Schrodinger Fundamentals for Mesons and Baryons

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Abstract

A mass model of the neutron and proton reported previously was successful in providing insights into physics and cosmology [9][13]. The equation E=e0*exp(N), where e0 is a constant, was used to characterize energy. This equation works but Edwin Klingman [17] indicated that it needed a clear derivation. This document presents the Schrodinger based fundamentals of the relationship and an understanding of N values for the proton mass model. The fundamentals indicate that zero energy, probability one and quanta found in the neutron model should apply to all mesons and baryons. To study this, data from the new Particle Data Group (PDG) 2016 Particle Physics Booklet [18] was placed in an Excel© spreadsheet and analyzed. The principles zero energy and probability one are consistent with PDG data (even though the particle accelerator must supply energy to create the particles). Understanding mesons and baryons including their properties and fields is important to physics (a subject known as chromodynamics). It is intriguing that results also extend Schrodinger's equation to quantum gravity and cosmology. New in this document:

1. Nature is extremely simple at the most fundamental level. Schrodinger "quantum circles" at probability one are the source of Charge, Parity, Time (spin) and Fields. Nature creates everything by separating properties from zero (CPTF=0). Energy was originally zero and separated into mass+ kinetic energy and opposite field energy. Parity conjugation is involved in some separations.
2. Quark masses were correlated and their fields identified. It is proposed that "tunneling" allows mesons and baryons to form at various energies rather than their "ideal" energy (the energy where mass+ kinetic energy is equal and opposite the field energy). This explains the large number of mesons and baryons.
3. Fundamentals of decay time are presented and demonstrated for the neutron. Meson and baron decay times are based on N values for their quarks. Some mesons have positive and negative field components correlated with longer decay times (11 orders of magnitude longer).
4. Currently literature suggests that charge, parity and time (CPT) is violated in the weak interaction. New properties of the Up and Down quarks were discovered that cast doubt on this result. The new properties explain Iso-spin (I) and allow baryons to conserve CPTIF=0.

Fundamentals of the equation E=e0*exp(N)

The Feynman Lectures on Physics [2], Page 19-1 discusses the Schrodinger equation. It is used to describe the hydrogen atom.

Psi(r,t)=exp(i E/H)*psi(r)

The symbol exp stands for the natural number e to power (i E/H), psi(r,t) is a complex wave function, E is field energy, t is time, H is Heisenberg's constant and i is the imaginary number (square root of negative 1)

The above equation yields a complex probability psi (p):

dp/dt= -iE p/H

dp/p dt= -i E/H

ln p= -i Et/H

p=exp(-i Et/H)

Restriction 1: We will deal with probabilities represented by complex conjugate multiples that give probability 1, specifically, P=exp(-i Et/H)*exp(i Et/H)=1 where Et/H=1.

Restriction 2: We will only deal will orbits (also called "quantum circles" or Argand diagrams). The time t to circle a field at radius R is t=2 pi R/V. The energy in the field will be E and E*t=H where H is Heisenberg's constant (4.13e-21 MeV-sec), not the reduced constant that divides H by 2pi). (Note: Schrodinger's equation is non-relativistic and V is C but we will use it both ways with restrictions.)

We will often take the natural logarithm (ln) of both sides of an equation. Recall that adding logarithms of values is equivalent to multiplying the values and ln(value)-ln(value) is equivalent to dividing values. Also recall that an exponent changes its sign when it moved from the top of an equation to the bottom of an equation. We will take the anti-logarithm as shown below to recover the original values.

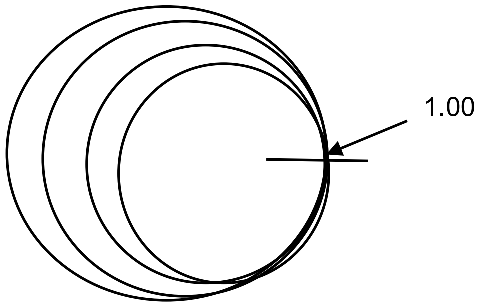
P	p1*p2=exp(-i Et/H)*exp(i Et/H)		
	with Et/H=1		
multiply by adding the logarithms			
ln P	ln(p1*p2)=-i+i=0		
P	exp(0)=1		

Example of exponent sign change:

7.39=exp(2)	7.38906
7.39=1/exp(-2)	7.38906

Components of 1 and nested orbits

P=exp(i Et/H)*exp(-i Et/H)=1 but we will seek probability components of 1 and their relationship to orbits. The orbits can be different sizes, nested as follows and represent probability 1/1*1/1=1. We will call these "quantum circles" and the only point we are interested in is Et/H=1.



Looking ahead, orbits will be meaningfully demonstrated in a proton mass model but we are simply looking deep inside probability 1 to find its exact components. Each component obeys Schrodinger's equation Et/H=1.

We define a probability component p =e0/E where e0 is a constant and has the same units as E. This means energy is increased by a low probability, i.e. E=e0/p and each E is related to time t by t=H/E. Specifically, we will look at probabilities that obey the following restrictions that I call constructs (constructs are nested orbits with very specific pairs).

The probability= 1 construct

Probability 1=p1*p2/(p3*p4).

We will divide two complex probability pairs that equal 1, specifically P=1=p1*p2/(p3*p4)=exp(-13i)*exp(-12i)/(exp(-15i)*exp(-10i)). This expression will be evaluated below using natural logarithms of exp(-Ni). The exponent changes it sign from positive to negative when it is moved from the bottom to the top of the relationship.

exp(-13i)	exp(-15i)	
exp(-12i)	exp(-10i)	
exp(-13i)*exp(-12i)/(exp(15i)*exp(13i)=1		
exp(-13i)*exp(-12i)*(exp(15i)*exp(10i)=1		
multiply the above by adding logs		
0=-13i-12i+15i+10i		
0=-25i+25i		
take the anti logarithm		
P=exp(0)=1		

The natural log of P=1=p1*p2/p3*p4 is -13i-12i+15i+10i=0 and the anti-logarithm P= exp(0)= 1. We end up with P=1, but it now has four probability components.

The energy= 0 construct

Next, we will evaluate orbital components that have overall zero energy. This is possible because mass plus kinetic energy will be defined as positive and the equal and opposite field energy negative. This allows energy components to add and subtract to zero. The example above will be used to extend the probability 1 construct to create an energy zero relationship. The result is called the energy zero construct. In the derivation below we "add balancing terms" (by balance we mean adding numbers so that all are represented but each one has a positive and negative term). After balancing terms are added we don't need to write the imaginary number because negative i exponents balance the positive i exponents because, for example:

1= exp(-13i)*exp(13i)=exp(-13)*exp(13).

Energy zero construct

N1=13i N3=15i
N2=12i N4=10i

p1=exp(-13i) p3=exp(-15i)
p2=exp(-12i) p4=exp(-10i)

1=p1*p2/(p3*p4)

exp(-13i)*exp(-12i)/(exp(15i)*exp(13i)=1
exp(-13i)*exp(-12i)*(exp(15i)*exp(10i)=1
add balancing terms to the above multiplication
exp(-13i)*exp(13i)*exp(-12i)*exp(12i)*exp(-15i)*exp(15i)*exp(-10i)*exp(10i)=1
multiply the complex conjugates
1*1*1*1=1
This is equal to:
exp(-13)*exp(13)*exp(-12)*exp(12)*exp(-15)*exp(15)*exp(-10)*exp(10)=1
And equal to the following because exp(-N)*exp(N)=e0/e0*exp(N)/exp(N)=1
e0*exp(-13)*e0*exp(13)*e0*exp(-12)*e0*exp(12)*e0*exp(-15)*e0*exp(15)*e0*exp(-10)*e0*exp(10)=1

The above expression can be converted to addition and subtraction that totals zero because the terms are matched equal and opposite pairs.
0=e0*exp(13)-eo*exp(13)+e0*exp(12)-e0*exp(12)+e0*exp(15)-e0*exp(15)+e0*exp(12)-e0*exp(12)
With e0 defined as energy, this converts the probability 1 equation to an energy zero equation.

The restrictions above apply:
They satisfy the Schrodinger equation if the numbers are imaginary, i.e 13 is really 13i.
They satisfy the Schrodinger equation if t equals H/E.

This is the zero energy construct

The energy zero construct is derived by adding balancing terms to the probability 1 construct and converting it to addition and subtraction. Including e0 in the equation allows the numbers to represent energy. The added balancing terms allow elimination of the imaginary number because the four complex probabilities multiply with their four conjugates. (1/1*1/1*1/1*1/1=1). Probability is unity and energy is zero but we can distinguish exact energy components of the proton when we introduce the correct N values. The correct equation for energy is E=e0*exp(Ni) but the imaginary numbers multiply to 1. Energy E=e0*exp(N) can be quite high since it follows an exponential relationship but Et/H=1 is maintained because each orbital time t is corresponding low.

Identify the following quantities			
mass+kinetic energy-field energy=0			
mass=eo*exp(13.432)			
kinetic energy=eo*exp(15.432)+e0*exp(10.432)-eo*exp(13.432)			
field energy=-e0*exp(15.432)-e0*exp(10.432)			

Looking ahead (see heading below entitled "Strong interaction orbits"), the energy zero construct will represent nested orbits that obey Schrodinger's Et/H=1 and contain the above mass, kinetic energy and field energy terms.

Fundamentals of the number N= 0.0986

The model discussed later in this document uses the number N=0.0986 several places. For example, N=15+1/3+0.0986 is one of the quarks. According to Schrodinger the complex wave-functions psi*psic gives the probability of a particle with a defined criteria. Consider an electromagnetic field where the probability of each part is p/3.

N		Probability each part	Probability	ln P=N
N=-.0986		1/3*EXP(iet/h)	0.906i	neg 0.0986i
N=-0.098-0.098		(1/3*EXP(iet/h))^2	0.821i	neg 0.1972i
N=-.098-.098-.098		(1/3*EXP(iet/h))^3	0.744i	neg 0.2958i

N is the logarithm of a probability. The natural log of an exponential quantity leaves the exponential quantity unchanged. If the exponent is imaginary, the natural log retains the imaginary number.

exp(Ni)
ln(exp(Ni)
Ni

We now understand the N values 0.0986, 0.197 and 0.296 but we also know that they must be imaginary, i.e. N=0.0986i, etc. Looking ahead the N for one quark mass is Ni=0.0986i+0.3333i+15i=15.432i (This value was abbreviated to 15i in the energy zero construct derivation).

Evaluating e0 and the energy for numbers like 15.432i

The column labelled N below correlates data [3][6] if E=e0*exp(N) and e0=2.02e-5 MeV. N is a natural logarithm. This uses the equation without imaginary numbers but provides a clue regarding correct N values for neutron components.

unifying concepts.xls cell aw48			Proposed	IS Hughes
		Particle Data	Energy	Bergstrom
		Group energy	E=eo*exp(I	Randall
Identifier	Ni or N	(Mev)	(Mev)	energy
	(E=e0*exp(N))		e0=2.02e-5	(Mev)
1/3 of E/M E	0.0986			
e neutrino ke	0.197	2.00E-06	2.47E-05	3.00E-06
E/M Field E	0.296	0.0000272	2.72E-05	
	(3*.0986=.296)			
ELECTRON	10.136	0.51099891	0.511	
mu neutrino	10.408	0.19	0.671	less than 0.25
Graviton*		1.75E-26	2.732	
Up Quark M	11.432	1.5 to 3	1.867	1.5 to 4.5
E Operator	12.432		5.076	
Down Field E	13.432	3 to 7	13.797	5 to 8.5
Strange Quar	15.432	95+/-25	101.947	80 to 155
Charmed Fiel	17.432	1200+/-90	753.29	1000 to1400
Quark?	19.432	4200+/-70	5566.11	4220
Quark?	21.432		41128.30	40000
W+,w- boson	22.106	80399	80668.71	81000
Z	22.228	91188	91154.0	91182
HIGGS	22.575	125300	128992.1	105000
* sum of 3 Ns of 10.431+10.408 (2.73/exp(60)=2.4e-26 mev)				
Mw/Mz	Weinberg radians		sin^2 theta	
0.88497136	0.4843638	0.465645464	0.216826	

Many of the numbers above contain the fraction 0.432. This suggests that 10.431 is the starting point for the electron since 10.432 -3*0.0986=10.136 (an electron and its field?). Some code breaking was required [8]. Originally the electron was used to evaluate the constant e0 [9]. If e0 were 2.02e-5 MeV, it would make the electron N=10.136 (0.511 MeV) and make the electromagnetic field N=3*0.0986=0.296 (E =27.2e-5 MeV). The proton contained 3 quarks and the rough correlation above suggested that they might be quarks or quark field energies following the series 11.432, 15.432, 17.432. In retrospect these numbers must contain the imaginary number, i.e. 15.432i. In this work mass+ kinetic energy is equal and opposite field energy. Quark mass data (PDG) is lower than found in the neutron model below with correspondingly higher kinetic energy.

Part 1 Application of Fundamentals to the Neutron and Proton

N values for neutron mass and kinetic components

What follows uses the restrictions (E*t/H=1) and exp(-i*1)*exp(i*1)=1) and constructs probability 1 and energy 0. It uses the equation E=e0*exp(N) with N values carefully selected to balance.

Looking ahead the column on the right hand side of this diagram creates a fine mathematical model of the proton. I call the rightmost column “fundamental N values” for mass and kinetic energy components. The left side of the diagram is an attempt to trace the fundamental N values back to N=90. Operations 2,3,4&5 are speculative but the right hand column correctly models the proton mass and kinetic energy components.

Operation 1	Operation 2&3		Operation 4&5		Fundamental N values	
22.5	10.167	5.167	15.333	0.0986	15.432	set1
	12.333		12.333	0.0986	12.432	
22.5	10.167	3.167	13.333	0.0986	13.432	set2
	12.333		12.333	0.0986	12.432	
22.5	10.167	3.167	13.333	0.0986	13.432	set3
	12.333		12.333	0.0986	12.432	
	0.667		0.667	0.0750	0.075	set4
22.5	11.500					
	10.333		10.333		10.333	
90	90		90		90	

There is a related fundamental N table for proton field energy components that also totals 90. It is on the right hand side of the table below. The four values in each box are called a quad. There is a specific position for mass, kinetic energy, the strong field and the gravitational field component. The key at the top of the table and is never violated. I view the values on the right as separations from values on the left. For example 15.432+2= 17.432 and 12.432-2= 10.432 is a separation involving N=2. Orbits of the three proton quarks are represented by the first three quads. N=12.432 is the log of a specific kinetic energy.

	Unified.xls cell cq5	
	Calculation of Neutron M	
	mass	S field
	ke	G field
Quad 1	15.432	17.432
	12.432	10.432
Quad 2	13.432	15.432
	12.432	10.432
Quad 3	13.432	15.432
	12.432	10.432
Quad 4	-10.333	-10.333
	10.408	10.408
Quad 5	10.33	10.333
	0	0
	90.000	90.000

10.167i
5.167i
0.0986i
15.432i

Going back to the probability 1 construct, we will use the following four values for the first orbit.

15.432 17.433

12.431 10.432

The probability 1 construct is: p=1/exp(15.43)*1/(12.432)*exp(17.431)*exp(10.432)=1

Quad 1 key	N1	E1 mass	N3	E3 field1	
	N2	E2 ke	N4	E4 field2	
		MeV=2.02e-5*exp(N)		MeV	
Quad 1	15.432	101.947	17.432	753.291	
	12.432	5.076	10.432	0.687	
	27.864	⟵ ⟶	27.864		
		N is conserved			
		N1+N2=N3+N4			
	N=ln p	(p=1/exp(N))			
p1	15.432	1.986E-07	17.432	2.688E-08	P3
p2	12.432	3.989E-06	10.432	2.948E-05	P4
	Probabilities are conserved				
	p1*p2	7.923E-13	p3*p4	7.923E-13	

The quad conserves N= 27.864 and probability P1*P2=P3*P4= 7.9e-13 where probability=1/exp(N).

The energy 0 construct follows using N values for the neutron and energy E=2.02e-5*exp(N). The values are arranged differently in the table below. Energies E3 and E4 on the right hand side of the table represent field energy. Mass plus kinetic energy is exactly balanced by negative field energy. The quad describes an orbit. The mass with kinetic energy orbits in a field and is attracted to a second field (nested orbits). Kinetic energy has two components E2 and (E3+E4-E1-E2). There are positive and negative balancing pairs of N because E1+E3+(E4-E1-E2)+E2-E3-E4=0=(E1-E1)+(E2-E2)+(E3-E3)+(E4-E4).

	ke (difference ke)			**E3 field1**	
E1 mass	**E3+E4-E1-E2**	**E2 ke**			**E4 field2**
mev	**mev**	**mev**		**mev**	**mev**
101.947	**646.955**	**5.076**		**-753.291**	
					-0.687
E1+difference ke		**753.978**		**E3+E4**	**-753.978**

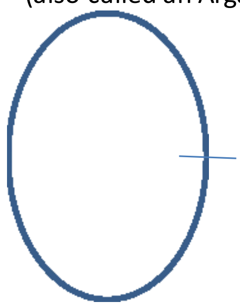
quad 2&3	13.432	15.432	101.947
	12.432	10.432	0.687
	25.864 ⟶	25.864	

13.797	**88.837**			**-101.947**	
					-0.687
E1+difference ke		**102.634**		**E3+E4**	**-102.634**

Next we demonstrate that Quads 2 and 3 are in fact meaningful orbits. The above information is in the two columns on the right of the table below (Quad 1 above produces the other column). The bottom of each table shows energy and time that multiply to H. In each case, the orbit (quantum circle) is complete at Et/H=1.

Quantum circle

(also called an Argand diagram)



psi*psic=1

Et/H=1

Strong interaction orbits

Unification Table		cell ax74		Strong stran	Strong down	Strong down
				(Mev)	(Mev)	(Mev)
Field Energy E (MeV)				753.98	102.63	102.63
Particle Mass (mev)				101.947	13.797	13.797
Mass M (kg)				1.82E-28	2.46E-29	2.46E-29
Kinetic Energy (mev)				652.03	88.84	88.84
Gamma (g)=m/(m+ke)				0.1352	0.1344	0.1344
Velocity Ratio		v/C=(1-(g)^2)^.5		1.0000	0.9909	0.9909
R (meters) =((HC/(2pi)/(E*M/g)^0.5)				2.6171E-16	1.9226E-15	1.9226E-15
Force	Newtons	F=E/R*1.6022e-13		461573.9	8.55E+03	8552.7
Inertial F Nt		F=M/g*V^2/R		461573.926	8.40E+03	8398.168
Force=HC/(2pi)/R^2=3.16e-26/Range^2 (nt)				461573.9	8.55E+03	8552.7
				n	n	n
time=2pi R/C (sec)				5.49E-24	4.03E-23	4.03E-23
e*t (mev-sec)				4.136E-21	4.136E-21	4.136E-21
e*t/h				1.00000	1.00000	1.00000

753.978	Field (MeV)	
5.485E-24	time (sec)=2*pi()*2.62e-16/(1*3e8)	
4.1357E-21	h (mev-sec)	

The table above [9] labelled fundamental N values is separated into the 5 quads below for the neutron (which transitions into a proton, electron and neutrinos). The first 3 quads represent quarks and each is an orbit. All quads obey the probability=1 and energy=0 constructs above.

	Unified.xls cell cq5			
	Calculation of Neutron Mass			
	mass	Energy	S field	Energy
	ke	MeV	G field	MeV
Quad 1	15.432	101.95	17.432	753.29
	12.432	5.08	10.432	0.69
Quad 2	13.432	13.80	15.432	101.95
	12.432	5.08	10.432	0.69
Quad 3	13.432	13.80	15.432	101.95
	12.432	5.08	10.432	0.69
Quad 4	-10.333	0	-10.333	0
	10.408	0.67	10.408	0.67
Quad 5	10.33	0.62	10.333	0.62
	0	0	0	0
	90.000	sum	90.000	sum

The neutron mass model

The neutron model is simply the addition of energy quads described above. The top 3 quads are the quarks. The 4^{th} and 5^{th} quads are inside the neutron but prepare the neutron for decay into a proton, electron and neutrino. N=10.33 has been borrowed from the 4^{th} quad to form a fifth quad. N=90 total is conserved with the addition of all the logarithms.

The position in the quad has the following association:

mass	field1
kinetic energy	field2

The field2 position is part of the gravitational field. The nested orbits described by the model satisfy the E*t=h criteria although some of them are relativistic (use gamma). Overall the table represents P= 1= psi*psic where psi= exp(i Et/H) and E= 0. The quarks in the model below have higher mass than data values but correspondingly higher kinetic energy (energy transitions have occurred).

	Unified.xls cell g191					Mass, Kinetic Energy and Fields for Neutron					
	2.02472E-05	0.098612289									
							Neutron Mass Model				
	N for Neutron Energy Interactions								Expansion		Gravitational
	mass	Energy	S field	Energy	Mass	Difference I	Weak KE		KE	Strong field	Field
	ke	MeV	G field	MeV	MeV	MeV	MeV	MeV	MeV	MeV	MeV
Quad 1	15.43	101.95	17.43	753.29	101.95	652.03				-753.29	
	12.43	5.08	10.43	0.69							-0.69
Quad 2	13.43	13.80	15.43	101.95	13.80	88.84				-101.95	
	12.43	5.08	10.43	0.69							-0.69
Quad 3	13.43	13.80	15.43	101.95	13.80	88.84			10.15	-101.95	
	12.43	5.08	10.43	0.69		-30.45	10.15		10.15		-0.69
Quad 4	-10.33	0.00	-10.33	0.00							
	10.41	0.67	10.41	0.67				0.671	t neut ke		-0.67
Quad 5	10.33	0.62	10.33	0.62		0.62				-0.62	
	0.00	0.00	0.00	0.00							
	90.00	sum	90.00	sum	129.54	799.87	939.5654133	0.671	20.30	-957.81	-2.73
							NEUTRON MASS		Total m+ke	Total fields	
									Total positi\	Total negative	
									960.54	-960.54	
									MeV	MeV	

The quads on the left and associated energy are arranged into columns of mass plus kinetic energy. The opposite field energy (strong plus gravitational) are arranged into the two right hand columns. For example, the total for the top quad equals 101.95+652.03-753.29-0.69=0 MeV. This assures that the energy zero criteria is met. The quarks become tightly bound with strong fields and also lose 3*10.15 MeV which becomes the weak kinetic energy (strong residual energy related to fusion) and 2*10.15 MeV that becomes expansion energy (expansion as in cosmology). The kinetic energy position 0.67 MeV is a neutrino and the field position -0.67 becomes part of the gravitational field that totals -2.73 MeV. The bottom quad kinetic energy position contributes 0.622 MeV to the neutron mass and the field position -0.622 becomes additional field energy. The exact mass of the neutron is given by the adding the totals of the mass and kinetic energy columns. Fundamentals allow kinetic energy to be re-arranged within the model (the imaginary components just appear in different places but still follow the zero energy construct).

Quads 4 and 5 "separate" and becomes the electron + anti-electron neutrino. The mass position is now N=10.33-0.0986*2=10.136. Its associated energy is 0.511 MeV. The difference kinetic energy 0.111 MeV is electron kinetic energy (this value plays an important role in all mesons, baryons and cosmology). The bottom quad kinetic energy position is the ae neutrino. The anti-electron neutrino is ejected with kinetic energy 2.47e-5 MeV.

N	E (MeV)	N		E (MeV)	E (MeV)	E (MeV)
		-0.296		-2.72E-05		
		equal and opposite charge				
-10.33	-0.62	-10.33	-0.62			
10.41	0.67	10.41	0.67			
The electron separates here				ELECTRON		
10.14	0.51	10.33	0.62	0.51	0.11	
0.197	2.47E-05	0.296		2.72E-05		e-neutrino

After electron separation the quads represent the proton model shown below. The energy 0.622 MeV (associated with N=10.33) is separated from the neutron and 0.671 MeV of kinetic energy exits the neutron as a neutrino, leaving the proton mass 1.293 MeV lower than the neutron. We will later discuss how the proton gets its charge.

The proton mass model

N for Proton Energy Interactions					Proton Mass Model					Gravitational
mass	Energy-mev	S field	Energy	Mass	Difference KE	Residual ke		Expansion	Strong field	Field
ke		G field	MeV	MeV	MeV	MeV	MeV	MeV	MeV	MeV
15.43	101.95	17.43	753.29	101.95	652.03				-753.29	
12.43	5.08	10.43	0.69							-0.69
13.43	13.80	15.43	101.95	13.80	88.84				-101.95	
12.43	5.08	10.43	0.69							-0.69
13.43	13.80	15.43	101.95	13.80	88.84			10.15	-101.95	
12.43	5.08	10.43	0.69		-30.45	10.15		10.15		-0.69
		-0.296	-2.72E-05							
		equal and opposite cha		0.00	-5.44E-05					
-10.33	0.00	-10.33	0.00				0.67	v neut ke		
10.41	0.67	10.41	0.67	0.00	-0.67		0.67	t neut ke	-0.62	-0.67
Neutron separates here to form proton and elec				**129.54**	**798.58**	938.2720733	**1.34**	**20.30**	**-957.81**	**-2.73**
10.136	0.51	10.33	0.62	0.51	0.11		2.47E-05	e neutrino ke		
0.197	2.47E-05	0.296	2.72E-05	ELECTRON	KE mev			960.54	-960.54	-2.98E-05
								Total m+ke	**Total fields**	
								Total positi	**Total negative**	

The three quark masses total 129.54 MeV and their kinetic energy is 798.58 MeV. Together they total the proton mass 938.2720733 MeV. The overall mass plus kinetic energy of the quads is 960.54 MeV balanced by equal and opposite field energy. All the values in this table have important roles in physics and cosmology, including gravitational field energy (-2.73 MeV). The masses of the neutron and proton are well known and compare favorably with the models.

Accuracy of the mass models

Compare the above values for the neutron and proton with measured valu				update feb 2017					
931.4940281	nist		0.510998946	0.510998946					1.30E-07
931.4940955	pdg	548.579909	0.51099895		0.5110003		-1.33148E-06		2.40E-07
simple cell g67	Data		Data (mev)		Calculation (mev)	calculation	Difference	Difference	measurement
			Particle Data Group		Present model	(amu)	(mev)	(amu)	error (amu)
		(amu)		(amu)	(mev)				
Neutron	nist	1.00866492	939.5654133	939.5654135	939.5654133	1.0086649	2.253273E-10	2.67158E-10	6.20E-09
Proton	nist	1.00727647	938.2720814	938.2720813	938.2720733	1.0072765	8.028782E-06	8.58522E-09	6.2E-09

This model represents the exact neutron mass 939.5654133 MeV [18] with error of 1e-10 MeV. Note that the model has three quarks, 101.95 MeV, and two quarks with the values 13.8 MeV. After studying mesons and accessing recent data (PDG) regarding the quark masses, it was determined that the 13.8 MeV quarks transition to 4*0.622=2.49 MeV quarks plus 11.93-0.622=11.307 MeV of kinetic energy. The 101.95 quark transitions to a Down quark with mass 7*0.622=4.357 and 97.59 MeV kinetic energy (in the proton it also contains 651.34 MeV of kinetic energy). Total mass plus kinetic energy is conserved during these transitions. Neutron and proton models showing this transition are shown below.

Unifying.xls cell 2:df9											
		CALCULATION OF PROTON MAS			Mass and Kinetic Energy						Field Energie
	mass	Energy-me	strong fiel	Energy-me	Mass	Difference	Strong residu	Neutrinos	Expansion	Strong & E,	Gravitatior
	ke		grav field		mev	mev	mev	mev	mev	field energ	Energy
	15.432	101.947	17.432	753.291	0.000	651.344				-753.29	
	12.432	5.076	10.432	0.687		101.947					-0.69
	13.432	13.797	15.432	101.947	2.490	**88.150**				-101.95	
	12.432	5.076	10.432	0.687		**11.930**					-0.69
	13.432	13.797	15.432	101.947	2.490	**88.150**				-101.95	
	12.432	5.076	10.432	0.687		**11.930**			10.151	expansion	-0.69
			-0.296	-2.72E-05		**-30.45**	10.15		10.151	expansion ke	
			equal and opposite charge			2.06		0.00E+00	v neutrino	2.72E-05	
	-10.333	0	-10.333	0.00E+00	0.00	-5.44E-05		0.67	v neutrino	2.72E-05	
	10.408	0.67	10.408	0.67		-0.67		0.67	t neutrino	-0.62	-0.67
	Neutron separates here to form proton and				105.68	822.44	**938.272073**	**PROTON MASS**			
	10.136	0.511	10.333	0.622	**0.511**	0.111	0.622	Electron + ke		0.000	
	0.197	2.47E-05	0	0	**ELECTRON**			2.47E-05	ae neutrino ke		
			0.296	2.72E-05				1.342	20.303	-957.807	-2.732
									960.539	-960.539	0.000

Next we show that the electron decay quad above obeys the probability 1 and energy zero constructs.

probability 1 construct for electron quad			
N1=10.136i	N3=10.33i		
N2=0.179i	N4=0		
p1=exp(-10.136	p3=exp(-10.33i)		
p2=exp(-0.179i)	P4=exp(0)		
1=p1*p2/(p3*p4)			
take the natural log			
0=ln(p1*p2/(p3*p4))			
0=-10.136i-0.179i+10.33i+0			
Energy zero construct for electron quad			
E/e0=0	exp(10.136i)+exp(.179i)-exp(10.33i)		

Cosmology implications of the equation E=e0*exp(Ni)

We can't consider the equation E=eo*exp(10.136i) as the equation for electron mass. The problem is that the imaginary number can only be eliminated by addition and subtraction of natural logarithms times the imaginary number. But the neutron model contains N values that satisfy the zero energy, probability 1 constructs. Although E=eo*exp(Ni) can be problematic, the model taken as a whole is meaningful. Overall it represents zero, but we can look inside and see its components. This characteristic of nature has been recognized for some time (P=psi*psic gives the probability that something exists in the range x).

What must be included in the model to balance the imaginary numbers? Return to the fundamental N tables for mass, kinetic energy and fields reproduced below.

	mass	S field
	ke	G field
Quad 1	15.432	17.432
	12.432	10.432
Quad 2	13.432	15.432
	12.432	10.432
Quad 3	13.432	15.432
	12.432	10.432
Quad 4	-10.333	-10.333
	10.408	10.408
Quad 5	10.33	10.333
	0	0
	90.000	90.000

The numbers on the right are fields with negative Ni values that balance the positive Ni values on the left side within each quad. This is true inside each quad but is there a global analog? The probability of the neutron components on each side is probability=1/exp(90). Mass, kinetic energy and fields must be considered as a whole and the overall probability is 1/exp(90i)*1/exp(90i). This extremely improbability must be balanced be something else to bring the over probability to 1 and balance the imaginary numbers.

Cosmologists have estimated the huge number of neutrons (protons) in nature [3][4][5][6]. Rough estimates derived from Hubble's constant suggested there might be exp(180) neutrons [7][10][13]. If initial conditions were probability 1 and energy zero, P=1=exp(180)/exp(180) with exp(180) neutrons.

The neutron model represents zero energy. The negative Ni values require fields to be negative balanced by mass plus kinetic energy. If the neutron is multiplied exp(180) times it is still zero.

Unification

Do values from the neutron model represent the four forces (interactions)? First consider the electromagnetic interaction:

Unification Table		**cell ax74**		**Electromagne**
				MeV
Field Energy E				**2.72158E-05**
Particle Mass (mev)				**0.511**
Mass M (kg)				**9.11E-31**
Kinetic Energy (mev)				**1.361E-05**
	Rydberg energy from PDG			**1.361E-05**
Gamma (g)=m/(m+ke)				**0.99997**
Velocity Ratio		**v/C=(1-(g)^2)^.5**		**7.298E-03**
R (meters) =((HC/(2pi)/(E*M/g)^0.5)				**5.291260E-11**
Electromagnetic R minus proton R=5.291627				**5.291E-11**
Force	**Newtons**	**F=E/R*1.6022e-13**		**8.241E-08**
				8.623E-04
Inertial F Nt		**F=M/g*V^2/R**		**8.241E-08**
Force=HC/(2pi)/R^2=3.16e-26/Range^2 (nt)				**1.129E-05**

time (sec)=5.29e-11*2*pi/(0.0072*3e8)		1.520E-16
h (mev sec)=27.2e-5*1.52e-16		4.1357E-21

The Schrodinger equation is for field energy that moves at velocity C. Above, however we used gamma=m/(m+ke) and its relationship with velocity (gamma=(1-(V/C)^.5)^.5). The interesting fundamental for the electron orbit above is that it produces correct results (E*t=H) with gamma. But gamma is very close to the fine structure constant alpha described in the literature [18]. We will compare gamma=0.00729 for the electron's orbit with alpha. They calculate alpha as follows:

alpha	e^2/(4*PI()*e0hC)
e0 F/m	8.85E-12
e J	1.60E-19
h J sec	1.05E-34
c m/sec	299792458
alpha	0.00729735
gamma	0.00729780

There is a very small difference. The particle data group [18] uncertainty for alpha is 0.23 ppb=0.0000000023. Alpha, also called the fine structure constant, is one of the crowning achievements of theoretical electrodynamics [2]. Gamma and alpha are brought into agreement if the electromagnetic field uncertainty is considered. The electromagnetic field (twice the Rydberg energy 13.605693009 eV) is listed with uncertainty 6 ppb. The difference between the Rydberg energy and my value is approximately the uncertainty value.

Rydberg *2	2.721138E-05
Unification table	2.721567E-05
Rydberg-Unif	-4.28E-09
PDG uncertainty	6.00E-09

The three quark masses plus kinetic energy with equal and opposite field energy have also been discussed and the orbits obeyed e*t/h=1. We will focus on the strong residual interaction and gravitation.

The chart below summarizes the orbits of the neutron model (energies refer to the original neutron model without the quark transitions mentioned above but with mass plus kinetic energy, the chart is accurate).

Summary of neutron model orbits	
Orbits 1,2&3	Three quark orbits are formed by quads 1,2 and 3, each with e*t=h.
	Next, 30.45 mev of ke taken out of the quark bundle....quarks are now bound by a -30.15 MeV field.
	(A quark bundle is the three quarks with their kinetic energy. Total=129.54+799.87= 929.41 MeV).
	The quark bundle has 10.15 mev of kinetic energy (929.41+10.15=939.56 MeV).
	But the energy zero criteria is 20.3 MeV "short" of being satisfied
	This creates a -20.3 MeV residual strong field. (-20.3=(939.565+0.622-960.532).
Orbit 4	The quark bundle mass 929.41 MeV orbits with 10.15 mev in the -20.3 mev field.
	The energy zero components of this orbit are: 929.41+10.15+0.671-960.532=-20.3.
	With the addition of 0.111 mev in the presence of a proton, fusion can occur
	and this releases a portion of the 10.15 mev in the weak orbit.
	Next, the neutron with 20.3 mev falls into a -2.73 MeV gravitational field. An orbit
	is established with 10.15 MeV of kinetic energy and 10 PE.
	(Fdr/2=3.656e-38*7.224e-14*exp(90)*6.24e12=10.06 MeV)
Orbit 5	The neutron mass orbits with 10.15 mev in -2.73 mev gravitational field (the gravitational field emanates from the quark fields).
	The energy zero components of this orbit are: 939.565+10.15+10.15+0.671-957.89-2.73=0. (some hidden).
	The radius of this orbit is 7.22e-14 meters.
	The attraction between exp(180) protons in the proper geometry creates the gravitational field
	(see appendix 1 topic "cellular cosmology" and "quantum gravity".)
	But the 10.15 MeV kinetic energy decreases as the cell expands against gravity converting ke to potential energy.
	As the 7.22e-14 m cell expands, the universe expands.

The following diagram explains the energy relationships:

		zero	neutron given 20.3 ke but must fall into gravitational field						
		960.532		10.15 pe	initial state (neutron has ke in grav field)				
fusion energy		neutron m	-20.305	10.15 ke	Fdr=20.3	state after expansion			
10.15 ke	quark bundle		strong residual field						
960.532	957.18+2.73+.622						-20.3	(939.565)+0.662-960	

Feynman was fond of saying "we do not know our base state". Actually, when we discuss mesons and other baryons below we will find our state is in the diagram above. It is labelled "state after expansion". The mesons have a built in "weak" field energy of -20.3 MeV and are also within a gravitational field.

The initial separation is 960.532 MeV positive (mass + kinetic energy) and 960.532 MeV negative. Orbits are established that satisfy the zero energy and zero probability criteria. The fields in the neutron model total -960.532 MeV. This establishes the maximum negative line at the bottom of the diagram. But -30.455 (3*10.15) MeV is taken out of the total quark mass plus kinetic energy. A quark bundle forms with 939.41+10.15=939.56 MeV but the total field is -960.53 MeV. To satisfy the zero energy criteria, a strong residual field of -20.3 MeV is created. The quark bundle falls into the field and develops 10.15 MeV of kinetic energy. This establishes orbit 4 and positions the neutron at exactly 939.56 MeV, the line labelled neutron mass+ke. Some of this kinetic energy can be lost as binding energy between nucleons during fusion.

The remaining 20.3 MeV that was taken out of the quark bundle increased the neutron to the zero line at the top of the diagram. But there is a -2.73 MeV gravitational field emanating from the total field value -960.53 MeV. The zero energy construct is satisfied but some components are hidden (like neutrinos). Overall the neutrons mass (quarks) are attracted to this field. As the bundle of quarks fall into the field, they gain 10.15 MeV of kinetic energy. This is the condition that defines the gravitational constant 6.67e-11 NT m^2/kg^2 in orbit 5. The radius of this orbit is R=(1.973e-13 MeV-m)/(2.73*2.73)^.5=7.22e-14 meters. There is exp(180) of these radii, each containing one neutron. Since each neutron has 10.15 MeV of kinetic energy, they move away from one another but are resisted by the gravitational field (Fdr=10.1 MeV as expansion occurs). This decreases the kinetic energy in orbit 5 and increases the radius of each orbit (see discussion of cellular cosmology in Appendix 1 [7][9][13]). Considering exp(180) cells, each containing a proton, this expands the universe. Orbit 5 continues to expand until other forces start to dominate. For example, protons accumulate and form large bodies held in gravitational orbits. With these descriptions, we can describe the orbits below mathematically.

					Gravity
Unification Table		**cell ax74**		**Strong Residual**	**proton**
				MeV	**MeV**
Field Energy E (MeV)				**20.303**	**2.732**
Particle Mass (mev)				**929.414**	**938.272**
Mass M (kg)				**1.66E-27**	**1.6726E-27**
Kinetic Energy (mev)				**10.151**	**10.112**
Gamma (g)=m/(m+ke)				**0.9892**	**0.9893**
Velocity Ratio		**v/C=(1-(g)^2)^.5**		**0.1466**	**0.1456**
R (meters) =((HC/(2pi)/(E*M/g)^0.5)				**1.4287E-15**	**7.2238E-14**
Force	**Newtons**	**F=E/R*1.6022e-13**		**2276.7**	**3.6557E-38**
Inertial F Nt		**F=M/g*V^2/R**		**2264.43877**	**3.6557E-38**
Force=HC/(2pi)/R^2=3.16e-26/Range^2 (nt)				**15488.2**	**6.1**
				y	n
time=2pi R/C (sec)				**2.04E-22**	**1.51E-21**
e*t (mev-sec)				**4.147E-21**	**4.136E-21**
e*t/h				**1.00271**	**1.00000**
Coupling constant derived from this work				**0.1470**	**1/exp(90)**
Derived c^2 (E*R) mev m				**2.90E-14**	**1.19E-51**
Derived c^2 joule m				**4.65E-27**	**1.91E-64**
Derived exchange boson (mev)				**138.11**	
***published c^2 mev m**				**1.56E-14**	**1.17E-51**
***published c^2 joule m**				**2.5E-27**	**1.87E-64**
***Range**					**8.82E+25**

Part 1 Summary for the neutron and proton

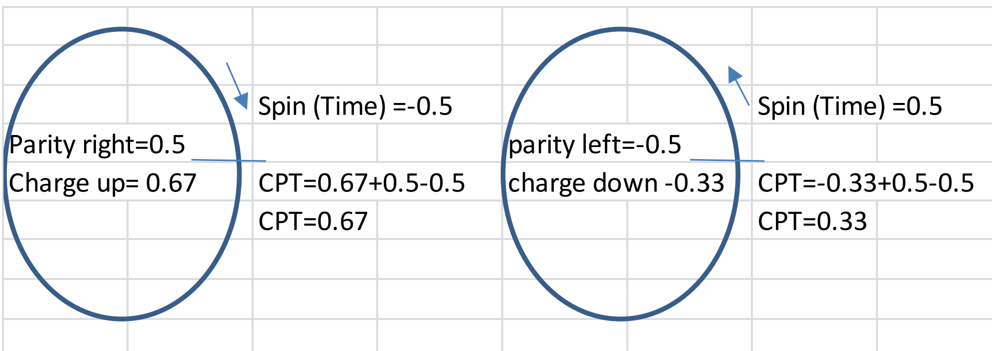
Energy can be represented by the equation E=e0*exp(Ni), where e0=2.02e-5 MeV and i is the imaginary number. This is a useful equation with the following restrictions: E*t=H, orbits that obey psi*psic=1, orbits that preserve probability 1 and energy zero. Orbits contained in a neutron obey these restrictions and allow a mathematical model that describes its mass within experimental error. This is an extremely useful model. Energy values in the model allow the 4 fundamental forces to be understood. The neutron components themselves are very improbable when probability is defined as P=eo/E. Nature overall respects the restrictions listed above. With energy zero and probability 1 overall, we can understand the number of neutrons in the universe. Furthermore, a gravitational field emanating from the proton agrees with the gravitational field constant when the attractions of exp(180) neutrons are considered as a whole inside the proper geometry [10]. The neutron model contains kinetic energy values fundamental to the field of cosmology. The neutron models gravitational field energy -2.73 MeV establishes the initial radius of a cell that describes space and time. Expansion of this radius underlies the expansion of the cosmos [13].

Part 2 Fundamental of Mesons and Baryons

Properties

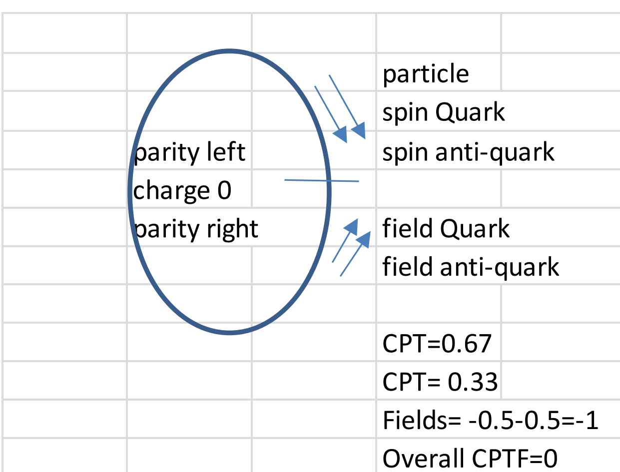
Parity

Parity is handedness. Charge+ Parity+ Time =CPT is invariant except for the weak interaction in meson decays (later I question this exception). Use your hands to understand parity, charge and time. Time direction is referred to as spin and has the value 0.5 or -0.5. In the diagram below, time flows into your fingers and if you change charge (thumb of your hand) from up to down with your right hand, it changes the time direction. Changing spin direction without changing charge down requires you to use your left hand.



Quarks have CPT=0.67 and anti-quarks have CPT=0.33. One quark and one anti-quark form a meson with CPT=1. All mesons have a field (F) of value -0.5-0.5= -1 and this makes CPTF=0. In this work 1 and -1 are opposites not absolute values.

Zero properties for mesons



Finding zero is extremely important since it helps understand what everything is made of. Put you left hand out with fingers curved. Next turn you right hand over and place it next to you left hand with the fingers curved in the same direction. This is the initial condition of the quark and anti-quark pair (a meson). They are opposite parity (left and right represented by -0.5 and 0.5) but the two thumbs are pointed in opposite directions. They represent fractional charge but one is positive 0.67 (2/3) and one is negative 0.67 charge (0= 0.67-0.67). The circles also represent an orbit. The mass of each particle plus kinetic energy must be exactly balanced by a field. The fields are opposite and we can represent that by time running in the anti-clockwise direction. According to Schrodinger's equation the particles and fields are only real (Probability=psi*psic=1) at the tick mark on the right hand side of the diagram. At this point Et/H=1.

Origin of fractional quark charges

The accelerator creates an energetic collision between an electron and anti-electron (or proton and anti-proton for baryons). Energy is added to electrons (0.511 MeV) and the author believes this creates particles of mass 0.622 MeV and other particles with higher energy. The same thing happens to the anti-electron. The collision neutralizes the electron charge. We will examine the electron quads from the proton model to understand the 0.622 MeV particle's charge and properties. These two quads show the decay of a neutron into a proton, electron and anti-neutrino. Each position in the quad has different properties. The 0.622 MeV particle is in the mass position after it's reconversion from an electron.

mass		Field 1	
kinetic energy		Field 2	

		-0.296	-2.72E-05	Proton positive Charge			
		equal and opposite charge					
-10.333	0	-10.333	0.00E+00	0.00			
10.408	0.67	10.408	0.67				
Neutron separates here to form proton and				105.68		0.111 ke ejected	
10.136	0.511	10.333	0.622	**0.511**	**ELECTRON**		
0.197	2.47E-05	0	0				
		0.296	2.72E-05	Electron negative charge			
				ae neutrino ejected			

The electron can be converted back into a 0.622 mass particle with the gain of 0.111 MeV of kinetic energy from the accelerator and re-absorbing the anti-electron neutrino.

	ch -1/3				1.11E-01	ke absorbed	
10.333	0.62	10.333	0.62	0.511			
					2.47E-05	ae neutrino (ke) absorbed	

But the N value 10.431 is charge neutral since 10.431-3*0.0987=10.136. Three N units (0.0986*3= 0.295) represents the electromagnetic field (E=e0*exp(0.295)=27.2e-6) and E=e0*exp(10.136)=0.511 MeV is the mass of the electron. This means the particle of mass 0.622 MeV (N=10.33) has charge -1/3.

10.431	neutral		
0.098	-0.33333		
10.33	0.622	charge -1/3	

The 0.622 MeV particle of charge -1/3 is in the quads mass position. The quarks occupy this position in the full proton model. I believe based on the above that this particle is quark like and has charge, parity and spin. The diagram below shows how these particles can form the Up and Down quarks:

cpt	iso-parity	Iso-spin	spin	p	mass	charge	
0.33			0.5	-0.50	0.62	0.33	
0.33			0.5	-0.50	0.62	0.33	
0.33			-0.5	0.50	0.62	0.33	
-0.33	-0.5	0.5			0.62	-0.33	
0.67			0.5	-0.5	2.49	0.67	UP

The Up quark is a composite of four 0.622 MeV parts. It has mass 2.49 MeV (close to the measured PDG value) and charge 0.67. Three of the 0.622 parts give the Up quark parity of -0.5 and spin (time)=0.5. The CPT value is shown on the left.

cpt	iso-parity	Iso-spin	spin	p	mass	charge	
0.33			0.5	-0.50	0.62	0.33	
0.33			0.5	-0.50	0.62	0.33	
0.33			-0.5	0.50	0.62	0.33	
-0.33	-0.50	0.5			0.62	-0.33	
-0.33			-0.5	0.50	0.62	-0.33	
0.67			0.5	0.50	0.62	-0.33	
-0.33	-0.50	0.5			0.62	-0.33	
0.67			0.50	0.50	4.35	-0.33	Down

The Down quark has three additional parts of mass 0.622. Again CPT for each part is on the left.

Iso-spin

The fourth 0.622 MeV component of the Up quark gives it Iso-spin (and Iso-parity). Each part of the Up quark can conjugate, giving the Up quark a variety of properties. The four extra four components of the Down quark represent even more Iso-spin and Iso-parity combinations. The light quarks (U, u, D, d) have Iso-spin 0.5 or -0.5. The values measured for mesons are 0, 1 or 0.5. When a meson is encountered with 0.5, we know that that it contains only one light meson. Simulations of all the PDG mesons was carried out (some are shown in Appendix 4). All the simulations match data. Iso-spin variations available with the Up, Down, up and down quarks meet required iso-spin and parity.

Conjugation and Iso-spin combinations give the Down quark properties observed in nature. Also understanding these Up and down quark, I suspect, allows CPT to be preserved in decays. This is important because currently physicists believe that CPT is violated in weak interactions.

Master list of quark properties

The other quarks are less complex (single particles with kinetic energy quanta). The strange quark is associated with N=15.431 with E=e0*exp(15.431)=101.9 MeV (agreeing with the PDG mass). It has charge -0.33 and CPT=0.67. The following summary table will be used several times in this paper but focus on CPT for now. The quarks are shown in UPPER case letters and anti-quarks in lower case. The anti-quark charge is always opposite the quark charge but the spin and parity values give quarks CPT values of 0.67 and anti-quarks CPT values of 0.33.

Field E	4176.94	4177	1273	1273	753.29	753.29	101.9	101.9	101.9	101.9
Field N	19.14	19.14	17.96	17.96	17.43	17.43	15.43	15.43	15.43	15.43
CPT	0.33	0.67	0.33	0.67	0.33	0.67	0.33	0.67	0.33	0.67
parity	-0.5	0.5	0.5	-0.5	-0.5	0.5	-0.5	0.5	0.5	-0.5
Iso-spin I	0	0	0	0			-0.5	-0.5	0.5	0.5
Charge	0.33	-0.33	-0.67	0.67	0.33	-0.33	0.33	-0.33	-0.67	0.67
spin	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Quark N	17.43	17.43	17.43	17.43	15.43	15.43	13.43	13.43	11.43	11.43
Quark	bottom	BOTTOI	charm	CHARM	strange	STRANGE	down	DOWN	up	UP
MeV	4176.9	4176.9	1273.2	1273.2	101.9	101.9	4.36	4.36	2.49	2.49

The author used the above system to match the measured properties (Particle Data Group 2016 booklet [18]) of all the mesons and baryons. However charge and parity conjugation must be used for some of the mesons. Also, the extra 0.622 MeV components of the up and down quarks allow all the iso-spin data to be simulated.

Spin and parity conjugation

Time is related to direction of spin and parity is handedness. Each quark must obey CPT invariance (Charge+ Parity+ Time). When the Strange, strange, Charm, charm, Bottom and bottom quarks conjugate the parity of the quark must decrease for the charge to increase (they must change in opposite directions).

Original parity	1	
New parity	0	changed by -1
New charge	0.33	changed by +1
Original Charg	-0.66	
		CPT unchanged -1+1

Allowed conjugations shown below preserve CPT. The Up and Down are shown later.

Particles Strange, Bottom and Charm					Anti-particles strange, bottom and charm				
CPT	spin	C	P		CPT	spin	C	P	
0.67	0.5	-0.33	0.5	S,B normal	0.33	0.5	0.33	-0.5	s,b normal
0.67	0.5	0.67	-0.5	S,B parity and charge conjugated	0.33	0.5	-0.67	0.5	s,b parity and charge conjugat
0.67	-0.5	0.67	0.5	S,B spin and charge conjugated	0.33	-0.5	0.33	0.5	s,b parity and spin conjugated
0.67	0.5	0.67	-0.5	C normal	0.33	0.5	-0.67	0.5	c normal
0.67	0.5	-0.33	0.5	C parity and charge conjugated	0.33	0.5	0.33	-0.5	c parity and charge conjugatec
0.67	-0.5	0.67	0.5	C parity and spin conjugated	0.33	-0.5	0.33	0.5	c parity and spin conjugated

Example of parity and charge conjugation

In the table below, we evaluate an anti-bottom-Bottom meson (abbreviated bB with the lower case corresponding to anti-particles). The bottom-Bottom meson Upsilon(1S) is found at 9460.3 MeV. PDG data shows the symbol 0-,1— for this meson. The first 0 is I (for iso-spin later described), the second number is J for overall spin. The first minus after J is for parity and the second minus is for measured charge. The table below shows calculations required to determine if the meson matches the J=1 data. Firstly small s below is the addition of spin for the two quarks. Referring to the table above both spins are 0.5 and 0.5+0.5=1. Another value called Angular momentum L is related to parity. If parity is -1, L=0 and if parity is 1, L=1. Next, the values abs(L-s) and abs(L+s) are evaluated. The predicted value for J is between the two values. In this case the value 1 falls between 1 and 1. This checks the result above.

2016							
PDG				PDG_data			Ang mom
J data	abs(L-s)	abs(L+s)	s	parity		PDG_data	L
1	1	1.0	1.0	-1.0	-1.0	0-1--	0

There quarks have iso-spin 0, matching the PDG value 0.

The PDG charge data is -1 but the quarks below add to zero charge (0.33-0.33=0) using the master list (see topic above entitled “Master list of quark properties”. Also add the parity values (-.5+.5=0).

				CPT	0.33	0.67
				parity	-0.5	0.5
				Iso-spin I	0	0
				Charge	0.33	-0.33
				spin	0.5	0.5
	Data	Meson		Quark N	17.33	17.33
name	PDG	Energy		MeV	bottom	BOTTOM
	MEV	MEV		Measured		
Upsilon(1S	9460.3				1	1

By inference, the quarks must be in the following parity conjugated configuration.

				CPT	0.33	0.67
				parity	0.5	0.5
				Iso-spin I	0	0
				Charge	-0.67	-0.33
				spin	0.5	0.5
	Data	Meson		Quark N	17.33	17.33
name	PDG	Energy		MeV	bottom	BOTTOM
	MEV	MEV		Measured		
Upsilon(1S)	9460.3				1	1

The Particle Data Group lists the negatively charged bB meson as parity -1, whereas I add the two quarks parities together and get plus 1. I believe they add parity -1 to zero charge to achieve -1 charge. This is only a problem related to convention, not fundamentals.

CPTF=0 Conservation for mesons

The master list of quark properties gives the field energy for each of the quarks. Each field spin (time) is considered -0.5. This means that each meson has a -0.5-0.5= -1 field (F). Since Quarks with CPT=0.67

and anti-quarks with CPT=0.33, meson CPT=0.67+0.33=1. The value CPTF= 1-1= 0 is conserved. The up and down quarks have iso-spin and iso-parity due to the 4*0.622 and 7*0.622 MeV particles. The iso-spin and parity properties allow all the PDG properties to be matched. The required combinations and the Up and Down variations available are described in Appendix 3. The required variations do not violate CPT.

CPTFI=0 Conservation for baryons

It might seem curious that there are three quarks in baryons and only two quarks in mesons. Each quark has a field (spin or time= -0.5). This means the baryon field (F) has spin 3*(-.5)= -1.5. The master table of properties for baryon Quarks equal CPT= 0.66*3=2. Baryons of anti-quarks equal CPT= 0.33*3=1. Recall that baryons consist of three Quarks (BCU for example) or three anti-quarks, but never mix to avoid fractional charge. All the baryons in the 2016 PDG Booklet [18] have either an up or down quark involved (this is verified by correlations of decay time discussed later). The up and down quarks have iso-spin and iso-parity. Baryons incorporate iso-spin into their basic properties and CPTIF=0 becomes a conserved quantity. This allows QQQ baryons to have CPTI=0.67*3- 0.5= 1.5. This is reduced to zero by the field CPTIF= 1.5-1.5= 0. Alternately qqq baryons have CPT=0.33*3+ 0.5= 1.5. This again is reduced to zero by the -1.5 fields. The following table shows the combinations of iso-spin that allow the PDG data for charge, parity and time to be perfectly matched.

Combinations required to match property data			
P	Iso-spin		
-1	0.5		
1	0.5		
	-0.5		
	0.5		

Appendix 3 shows that the Up quark is capable of these variations without violating CPT for each 0.622 MeV particle.

Each baryon has been analyzed to determine if they violate CPTIF=0. The degrees of freedoms available with either 4*0.622 or 7*0.622 particles allows CPTIF= 0 to be conserved for all baryons (Appendix 3).

Baryon and meson mass proposal

The PDG property and mass data shows that the N=15.43 and N=13.431 particles have transitioned to lower masses with compensating increased kinetic energy. The proton consists of the Down-Up-Up combination of quarks. The following diagram presents the proton model with mass and kinetic energy components written differently without changing the proton mass simulation. The quark mass associated with N=15.432 (101.9 MeV) is in the mass position. It has 651.34 MeV of kinetic energy. This quark is a Down quark with 7*0.622=4.357 MeV with 97.59 MeV of additional kinetic energy. (The quad energy in this yellow box must be 753.291 MeV). Also the yellow boxes for the two Up quark masses are written 1.87+.622=2.49 MeV, each with 99.46 MeV (88.15+11.307) of kinetic energy. (the quad energy 101.947 is conserved). The mesons and baryons are also simply combinations of 651.34, 88.15, 13.8, 11.31 and 0.622 MeV. The electron emerges from 0.622 MeV (0.511 plus 0.111 MeV of kinetic energy).

Unifying.xls cell 2:df9											
		CALCULATION OF PROTON MAS			Mass and Kinetic Energy						Field Energie
	mass	Energy-me	strong fiel	Energy-me	Mass	Difference	Strong residu	Neutrinos	Expansion	Strong & E	Gravitation
	ke		grav field		mev	mev	mev	mev	mev	field energ	Energy
	15.432	101.947	17.432	753.291	4.357	651.344				-753.29	
	12.432	5.076	10.432	0.687		97.590					-0.69
	13.432	13.797	15.432	101.947	2.490	**88.150**				-101.95	
	12.432	5.076	10.432	0.687		**11.307**					-0.69
	13.432	13.797	15.432	101.947	2.490	**88.150**				-101.95	
	12.432	5.076	10.432	0.687		**11.307**			10.151	expansion	-0.69
			-0.296	-2.72E-05		**-30.45**	10.15		10.151	expansion ke	
			equal and opposite charge			2.06		0.00E+00	v neutrino	2.72E-05	
-10.33	-10.333	0	-10.333	0.00E+00	0.00	-5.44E-05		0.67	v neutrino	2.72E-05	
	10.408	0.67	10.408	0.67		-0.67		0.67	t neutrino	-0.62	-0.67
	Neutron separates here to form proton and				105.68	822.44	**938.272073**	**PROTON MASS**			
10.33	10.333	0.622	10.136	0.511	**0.511**	0.111	0.622	Electron + ke		0.000	
	0	0	0.197	2.47E-05	**ELECTRON**			2.47E-05	ae neutrino ke		
			0.296	2.72E-05				1.342	20.303	-957.807	-2.732
	90.000		90.000	ch -1/3			1.673E-27		Total m+k	Total fields	

Particle Data Group data comparison

There are differences between the proton/neutrons and the other baryons. The above proton diagram is based on zero energy and probability one as an initial condition. Mesons and baryons conserve zero in a slightly different way that protons and neutrons. Another difference is their decay times. Many of the mesons and baryons almost immediately decay, the neutron decays in 808 seconds and no proton decays have been observed.

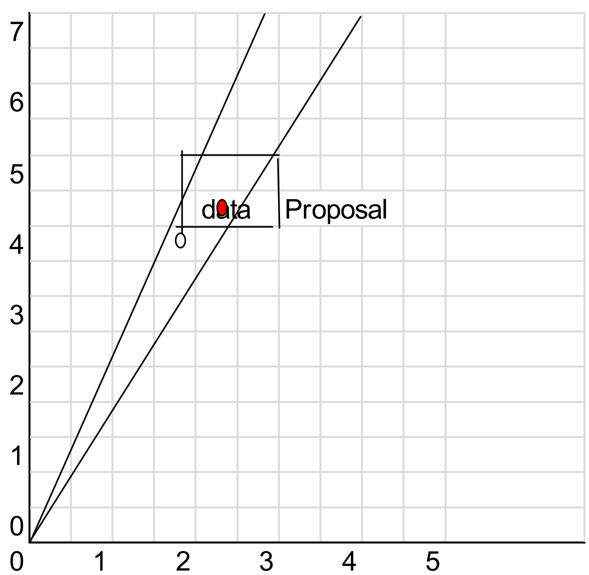
Recent (2016 PDG) quark mass data was reviewed [18]. Comparison masses are a function of an N value where E=e0*exp(N) and e0 is a universal constant 2.02e-5 MeV for all particles and energies. The value e0 is derived in the section entitled “Proton mass model”.

	cell h6 2017 PDG Data MeV	N quark	Comparison masses Quark Mass energy MeV	Field N	Field energy MeV	PDG charge
UP	**2.49**		**2.49**	15.43	101.95	0.67
		11.43	1.87			
		13.43	13.80			
DOWN	**4.36**		**4.36**			-0.33
STRANGE	**102.00**	15.43	**101.95**	17.43	753.3	-0.33
CHARM	**1275.00**	17.96	**1273.19**	17.96		0.67
BOTTOM	**4180.00**	19.14	**4176.94**	19.14		-0.33

Note: There is an N series (11.43+2=13.43+2=15.43) that suggests there should be a quark at N=13.43 (13.8 MeV). It is not observed, probably because it transitions to a 4x0.622 =2.49 MeV Up quark. The PDG data for the Up and Down masses is shown below. The proposed up and down quark masses (the red dot below) are consistent with PDG values.

Down Mass

(MeV)



Up Mass (MeV)
rpp2014-rev-quarkmasses.pdf
Figure 2

Balanced mass, kinetic energy and field energy

The diagram below shows the relationships between quark mass, kinetic energy and their field energy. The sum is zero for each line considering mass + kinetic energy as positive and the fields as negative.

			Difference between quarks.				
Name	Quark N	Mass MeV	**KE** MeV	**KE** MeV	KE MeV	**Field** MeV	Field N
				up			
Up	**11.432**	**2.49**	**11.3**	88.15		**101.95**	**15.432**
				(101.95-13.8)			
Down	**13.432**	**4.36**		97.59		**101.95**	**15.432**
Down w strange energy		4.36		97.59	651.3	**753.29**	
Strange	**15.432**	**101.95**			**651.3**	**753.29**	**17.432**
		753.3+5*88.1+7*11.9					
Charm	17.432	**1273.19**				**1273.19**	**17.957**
Bottom		753.3+4*651.3+8*88.1+10*11.9					
	17.432	**4176.94**				**4176.94**	19.145

The Up quark is 4*0.622=2.49 MeV (the value 1.87= 3*0.622 MeV and 1.87=e0*exp(11.432). N=11.432 for this quark with regard to decay calculations. Increasing the accelerator power, additional quanta are activated. Each quark consists of mass and kinetic energy “quanta” that originate in the proton model. The quanta are differences between quark energies but can be combined. The quanta are 651.3, 88.15, 11.9 and 0.622 MeV (11.31=11.91-0.622). The down quark found in the proton and neutron has a kinetic energy component that originates in the original proton model as a strange quark. Each quark has an N value for the quark mass and a different N for the quark field energy. Combinations of N values are associated with meson and baryon decay times (sum of Nmass-Nfields).
The following diagram show the steps in achieving the highest mass common quark called the Bottom quark. The quanta involved are listed. The five quark energy “plateaus” are always accompanied by anti-quarks.

anti-quarks		charge	N	Quarks		charge
bottom	4176.94	0.33		BOTTOM	4176.94	-0.33
10	11.31			10	11.31	
8	88.15			8	88.15	
4	651.34			4	651.34	
1	753.29		17.43	1	753.29	
charm	1273.19	0.67		CHARM	1273.19	-0.67
7	11.31			7	11.31	
5	88.15			5	88.15	
	753.29		17.43		753.29	
strange	101.95	0.33	15.43	STRANGE	101.95	-0.33
down	4.35	0.33	*13.43*	DOWN	4.35	-0.33
	0.62				0.62	
	0.62				0.62	
	0.62				0.62	
up	2.49	-0.67	11.43	UP	2.49	0.67
	0.62				0.62	
	0.62				0.62	
	0.62				0.62	
	0.62				0.62	
	a-Electron		$\leftarrow$ ~~collision~~ $\rightarrow$			Electron

Conversely, this means that mesons and baryons may decay along the reverse path. The up and down quarks are multiples of 0.622 MeV components. Although there are intermediate mesons found in the decay products, the 0.622 particle can decay into multiple electrons 0.511 or 0.111 MeV of kinetic energy and anti-electron neutrinos. Gamma rays may also be created when anti X and X opposites decay. Protons and neutrons are sometimes found in the decay products of baryons. Multiples (or fractions) of the value 0.111 MeV is involved in predicting decay time.

The proton and neutron

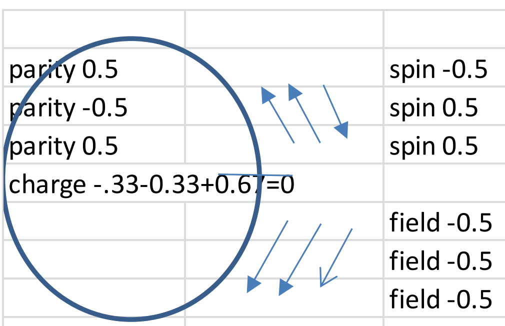
We start again with diagrams that represents zero. The properties of the proton and neutron are below:

		Proton D-U-U		
Original parity		0.5	-0.5	-0.5
Parity P		0.5	-0.5	-0.5
iso-spin I		-0.5	0.5	0.5
Charge		-0.33	0.67	0.67
spin (T)		-0.5	0.5	0.5
Quark N		13.4319	11.4319	11.4319
name		DOWN	UP	UP
Mass		4.35685	2.49	2.49
MeV				
CPT invariance		-0.33	0.67	0.67
		Iso-spin		0.5
		Proton charge		1
		Proton parity		-0.5
		Proton spin		0.5
		CPTI		1.5
		Fields		-1.5
		CPTIF		0

		Neutron D-U-U (parity changes charge)		
Original parity		0.5	-0.5	-0.5
Parity P		0.5	-0.5	0.5
iso-spin I		-0.5	0.5	0.5
Charge		-0.33	0.67	-0.33
spin (T)		-0.5	0.5	0.5
Quark N		13.4319	11.4319	11.4319
name		DOWN	UP	UP
Mass		4.35685	2.49	2.49
MeV				
CPT invariance		-0.33	0.67	0.67
		Iso-spin		0.5
		Neutron charge		0
		Neutron parity		0.5
		Proton spin		0.5
		CPTI		1.5
		Fields		-1.5
		CPTIF		0

There are three fields since there are three quarks (Fields= -1.5). The proton and neutron CPT must include iso-spin to satisfy the zero criteria (CPTI=1.5, Fields= -1.5). This is discussed more fully below under the heading Baryon Composition but iso-spin is simply spin of the extra 0.622 particles in the up and down quarks.

The "orbit" that represents P=psi*psic=1, Et/H=1 and energy=0 at the tick mark (collapse of the wave function) on the right of the circle is shown for the Neutron. The table below the circle adds the components to CPTIF=0.



Zero properties for the Neutron	
Parity =0.5-0.5+0.5=0.5	
Charge =0.33+0.33-0.67=0	
Spin =0.5-0.5+0.5=0.5	
Iso-spin=-.5+.5+.5=.5	
CPTI=.5+0+.5+.5=1.5	
Fields= -0.5-0.5-0.5=-1.5	
CPTIF=0	

The Neutron has half spin (as measured) and neutral charge (as measured). It also has iso-spin 0.5. The neutron transitioned from a proton-electron recombination. We can also show the parity shift that causes the proton-electron charge difference as a "separation". It appears that a parity shift is identical to this separation but the quark charges also give the proton charge meaning the charge separation below is superfluous. (The author believes that nature originates with a series of separations. Some separations may be parity shifts).

		-0.296	-2.72E-05	Proton positive Charge		
		equal and opposite charge				
-10.333	0	-10.333	0.00E+00	0.00		
10.408	0.67	10.408	0.67			
Neutron separates here to form proton and				105.68		
10.333	0.622	10.136	0.511	**0.511**	**ELECTRON**	
0	0	0.197	2.47E-05			
		0.296	2.72E-05	Electron negative charge		

Meson masses

The following two diagrams show the four quarks involved in mesons, the quanta they consist of and their fields. The yellow mass plus kinetic energy boxes are from the proton model. Most of the time the meson will not be exactly the sum of the masses and kinetic energies due to the possibility of tunneling (tunneling is a known quantum mechanical process that allows improbable transitions to occur). The Bottom quark mass plus kinetic energy consists of the values on the left multiplied by the numbers in column 2. The properties for the Bottom and Charm probably come from N=17.431 since 753.29=2.02e-5*exp(17.431) MeV and 17.431 is a number in the quark series discussed above.

	Proton Model Components		Tunnel Quanta		Proton Model Components		Tunnel Quanta
	88.15	651.34			88.15	651.34	
	13.80				13.80		
	Bottom m+ke				Charm m+ke		
	4176.94				*1273.19*		
	11.31	10	11.31		**11.3**	7	11.31
Quark	13.80	0	13.80		13.80	0	13.80
Componer	88.15	8	88.15		88.15	5	88.15
	651.34	4	651.34		651.34	0	651.34
	753.29	1			753.29	1	
	-4176.94	Bottom Field			-1273.19	Charm Field	

	Proton Model		Tunnel		Proton Model		Tunnel		Proton Model		Tunnel
	Origin		Quanta		Components		Quanta		Origin		Quanta
	101.95	651.34			4.36	88.15			2.49	88.15	
						11.93			-0.62	11.93	
	Strange m				Down m				Up m		
	101.95				*4.36*				*2.49*		
	11.31	0	11.31		11.31	0	11.31		11.31	0	11.31
	13.80		13.80		13.80	0	13.80		13.80	0	13.80
	88.15		88.15		88.15	0	88.15		88.15	0	88.15
	0.62	0.00	0.62		0.62	7	0.62		0.62	4	0.62
	Stange ke				Down ke				Up ke		
	651.34				97.59				99.46		
	-753.29	Strange Field			-101.95	Down Field			-101.95	Up Field	

In all cases, the mass plus kinetic energy of the quark is equal and opposite the field energy. The field energy components are also 651.34, 88.15, 13.8, 11.3 and 0.622 MeV.

Each meson has a quark and anti-quark and are formed by the collision of energetic electrons and positrons. Each of the two quarks has field energy. Although the meson obeys the zero energy fundamental, it was not formed in the beginning like the proton and neutron. This means the accelerator must supply the energy for the mass, kinetic energy and field energy. With field energy equal and opposite it satisfies the energy zero fundamental.

There are three mesons (out of 130) that have quark masses (my values near PDG) quark plus kinetic energy balanced by equal and opposite negative field energy defined by the master list N value (call these ideal mesons). The meson illustrated below contains one Strange quark of mass 101.9 MeV with its kinetic energy 651.3 MeV and one Up anti-quark of mass 2.49 MeV with its kinetic energy of 100.08 MeV. This totals 855.24 MeV. The field energy is 753.3 MeV for the strange quark and the field energy for the down quark is 101.95 MeV. This also totals -855.24 MeV.

	Proton Model		Tunnel		Proton Model	
	Origin		Quanta		Origin	
	101.95	651.34			2.49	88.15
					-0.62	11.93
	Strange m				Up m	
	101.95				*2.49*	
	11.31	0	11.93		11.31	0
	13.80		13.80		13.80	0
	88.15		88.15		88.15	0
	0.62	0.00	0.62		0.62	4
	Stange ke				Up ke	
	651.34				99.46	
	-753.29	Strange Field			-101.95	Up Field
	Strange	up a-quark				
mass	101.95	2.49				
ke	651.34	99.46				
		855.24				
Field	-753.29	-101.95				
		-855.24				
	Predicted	1710.48	1717	Actual mass (MeV)		
			K*(1680)			

The accelerator experiment finds the K* meson at 1717 MeV but it has only been measured to within 54 MeV accuracy. The proton model components predict without tunneling that it should occur at 855+855=1710.

Tunneling proposal

The meson and baryon energy would be easy to predict if the masses, kinetic energies and fields were exactly those in the proton model. They would be "ideal mesons" but there would be only 18 mesons (different combinations of quarks) instead of approximately 130. Instead of 2 ideal baryons like the proton and neutron, there are approximately 50 baryons. All the mesons and baryons are based on ideal mesons and baryons but nature uses tunneling based on the common components. For example this means that a Strange-down meson can form even if there is not quite enough energy to achieve an ideal meson. There are other mesons with exactly the same Strange quark and down quark but with slightly different measured energies.

Next we will examine tunneling values. The example below is one of the variations. In the diagram below I am multiplying 3*11.31 and negative 2*88.15 to find the tunneling value -142.38 MeV.

		Proton Model		Tunnel	Proton Model		Tunnel	
		Origin		Quanta	Origin		Quanta	
		88.15	651.34		13.80	88.15		
		13.80			-11.93	11.93		
		Strange m		-142.38	Down m			
		101.95			*4.36*			
		11.31	0	3	11.31	0	0	
		13.80	1	0	13.80	0	0	
		88.15	1	-2	88.15	0	0	
		0.62	0	0	0.62	7	0	
		Stange ke			Down ke			
		651.34			97.59			
		-753.29	Strange Field		-101.95	Down Field		
Strange Down meson		106.30		Tunneling	Revised			
ke meson		748.93		Value	Ideal			
M+ke		855.24		-142.38	712.86			
Field meson		-855.24		142.38	-712.86			
				Predicted	1425.72	1432.4	Actual (MeV)	
						K(2)*(1430)		

The diagram above suggests that the quark mass plus kinetic energy does not have to be exactly 1433 MeV. It can form with a few pieces missing and still represent a Strange-down meson. Once the missing pieces are identified actual meson energy can be predicted from ideal and tunneling values. Since tunneling values affect field energy as well as mass plus kinetic energy, they are still opposite and equal. It is important that the added and subtracted values are equal and opposite because this maintains the zero energy construct even though the meson itself has tunneled to new values of equal and opposite energy. We will call this the revised ideal meson. Adding and subtracting equal and opposites also maintain probability 1 (psi*psic=1). Specifically, each energy component has an associated N value by the equation N=ln(E/eo). The N values are negative for the field and positive for the mass. Probability 1=exp(N)/exp(N)=exp(N-N)=exp(0). The probability 1 criteria is met with each balancing mass plus kinetic energy matched by a negative field. To demonstrate how the components represent probability 1 the following diagram shows both mass plus kinetic energy and field energies. Since all mass and kinetic energy components have complementary components in their fields, there are always many complementary probabilities that divide to probability 1.

			Proton Model		S+D	Proton Model			
			Origin		Tunneling	Origin			
			88.15	651.34		13.80	88.15		
			13.80		ke	-11.31	11.31		
			Strange m	Strange ke	Tunneling	Down m	Down ke		
			101.95	*651.34*	*-409.65*	*4.36*	*97.59*		97.59001
	N		11.31	0		11.31	1	0	
	13.431		13.80	0	-4	13.80	0	0	
			88.15	0	-4	88.15	1	0	
			0.62	0	-3	0.62	-3	0	
			651.34	1	0.00				
		S m meson	101.95	4.36	D m mass				
		S ke meson	651.34	97.59	D m ke				
P=exp(13.431)/exp(13.431)				855.24	-409.65		445.58	Actual Meson	
P=1				ideal			revised Ide	891.17	891.66
		Field meson		-855.24	409.65		-445.58	(MeV)	K*(892)
			-753.29	-101.95					
				Strange	S+U Field		Up		
				Field	Tunneling		Field		
			-101.95	*-753.29*	*-409.65*	*-4.36*	*-101.95*		
	N		-11.31		0	-11.31	0		
	13.431		-13.80	1	4	-13.80	1	0	
			-88.15	1	4	-88.15	1	0	
			-0.62	0	3	-0.62	0	0	
								0	
			-651.34	1	0				

The mesons above can now be simulated by evaluating the tunneling value along with ideal mass. Note that the meson mass plus kinetic energy remains equal and opposite the field satisfying the energy zero, probability one criteria.

Summary for meson mass simulations

The author simulated the mass of each of mesons and baryons listed in the 2016 Particle Data Group booklet. It is too large to show in the text but excerpts are in Appendix 4. All the meson data can be simulated with equal and opposite mass plus kinetic energy and fields, although tunneling must be considered. All values obey the energy zero fundamental and probability 1 criteria. The mu meson is interesting because it is found at 105.6584 MeV. One might think that light quarks with mass (2.49 MeV, etc.) might form a lighter particle. But the meson must contain kinetic energy and balancing fields that have higher energy. This explains why the mu meson is not lighter.

Meson decay fundamentals

Study of mesons and baryons indicates that N values are correlated with decay time. Specifically, the sum of N values for the quark masses minus the sum of N values for the fields is the critical value (sum Nmass-sum Nfields or simply N-N below). We can correctly simulate the decay time for all mesons and baryons by using the following fundamentals. We are using an orbit that obeys Et=H.

mass of decaying meson orbits in weak field of radius R
with kinetic energy (ke is multiples of 0.111 MeV)
R=hC/(Efield*m/gamma)=1.97e-13/(20.3*mass/gamma) meters
V=C*(1-(m/(m+ke))^2)^0.5
gamma= (1-(V/C)^2)^0.5
circle time=t1=2*pi*R/V
there is an energy ratio between the mass and field energy
that changes the time to orbit the field
decay time=t2
E1*t1=H=E2*t2
t2/t1=E2/E1
t2/t1=e0*exp(N2)/e0*exp(N1)=exp(N2-N1)
decay=circle time*exp(Nmass-Nfields)

Decay time t=time around circle*exp(N-N)

Time around circle=R*2pi/V, where R is the radius of the orbit and V is velocity.

R=hC/(m/g*E)^.5 where m is the meson mass, E= 20.3 MeV, h is Heisenberg's reduced constant, C is light speed, m is the mass of the meson and gamma g =m/(m+ke). The value hC= 1.973e-13 MeV-meter.

Velocity V is related to the kinetic energy of a meson mass orbiting weak field energy of -20.3 MeV. The kinetic energy is multiples (or fractions) of 0.111 MeV. It circles to Et/H=1.0 where it establishes its decay time. The decay process continues according to probabilities and decay time.

The neutron decay time will be predicted below:

		15.432	Down quark N		
		15.432	Up quark N		
		15.432	Up quark N		
		10.136	Ejected Electron N		
		56.432	N for neutron decay		
mass	939.56	MeV			
Field	957.85	MeV			
ke	0.1194	MeV			
V/C	(1-(m/(m+ke))^2)^0.5			0.015940925	
gamma				1.000	
Radius	1.9733e-13/(field*m/gamma)^0.5			2.08E-16	meters
Time around radius		2*pi()*R/V		2.73E-22	seconds
Decay time =circle time*exp(Ndecay)					
Decay time =2.733e-22*exp(56.432)				880.45	seconds
				Data 880.2	seconds

Physicists use mean time as the decay time criteria where probability of decay at time t is P= exp(-time/decay time). At P=.5= exp(-0.693). Literature indicates that decays are predicted by the wave functions for the particles, their momentum and ejected products. The above derivation follows the literature in general except velocity rather than momentum is used. Velocity around the quantum circle is related to the released energy 0.111 MeV. The wave-function is related to N=56.432i. I believe this approach is new and useful in physics. (Physics has not recognized the N values reported herein).

Fast meson and baryon decays

Most mesons will have decay times on the order of 1e-22 seconds. Some will have conjugated parity or time but this does not change the decay time. We will use the PSI(2S) as an example of a very short decay time.

			13.432	Down quark N		
			11.432	Up quark N		
			-15.432	Down field N		
			-15.432	Up field N		
psi(2S)			-6	N for decay		
	mass	3686.097	MeV			
	Field	20.2	MeV			
	ke	0.555	MeV			
	V/C	(1-(m/(m+ke))^2)^0.5			0.02	
	gamma				1.000	
	Radius	1.9733e-13/(field*m/gamma)^0.5			7.23E-16	meters
	Time around radius		2*pi()*R/V		8.73E-22	seconds
	Decay time =circle time*exp(Ndecay)					
	Decay time =8.73e-22*exp(-6)				2.16E-24	seconds
				Data	2.22E-24	seconds

Slow meson and baryon decay times

All mesons will have CPTF=0 but some mesons have extremely long decay times. It was discovered that this is correlated with fields that are reversed in a way Nmass-Nfields becomes a large number, like 26.89, not the N-N above which was -6.

The following example is for the Kaon K(S)0, one of the slower decaying mesons. This is 14 orders of magnitude slower than the PSI(2S). This coincides with one of the fields being reversed satisfying the above criteria above.

		15.432	Strange quark N		
		13.432	Down quark N		
		-17.432	Strange field N (reversed)		
		15.432	Down quark field N		
K(S)0		26.864	N for decay		
mass	497.6	MeV			
Field	875.5	MeV			
ke	0.262	MeV			
V/C	(1-(m/(m+ke))^2)^0.5			0.032	
gamma				0.999	
Radius	1.9733e-13/(field*m/gamma)^0.5			2.99E-16	meters
Time around radius		2*pi()*R/V		1.93E-22	seconds
Decay time =circle time*exp(Ndecay)					
Decay time =1.93e-22*exp(56.432)				8.96E-11	seconds
			Data	8.95E-11	seconds

Ref: MB sheet 3 cell 267.

Remainder of decay time predictions

All decay time predictions are within experimental error with the kinetic energy moving the particle toward the Et/h=1 condition averaging 0.23 MeV (the required values were back calculated but are the associated with changing the0.622 MeV particles back into electrons found in the decay products). See Appendix 3 for examples.

Baryon composition

A few allowed baryon quark combinations are diagramed below. The primary rule is that they can't have fractional charge. All the observed combinations are three quarks or three anti-quarks (no quark anti-quark combinations allowed). CPT of each quark is invariant.

Surprisingly the 2016 PDG Booklet contained fewer quarks. Most of the quarks had iso-spin, meaning that they contained down and up quarks. I analyzed the quarks to find out if CPTF for the baryons could be zero. This meant that the CPTF would have to be 1.5 since there were three fields of value -1.5 in each of the PDG baryons. If each baryon contains at least one down or up quark the zero criteria could be met if iso-spin is added to CPTF. In other words CPTIF=0 if iso-spin is added (CPTIF= 0= 1.5-1.5). Recall that up and down mesons have either 4 or 6 0.622 features (down diagram repeated below).

cpt	iso-parity	Iso-spin	spin	p	mass	charge	
0.33			0.5	-0.50	0.62	0.33	
0.33			0.5	-0.50	0.62	0.33	
0.33			-0.5	0.50	0.62	0.33	
-0.33	-0.50	0.5			0.62	-0.33	
-0.33			-0.5	0.50	0.62	-0.33	
0.67			0.5	0.50	0.62	-0.33	
-0.33	-0.50	0.5			0.62	-0.33	
0.67			0.50	0.50	4.35	-0.33	Down

Since Iso-spin is simply spin for the extra 0.622 particle, it is okay to add iso-spin to CPT. The fact that baryons will have several of these particles means many combinations of iso-spin are possible (0.5-0.5=0 and 0.5+0.5=1) and for up quarks 0.5 and -0.5.

	Proton D-U-U		
Original parity	0.5	-0.5	-0.5
Parity P	0.5	-0.5	-0.5
iso-spin I	0.5	-0.5	-0.5
Charge	-0.33	0.67	0.67
spin (T)	0.5	0.5	0.5
Quark N	13.4319	11.4319	11.4319
name	DOWN	UP	UP
Mass	4.35685	2.49	2.49
MeV			
CPT invariance	0.67	0.67	0.67
	Iso-spin		-0.5
	Proton charge		1
	Proton parity		-0.5
	Proton spin		1.5
	CPTI		1.5
	Fields		-1.5
	CPTIF		0

	Neutron D-U-U (parity changes charge)		
Original parity	0.5	-0.5	-0.5
Parity P	0.5	-0.5	0.5
iso-spin I	0.5	-0.5	-0.5
Charge	-0.33	0.67	-0.33
spin (T)	0.5	0.5	0.5
Quark N	13.4319	11.4319	11.4319
name	DOWN	UP	UP
Mass	4.35685	2.49	2.49
MeV			
CPT invariance	0.67	0.67	0.67
	Iso-spin		-0.5
	Neutron charge		0
	Neutron parity		0.5
	Proton spin		1.5
	CPTI		1.5
	Fields		-1.5
	CPTIF		0

Baryon and meson summary

Baryon and meson masses, with only the mu and neutral pi as slight exceptions, were simulated within experimental error using energy quanta found in the proton model and the concept of tunneling [15]. A master list of quark properties was presented that allow accurate simulations of mesons and baryons. Fundamentals were presented relating the difference between N values for mass and fields to decay and accurate simulations were presented. These N values help identify the quarks inside the baryons, which agree with PDG names and properties. With the understanding of the mesons and baryons, we can make the following observations.

- Nature is extremely simple at the most fundamental level. Schrodinger “quantum circles” are the basis of all mesons and baryons and the quarks they consist of. The quantum circle represents probability 1 (psi*psic=1) and zero energy for creation of the neutron and proton (the accelerator must supply energy for other baryons but the probability 1 energy 0 principle applies). In addition all meson and baryon properties originate from the value zero. This includes charge, parity, time and fields (CPTF). Charge, parity and time conjugate for quarks but overall the mesons they create originate with properties that add to the value zero. This means that nature originates from one and zero by a process of separation. Parity conjugation causes at least some of the fundamental separations

- Some mesons have positive and negative field components correlated with longer decay times (longer by 11 orders of magnitude).
- Currently literature suggests that charge, parity and time (CPT) is violated in the weak interaction. The Up and Down quarks consist of four and seven 0.622 MeV particles respectively. Each particle has its own CPTF. This gives mesons and baryons iso-spin and presents the possibility that meson decays obey. This needs further investigation.

The proton model is a source of information. The fundamentals of the proton model are now understood and solidly based on the Schrodinger equation. This is important because it gives credence to application of the proton model to other aspects of nature, specifically, unification [1][9], quantum gravity [7][10], cosmology [13][16][12][21] and atomic binding energy [14][20].

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Appendix 1 Quantum gravity

Gravity appears to be different that the other 3 interactions but a concept called cellular cosmology allows substitutions that lead to a calculation of the gravitational constant (G) from proton mass model information once the coupling constant (1/exp(90)) is applied. In retrospect, all four interactions curve space similar to gravity. This is important because gravity was thought to be large scale curvature due to mass. Like other interaction, waves are generated when perturbations occur.

Cellular cosmology

Consider large mass M broken into exp(180) protons labelled lower case m below. The mass (m) of a proton is 1.67e-27 kg. Fill a large spherical volume with exp(180) small spheres we will call cells. Consider the surface area of many small cells as a model of the surface of one large sphere with the same surface area. For laws of nature to be uniform throughout the universe there can be no preferred position. A surface offers this property but the equivalent surfaces of many small spheres also offer this property as long as we do not distinguish an edge. As such a surface model equivalent to the surface of many small cells is useful if the fundamentals of each cell are known.

In general relativity [15] the metric tensor (scholarly matrix equations from general relativity) is based on (ds^2=three distances^2 and (C*time)^2). Note that ds^2 is a surface area and it is this surface that we will break into exp(180) small spheres. Let small r represent the radius of each small cell and big R represent the radius of one large sphere containing exp(180) cells with the same surface area. Position a proton like mass on the surface of each cell. The total energy will be that of one protons/cell plus a small amount of kinetic energy. We will evaluate the gravitational constant G of a large sphere and compare it with G of small cells.

Area=4*pi*R^2
Area=4*pi*r^2*exp(180)
A/A=1=R^2/(r^2*exp(180)
R^2=r^2*exp(180)
r=R/exp(90)   surface area substitution
M=m*exp(180) mass substitution

For gravitation and large space, we consider velocity V, radius R and mass M as the variables (capital letters for large space) that determine the geodesic. With G constant, M=m*exp(180) and the surface area substitution R=r*exp(90), the gravitational constant would be calculated for large space and cellular space as follows (lower case r,v and m below are for cellular space):

At any time during expansion		
Large space		**Cellular Space**
		With substitutions:
		R=r*exp(90) and M=m*exp(180)
R*V^2/M=	**G=G**	**r*exp(90)*V^2/(m*exp(180))**
R*V^2/M=	**G=G**	**(r*v^2/m)/exp(90)**

The extremely small value 1/exp(90) is the coupling constant for gravity. When measurements are made at the large scale as must done to measure G, the above derivation indicates that we should multiply cell scale values (r*v^2/m) by 1/exp(90) if we expect the same G. Geometric and mass relationships give the cell "cosmological properties". I call this cellular cosmology.

It must be recognized that for equal gravitational constant the radius of curvature and mass are vastly different between the large and small scale. It was unfortunate that the great physicists of the 1900's did not have the advantage of WMAP [6] expansion model, nor did they have the advantage of knowing the approximate number of protons in the universe. Perhaps they couldn't compare cellular scale space to large space because they lacked information.

Calculation of gravitational constant from the proton mass model

Using values for the proton mass model that the author believes unify nature's forces (6), the gravitational constant is calculated below and agrees with the published constant, G=6.674e-11 N meters^2/kg^2.

The following table follows a format that will be used several times. The goal is to use the fundamental radius 7.224e-14 meters to calculate the gravitational inertial force. The inputs listed at the top of the table originate in the neutron model above. Firstly, the mass of a proton in MeV and its mass in kg are specified in the table. The gravitational field energy 2.723 MeV gives R=7.224e-14 but there is kinetic energy (10.14 MeV) in the orbit that the neutron falls into. With mass and kinetic energy, gamma and V/C can be calculated. Next the inertial force is determined for the mass orbiting at radius R.

GRAVITY		
	proton	neutron
Neutron Mass (mev)	**938.2720**	**939.565**
Neutron Mass M (kg)	**1.673E-27**	**1.675E-27**
Field Energy E (mev)	**2.732**	**2.732**
Kinetic Energy ke (mev)	**10.111**	**10.140**
Gamma (g)=M/(M+ke)	**0.9893**	**0.9893**
Velocity Ratio v/C=(1-g^2)^0.5	**0.1456**	**0.1457**
R (meters) =(HC/(2pi)/(E*E)^0.5	**7.224E-14**	**7.224E-14**
Inertial Force (F)=(M/g*V^2/R)*1/EXP(90) N	**3.656E-38**	**3.666E-38**
HC/(2pi)=1.97e-13 mev-m		
Calculation of gravitational constant G		
G=F*R^2/(M/g^2)=NT m^2/kg^2	**6.6739E-11**	**6.6743E-11**
Published by Partical Data Group (PDG)	**6.67E-11**	**6.6743E-11**

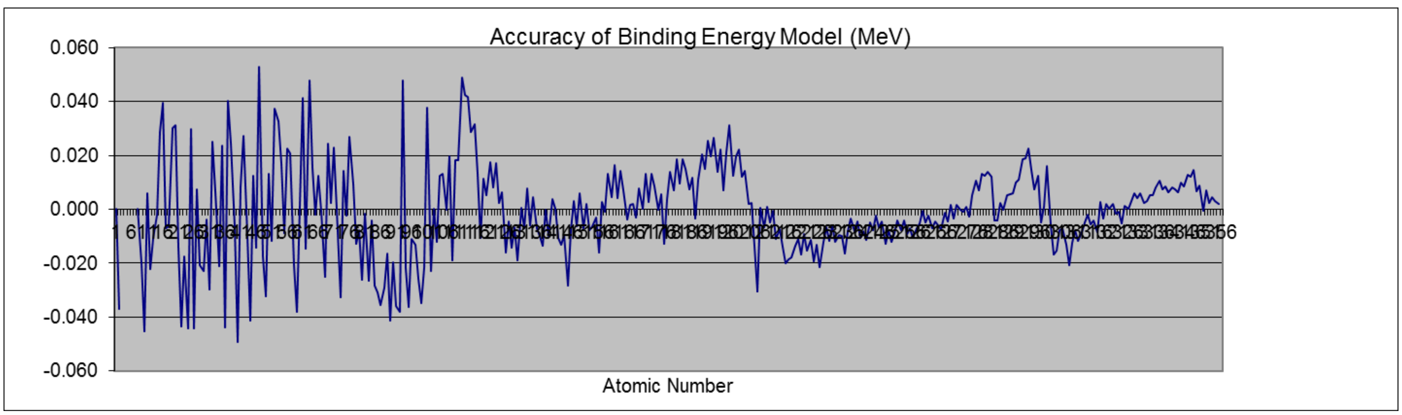
The measured gravitation constant G [16] is calculated above from fundamentals. The constant 1/exp(90) scales the quantum level to the large scale we observe around us. It has the effect of dramatically reducing the force between neutrons and makes gravity very long range compared to the other forces. The inertial force 3.66e-38 N is the same force as the literature above and confirms the radius 7.22e-14 as the radius for quantum gravity.

Note: There is a small difference in kinetic energy between the proton and neutron. The literature above is based on a proton. The author believes that gravity is based on a neutron. Later in the document I will refer to the kinetic energy 10.11 MeV. The value 10.14 MeV is for the neutron kinetic energy and the value 10.11 MeV kinetic energy is for the proton.

Force (Nt)	3.656E-38	
Radius (m)	7.224E-14	
PE=Fdr*exp(90)	**20.115**	MeV
(Potential energy)		

Appendix 2 Binding energy

Reference 14 describes a model for binding energy. The model uses 10.15 MeV as the energy that changes as protons fuse and releases energy. The requirement for fusion is the close proximity of atoms that fall into each other's residual energy field. But the electron must be reconverted by the addition of 0.11 MeV of kinetic energy (temperature). This appears to verify two values of the nucleon mass models. The difference between NIST measurements and the binding energy prediction is shown below. The model's accuracy is on average very good with some values different by only 0.04 MeV out of 10.15 MeV.



Appendix 3 Demonstration of CPT Invariance and Iso-spin combinations

Mesons conserve CPTIF=0. The Up and Down mesons have Iso-spin and extra parity properties because they contain many 0.622 MeV particles, each with CPT properties. One can see that the diagrams of the Up and Down on the left have extra properties that can add and subtract to the required combinations on the right.

						Combinations required to match property data				
CPT	iso-parity	Iso-spin	spin	Parity	mass	charge		Up	Iso-Parity	Iso-spin
0.33	0.50	-0.5				0.33	combinations			0.50
0.33	0.50	-0.5				0.33			1	
0.33	-0.50	0.5				0.33			-1	0.5
0.67	0.50		0.5			-0.33			1	0.5
0.67			-0.5	0.50		0.67	Up		0.00	0.5
									-1	0.5

CPT	iso-parity	Iso-spin	spin	Parity	mass	charge		up	Iso-parity	Iso-spin
0.33	0.50	0.5				-0.67	combinations			-0.5
0.33	-0.50	0.5				0.33				0.5
0.33	-0.50	0.5				0.33			0	1.5
0.67			0.5	0.50		-0.33				
0.66			0.5	0.50		-0.34	u			

						Combinations required to match property data				
CPT	iso-parity	Iso-spin	spin	p	mass	charge			Iso-parity	Iso-spin
0.33	0.5	-0.50				0.33		D		0.5
0.33	0.5	-0.50				0.33	combinations		-2	1
0.33	0.5	-0.50				0.33				1
0.67	0.5	0.50				-0.33				-0.50
0.67	0.5	0.50				-0.33				0.50
0.67	0.5	0.50				-0.33			1	0.5
0.67			0.5	0.50		-0.33				
0.67			0.5	0.50		-0.33	Down			

						Combinations required to match property data				
CPT	iso-parity	Iso-spin	spin	p	mass	charge		dn	P	Iso-spin
0.33	0.50	-0.5				0.33			2	
0.33	-0.50	0.5				0.33	combinations		1	
0.33	-0.50	0.5				0.33				1
0.33	-0.50	0.5				0.33				-1
0.67	0.50	0.5				-0.33			1	-1
0.67	0.50	0.5				-0.33				
0.67			0.50	0.5		-0.33				
0.33			-0.5	0.50		0.33	dn			

Baryons use iso-spin in the conserved quantity CPTIF=0. This diagram shows the required combinations and the way the up quark components meet the requirements (typical of the Up, up, Down and down quarks).

								Combinations required to match property data	
CPT	iso-parity	Iso-spin	spin	Parity	mass	charge		Iso-parity	Iso-spin
0.33	0.50	0.5				-0.67		-1	0.5
0.33	-0.50	0.5				0.33		1	0.5
0.33	-0.50	0.5				0.33			-0.5
0.67	0.50	0.5				-0.33			0.5
0.66			0.5	0.50		-0.34			

Appendix 4 Simulations for mesons and baryons

(excerpts from Excel® spreadsheet named PDGFIELDPLUSMASS.XLS)

Mass Simulation excerpts

The first line is a Bottom-Bottom meson with measured energy 9460.3. Mass plus kinetic energy balances the field energy (-8354 MeV). It would take 2*8354=16708 MeV to form this meson. However, the meson is found at 9460 MeV because it "tunnels" its way into existence. The tunneling required to match the 9460 measurement is 3624 MeV. This value subtracts from the mass plus kinetic energy and adds to the field energy to create an ideal "revised" meson at 4730 MeV with balanced mass plus kinetic energy with opposite field energy. The calculated meson energy is 4730.1+4730.1=9460.2. The difference between the actual and calculated value is labelled "Calculated Accuracy" and is within the measurement error. This tunneling value is the largest of all the mesons and baryons. It averages 453 MeV. (#### below is 651.3)

Calculated Accuracy (MeV)	Tunneling Needed	Tunneling Match	(M #	(MeV ####	(MeV 88.1	(MeV 11.3	(MeV 13.8	(MeV 0.62	Predicted Meson E (MeV) M+KE+ Field E	Revised Ideal M+KE plus Tunneling	Revised Ideal Field minus Tuneling	PDG listing				name	Data PDG MEV
-0.02	-3623.7	-3623.74		-5	-4		-1	-1	9460.28	4730.1	-4730.14	BB	m	bB	-8354	Upsilon(1S)	9460.3
-0.04	-3424.2	-3424.20		-5	-2	2	-1		9859.36	4929.7	-4929.68	BB	m	bB	-8354	Xi(b0)(1P)	9859.4
0.37	-3407.5	-3407.29		-5	-2		2	-3	9893.17	4946.6	-4946.59	BB	m	bB	-8354	Xi(b1)(1P)	9892.8
-0.53	-3397.8	-3398.10		-4	-9			1	9911.56	4955.8	-4955.78	BB	m	bB	-8354	Xi(b2)(1P)	9912.2
-0.26	-3342.3	-3342.38		-5	-1	-1	1		10023.00	5011.5	-5011.50	BB	m	bB	-8354	Upsilon(2S)	10023.26
0.54	-3272.0	-3271.76		-5			-1	-2	10164.24	5082.1	-5082.12	BB	m	bB	-8354	Upsilon(1D)	10163.7
-0.74	-3237.6	-3237.94		-5		-2	3		10231.87	5115.9	-5115.94	BB	m	bB	-8354	chi(b0)(2P)	10232.5
-0.02	-3226.2	-3226.16		-4	-7	1	-1	-2	10255.44	5127.7	-5127.72	BB	m	bB	-8354	Xi(b1)(2P)	10255.46
-0.76	-3219.6	-3219.94		-4	-7	-1	1		10267.89	5133.9	-5133.94	BB	m	bB	-8354	Xi(b2)(2P)	10268.65
0.90	-3176.3	-3175.67		-4	-6		-3		10356.43	5178.2	-5178.21	BB	m	bB	-8354	Upsilon(3S)	10355.2
-0.74	-3097.8	-3098.20		-4	-5	-1	-3	1	10511.36	5255.7	-5255.68	BB	m	bB	-8354	Xi(b1)(3P)	10512.1
2.08	-3064.2	-3063.14		-4	-5	-5	3	-3	10581.48	5290.7	-5290.74	BB	m	bB	-8354	Upsilon(4S)	10579.4
0.63	-3050.3	-3049.96		-4	-5	-4	3		10607.83	5303.9	-5303.92	BB	m	bB	-8354	Xi(10610)+-	10607.2
0.08	-3049.4	-3049.34		-4	-5	-4	3	1	10609.08	5304.5	-5304.54	BB	m	bB	-8354	Xi(10610)0	10609
-0.69	-2908.4	-2908.73		-4	-3	-1	-2		10890.31	5445.2	-5445.15	BB	m	bB	-8354	Upsilon(10860)	10891
-1.39	-2860.1	-2860.83		-4	-2	-7			10986.11	5493.1	-5493.05	BB	m	bB	-8354	Upsilon(11020)	10987.5
-1.93	-1792.7	-1793.65		-2	-5	-2	-2		6273.17	3136.6	-3136.59	B	m	**Bc**	-4930	Bc +	6275.1
0.37	-2530.2	-2530.03		-3	-6	-3	-1	1	5840.21	2920.1	-2920.10	B	m	bC	-5450	B(s2)*(5840)0	5839.84
-0.40	-500.5	-500.68			-6		2	1	9898.90	4949.4	-4949.45	B	m	Bc	-1E-04	h(b)(1P)	9899.3
0.24	-1639.2	-1639.00		-2	-4	-1	2		5279.77	2639.9	-2639.89	B	m	bD	-4279	B+-	5279.31
-0.30	-1639.1	-1639.34		-2	-3	-4	-2	1	5279.10	2639.5	-2639.55	B	m	Bd	-4279	B0	5279.62
-0.32	-1616.6	-1616.72		-2	-3	-3	-1	-3	5324.33	2662.2	-2662.16	B	m	Bd	-1E-04	B*	5324.65
0.25	-1595.5	-1595.35		-2	-3		-2	-1	5367.07	2683.5	-2683.53	B	m	bD	-4279	B0(s)	5366.82

All the decays are matched within experimental accuracy except the mu and pi mesons that have measured to extreme accuracy.

Excerpt from decay calculations

The average energy that creates velocity V for the decaying is mesons is 0.32 MeV. Decay time observations are compared to simulated values.

Planck's reduced h				R=Const/(mass*field)^.5			Decay t=2 pi R/(V)*exp(dN)												
Time =h/full width		v/c=(1-(m/(m+ke))^2)^0.5			time around=2 pi hreduced/width			52.3											
time--secor	E for V			1.97327E-13	4.136E-21	alt is cs		3x17.432=52.3											
2016	Average			R	3.0E+08	1	Predicted	Calculated											
PDG Data	0.32		(1-(v/c)^2)^.5		t=2 pi R/(V)	Decay N	Decay Time	Decay N		Nmass	Nmass	Nmass	Nmass	Nmass	Nfield	Nfield	Nfield	Nfield	Nfield
sec		V/C	gamma	cons/(m*f/g)^.5	sec	P=1/exp(N)	Decay=t/P	0.1		Bottom	Charm	Strange	Down	Up	Bottom	Charm	Strange	Down	Up
1.64E-24	4.00E-01	0.0118	1.000	**2.85E-17**	5.05E-23	-3.43	1.64E-24	-3.43	B1(5721)+	34.86	0.00	0.00	0.00	0.00	-38.29	0.00	0.00	0.00	0.00
1.32E-21	3.33E-01	0.0107	1.000	**2.82E-17**	5.54E-23	3.17	1.70E-21	3.43	B(s1)*(5830)	-34.86	0.00	0.00	0.00	0.00	38.29	0.00	0.00	0.00	0.00
1.21E-20	2.70E+00	0.0239	1.000	**4.50E-16**	3.95E-22	3.43	1.22E-20	3.43	Upsilon(1S)	-34.86	0.00	0.00	0.00	0.00	38.29	0.00	0.00	0.00	0.00
2.06E-23	8.35E-04	0.0004	1.000	**3.78E-13**	1.94E-17	-13.76	2.06E-23	-13.76	Upsilon(2S)	34.86	0.00	0.00	0.00	0.00	-38.29	0.00	0.00	0.00	0.00
3.24E-23	4.23E-01	0.0090	1.000	**4.30E-16**	9.98E-22	-3.43	3.24E-23	-3.43	Upsilon(3S)	34.86	0.00	0.00	0.00	0.00	-38.29	0.00	0.00	0.00	0.00
3.21E-23	4.32E-01	0.0090	1.000	**4.26E-16**	9.88E-22	-3.43	3.21E-23	-3.43	Upsilon(4S)	34.86	0.00	0.00	0.00	0.00	-38.29	0.00	0.00	0.00	0.00
1.22E-23	3.00E+00	0.0234	1.000	**4.20E-16**	3.75E-22	-3.43	1.22E-23	-3.43	Upsilon(1086	34.86	0.00	0.00	0.00	0.00	-38.29	0.00	0.00	0.00	0.00
1.08E-23	3.82E+00	0.0264	1.000	**4.18E-16**	3.32E-22	-3.43	1.08E-23	-3.43	Upsilon(1102	34.86	0.00	0.00	0.00	0.00	-38.29	0.00	0.00	0.00	0.00
5.07E-13	8.11E-03	0.0016	1.000	**3.54E-17**	4.61E-22	20.82	5.07E-13	20.82	Bc +	17.43	0.00	15.43	0.00	0.00	-19.14	0.00	17.43	0.00	0.00
4.48E-22	2.39E-02	0.0029	1.000	**5.73E-16**	4.20E-21	-2.24	4.48E-22	-2.24	B(s2)*(5840)	17.43	17.43	0.00	0.00	0.00	-19.14	-17.96	0.00	0.00	0.00
1.64E-12	8.43E-01	0.0179	1.000	**4.14E-17**	4.86E-23	24.24	1.64E-12	24.24	B+-	17.43	0.00	0.00	13.43	0.00	19.14	0.00	0.00	-15.43	0.00
1.52E-12	9.84E-01	0.0193	1.000	**4.14E-17**	4.50E-23	24.24	1.52E-12	24.24	B0	17.43	0.00	0.00	13.43	0.00	19.14	0.00	0.00	-15.43	0.00
							0.00E+00		B*										
1.51E-12	9.95E-01	0.0193	1.000	**4.11E-17**	4.47E-23	24.24	1.51E-12	24.24	B0(s)	17.43	0.00	0.00	13.43	0.00	19.14	0.00	0.00	-15.43	0.00
1.52E-12	9.88E-01	0.0191	1.000	**4.09E-17**	4.49E-23	24.24	1.52E-12	24.24	B(s)*	17.43	0.00	0.00	13.43	0.00	19.14	0.00	0.00	-15.43	0.00
9.40E-24	5.19E-02	0.0050	1.000	**6.76E-16**	2.85E-21	-5.71	9.41E-24	-5.71	psi(4160)	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
5.49E-24	1.53E-01	0.0085	1.000	**6.72E-16**	1.66E-21	-5.71	5.49E-24	-5.71	Xi(4260)	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
6.45E-24	1.10E-01	0.0071	1.000	**6.63E-16**	1.95E-21	-5.71	6.46E-24	-5.71	Xi(4360)	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
1.06E-23	4.07E-02	0.0043	1.000	**6.59E-16**	3.22E-21	-5.71	1.06E-23	-5.71	Xi(4415)	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
3.64E-24	1.11E-01	0.0070	1.000	**6.54E-16**	1.95E-21	-6.28	6.43E-24	-5.71	Xi(4430)	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
9.14E-24	5.49E-02	0.0049	1.000	**6.43E-16**	2.77E-21	-5.71	9.15E-24	-5.71	Xi(4460)	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
3.29E-23	4.24E-03	0.0012	1.000	**5.78E-16**	9.97E-21	-5.71	3.29E-23	-5.71	B(2)*(5747)+	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
2.72E-23	6.20E-03	0.0015	1.000	**5.78E-16**	8.24E-21	-5.71	2.72E-23	-5.71	B(2)*(5747)0	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
8.13E-24	6.95E-02	0.0048	1.000	**5.67E-16**	2.46E-21	-5.71	8.13E-24	-5.71	B(j)(5970)+	17.43	0.00	0.00	0.00	11.43	-19.14	0.00	0.00	0.00	-15.43
7.09E-24	9.84E-01	0.0252	1.000	**7.87E-16**	6.54E-22	-4.53	7.09E-24	-4.52	J/psi(1S)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
7.84E-22	8.39E-02	0.0069	1.000	**7.39E-16**	2.24E-21	-1.05	7.84E-22	-1.05	Xi(c1)(1P)	0.00	34.86	0.00	0.00	0.00	0.00	-35.91	0.00	0.00	0.00
9.40E-22	5.83E-02	0.0058	1.000	**7.38E-16**	2.69E-21	-1.05	9.41E-22	-1.05	h(c)(1P)	0.00	34.86	0.00	0.00	0.00	0.00	-35.91	0.00	0.00	0.00
3.41E-22	2.22E-01	0.0112	1.000	**7.34E-16**	1.38E-21	-1.40	4.82E-22	-1.05	Xi(c2)(1P)	0.00	34.86	0.00	0.00	0.00	0.00	-35.91	0.00	0.00	0.00
2.22E-24	5.55E-01	0.0174	1.000	**7.21E-16**	8.71E-22	-5.97	2.16E-24	-6.00	psi(2S)	0.00	0.00	0.00	13.43	11.43	0.00	0.00	0.00	-15.43	-15.43
5.49E-22	1.71E-01	0.0094	1.000	**7.04E-16**	1.57E-21	-1.05	5.49E-22	-1.05	Xi(3872)	0.00	34.86	0.00	0.00	0.00	0.00	-35.91	0.00	0.00	0.00
2.39E-23	7.12E-01	0.0158	1.000	**5.15E-17**	6.84E-23	-1.05	2.40E-23	-1.05	B1(5721)0	0.00	34.86	0.00	0.00	0.00	0.00	-35.91	0.00	0.00	0.00
7.89E-21	1.05E+00	0.0324	0.999	**9.76E-16**	6.32E-22	2.52	7.90E-21	2.52	D*(2010)	0.00	-17.43	0.00	-13.43	0.00	0.00	17.96	0.00	15.43	0.00
2.34E-23	9.00E-02	0.0068	1.000	**7.04E-16**	2.16E-21	-4.53	2.34E-23	-4.52	Xi(3900)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
3.29E-23	4.56E-02	0.0048	1.000	**7.00E-16**	3.04E-21	-4.53	3.29E-23	-4.52	Xi(3915)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
3.13E-22	2.75E-02	0.0052	1.000	**9.78E-16**	3.92E-21	-2.53	3.14E-22	-2.52	D*(2007)	0.00	17.43	0.00	13.43	0.00	0.00	-17.96	0.00	-15.43	0.00
3.46E-22	2.25E-02	0.0046	1.000	**9.53E-16**	4.33E-21	-2.53	3.47E-22	-2.52	D(s)*+-	0.00	17.43	15.43	0.00	0.00	0.00	-17.96	-17.43	0.00	0.00
1.73E-22	8.99E-02	0.0088	1.000	**9.10E-16**	2.16E-21	-2.53	1.73E-22	-2.52	D(s0)*(2317)	0.00	17.43	15.43	0.00	0.00	0.00	-17.96	-17.43	0.00	0.00
1.88E-22	7.63E-02	0.0079	1.000	**8.83E-16**	2.35E-21	-2.53	1.88E-22	-2.52	D(s1)(2460)	0.00	17.43	15.43	0.00	0.00	0.00	-17.96	-17.43	0.00	0.00
7.15E-22	5.27E-03	0.0020	1.000	**8.70E-16**	8.94E-21	-2.53	7.16E-22	-2.52	D(s1)(2536)+	0.00	17.43	15.43	0.00	0.00	0.00	-17.96	-17.43	0.00	0.00
3.89E-23	1.78E+00	0.0372	0.999	**8.64E-16**	4.87E-22	-2.53	3.90E-23	-2.52	D(s2)*(2573)	0.00	17.43	15.43	0.00	0.00	0.00	-17.96	-17.43	0.00	0.00
6.27E-23	6.86E-01	0.0200	1.000	**7.49E-16**	7.83E-22	-2.53	6.27E-23	-2.52	Xi(c0)(1P)	0.00	17.43	15.43	0.00	0.00	0.00	-17.96	-17.43	0.00	0.00
5.82E-23	7.95E-01	0.0209	1.000	**7.26E-16**	7.28E-22	-2.53	5.83E-23	-2.52	eta(c)(2S)	0.00	17.43	15.43	0.00	0.00	0.00	-17.96	-17.43	0.00	0.00
4.10E-13	1.02E-01	0.0105	1.000	**1.22E-16**	2.45E-22	21.24	4.10E-13	21.24	D0	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	0.00
1.04E-12	1.59E-02	0.0041	1.000	**1.22E-16**	6.21E-22	21.24	1.04E-12	21.24	D-+	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	0.00
2.80E-24	1.11E-01	0.0108	1.000	**1.21E-16**	2.35E-22	-4.43	2.55E-24	-4.52	pi(2)1880	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
8.33E-24	7.12E-01	0.0255	1.000	**9.36E-16**	7.69E-22	-4.53	8.34E-24	-4.52	pi(2170)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
2.40E-23	8.56E-02	0.0084	1.000	**8.90E-16**	2.22E-21	-4.53	2.40E-23	-4.52	D(1)(2420)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
1.38E-23	2.59E-01	0.0145	1.000	**8.82E-16**	1.27E-21	-4.53	1.38E-23	-4.52	D(2)*(2460)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
1.41E-23	2.49E-01	0.0142	1.000	**8.82E-16**	1.30E-21	-4.53	1.41E-23	-4.52	D(2)*(2460)+	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
2.07E-23	1.15E-01	0.0088	1.000	**8.02E-16**	1.91E-21	-4.53	2.07E-23	-4.52	eta c(1s)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
2.42E-23	8.44E-02	0.0067	1.000	**7.13E-16**	2.23E-21	-4.53	2.42E-23	-4.52	psi(3770)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
4.11E-23	2.92E-02	0.0039	1.000	**7.08E-16**	3.80E-21	-4.53	4.12E-23	-4.52	Xi(3823)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
5.06E-23	1.93E-02	0.0031	1.000	**6.90E-16**	4.68E-21	-4.53	5.07E-23	-4.52	Xi(4020)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
2.74E-23	6.57E-02	0.0058	1.000	**6.99E-16**	2.53E-21	-4.53	2.74E-23	-4.52	Xi(c2)(2P)	0.00	17.43	0.00	0.00	11.43	0.00	-17.96	0.00	0.00	-15.43
8.52E-17	1.29E-01	0.0437	0.999	**3.26E-12**	1.56E-18	4.00	8.52E-17	4.00	pi0	0.00	0.00	0.00	-26.86	0.00	0.00	0.00	0.00	30.86	0.00

Meson CPTF simulation excerpts

CPTF simulations for some mesons are shown below. B is Bottom, c is anti-charm, etc. The Up, up, down and Down mesons often have different CPT due to the extra 0.622 particles. However, once CPT is established the properties C, P, T and Iso-spin agree with PDG data.

Each meson below is simulated by adding C,P,T from the master list of quark properties. The quarks are conjugated if necessary (conserving CPT) to match the PDG data. For Up, Down, up or down mesons sometimes iso-spin or parity is added. The three columns of the right show that the simulation matches the data. The important CPTF shows that CPTF=0 with meson fields= -1.

CPT	spin	C	P		CPT	spin	C	P		spin	P	CPTF	spin-data	Charge-data	Parity+data	
0.67	0.5	0.67	-0.5	B	0.33	0.5	0.33	-0.5	b			0.00	0.00	0.00	0.00	Bb
0.67	0.5	0.67	-0.5	B	0.33	0.5	-0.67	0.5	b			0.00	0.00	0.00	1.00	Bb
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	0.33	-0.5	b	0.67	0.5	0.67	-0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	0.33	-0.5	b	0.67	0.5	0.67	-0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	0.33	-0.5	b	0.67	0.5	0.67	-0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	0.33	-0.5	b	0.67	0.5	0.67	-0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	0.33	-0.5	b	0.67	0.5	0.67	-0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	0.33	-0.5	b	0.67	0.5	0.67	-0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	B			0.00	0.00	0.00	0.00	bB
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	B			0.00	0.00	0.00	0.00	bB
0.67	0.5	0.67	-0.5	B	0.33	-0.5	0.33	0.5	c		1	0.00	0.00	0.00	0.00	Bc
0.33	0.5	0.33	-0.5	b	0.67	0.5	0.67	-0.5	C			0.00	0.00	0.00	0.00	bC
0.67	0.5	-0.33	0.5	B	0.33	0.5	-0.67	0.5	c							Bc
0.33	0.5	-0.67	0.5	b	0.67	0.5	-0.33	0.5	D	0.50		0.00	1.00	0.00	0.00	bD
0.67	0.5	-0.33	0.5	B	0.33	-0.5	0.33	0.5	d	0.50		0.00	0.00	0.00	0.00	Bd
0.67	0.5	-0.33	0.5	B	0.33	0.5	-0.67	0.5	d			0.00	0.00	0.00	0.00	Bd
0.33	0.5	-0.67	0.5	b	0.67	-0.5	0.67	0.5	D			0.00	0.00	0.00	0.00	bD
0.67	-0.5	0.67	0.5	B	0.33	0.5	-0.67	0.5	d			0.00	-1.00	0.00	0.00	Bd
0.67	0.5	-0.33	0.5	B	0.33	0.5	-0.67	0.5	u			0.00	0.00	0.00	0.00	Bu
0.33	0.5	-0.67	0.5	B	0.67	0.5	-0.33	0.5	u			0.00	0.00	0.00	0.00	Bu
0.67	0.5	0.67	-0.5	B	0.33	0.5	0.33	-0.5	u	0.50		0.00	0.00	0.00	0.00	Bu
0.67	0.5	0.67	-0.5	B	0.33	0.5	0.33	-0.5	u	0.50			0.00	1.00	0.00	
0.67	0.5	0.67	-0.5	B	0.33	0.5	0.33	-0.5	u							
0.67	0.5	-0.33	0.5	C	0.33	0.5	-0.67	0.5	c			0.00	0.00	0.00	0.00	Cc
0.67	0.5	0.67	-0.5	C	0.33	0.5	0.33	-0.5	c			0.00	0.00	0.00	0.00	Cc
0.67	0.5	-0.33	0.5	C	0.33	0.5	-0.67	0.5	c			0.00	0.00	0.00	0.00	Cc
0.67	0.5	0.67	-0.5	C	0.33	0.5	0.33	-0.5	c			0.00	0.00	0.00	0.00	Cc
0.67	0.5	-0.33	0.5	C	0.33	0.5	-0.67	0.5	c			0.00	0.00	0.00	0.00	Cc
0.33	0.5	0.33	-0.5	c	0.67	0.5	0.67	-0.5	C			0.00	0.00	0.00	0.00	cC
0.67	0.5	0.67	-0.5	C	0.33	0.5	-0.67	0.5	c	0.50	-1	0.00	0.00	0.00	0.00	Cc
0.33	0.5	-0.67	0.5	c	0.67	0.5	-0.33	0.5	D	0.50		0.00	0.00	0.00	0.00	cD
0.33	0.5	-0.67	0.5	c	0.67	0.5	-0.33	0.5	D	1.00	-2	0.00	0.00	0.00	0.00	cD
0.33	0.5	0.33	-0.5	c	0.67	0.5	0.67	-0.5	D			0.00	0.00	0.00	0.00	cD
0.33	0.5	-0.67	0.5	c	0.67	0.5	-0.33	0.5	D	0.50		0.00	0.00	0.00	0.00	cD

Baryon CPTIF simulation excerpts

The table below is for baryon simulations. The same master list and procedures are used. In this case CPTIF=0 is the conserved quantity. The required contributions from the extra 0.622 properties are shown but the right most 3 columns all show zeros, indicating no difference between the PDG data and the simulations.

																iso-spi	iso-parity		0.005		
CPT	spin	C	P		CPT	spin	C	P		CPT	spin		P		CPTIF	0.622	0.622	spin-da	Charge	Parity+	data
0.67	0.5	-0.33	0.5	D	0.67	0.5	0.67	-0.5	UP	0.67	0.5	0.67	-0.5	UP	0.00	-0.50	-0.50	0.00	0.00	0.0	DUU
0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP	0.67	-0.5	0.67	0.5	UP	0.01	-0.50	-0.50	0.00	0.01	0.0	DUU
0.67	0.5	-0.33	0.5	S	0.67	0.5	-0.33	0.5	S	0.67	0.5	-0.33	0.5	UP	0.01	-0.5	-2	0.00	0.01	0.0	SSU
0.33	0.5	-0.67	0.5	c	0.33	0.5	0.33	-0.5	dn	0.33	0.5	0.33	-0.5	u							cdu
0.33	0.5	-0.67	0.5	dn	0.33	0.5	-0.67	0.5	dn	0.33	0.5	0.33	-0.5	u	-0.01	0.50	-1.00	0.00	-0.01	0.0	ddu
0.33	0.5	-0.67	0.5	dn	0.33	0.5	-0.67	0.5	dn	0.33	0.5	0.33	-0.5	u	-0.01	0.50	-1.00	0.00	-0.01	0.0	ddu
0.33	0.5	-0.67	0.5	dn	0.33	0.5	-0.67	0.5	dn	0.33	0.5	0.33	-0.5	u	-0.01	0.50	-1.00	0.00	-0.01	0.0	ddu
0.33	0.5	0.33	-0.5	s	0.33	-0.5	0.33	0.5	dn	0.33	0.5	-0.67	0.5	dn	-0.01	0.50		0.00	-0.01	0.0	sdd
0.33	0.5	0.33	-0.5	s	0.33	0.5	0.33	-0.5	dn	0.33	0.5	0.33	-0.5	dn	-0.01	0.50	1.00	0.00	-0.01	0.0	sdd
0.33	0.5	0.33	-0.5	s	0.33	0.5	-0.67	0.5	dn	0.33	0.5	-0.67	0.5	dn	-0.01	0.50	-1.00	0.00	-0.01	0.0	sdd
0.33	0.5	0.33	-0.5	s	0.33	0.5	0.33	-0.5	dn	0.33	0.5	-0.67	0.5	dn	-0.01	0.50	1.00	0.00	-0.01	0.0	sdd
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	D							CDD
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	S	0.67	0.5	0.67	-0.5	D						0.0	CSD
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	D							CDU
0.67	-0.5	0.67	0.5	UP	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	D	0.01	-0.50	-1.00	0.00	0.01	0.0	DDU
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	D							CDD
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	D	0.01	-0.50	-1.00	0.00	0.01	0.0	CDD
0.67	0.5	-0.33	0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	0.67	-0.5	UP							CDU
0.67	0.5	0.67	-0.5	C	0.67	0.5	0.67	-0.5	C	0.67	0.5	0.67	-0.5	UP							CCU
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	D							CDD
0.67	-0.5	0.67	0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	D	0.01	-0.50	-1.00	0.00	0.01	0.0	CDD
0.33	0.5	-0.67	0.5	b	0.33	0.5	0.33	-0.5	dn	0.33	0.5	0.33	-0.5	dn	0.00	0.50	1.00	0.00	0.00	0.0	bdd
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	0.67	-0.5	UP							CDU
0.33	0.5	-0.67	0.5	c	0.33	0.5	0.33	-0.5	s	0.33	0.5	0.33	-0.5	s							csu
0.33	0.5	0.33	-0.5	b	0.33	0.5	0.33	-0.5	s	0.33	0.5	-0.67	0.5	dn	-0.01	0.50		0.00	-0.01	0.0	bsd
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	S	0.67	0.5	-0.33	0.5	D	0.01	-0.50	-1.00	0.00	0.01	0.0	CSD
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP	0.01	-0.50		0.00	0.01	0.0	CDU
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	S	0.67	0.5	-0.33	0.5	D							CSD
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	S	0.67	0.5	-0.33	0.5	D							CSD
0.67	0.5	0.67	-0.5	C	0.67	0.5	0.67	-0.5	S	0.67	0.5	-0.33	0.5	S	0.01	-0.50		0.00	0.01	0.0	CSD
0.67	0.5	0.67	-0.5	C	0.67	-0.5	0.67	0.5	S	0.67	0.5	-0.33	0.5	S	0.01	-0.50		0.00	0.01	0.0	CSD
0.67	0.5	-0.33	0.5	B	0.67	0.5	-0.33	0.5	C	0.67	0.5	-0.33	0.5	C							BCC
0.33	0.5	-0.67	0.5	b	0.33	0.5	0.33	-0.5	c	0.33	0.5	-0.67	0.5	dn	-0.01	0.50	-1.00	0.00	-0.01	0.0	bcd
0.33	0.5	-0.67	0.5	b	0.33	0.5	0.33	-0.5	c	0.33	0.5	0.33	-0.5	dn		0.50		0.00	-0.01	0.0	bcd
0.33	0.5	-0.67	0.5	b	0.33	0.5	0.33	-0.5	c	0.33	0.5	-0.67	0.5	dn	-0.01	0.50	-1.00	0.00	-0.01	0.0	bcd
0.33	0.5	0.33	-0.5	s	0.33	0.5	0.33	-0.5	dn	0.33	0.5	-0.67	0.5	dn	-0.01	0.50		0.00	-0.01	0.0	sdd
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP	0.01	-0.50	-1.00	0.00	0.01	0.0	CDU
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP	0.01	-0.50	-1.00	0.00	0.01	0.0	CDU
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	0.67	-0.5	UP	0.01	-0.50		0.00	0.01	0.0	CDU
0.67	0.5	0.67	-0.5	B	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP	0.01	-0.50	-1.00	0.00	0.01	0.0	bdu
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	0.67	-0.5	UP	0.01	-0.50		0.00	0.01	0.0	CDU
0.67	0.5	0.67	-0.5	C	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP							CDU
0.33	0.5	0.33	-0.5	b	0.33	0.5	-0.67	0.5	s	0.33	0.5	-0.67	0.5	dn	-0.01	0.50	-1.00	0.00	-0.01	0.0	bsd
0.67	0.5	0.67	-0.5	B	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP							BDU
0.67	0.5	-0.33	0.5	B	0.67	0.5	-0.33	0.5	D	0.67	0.5	-0.33	0.5	UP							BDU
0.33	0.5	0.33	-0.5	s	0.33	0.5	-0.67	0.5	s	0.33	0.5	-0.67	0.5	dn	-0.01	0.50	-1.00	0.00	-0.01	0.0	ssd
0.33	0.5	0.33	-0.5	s	0.33	0.5	0.33	-0.5	s	0.33	0.5	-0.67	0.5	u	-0.01	0.50		0.00	-0.01	0.0	ssu
0.33	0.5	0.33	-0.5	s	0.33	0.5	0.33	-0.5	dn	0.33	0.5	-0.67	0.5	u	-0.01	0.50		0.00	-0.01	0.0	sdu
0.33	0.5	0.33	-0.5	s	0.33	0.5	-0.67	0.5	dn	0.33	0.5	-0.67	0.5	u	-0.01	0.50	-1.00	0.00	-0.01	0.0	suu
0.33	0.5	0.33	-0.5	s	0.33	0.5	0.33	-0.5	u	0.33	0.5	0.33	-0.5	u	-0.01	0.50	1.00	0.00	-0.01	0.0	suu