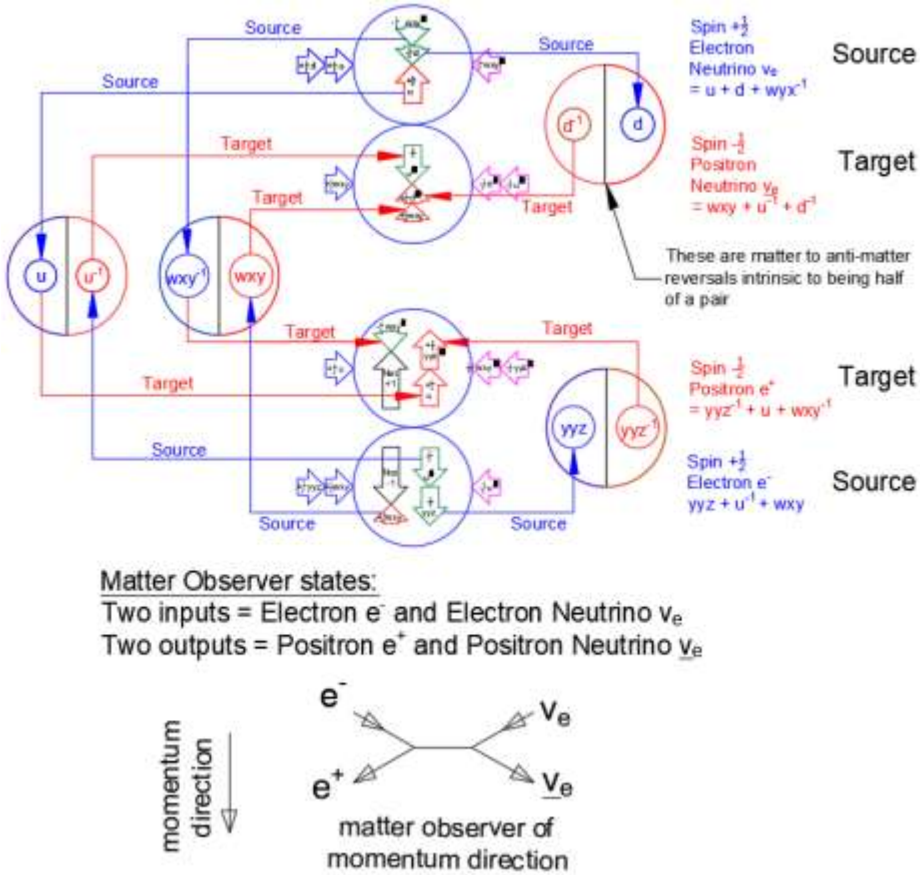


"Part of proton fusion" W^+

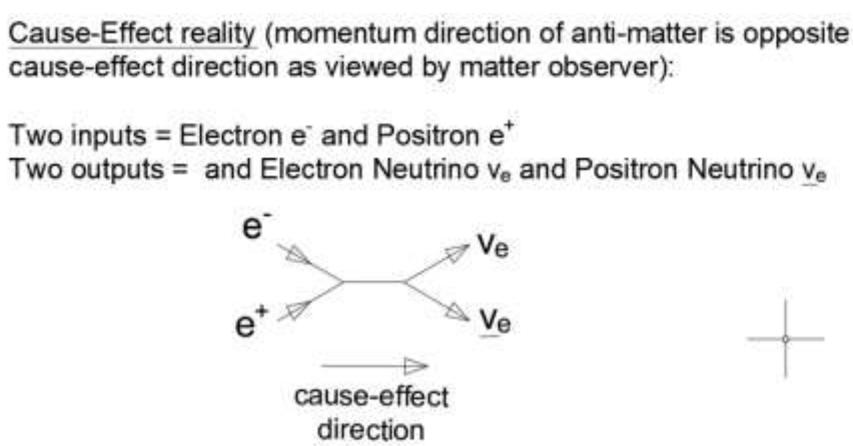
This W^+ pattern is typical of:
1) $u \Rightarrow d + e^- + v_e^{-1}$
2) $c \Rightarrow s + e^+ + v_e$
3) $c \Rightarrow s + \mu^+ + v_\mu$
4) $c \Rightarrow s + u + d$

2.10.1.3 W "Boson" Pattern

2.10.1.4 Z Boson Example

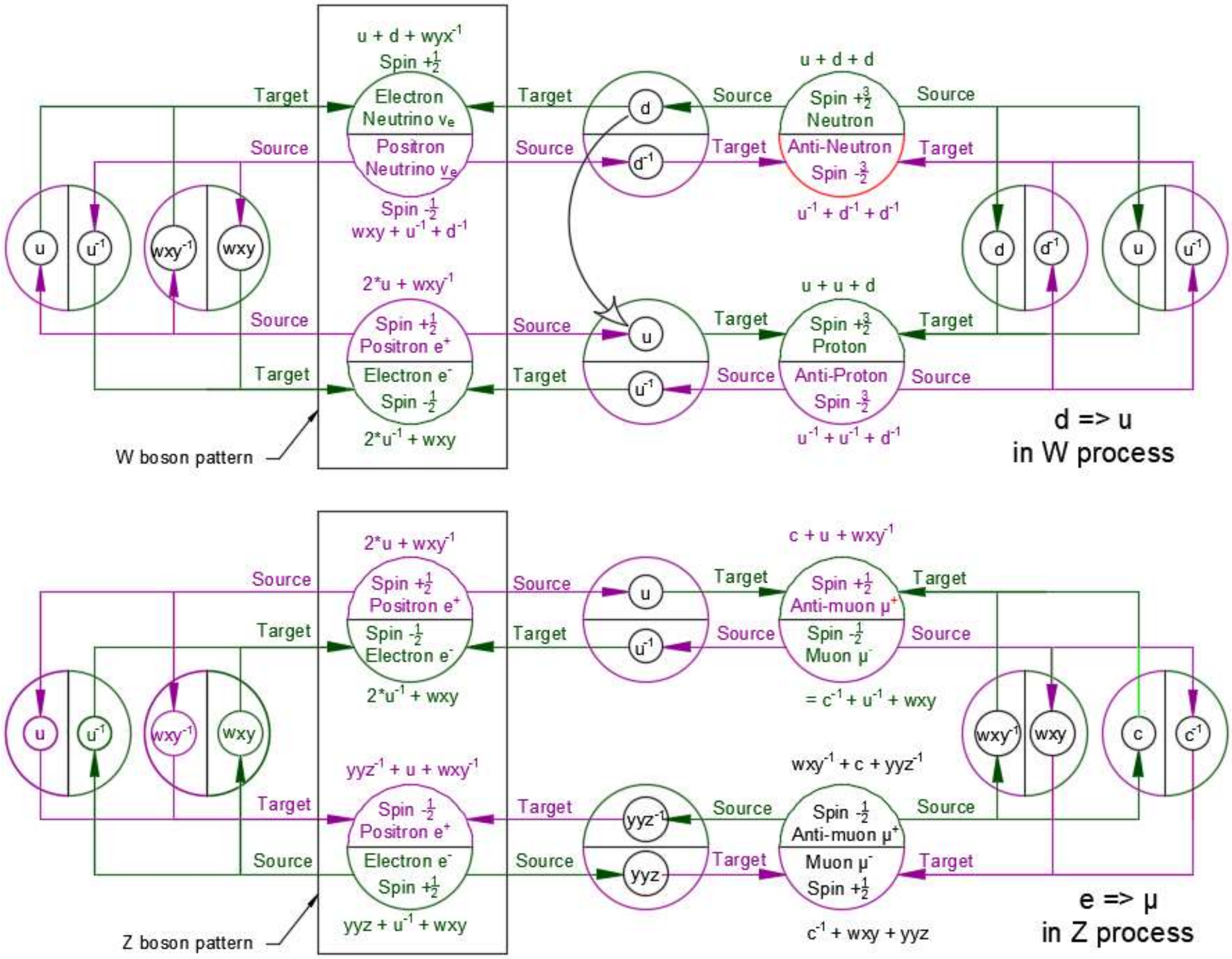


Z is like the photon, except it doesn't go anywhere because it was not created from orbiting opposite spin electrons. Instead, it was created from colliding electron and positron.



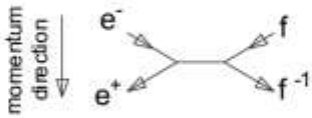
2.10.1.4 Z "Boson" Example

2.10.1.5 Comparison of W and Z Bosons

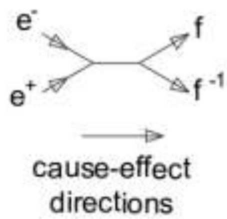


2.10.1.5 Comparison of W and Z "Bosons"

2.10.1.7 Z Boson Pattern Similar to Pair Production

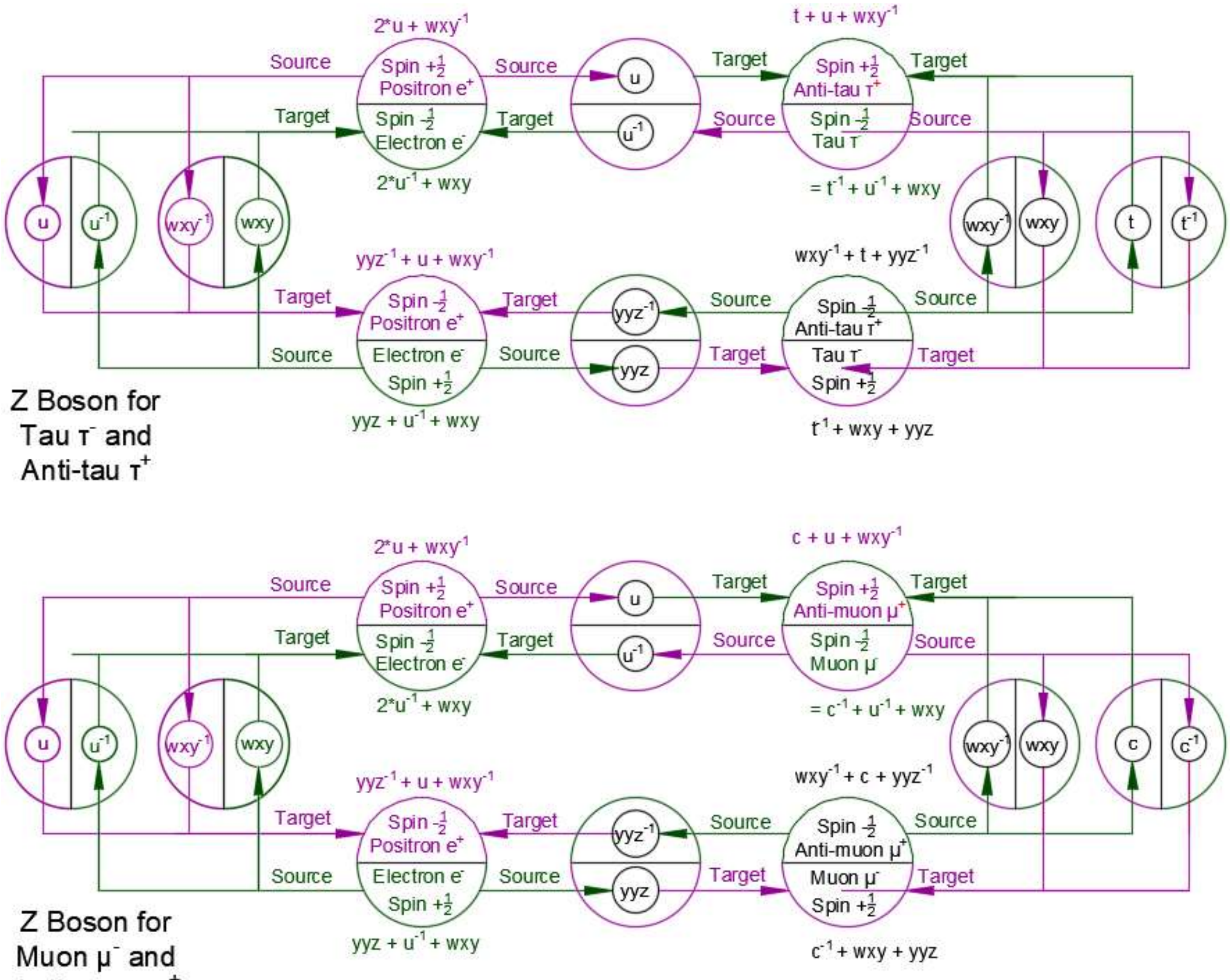


	invisible neutrinos			charged leptons			hadrons					
f	ν_e	ν_μ	ν_τ	e^-	μ^-	τ^-	u	d	s	c	b	matter
f^{-1}	ν_e^{-1}	ν_μ^{-1}	ν_τ^{-1}	e^+	μ^+	τ^+	u^{-1}	d^{-1}	s^{-1}	c^{-1}	b^{-1}	anti-matter



2.10.1.7 Z "Boson" Pattern Similar to Pair Production

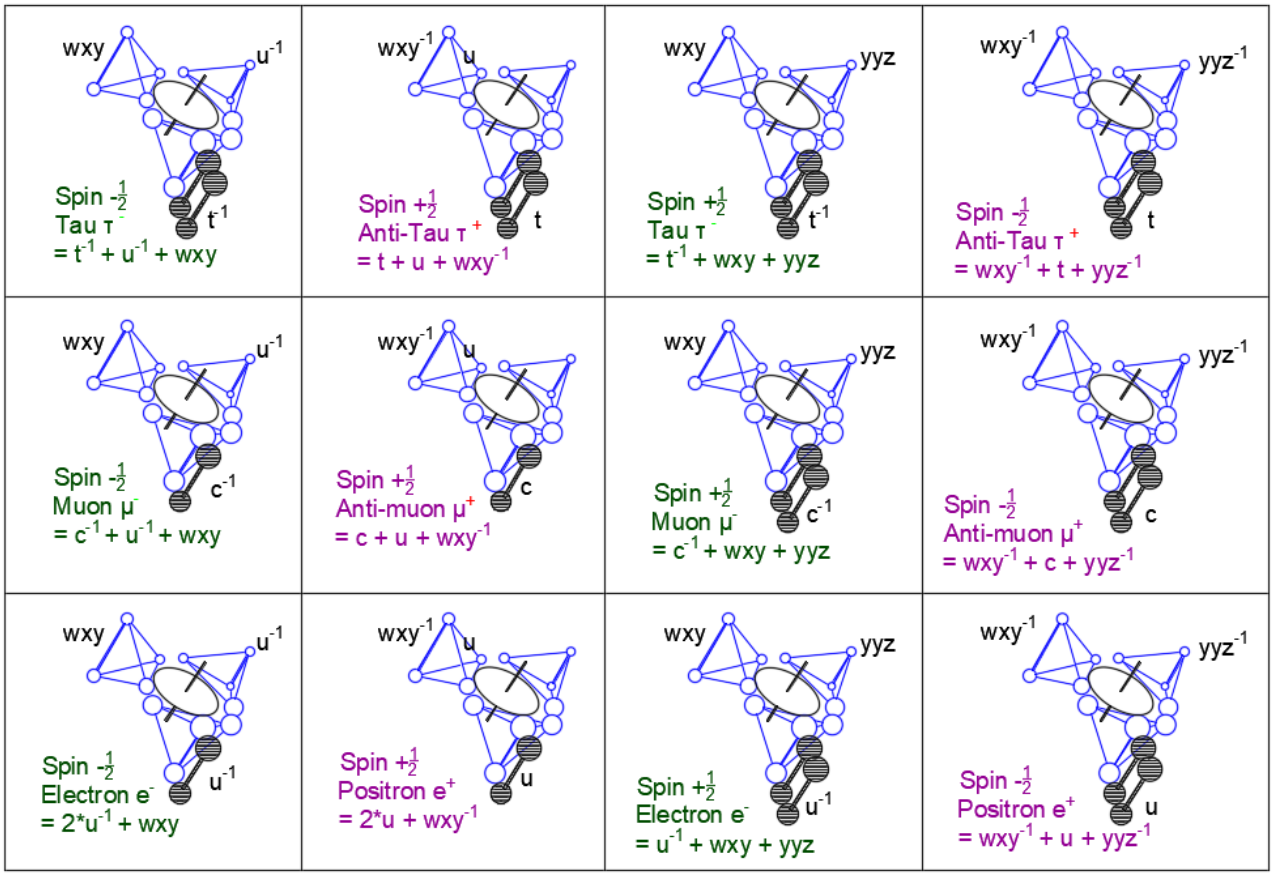
2.10.1.8 Z Boson for Tau and Muon



2.10.1.8 Z "Boson" for Tau and Muon

2.10.2 Electron, Muon, Tau

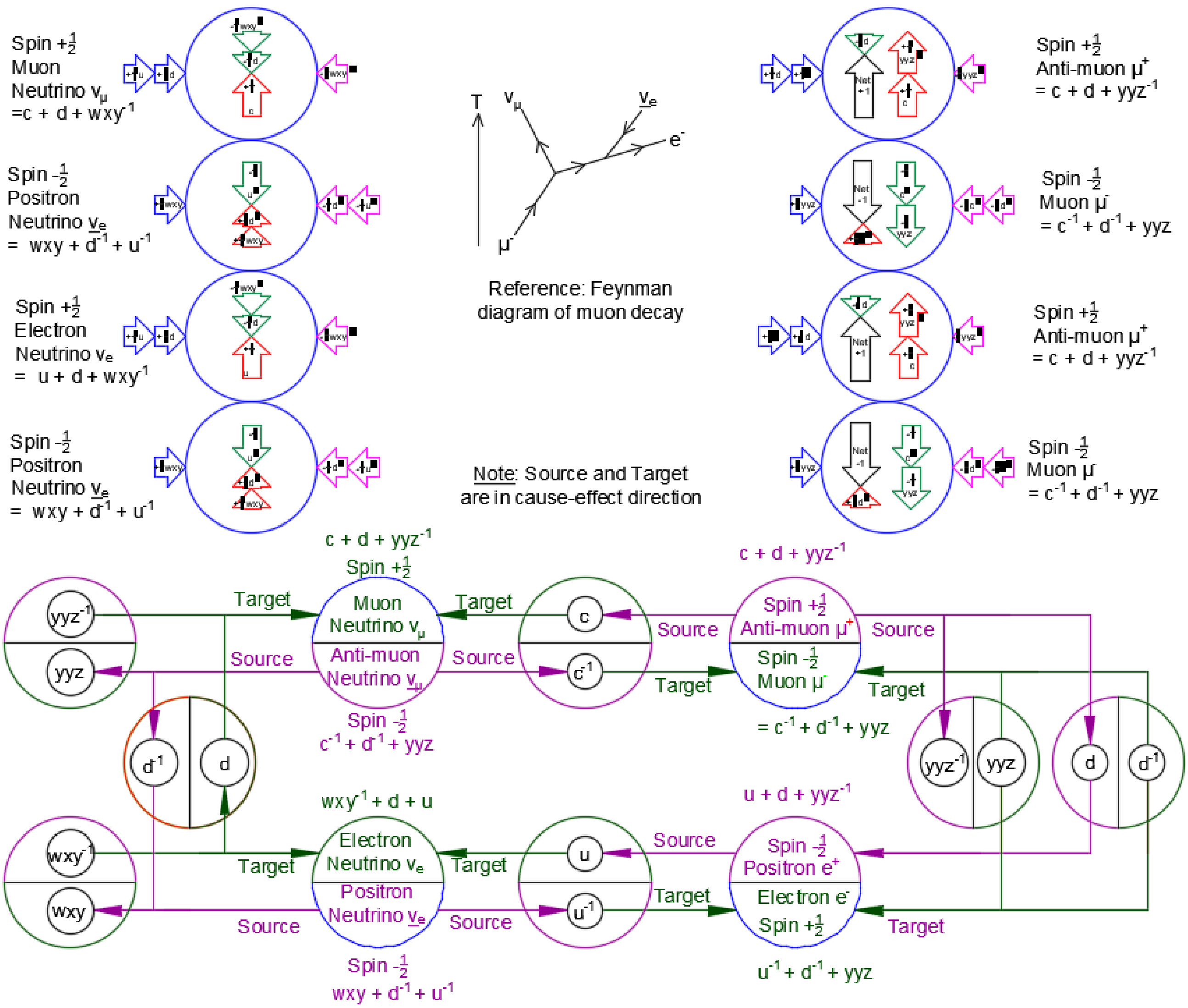
2.10.2.2 Pictorial of Three Levels and Two Spin Isomers of Electron, Muon, Tau



2.10.2.2 Pictorial of Three Levels and Two Spin Isomers of Electron, Muon, Tau

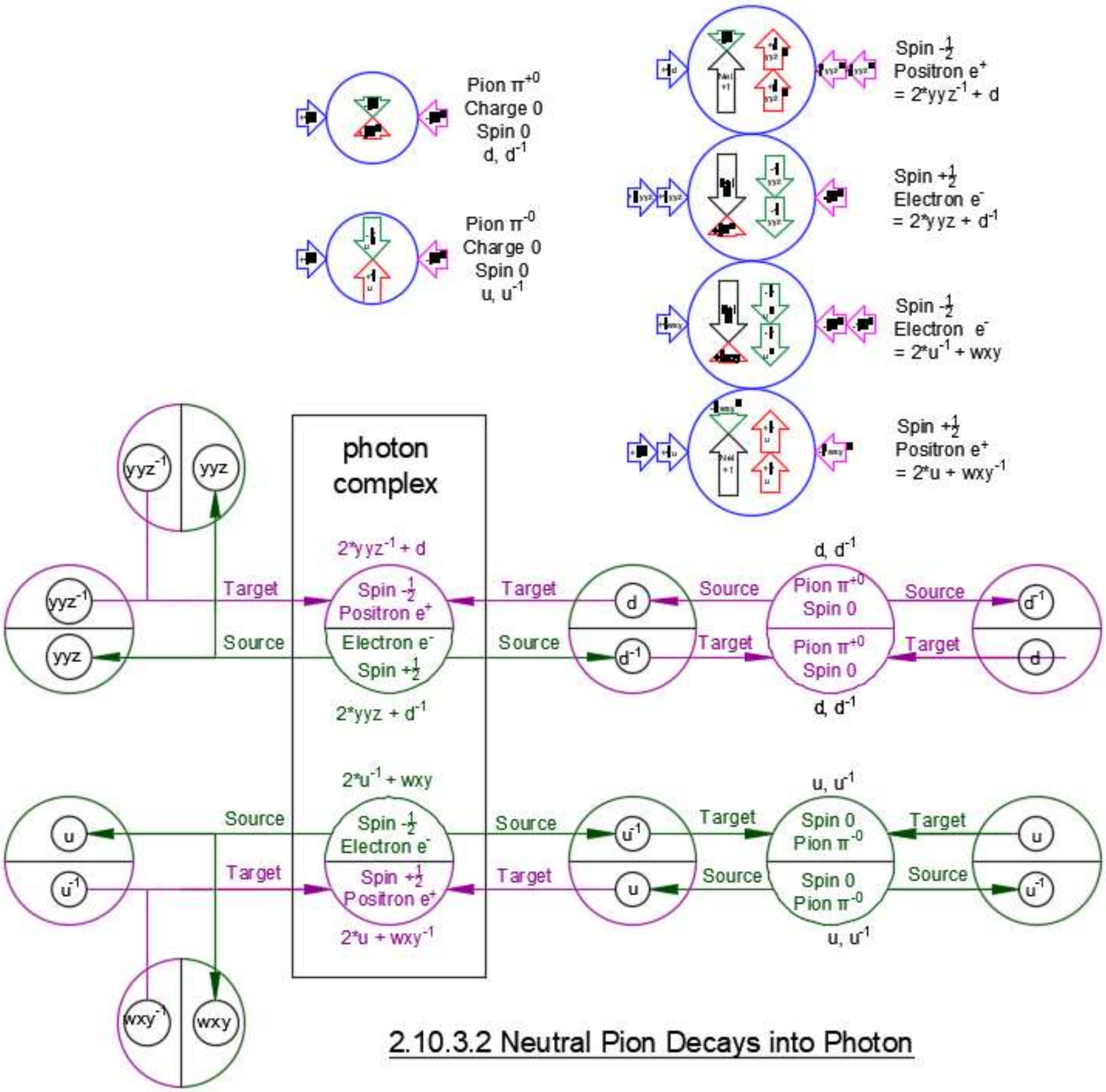
2.10.3 Muon, Pion, Proton, Meson "Decay"

2.10.3.1 Muon "Decay" Is Initiated by Anti-muon Neutrino



2.10.3.1 Muon "Decay" Is Initiated by Anti-muon Neutrino

2.10.3.2 Neutral Pion "Decays" into Photon



2.10.3.2 Neutral Pion Decays into Photon

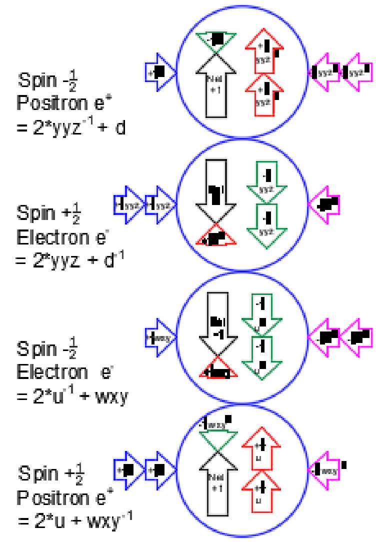
2.10.3.3 <u>Photon + Proton => Neutron + energy</u>

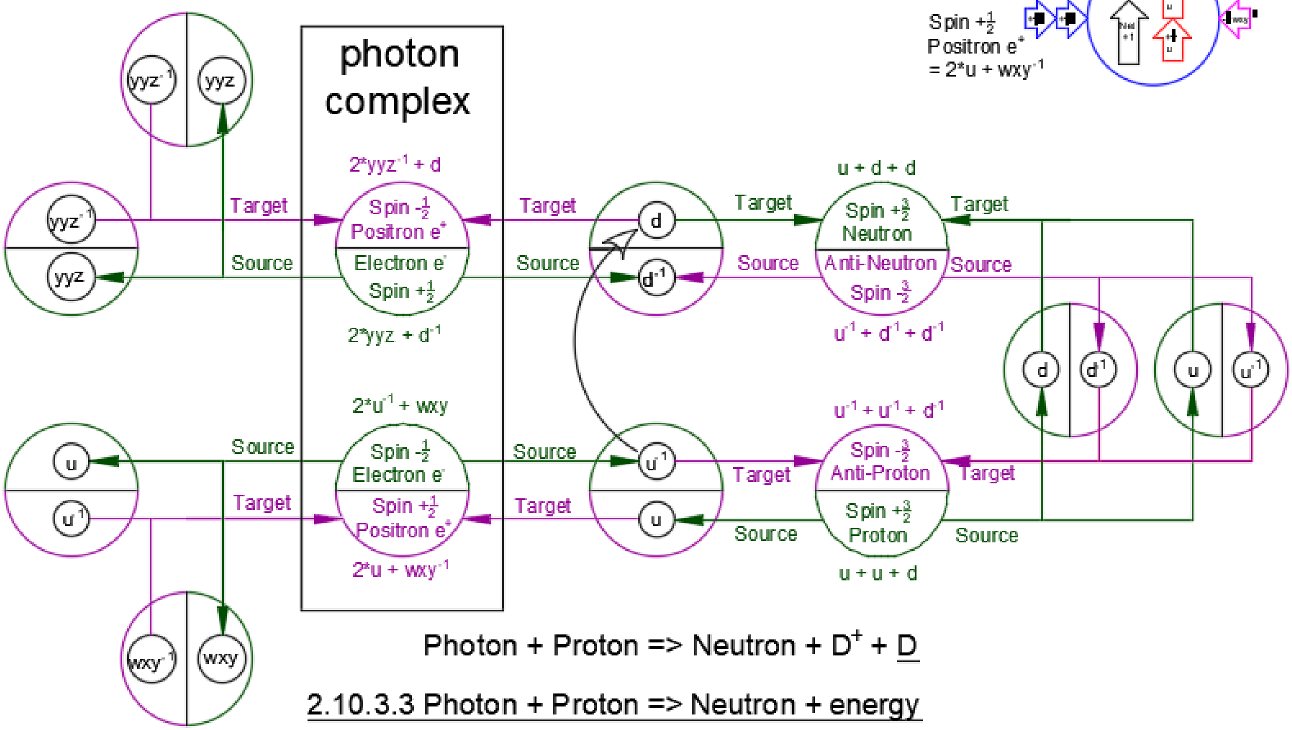
Simplified Reaction
Decay of D^+ meson

$D^+ \Rightarrow K^- + \pi^0 + \pi^+ + e^+ + \nu_e$
$K^- \Rightarrow \pi^0 + e^- + \nu_e^{-1}$
$D^+ \Rightarrow \pi^0 + e^- + \nu_e^{-1} + \pi^0 + \pi^+ + e^+ + \nu_e$
$D^+ \Rightarrow (\pi^{+0} + \pi^{-0}) + \pi^+ + (e^+ + e^-) + (\nu_e + \nu_e^{-1})$
$D^+ \Rightarrow \pi^+ + \text{energy}$
$c + d^{-1} \Rightarrow u + d^{-1} + \text{energy}$

Simplified Reaction
Creation of D^+ and $\underline{D}^0$ mesons

$D^+ = cd$
$D^0 = cu$
$\underline{D}^0 = \underline{cu}$
$\underline{D}^0 = c^{-1} + u^{-1}$
$D^+ + \underline{D}^0 \Rightarrow (c + c^{-1}) + (u + u^{-1})$
$D^+ + \underline{D}^0 \Rightarrow \text{energy}$

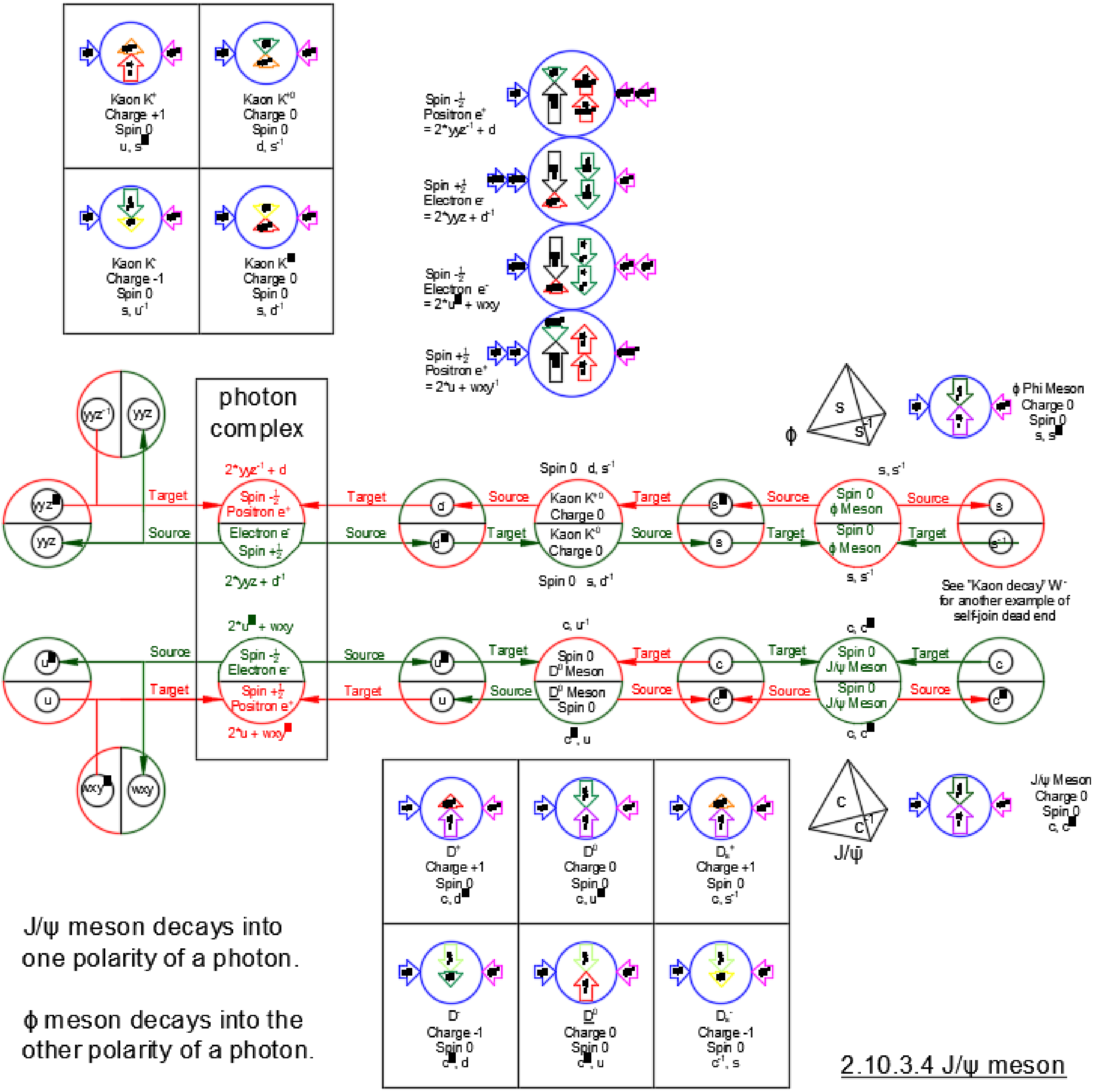




Photon + Proton => Neutron + D^+ + <u>D</u>

<u>2.10.3.3 Photon + Proton => Neutron + energy</u>

2.10.3.4 J/Ψ meson



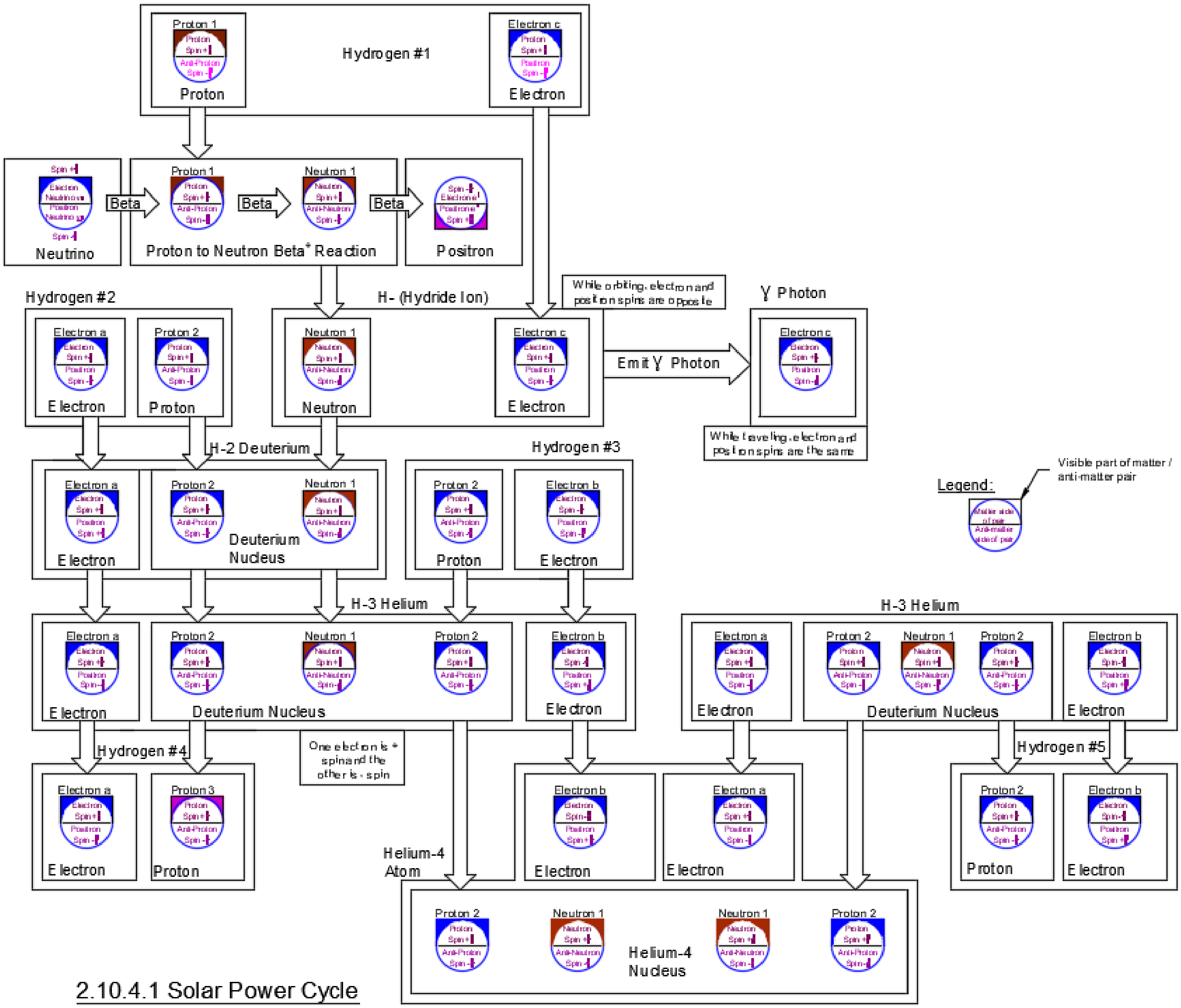
J/ψ meson decays into one polarity of a photon.

ϕ meson decays into the other polarity of a photon.

2.10.3.4 J/ψ meson

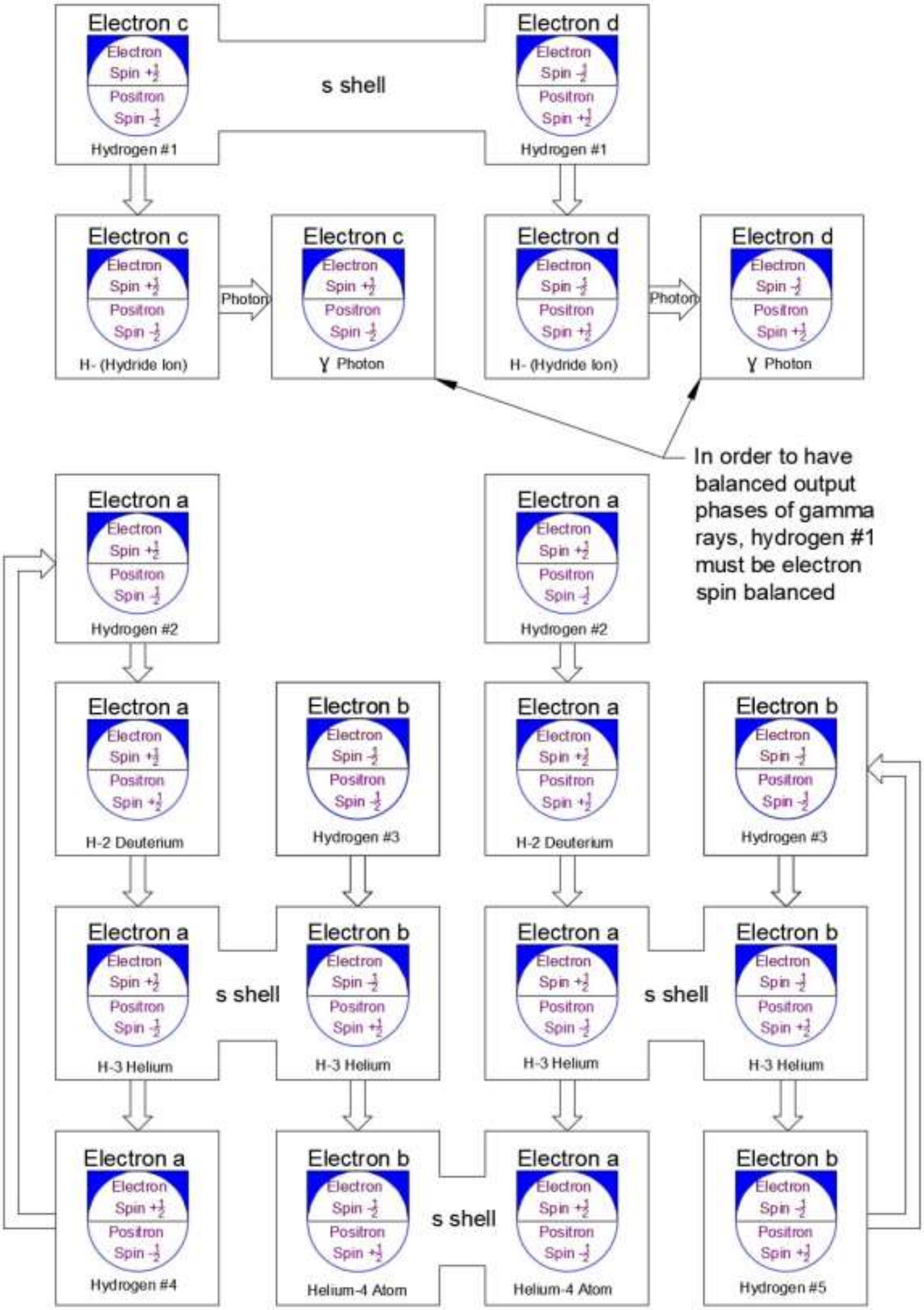
2.10.4 Solar Power Cycle

2.10.4.1 Solar Power Cycle



2.10.4.1 Solar Power Cycle

2.10.4.2 Solar Power Cycle Electron Inputs and Outputs



2.10.4.2 Solar Power Cycle Electron Inputs and Outputs