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Title: Baryon and meson mass estimates based on natural frequency components

Abstract

Experiments at high energy labs have resulted in a large volume of data regarding the several hundred unstable baryon and meson particles. Experimenters gather this information with the goal of understanding the basic principles that give these particles their masses, properties, and decay times. Their masses are thought to be related to the Higgs particle that was undiscovered until July 2012.
The proton and neutron are classified as baryons. This paper extends a theory that models the neutron and proton mass [1] based on information theory. It is shown that the remainder of the baryons and mesons are composed of quarks and kinetic energy components derived from energy interactions, similar to the proton and neutron. According to a zero energy principle, a quark mass and its kinetic energy are balanced against an equal and opposite field energy. An energy associated with a natural frequency is excited by collisions. Three quarks express themselves as a baryon while one quarks and one anti-quark express themselves as mesons. Baryons decay to either a proton or neutron and carry an extra spin of 0.5, like the neutron or proton. This document derives the natural frequencies involved and gives estimates for mesons and baryon masses. The goals of this study are to:

- Explain the basic energies that form mesons and baryons.
- Show diagrams of the baryons and mesons.
- Explain the process that allows decay to new combinations of mesons and baryons and ultimately to electrons.
- Show that baryons and mesons belong to the same energy hierarchy and show the basic series that result in hundreds of particles. The series explains why most of the particles in the accessible energy range have been found.
- Explain the mechanism for decay and correlate all the particle decay times. Suggest a mechanism for decay modes and suggest how to correlate branching ratios for the decay products.
- Show the energy components for the Mu and Tau.

Excel® Spreadsheet Entitled mesonbaryon.xls

The above excel spreadsheet is the author's calculations for all the mesons and baryons (including the mu and tau). Each line of the spreadsheet contains the PDG [5] data for the particle plus proposed calculations that show its mass, charge and decay time. Data and calculations for many of the decay products and their branching ratios are also included.

Component natural frequencies

Reference [1] describes four values (labeled N, identified as entropy and referred to as a quad) that are involved in a zero entropy, zero energy interaction. The interaction results in a particle with kinetic energy attracted to central fields. The table below reviews two natural frequencies that form the neutron and proton.

Natural frequencies
This energy contains the quark, its ki Balance energy
energy and its field
imbedded quark

N	energy	N	energy	mev quark		mev ke of quark	before	after	field par	field pa
13.43	13.80	15.43	101.95							
12.43	5.08	10.43	0.69	13.80	strang	83.76	102.63	102.63	101.95	0.69
15.43	101.95	17.43	753.29							
12.43	5.08	10.43	0.69	101.95	charm	646.95	753.98	753.98	753.29	0.69

Four energy (E) values result from the four N values by the equation: E=e0*exp(N). A frequency transition involves exchanging the value N=2 in a way that the entering N total (13.43+12.43=13.43+12.43) shifts to (15.43+10.43=13.43+12.43) while the total 25.86 remains constant. The energy for this transition also remains constant and a quark of mass E=e0*exp(13.43)=13.8 mev is created and receives kinetic energy that balances the energy before and after the transition. Specifically, the kinetic energy for the above quad is 83.8 mev=101.95+0.69-13.8-5.08. The mass plus kinetic energy value for the first quad totals 102.63 mev (101.95 + 0.69). Overall energy for all transitions is zero. This means that the two balancing field energies emerge that are negative and also total 102.63 mev (101.95+0.69). This total energy is called a natural frequency and is a basic component of all mesons and baryons. The top portion of the table above indicates that the 13.8 mev quark orbits in its strong field (-101.95 mev). Its orbital velocity is determined by the transition (N=2) and is exactly gamma =0.135 (natural log of 1/gamma=2.0). The quark is also attracted to the second, lower field (-0.69 mev) and orbits with kinetic energy related to transitions that occur during its decay.

The question related to baryon and meson masses is: "why do we see a response in particle detectors as the accelerator energy is increased through a specific level?" This paper proposes that there is a natural frequency match at the energy where the particle energy, including its fields is balanced at zero. For the quark of mass 13.8 mev, this balance is represented by the value 102.63 mev. For the second quad shown above, the higher energy is balanced (zero overall) at 754.0 mev. Each of these frequencies contains a quark and other components from the quad. A 101.95 mev quark is contained in the 754 mev natural frequency. When the natural frequency is matched by the experiment, there is a potential that quarks can be expressed as a meson or baryon at that frequency. The quark itself is imbedded in the natural frequency but for a brief time, experimenters have been able to infer its spin and charge just before decay products are produced. Decay times are measured by velocities and length of tracks in particle detectors.

Mesons are classified by the quarks that they may be composed of. According to the standard model for particles (reference 6 and 7) mesons contain pairs of quarks and anti-quarks that are labeled up, down, strange, charm, and bottom quarks. Also according to this classification, baryons contain combinations of three quarks/anti-quarks.

Reference 1 contained a chart, reproduced below, that helped to identify the energy of the quarks.

Particle review

unifying concepts.xls cell aw48				Proposed					
Identifier	N	Particle Data Group energy (Mev)	PDG charge	Energy E=eo*exp(N) (Mev)	IS Hughes energy (Mev)	Bergstrom energy (Mev)	Randall energy (Mev)	Best data for N Value	N difference (proposal-best data)
0.0986 energ	0.099								
e neutrino	0.000	2.00E-06		2.02E-05	1.50E-07	3.00E-06		-2.314869412	
E/M Field	0.296	0.0000272		2.72E-05				0.295200381	0.000636485
							0.0011		
ELECTRON	10.136	0.51099891	-1.00	0.511				10.13610614	2.61223E-06
mu neutrino	10.408	0.19		0.671	less than 0.25			9.146762759	1.261563509
Graviton*		1.75E-26		2.683					
Up Quark	11.432	1.5 to 3	0.67	1.867		1.5 to 4.5	2.4	11.6829627	-0.251017081
vt neutrino ?	12.432	18		5.076	less than 35	18			
Down Quark	13.432	3 to 7	-0.33	13.797		5 to 8.5	4.8	12.37610988	1.055835738
	16.432			277.120					
Strange quar	15.432	95+/-25	-0.33	101.947		80 to 155	104	15.45188486	-0.019939243
	16.432			277.120					
Charmed Qu	17.432	1200+/-90	0.67	753.29		1000 to1400	1300	17.97761351	-0.545667887
Bottom Quar	19.432	4200+/-70	-0.33	5566.11	4220	4000 to 4500	4200	19.15033377	0.281611852
Top Quark	21.432		0.67	41128.30		40000	171200	21.4041287	0.027816923
W+,w- bosor	22.099	80399	-1.00	80106.98	81000	80000	80400	22.10225098	-0.003638694
Z	22.235	91188	0.00	91787.1	91182	91000	91200	22.22817255	0.007
HIGGS	22.500	125300		119671.5		105000		22.54596011	-0.046

* sum of 3 N's of 10.431 and one 10.333 and graviton is 2.68/exp(90)=1.59e-38 mev.

Mw/Mz	Weinberg radians		sin^2 theta					6.3501E-11
0.87274771	0.509993439	0.48817152	0.238311			6.681E-11		6.3331E-11

Based on the sequence in the above table, the natural frequencies containing the up quark and the bottom quark can be identified. Following the same energy interaction process, the following table represents the remaining quarks important to mesons and baryons. This indicates that two additional natural frequencies are 14.48 mev and 5566.78 mev. These are tentatively identified as containing the 1.87 mev up quarks and the 753.3 mev bottom quark. Eventually all mesons decay to electrons and neutrinos. This is made possible by the 1.86 mev quarks that decays to 0.622 energies (1.86 mev/3=0.622 mev) that further decay to electrons and neutrinos.

								11.93				
mesonbaryon cell h6						mev	Difference		anti-particle			
N	energy (m	N	energy (mev	charge	quark mev	ke of quar	KE (mev)	before	after	field part1	field part2	
11.43	1.87	13.43	13.80									
12.43	5.08	10.43	0.69	0.667	1.87	7.5	11.9	14.48	14.48	13.80	0.69	dn
13.43	13.80	15.43	101.95									
12.43	5.08	10.43	0.69	-0.333	13.80	83.8	88.1	102.63	102.63	101.95	0.69	up
15.43	101.95	17.43	753.3									
12.43	5.08	10.43	0.7	-0.333	101.9	647.0	651.3	753.98	753.98	753.29	0.69	S
77.59	1506.6											
17.43	753.3	19.43	5566									
12.43	5.08	10.43	1	0.667	753	4808		5566.80	5566.80	5566.11	0.69	C

Particle Data group quark listings

Quark charges, spins and tentative masses are listed at the PDG website (reference 6). The convention for spin and charge used in this proposal are identical to the PDG listings:

Particle Data Group (		pdg mass (mev)	(I J) properties	charge
pdg qua	up	1.5-3.0	.5 .5+	0.667
pdg qua	down	3.0 - 7.0	.5 .5+	-0.333
pdg qua	strange -1	95 +/-25	0 .5+	-0.333
pdg qua	charm +1	1200 +/-90	0 .5+	0.667
pdg qua	bottom=-1	4200 +/- 70	0 .5+	-0.333

The measurement method accepted by the PDG involves chirality (spin along its axis of travel) and may include some kinetic energy since single quarks have not been observed independently. Based on the above proposal, each quad contains components that can be particles or anti-particles. For example, the 11.43+12.43=13.43+10.43 quad has components at energy 1.87 and 13.8 mev. Recall that the above quad represents an equal energy, equal entropy transitions and may be able to go either direction.

Application of natural frequencies to the baryons and mesons

Reference 1 contains details of the components totaling 938.27 mev for the proton and 939.56 mev for the neutron.

Cosmology operation 1: Set aside 20.3 mev to expand the universe. 939.56535312

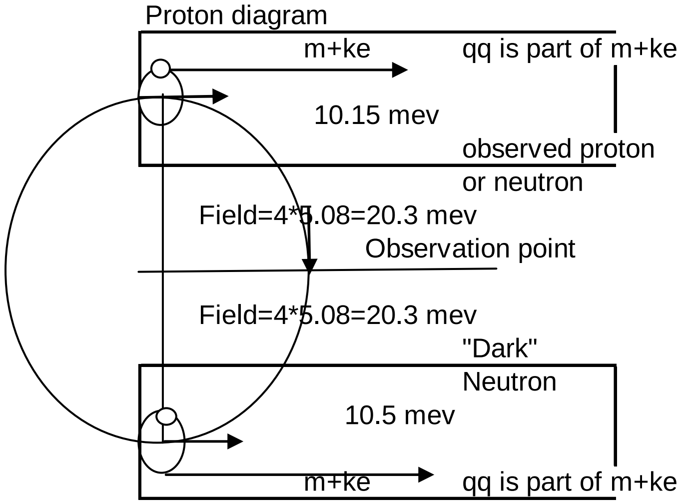
Unified.xls cell g191 Mass and Kinetic Energy → ← Field Energy

Charge	mass ke	Energy-mev	S field G field	Energy mev	Mass mev	Difference KE mev	strong residual ke mev	Neutrino mev	Expansion KE	Strong field energy mev	Gravitationa Energy mev		spin
0.667	15.432	101.95	17.432	753.29	101.947	641.880				-753.29			0.5
	12.432	5.08	10.432	0.69							-0.69		
-0.333	13.432	13.80	15.432	101.95	13.797	78.685				-101.95			0.5
	12.432	5.08	10.432	0.69							-0.69		
-0.333	13.432	13.80	15.432	101.95	13.797	78.685				-101.95			-0.5
	12.432	5.08	10.432	0.69							-0.69		
							10.15		20.303				
	10.408	0.67	0.075		0.000	0.000							
	-10.333												
	10.333	0.6224	0	2.02E-05	0.6224	0.000		2.02E-05		-2.02E-05			
	0	2.02E-05	10.333	0.6224							-0.6224		
					130.163	799.251	**939.5653531**	2.02E-05	20.303	-957.185	-2.683	Totals	
	90.000	sum	90.000				**NEUTRON MASS**		Total m+ke	Total fields			
									Total positive	Total negative			
									959.868	-959.868	0.000E+00		0.500

Reference [2], Application of information in the proton mass model to cosmology, contains a re-analysis of the WMAP data. The original analysis [6] concluded that dark matter was a significant component of our universe. The author's analysis concluded that the light matter and dark matter were approximately equal. This means for the neutron above that there is another 939 mev of "dark" matter.

Neutron and proton diagram

The following diagram describes the proposal for protons (typical for baryons). In the diagram below, the small circles represents the “bundles” of quarks with their kinetic energy orbiting in their strong field. The larger circle is a second orbit. The quark bundle orbits in a weak field with kinetic energy 10.15 mev. As explained in reference 2, the weak field is related to 4 neutrinos of energy 5.08 mev leaving the nucleon leaving an energy deficit. As the bundle falls into the field, it achieves 10.15 mev of kinetic energy by “falling into the field”.



It is clear from cosmology that the light and dark matter separate (dark matter has been inferred from gravitational lensing, velocity profiles of galaxies and WMAP analysis). This is reminiscent of the neutrino that is inferred by energy and property transitions that are “absent” but required for energy balances and property (spin, iso-spin, etc.) conservation. Quantum mechanics and the acceptance of anti-particles also provide a conceptual basis for energy that exists but is not observable in the same way as commonly accepted observations. The author believes that the “neutral proton like mass” that is out of phase from the standpoint of the quantum mechanical “observation point” indicated above. (An observation is the collapse of a wave function consisting of real and imaginary components). It further indicates that there is a symmetry regarding angular momentum and that both the quark orbits in their strong fields and the quark bundle (see reference 1) orbits in their weak fields are opposite in direction. This relationship would be required to in fact create these particles from “zero” (again see reference 1).

Series for the total energy of mesons and baryons

The masses of the neutron and proton are known according to reference [1]. The model for these masses can be used to extend the theory to the other baryons and mesons. Since the proposal involves adding natural frequencies to arrive at the energy of a particle, it is proposed that the additions form a limited series. The series appears to be a base 10 number sequence. Refer to the number positions as 1’s, 10’s and 100’s. The 1’s position is 14.5 mev, the 10’s position is 102 mev and the 100’s position is 754 mev. There are 191 mesons and baryons in the series that starts with 011 and ends with 729.

							100's	10's	1's			
	mesonbaryon	cell i115	Accuracy	data (mev	KE	Sum of na	N	N	N			
						frequencie	17.4/15.4	15.4/13	13.4/11.4		-1	-1
			0.12		mev	mev -->	753.29	101.95	13.80		5.08	0.69
mu	x1	1	0.00	105.6584	105.5926	105.5926		1	1	m	2	2
pi0	x1	2	-0.01	134.9766	3.63	140.4781		1	5	m	6	6
pi	x1	3	0.00	139.5702	1.85	140.4781		1	5	m	6	6
K	x2	4	-0.01	493.677	16.45	492.1413		2	6	m	8	8
K(L)0	x2	5	-0.02	497.614	1.91	492.1413		2	6	m	8	8

For accounting purposes, the author uses slightly different frequencies. The energy 753.29 = 753.98-.69 mev. The reason for this is the 0.69 mev energy is always absent from the baryons and mesons. Apparently it exits before measurement of the meson or baryon energy. Likewise, 101.95=102.63-.69 and 13.8=14.48-.69 mev. The only exceptions to this rule are the proton and neutron that retain their 0.69 energies. The sum of natural frequencies (abbreviated SNF) is the 100’s position times 753.29 plus 10’s position times*101.95 plus 1’s position times 13.8 minus (sum of positions) times 5.08. This means that all of the 5.08 chunks of kinetic energy also exit before measurement of the meson and baryon energy. For example, the SNF for the mu is 101.95*1+13.8*1-2*5.08=105.5925 mev. The sum of positions is 2 (1 for the 101.95 and 1 for the 13.8). There are only three particles that are singles. All of the others have a dark side. For example the K has the following SNF. 492.143=2*(2*101.95+6*13.8-8*5.08). Note the factor of 2.

The predicted and measured neutron and proton masses from reference 1 are shown as natural frequency components in the table below.

	mesonbaryon	cell i115	Accuracy	data (mev	KE	Sum of na	N	N	N		
						frequencie	17.4/15.4	15.4/13	13.4/11.4		-1
			0.12		mev	mev -->	753.29	101.95	13.80		5.08
p		15	0.00	938.272	10.15	944.0186	1	2	0	b	3
n		16	0.00	939.5653	10.15	944.0186	1	2	0	b	3

Using the above rules note that the SNF is still a little more that 5.07 too high. From this and the neutron diagram, if we follow the same rule the other baryons and mesons may also have subtractions (or additions) of 5.07. Here is the main table used to calculate the meson and baryon masses. The first example is for the proton and neutron so that one can see the relationship to the SNF.

		Charge	-0.333	0.667	0.667		-0.333	-0.333		0	-0.333	-0.333			0.667	0.667		-1				
maintable	Calculatec	Spin	0.5	0.5	0.5			0.5		0	0.5	0.5			0.5	0.5						
	Meson	N	17.43	17.43	17.43		15.43	15.43			13.43	13.43			11.43	11.43	10.3	10.13	12.43		10.3	
PDG	Energy	particle		charm	charm	KE	strange	strange	down ke	anhil ke	down	down	up ke	anhil ke	up	up	anil ke	elect	reprise	neutrir	ke plus	ke plus
MEV	MEV	calculation	753.3	753.3	753.3	651.3	101.9	101.9	88.15	13.8	13.8	13.8	11.93	1.87	1.87	1.87	0.62	0.51	5.08	0.67	0.6	0.11
938.272013	938.27	938.27				1.00		1	2.00		1	1	0.00				0.00		-1	-1		
939.565346	939.57	939.57				1.00		1	2.00		1	1	0.00				0.00		-1		1	

Note that the table now contains the values 651.3, 88.15 and 11.93 mev. These three values are the difference between the quark energies. For example 753.3-101.9=651.3. The calculated mass for all but the last three columns adds up to the SNF if one again multiplies the 1's in the table with the energies 753.3, etc. and sum across. The last three columns contain subtractions (additions) from the SNF. The proton is exactly the right mass if 5.08 and 0.67 mev are subtracted from the SNF. The neutron is within measurement error but note that the subtraction is 5.08 and the addition is 0.622 mev.

Hierarchy transitions

As indicated in Reference 1, neutrons and protons start with a 101.95 mev quark and two 13.8 mev quarks (one quark and one anti-quark) but they move to lower energy. The proton iso-spin, spin and charge match the PDG values when it contains two 13.8 mev quarks plus one 1.87 mev quark. The neutron properties match the PDG values when it contains one 13.8 mev quark and two 1.87 mev quarks. This is possible because the natural frequencies occur in a hierarchy allowing decay to lower states. Note below that the 101.95 quark can become a 13.8 quark by releasing 88.15 mev, and a 13.8 quark can become a 1.87 mev quark by releasing 11.93 mev. These changes will be called hierarchy transitions. For only the proton and neutron, as indicated in reference 1, four energies of 5.076 mev each exit the neutron and leave a deficit. This deficit is the weak energy [1]. Also, reference [1] indicated that there is activity in the electron and neutrino quads associated with the energies 0.622 and 0.67 mev.

The following table summarizes the discussion above for the proton. The quarks are labeled according to their energy in mev.

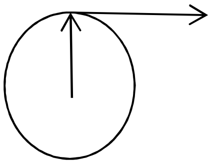
		Neutron			Neutron			
		Energy of quarks in upper state						
Original natural frequency					Energy after hierarchy transition			
mev		mev			mev			charge
753.98		101.95	strange quark		3.73	two down quarks		-0.666667
205.27		27.59	two up quarks		13.80	one up quark		0.6666667
		810.02	kinetic energy		922.03	kinetic energy		
-20.30						loss of 4*5.08 mev		
0.622						kinetic energy		
939.57		939.57			939.57			0.00

		Proton			Proton			
		Energy of quarks in upper state						
Original natural frequency					Energy after hierarchy transition			
mev		mev			mev			charge
753.98		101.95	strange quark		1.87	down quark		-0.333333
205.27		27.59	two up quarks		27.59	two up quarks		1.3333333
		808.73	kinetic energy		908.81	kinetic energy		
-20.30						loss of 4*5.08 mev		
-0.671						kinetic energy/neutrino		
938.27		938.27			938.27			1.00

The above table will be presented in rows for all the mesons and remainder of the baryons (about 191 particles). The total energy is arrived at by multiplying each column with the mev value in the header column and then summing across the row to arrive at a total. This format is more compact (one row per particle) and will allow the properties and decay times to be added for all of the particles.

The small circle above will be called a quark bundle. Most of the mass and kinetic energy in the particle is concentrated in this orbit that contains quarks with kinetic energy confined by the strong field. For the proton, this orbit has radius 2e-16 meters.

quark bundle



quark mass+kinetic energy=929.41 mev

strong field=957.18 mev

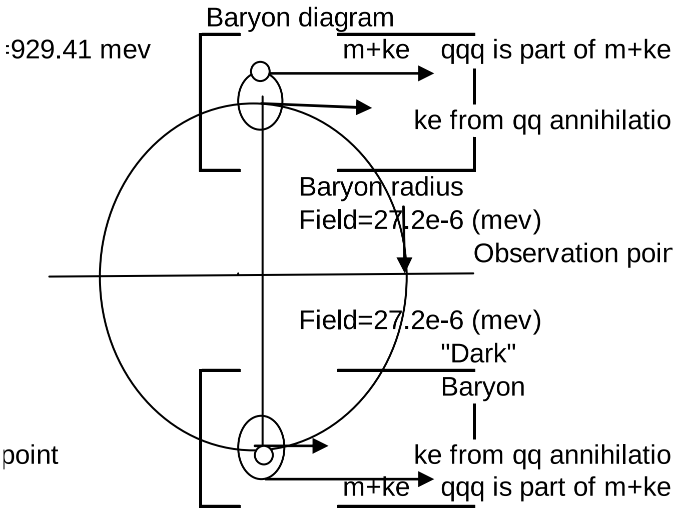
R=2.08e-16 meters

qqq mass	strong field	qqq kinetic energy	V/C	gamma	quark bundle radius
129.54 mev	957.18 mev	810.02 mev	0.9904	0.138	**2.08E-16** meters
quark bundle mass	weak field	weak ke			baryon radius
929.41 mev	20.30 mev	10.15 mev	0.1466	0.989	**1.43E-15** meters

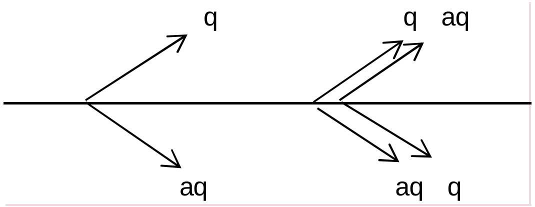
Neutrons may be produced in pairs as indicated above but separate into light and dark neutrons. Neutrons in turn, decay into protons and electrons (reference 1). The quark bundle, in turn, orbits in a weak field (20.3 for the proton and neutron) that results from the loss of 4*5.08 mev of kinetic energy. For the proton and neutron the weak kinetic energy is 10.15 mev (one half of the field energy) that results from the fall into the missing energy field. For the proton, this larger baryon radius is 1.43e-15 meters. This is fully explained in reference 2 where these weak fields are used to predict the binding energy curve for atoms.

Proposed meson and baryon diagrams

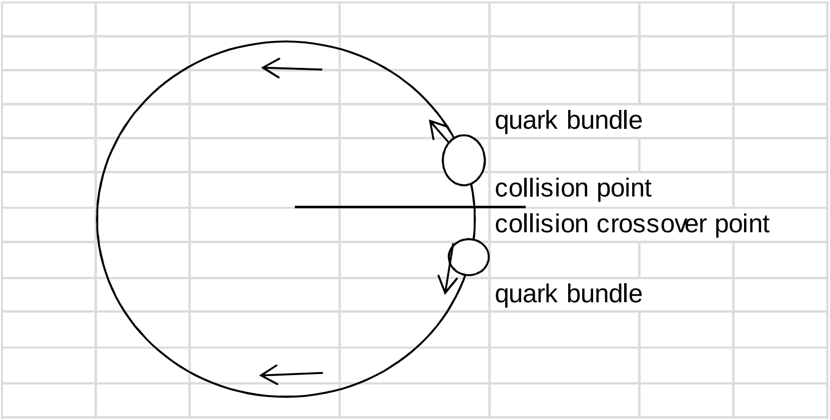
A more general diagram is presented below for the remainder of the baryons. Another refinement is that some of the quarks in the baryons and mesons are anti-particles. Quarks are labeled as positive and anti-quarks are listed as negative. This distinction will be important in predicting their properties and decay times. Both types of quarks give positive energy to the baryons and mesons.



The remaining baryons consist of a pair of quark bundles. The collision that produces the baryon produces quarks and anti-quarks with kinetic energy. The following diagram shows the process:



Pairs of quarks are created out of kinetic energy and separate at the collision point and progress once around the baryon radius until they collide at the cross-over collision point (observation point). They decay at this point and the decay time is predicted by the time to progress around the radius.

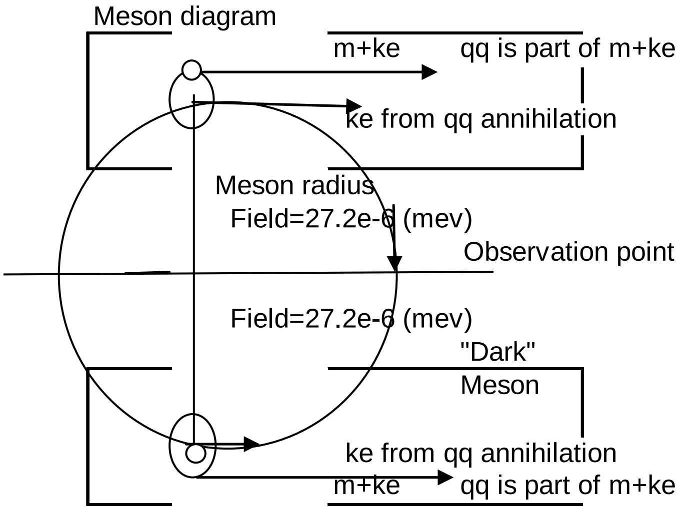


Baryons created in high energy collisions decay to protons, neutrons, mesons and neutrinos. The mesons, in turn, decay to either other mesons or ultimately to electrons and neutrinos. As indicated in the diagram the two parts to the baryon are balanced from the standpoint of opposite directions and properties. With two equal and opposite parts, it is possible for a simple electron collision to produce mesons and baryons that have net properties (spin, iso-spin, charge and entropy) since half of the particle is dark. The author suspects that dark particles are out of phase with our ability to observe the particle.

Cross-over collisions

The neutron or proton found in the decay products of the baryon are probably the result of an “exchange or cross-over” collision that occurs between the two portions of the original particle. Cross-over collisions adjust the energy between the two halves of the particle and setup the decay mode that it experiences. It explains how a baryon assembles enough energy on one side to decay to a proton or neutron. Subsequent hierarchy transitions occur in the decay to give mesons or electrons at lower energy.

Proposed meson diagram



Like the baryons, it proposed that mesons result in natural energy interactions that occurs in two parts, except there are only two quarks per part. The two halves are symmetrical and result in particles that are observable in appropriate detectors and dark particles that are unobservable. The quarks are in “bundles” with their kinetic energy and form an orbit around their strong field energy (the small circles). Each half of the structure is held into another orbit (the large circle) by the N*5.08 mev field energy (N is the total number of original quarks from the number series based energy). The weak kinetic energy for the larger radius orbit (on the order of 1e-15 meters) is the result of pair annihilation of some 1.79 mev quarks. The 1.79 mev energy is exactly 3*0.622 mev and the decay 0.622→0.511+.114 provides a path for meson decay into electrons and kinetic energy. This decay adds to the weak kinetic energy in some baryons and mesons. (Recall that all mesons eventually decay into electrons and neutrinos).

Mass estimates and properties for the remaining mesons and baryons

Mesons and baryons start with a total energy based on the number sequence related sum of their natural frequencies. Similar to the proton and neutron, there are adjustments that occur before the properties are measured. Most of the quarks imbedded in the original natural frequency annihilate (particle+anti-particle) into kinetic energy (or move to the out of phase portion of the meson diagram?). A few of the original quarks remain in the final meson and these quarks carry properties that add to the final energy, spin, iso-spin and charge of the meson. There are an equal and opposite number of remaining quarks and anti-quarks. With these adjustments, the final meson or baryon energy is slightly below the original number sequence energy and the properties add exactly to the spin, iso-spin and charge listed in the PDG tables. Here is a small portion of the hyperlinked mesonbaryon.xls spreadsheet that shows the final configuration of each meson and baryon.

			Iso-spin		0	-0.7	Iso-spin	0.5	0.5	0	0	0.5	0.5		-0.5		0.5			
			Charge	-0.33	-0.33		0.00	-0.33	-0.33			0.67	0.67		-1					
	maintable	Calculatec	Spin		0.5		0	0.5	0.5			0.5	0.5							
		Meson	N	15.4	15.4			13.4	13.4			11.4	11.4	10.3	10.1	12.4		10.3		0.10
	PDG	Energy	particle	strang	strang	down	anhil ke	down	down	up ke	anhil ke	up	up	anil k	elect	repris	neutri	ke plu	ke plus	
Name	MEV	MEV	calculation	102	102	####	13.8	13.8	13.8	11.9	1.87	1.87	1.87	0.62	0.51	5.08	0.67	0.6	0.11	Eaccurac
mu	105.658367	105.66	105.66			1.00				2.00	0			6.00	1				-4	-0.0004
pi0	134.9766	134.97	134.97		1	0.00	3.00		-1	1.00	1			0.00	-1	-1	-3	3	2	-0.0077
pi	139.57018	139.57	139.57			1.00	3.00		1	2.00	1		-1	0.00	-2				1	-0.0027
K	493.677	493.67	246.84		1	1.00	2.00			5.00	4	-1		0.00	0.5		-0.5	1	2	-0.0051
K(L)0	497.614	497.60	248.80		-1	1.00	6.00		1	0.00				0.00	-1.5	0.5		1	3	-0.0168

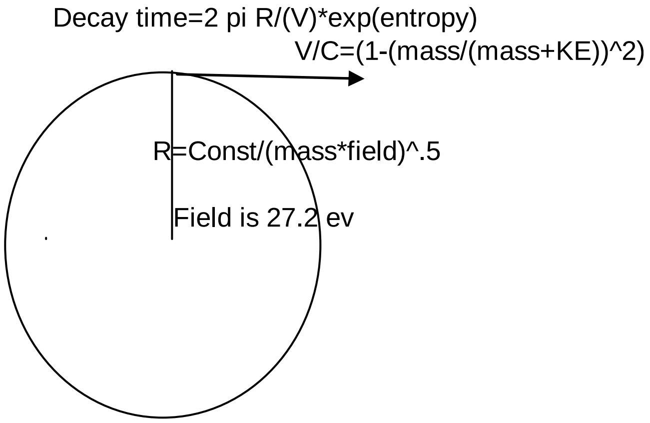
Hierarchy transitions allow final decay of mesons to electrons, neutrinos and kinetic energy. The mechanism for decay is the adjustment that allows quarks to move to lower energy positions while preserving kinetic energy. The final decay to electrons is based on the 1.87 mev quark being exactly 3*0.622 particles that decay to electrons or give off quanta of 0.622 mev energy. Decay times and property predictions are discussed in subsequent sections.

Comparison of predicted meson and baryon energy with Particle Data Group data

The results are so detailed that no attempt has been made to include them in this Microsoft word document. The meson and baryon mass correlations are within experimental error with three minor exceptions.

Baryon and Meson Decay Time Correlations

The baryon decay time is correlated by the time for the quark bundle (mass plus strong kinetic energy) to travel one time around a circumference defined by the weak energy radius. The travel velocity is calculated at the kinetic energy (velocity) of the energy release and the mass of the particle. The decay time diagram follows:



Kinetic energy for decay time calculation

Decay time is the time for the meson or baryon to travel around a circle defined by R above. However, the velocity (kinetic energy) in the brief orbit must be know to calculate the time. Kinetic energy for the decay time calculation comes from two sources. Firstly, there is annihilation of quarks inside the sum of natural frequencies. Secondly, there are small kinetic energy additions/subtractions similar to that of the neutron diagram above. These additions are either 0.622 or 0.111 mev. Here is an excerpt from the meson mass calculation table detailing the kinetic energy, highlighted in yellow. For example, most of the kinetic energy comes from annihilation of 2 pair of 1.87 quarks. The only exception is the mu. Almost the entire SNF shows up as kinetic energy since the only mass is the electron in its 27.2e-6 field. The kinetic energy is the right side column of the table below.

up ke	anhil ke	up	up	anil k	elect	repris	neutri	ke plu	ke plus					115.74
11.9	1.87	1.87	1.87	0.62	0.51	5.08	0.67	0.6	0.11	Eaccurac	E meas		ok?	mev
2.00	0			6.00	1				-4	-0.0004	0.00	mu	0	109.33
1.00	1			0.00	-1	-1	-3	3	2	-0.0077	0.00	pi0	0	3.96
2.00	1		-1	0.00	-2				1	-0.0027	0.00	pi	0	1.98
5.00	4	-1		0.00	0.5		-0.5	1	2	-0.0051	0.02	K	1	8.31
0.00				0.00	-1.5	0.5		1	3	-0.0168	0.02	K(L)0	1	0.96
4.00	4			0.00	0.5	0.5	1	-1	-1	-0.0119	0.02	K(S)0	1	6.74
0.00	0			0.00	-0.5	0.5			4	-0.0168	0.02	K0	1	0.45
1.00	0			3.00	-1	0.5			-3	0.00	0.02	eta0	1	1.53
9.00	8		1	0.00		0.5	-1	-1		0.10	0.34	rho(770)	1	14.32
7.00	5		1	3.00	-0.5	1				0.09	0.12	omega(78	1	11.20
2.00	2			0.00	-1					-8.61	400.00	f(0)(600)	1	3.73
2.00	0		-1	3.00		-0.5			-2	-0.11	0.26	K*(892)	1	1.64
2.00	0		1	3.00			-1		-2	-0.22	0.80	K*(892)	1	1.64
1.00	0			3.00	-0.5				-3	-0.05	0.22	K*(892)0	1	1.53
0.00				0.00		-1	-1			0.0000	0.00	p	1	10.15
0.00				0.00		-1		1		0.00	0.00	n	1	10.15

The Particle Data Group lists the full width (in Mev). All data was translated to time by using time=Heisenberg’s reduced constant/full width. Most of the meson and baryons decays are either accelerated or retarded by a probability. Apparently, if energy has exited that particle must be accounted for before decay can progress. This delays the decay. An example of decay delay that occurs frequently in the mesonbaryon.xls is loss of the energy associated with N=10.431 (E= 0.689 mev). Delay of decay is accounted for by a probability. The probability dt/dt0=1/exp(N) is multiplied by the travel time calculated above. This means that time to travel half circle of radius R * probability gives decay time. For the example above, N=2+10.43=12.43 and P becomes P=1/exp(12.43). These calculations are in mesonbaryon.xls spreadsheet. The fundamentals that allow this determination and are reviewed below:

$$\begin{tikzcd}
 & \text{1=exp(N)/exp(N)} \arrow[dl] \arrow[dr] & \\
\text{Energy ratio E/e0=exp(N)} \arrow[r] & \text{E/eo*P=1} & \text{Probability P=1/exp(N)} \arrow[l]
\end{tikzcd}$$

Also

E= 2 pi h v where v is frequency and h is Planck's reduced constant

				define e0 (mev)	mev-sec				
				2.025E-05	6.582E-22	reduced Planck			m*dt=c
		E/e0=exp(N)		E=e0 exp(N)	v=E/h	dt=2*pi()/v			e0 exp(N)dt=c
N	E/e0*P		P=1/exp(N)	Energy/mass	frequency	dt (sec)	v dt	cos (v dt)	
0	1	1.00	1.00	2.02472E-05	3.08E+16	2.04E-16	6.28	1	4.14E-21
0.098612289	1	1.10	0.91	2.235E-05	3.39E+16	1.85E-16	6.28	1	4.14E-21
0.197224577	1	1.22	0.82	2.466E-05	3.75E+16	1.68E-16	6.28	1	4.14E-21
0.295836866	1	1.34	0.74	2.722E-05	4.14E+16	1.5195E-16	6.28	1	4.14E-21
4	1	54.60	0.02	1.105E-03	1.68E+18	3.74E-18	6.28	1	4.14E-21
10.13610876	1	25238.07	3.96E-05	5.110E-01	7.76E+20	8.09E-21	6.28	1	4.14E-21
13.43194562	1	681427.83	1.47E-06	1.380E+01	2.10E+22	3.00E-22	6.28	1	4.14E-21
15.43194562	1	5035108.44	1.99E-07	1.019E+02	1.55E+23	4.06E-23	6.28	1	4.14E-21
15.67117485	1	6.40E+06	1.56E-07	1.295E+02	1.97E+23	3.19E-23	6.28	1	4.14E-21
17.65153172	1	4.63E+07	2.16E-08	9.383E+02	1.43E+24	4.41E-24	6.28	1	4.14E-21
90			8.194E-40				1	1	
N-n		E1/E2	P1/P2	E1/E2	v1/v2	dt1/dt2=1/exp(N)=1/exp(2)		m1/m2*dt1/dt2=m1/m2*exp(N)=c	
2		7.39	0.14	7.39	7.39	0.14			m1/m2*.14

"After each time cycle, the quantum mechanics probability equals exp(vt)*exp(ivt)=1=cos (vdt)=1 since we are within the radius of an orbit. When the information theory probability (P) is near 1, time increments are large with a maximum at 2.04e-16 seconds (call this dt0). Of course if energy is high, time progresses in smaller dt increments as shown above. The use of two probabilities may be confusing but for the remainder of this work, we will always evaluate information theory probability P = e0/E when the quantum mechanical probability is equal is unity to avoid complex numbers (all distances are within the orbital radius). For example if N for decay is N=2, a time ratio (dto/dt) is larger by the ratio exp(2). This relationship is used in the decay times for mesons and baryons."

Example below is the neutral pion (pi0)

dt1/dt2=dt1/exp(N)

note that dt around the particle radius is about constant (3e-22 seconds)

example decay

$$\text{time/P} \quad \frac{\text{3.10E-22 numerator}}{\text{3.99E-06 denominator}} \qquad \text{7.78E-17 decay is delayed to this value}$$

example of how probability helps constant be maintained

3.10E-22 P corrects t to const

Decay time appears to be correlated by the tentative rule: Decay time is delayed by the relative ease of the quark to decay. Most of the information probabilities for decay of mesons and baryons are either 10.431 or 12.431. However, there are a few cases with particle entropies add or subtract to give N. If one quark has N1=15.43 and another quark in the particle has N2=13.43, the difference in N, i.e. dN=13.43-11.43=2, forms a probability P=1/exp(2) that delays the decay. For these mesons, the decay properties determine which combinations of quarks comprise these baryons and mesons.

The following table summarizes the above rules and compares decay time data with calculations.

				This field					
calculated entropy =n*10.431+m*12.43:				holds the mass			##		0.6321206
				in orbit			##		
			1.2	std dev					time--secon
Calculated	10.41		0.11	accuracy				delta	best
Entropy	10.33		percent/accuracy					PDG Da	PDG Data
33.30	10.43	12.4	t accur	Field mev	###	Particle		percent	sec
31.00	3		10.57	2.7E-05	1	mu		0.00	2.20E-06
6.00	-3	3	-0.79	5.4E-05	2	pi0		5.13	8.439E-17
24.86	0	2	-168.88	2.7E-05	1	pi		0.02	2.60E-08
24.86		2	-2.80	2.7E-05	1	K		0.17	1.24E-08
-12.43		-1	-24.10	8.2E-05	3	K(L)0		0.00	1.32E-24
10.43	1		6.97	2.7E-05	1	K(S)0		0.05	7.35E-15
24.86		2	8.30	2.7E-05	1	K0		0.39	5.11E-08
0.00			-1.94	2.7E-05	1	eta0		5.38	5.06E-19
-10.43	-1		-0.29	2.7E-05	1	rho(770)		0.54	4.41E-24
-7.33	-1	-3	0.56	5.4E-05	2	omega(782)		0.94	7.75E-23
-12.43		-1	1.64	2.7E-05	1	f(0)(600)		25.00	8.23E-25
-10.43	-1		-0.26	2.7E-05	1	K*(892)		1.77	1.30E-23
-10.43	-1		-0.26	2.7E-05	1	K*(892)		1.77	1.30E-23
-10.43	-1		-0.72	2.7E-05	1	K*(892)0		1.64	1.35E-23
89.93	-1	3				p			2.40E+17
56.728	1	1	2.01			n		0.17	8.81E+02

Identifying the quarks involved in the baryons and mesons

The energies in the SNF gives a good guide regarding the quarks involved in each meson and baryon. The second guide is the charge of the particle. The charge of each quark is listed in PDG and adding together a quark and anti-quark to give the PDG particle charge requires certain combinations. Spin is another criteria and the mesons can only be spin zero if a particle and anti-particle are involved. When spin is different than zero, other particles like a neutrino or electron may be involved.

For the neutron and proton decay times comparisons can be made with experimental data that allow inference about the particles involved. The specific probabilities involved in decay are dt0/dt=1/exp(N) where N=additions or subtractions of 11.43, 13.43, 15.43 etc, depending on the quarks involved in the meson or baryon. Total entropy for the neutron is: (1 down quark+2 up quarks +3 grav neutrinos-electron neutrino =15.43+13.43*2+2*12.43-10.43=56.73). The experimental value is 56.77 based on the calculated time around the neutron weak radius). Experimentally proton decay has not been observed and PDG specifies a lower limit (that translates to entropy of 80). Based on the proton containing the same quarks as the proton plus charge separation the N value may be 90. (=15.43+2*13.43+3*12.43+10.43=90).

Comparison with decay time data

The decay time results are so detailed that no attempt has been made to include them in this Microsoft word document. It is noted however that the detailed decay times are all very close or less than experimental error. The statistics are as follows:

1.2	std dev
0.11	accuracy

Decay modes

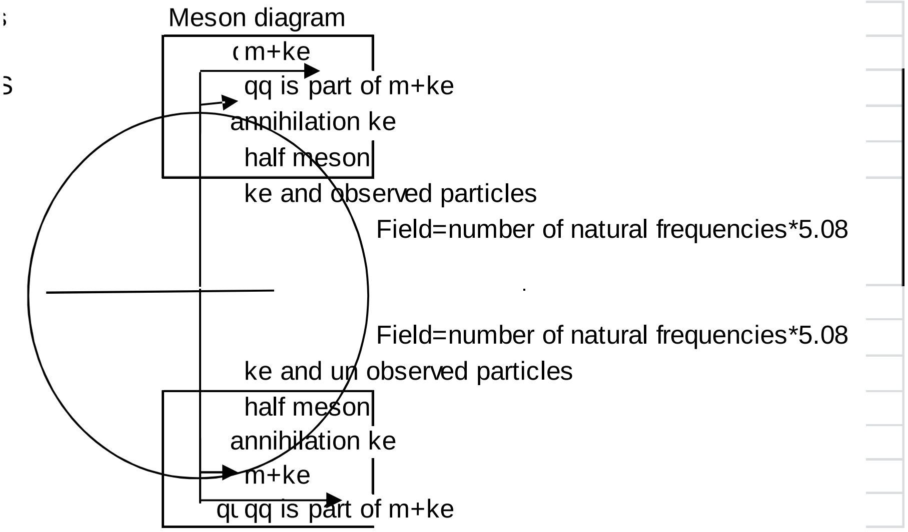
All mesons eventually decay to pi and mu mesons, although there are several intermediate combinations. The pi and mu mesons decay to electrons, gamma rays and neutrinos. One could ask the question why all mesons take this path.

The particle data group lists decay modes for the mesons. A small sample of the modes and the prevalent decays within the mode is listed below. The question "why do mesons decays have different modes?" was addressed.

- Pi+/- decay modes
- Pi0 decay modes
- Eta decay modes
  - Neutral mode
  - Charged mode
- Mesons up to 980 mev
  - Double pi mode
  - Triple pi mode
  - Neutrals
- Mesons from 980 on up
  - Kaons/anti-kaons
  - Pi pi
  - Combinations of lighter mesons with one, two or three pi mesons plus photons.
- Heavier particles
  - Leptonic
  - Semi-leptonic
  - Hadronic

What are decay modes?

The author proposes that there is a collision zone between two halves of the mesons or baryons. This would allow kinetic energy to "crossover", allowing the particles to continue their decay. If a different collision occurs, there is a different starting energy and consequently a different decay mode.

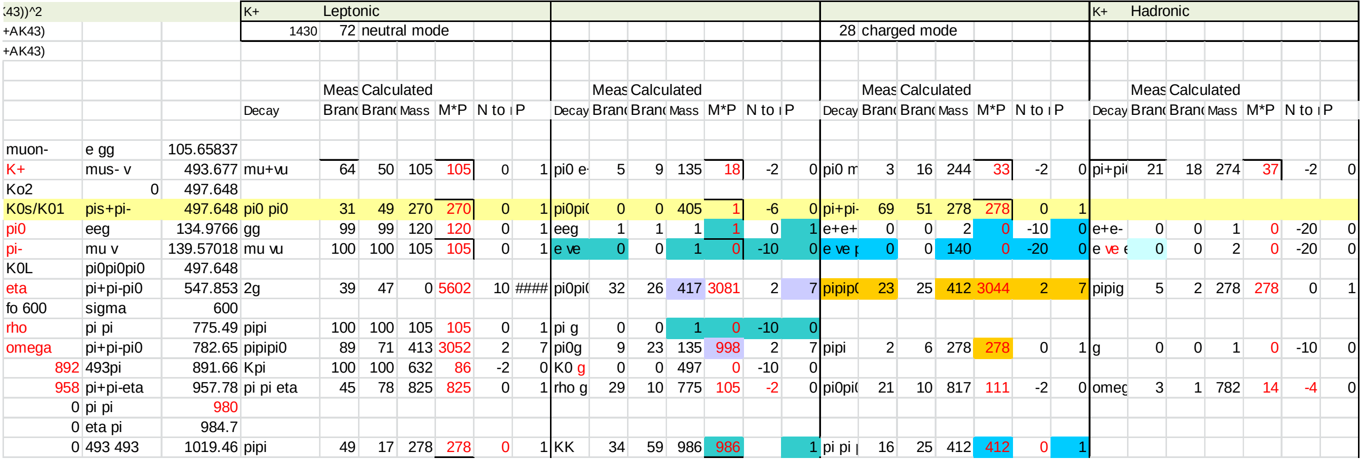


Pi and mu mesons are prevalent in decays because there are many ways for the fundamental frequencies to cascade downward to these energies.

Branching Ratios

m1/m2*dt1/dt2=m1/m2*exp(N)=c
m1/m2*.14

Branching Ratio=mass involved in decay*Probability of decay/(sum m*P)



43))^2			K+	Leptonic																				K+	Hadronic					
+AK43)			1430	72	neutral mode														28	charged mode										
+AK43)																														
				Meas	Calculated						Meas	Calculated						Meas	Calculated						Meas	Calculated				
			Decay	Branc	Branc	Mass	M*P	N to	P	Decay	Branc	Branc	Mass	M*P	N to	P	Decay	Branc	Branc	Mass	M*P	N to	P	Decay	Branc	Branc	Mass	M*P	N to	P
muon-	e gg	105.65837																												
K+	mus- v	493.677	mu+vu	64	50	105	105	0	1	pi0 e	5	9	135	18	-2	0	pi0 m	3	16	244	33	-2	0	pi+pi	21	18	274	37	-2	0
Ko2	0	497.648																												
K0s/K01	pis+pi-	497.648	pi0 pi0	31	49	270	270	0	1	pi0pi	0	0	405	1	-6	0	pi+pi-	69	51	278	278	0	1							
pi0	eeg	134.9766	gg	99	99	120	120	0	1	eeg	1	1	1	1	0	1	e+e+	0	0	2	0	-10	0	e+e-	0	0	1	0	-20	0
pi-	mu v	139.57018	mu vu	100	100	105	105	0	1	e ve	0	0	1	0	-10	0	e ve	0	0	140	0	-20	0	e ve	0	0	2	0	-20	0
K0L	pi0pi0pi0	497.648																												
eta	pi+pi-pi0	547.853	2g	39	47	0	5602	10	#####	pi0pi	32	26	417	3081	2	7	pipip	23	25	412	3044	2	7	pipig	5	2	278	278	0	1
fo 600	sigma	600																												
rho	pi pi	775.49	pipi	100	100	105	105	0	1	pi g	0	0	1	0	-10	0														
omega	pi+pi-pi0	782.65	pipipi0	89	71	413	3052	2	7	pi0g	9	23	135	998	2	7	pipi	2	6	278	278	0	1	g	0	0	1	0	-10	0
892	493pi	891.66	Kpi	100	100	632	86	-2	0	K0 g	0	0	497	0	-10	0														
958	pi+pi-eta	957.78	pi pi eta	45	78	825	825	0	1	rho g	29	10	775	105	-2	0	pi0pi	21	10	817	111	-2	0	omeg	3	1	782	14	-4	0
0	pi pi	980																												
0	eta pi	984.7																												
0	493 493	1019.46	pipi	49	17	278	278	0	1	KK	34	59	986	986		1	pi pi	16	25	412	412	0	1							

Spreadsheet mesonbaryon.xls contains many branching ratio calculations. The results compared with measured values show that N again gives a probability involved in determining which decay particles are more prevalent in decay fragments. It is also clear, that for branching, the N value associated with electrons reduces the probability of decay by P=1/10.136 to anything involving gamma rays or electrons. The N value that characterizes a particular particle in the decay is a difference value for the quarks values. For example, the pi0 is again N=13.43-11.43=2. When a particle decays into two pi0's the particles are often opposite, meaning that N for that particular combinations of pions is N=2-2.

Allowed combinations

About 191 mesons and baryons have been found experimentally as of 2012. In some literature, series of mesons that make up sets of 4, 8 or even 16 mesons are identified. These sets were originally thought to be "full" indicating that other combinations would not be found in nature, but this tentative rule has since been violated by additional experimental results. It appears to the author that the main limiter appears to be the number sequence shown below (shown below the 100's, 10's and 1's column). The sequence has a few gaps especially at the lower and higher end and more work is required to understand these gaps.

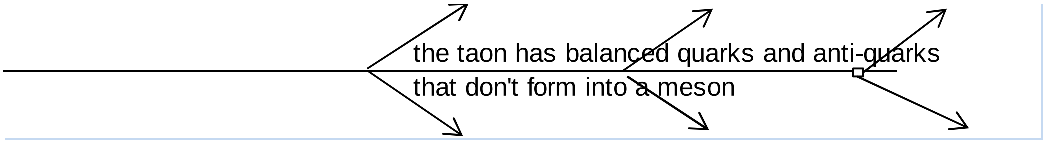
							100's	10's	1's	
	mesonbaryon cell i115		Accuracy	data (mev	KE	Sum of na	N	N	N	
						frequencie	17.4/15.4	15.4/13	13.4/11.4	
			0.12		mev	mev -->	753.29	101.95	13.80	
mu	x1	1	0.00	105.6584	105.5926	105.5926		1	1	m
pi0	x1	2	-0.01	134.9766	3.63	140.4781		1	5	m
pi	x1	3	0.00	139.5702	1.85	140.4781		1	5	m
K	x2	4	-0.01	493.677	16.45	492.1413		2	6	m
K(L)0	x2	5	-0.02	497.614	1.91	492.1413		2	6	m
K(S)0	x2	6	-0.01	497.614	13.55	492.1413		2	6	m
K0	x2	7	-0.02	497.614	0.95	492.1413		2	6	m
eta0	etc.	8	0.00	547.853	2.45	544.4696		2	9	m
rho(770)	↓	9	0.10	775.49	28.50	773.0975		3	11	m
omega(782)		10	0.09	782.65	22.61	773.0975		3	11	b
f(0)(600)		11	-8.61	800	14.89	792.4125		4	1	m
K*(892)		12	-0.11	891.66	3.25	897.069		4	7	m
K*(892)		13	-0.22	895.5	3.25	897.069		4	7	m
K*(892)0		14	-0.05	895.94	2.99	897.069		4	7	m
p		15	0.00	938.272	10.15	944.0186	1	2	0	b
n		16	0.00	939.5653	10.15	944.0186	1	2	0	b
eta'(958)		17	-0.02	957.78	19.44	956.6887		4	11	m
a(0)(980)		18	-4.00	980	3.09	976.0037		5	1	m
f(0)(980)		19	-4.00	980	3.55	976.0037		5	1	m
phi(1020)		20	-0.01	1019.455	1.52	1021.04		5	3	m
Lambda		21	0.01	1115.683	12.07	1108.254		5	8	b
h(1)(1170)		22	-9.42	1170	2.99	1160.582		5	11	m
Sigma		23	-0.01	1189.37	9.02	1179.897		6	1	b
Sigma		24	0.01	1192.642	2.10	1197.34		6	2	b
Sigma		25	0.00	1197.449	2.64	1197.34		6	2	b
b(1)(1235)		26	2.73	1229.5	25.64	1232.226		6	4	m
a(1)(1260)		27	2.23	1230	2.03	1232.226		6	4	m
Delta(1232)		28	-0.44	1232	17.65	1232.226		6	4	b
K(1)(1270)		29	-4.89	1272	5.11	1267.111		6	6	m
f(2)(1270)		30	0.55	1275.1	43.87	1284.554		6	7	m
f(1)(1285)		31	-0.18	1281.8	0.74	1284.554		6	7	m
c		32	-5.45	1290	0.00	1284.554		6	7	m
eta(1295)		33	2.92	1294	3.81	1301.997		6	8	m
pi(1300)		34	2.00	1300	68.91	1301.997		6	8	m
Xi		35	0.01	1314.86	9.93	1319.439		6	9	m
a(2)(1320)		36	0.12	1318.3	14.49	1319.439		6	9	m
Xi		37	0.00	1321.71	31.38	1319.439		6	9	m
f(0)(1370)		38	4.32	1350	79.37	1354.325		6	11	m
pi(1)(1400)		39	0.32	1354	70.33	1354.325		6	11	m
Sigma(1385)		40	-0.18	1382.8	1.61	1391.083		7	2	b
Sigma(1385)		41	-0.06	1383.7	1.63	1391.083		7	2	b
Sigma(1385)		42	0.21	1387.2	1.95	1391.083		7	2	b
K(1)(1400)		43	5.53	1403	38.63	1408.525		7	3	m
Lambda(1405)		44	0.94	1405.1	3.15	1408.525		7	3	b
eta(1405)		45	-1.27	1409.8	3.29	1408.525		7	3	m
K*(1410)		46	-5.47	1414	34.28	1408.525		7	3	m
omega(1420)		47	2.21	1425	1.07	1425.968		7	4	b
K(2)*(1430)		48	-0.88	1425.6	6.12	1425.968		7	4	m
f(1)(1420)		49	0.01	1426.4	3.80	1425.968		7	4	m
K(0)*(1430)		50	-4.03	1430	46.62	1425.968		7	4	m
K(2)*(1430)		51	-0.33	1432.4	15.03	1425.968		7	4	m
N(1440)		52	3.41	1440	2.08	1443.411		7	5	b

						100's	10's	1's	
	mesonbaryon cell i115	Accuracy	data (mev	KE	Sum of na	N	N	N	
					frequencie	17.4/15.4	15.4/13	13.4/11.4	
		0.12		mev	mev -->	753.29	101.95	13.80	
N(1440)	52	3.41	1440	2.08	1443.411		7	5	b
rho(1450)	53	-4.15	1465	51.23	1460.854		7	6	m
a(0)(1450)	54	6.79	1474	44.87	1478.296		7	7	m
eta(1475)	55	3.99	1476	9.12	1478.296		7	7	m
f(0)(1500)	56	3.11	1505	15.03	1513.182		7	9	m
Lambda(1520)	57	0.45	1519.5	0.31	1513.182		7	9	b
N(1520)	58	0.47	1520	16.74	1530.625		7	10	b
f(2)'(1525)	59	4.60	1525	6.72	1530.625		7	10	m
Xi(1530)	60	0.00	1531.8	5.70	1530.625		7	10	m
Xi(1530)	61	-4.38	1535	28.58	1530.625		7	10	m
placeholder	61.5	0.00	1535.1	0.00	0				
Delta(1600) -,	62	0.58	1600	2.83	1602.268		8	3	b
Lambda(1600)	63	2.27	1600	28.57	1602.268		8	3	b
eta(2)(1645)	64	2.71	1617	41.77	1619.711		8	4	m
Delta(1620) -,	65	2.08	1630	26.68	1637.153		8	5	b
N(1650)	66	-0.40	1655	34.62	1654.596		8	6	b
Sigma(1660)	67	-5.40	1660	12.63	1654.596		8	6	b
pi(1)(1600)	68	10.04	1662	36.65	1672.039		8	7	m
omega(3)(1670)	69	5.71	1667	0.65	1672.039		8	7	b
omega(1650)	70	-0.55	1670	2.29	1672.039		8	7	b
Lambda(1670)	71	3.51	1670	1.54	1672.039		8	7	b
Sigma(1670)	72	2.26	1670	4.54	1672.039		8	7	b
pi(2)(1670)	73	-0.16	1672.2	43.09	1672.039		8	7	m
Omega	74	1.06	1672.45	1.55	1672.039		8	7	b
N(1675)	75	0.07	1675	0.00	1672.039		8	7	b
phi(1680)	76	-2.89	1680	28.56	1672.039		8	7	m
N(1680)	77	4.48	1685	21.40	1689.481		8	8	b
rho(3)(1690)	78	1.35	1688.8	0.60	1689.481		8	8	m
Lambda(1690)	79	-0.52	1690	4.54	1689.481		8	8	b
N(1700)	80	-0.37	1700	12.63	1689.481		8	8	b
Delta(1700) -,	81	-10.52	1700	57.60	1689.481		8	8	b
N(1710)	82	-3.08	1710	12.63	1706.924		8	9	b
K*(1680)	83	7.37	1717	65.69	1724.367		8	10	m
rho(1700)	84	4.37	1720	80.52	1724.367		8	10	m
f(0)(1710)	85	4.37	1720	23.09	1724.367		8	10	m
N(1720)	86	4.37	1720	51.10	1724.367		8	10	b
Sigma(1750)	87	-7.50	1750	10.22	1742.501	1	1	3	b
K(2)(1770)	88	4.39	1773	21.90	1777.387	1	1	5	m
Sigma(1775)	89	2.61	1775	0.17	1777.387	1	1	5	b
K(3)*(1780)	90	0.36	1776	15.98	1777.387	1	1	5	m
placeholder	91	0.00	0	0.00	1777.387	1	1	5	m
0	92	-0.01	1776.82	6.94	1777.387	1	1	5	m
tao	93	0.10	1776.82	0.57	1777.387	1	1	5	m
Lambda(1800)	94	4.98	1800	22.80	1601.087	1	0	6	b
Lambda(1810)	95	-5.02	1810	28.54	1601.087	1	0	6	b
pi(1800)	96	0.27	1812	27.43	1812.272	1	1	7	m
K(2)(1820)	97	-3.73	1816	32.24	1812.272	1	1	7	m
Lambda(1820)	98	-2.65	1820	8.07	1812.272	1	1	7	b
Xi(1820)	99	2.09	1823	0.73	1829.715	1	1	8	m
Lambda(1830)	100	0.00	1830	11.39	1829.715	1	1	8	b
phi(3)(1850)	101	-6.84	1854	9.55	1847.158	1	1	9	m

						100's	10's	1's	
	mesonbaryon cell i115	Accuracy	data (mev	KE	Sum of na	N	N	N	
					frequencie	17.4/15.4	15.4/13.	13.4/11.4	
		0.12		mev	mev -->	753.29	101.95	13.80	
D	102	0.02	1864.8	0.23	1864.601	1	1	10	m
D	103	0.11	1869.57	36.60	1864.601	1	1	10	m
Lambda(1890)	104	2.04	1880	2.51	1882.043	1	1	11	b
Delta(1905)	105	-3.64	1905	12.63	1901.358	1	2	1	b
Delta(1910)	106	6.65	1910	1.44	1918.801	1	2	2	b
Sigma(1915)	107	4.02	1915	0.33	1918.801	1	2	2	b
Delta(1920)	108	-0.75	1920	0.92	1918.801	1	2	2	b
Delta(1930)	109	9.98	1930	19.83	1936.244	1	2	3	b
Sigma(1940)	110	-3.76	1940	15.29	1936.244	1	2	3	b
f(2)(1950)	111	-6.51	1944	5.14	1936.244	1	2	3	m
Delta(1950)	112	3.91	1950	2.99	1953.687	1	2	4	b
D(s)	113	-0.13	1968.45	8.64	1971.129	1	2	5	m
a(4)(2040)	114	-7.43	1996	27.47	1988.572	1	2	6	m
D*(2007)	115	-0.92	2006.93	27.46	2006.015	1	2	7	
f(2)(2010)	116	-3.99	2010	25.33	2006.015	1	2	7	
D*(2010)	117	-0.05	2010.22	4.48	2006.015	1	2	7	
f(4)(2050)	118	5.46	2018	35.66	2023.458	1	2	8	
Sigma(2030)	119	-6.54	2030	41.19	2023.458	1	2	8	
K(4)*(2045)	120	-4.10	2045	49.94	2040.9	1	2	9	
Lambda(2100)	121	4.36	2100	10.09	1901.358	1	2	1	b
Lambda(2110)	122	-4.75	2110	10.09	1901.358	1	2	1	b
D(s)*	123	0.47	2112.3	0.00	2112.544	1	3	2	
N(2190)	124	-2.46	2115	5.77	2112.544	1	3	2	b
Lambda(c)	125	-0.13	2286.46	0.99	2288.843	1	4	1	b
f(2)(2300)	126	9.29	2297	14.20	2306.286	1	4	2	m
D(s0)*(2317)	127	0.05	2317.8	0.03	2323.729	1	4	3	m
D(0)*(2400)	128	5.73	2318	23.05	2323.729	1	4	3	m
f(2)(2340)	129	1.17	2340	2.36	2341.172	1	4	4	m
D(1)(2420)	130	0.06	2421.3	0.46	2428.385	1	4	9	m
Sigma(c)(2455)	131	0.05	2452.9	0.00	2445.828	1	4	10	b
Sigma(c)(2455)	132	0.09	2453.76	44.66	2463.271	1	4	11	b
Sigma(c)(2455)	133	-0.18	2454.03	44.66	2463.271	1	4	11	b
D(s1)(2460)	134	-0.06	2459.5	0.04	2463.271	1	4	11	m
D(2)*(2460)	135	0.00	2462.6	3.02	2463.271	1	4	11	m
D(2)*(2460)	136	0.34	2464.4	1.72	2463.271	1	4	11	m
Xi(c)	137	0.26	2467.8	11.06	2463.271	1	4	11	m
Xi(c)	138	-0.14	2470.88	3.17	2463.271	1	4	11	m
Sigma(c)(2520)	139	0.31	2517.5	0.33	2517.471	1	5	3	b
Sigma(c)(2520)	140	-0.08	2518	0.33	2517.471	1	5	3	b
Sigma(c)(2520)	141	-0.19	2518.4	0.28	2517.471	1	5	3	b
D(s1)(2536)	142	0.08	2535.28	19.92	2534.914	1	5	4	m
D(s2)*(2573)	143	-0.31	2572.6	0.50	2569.799	1	5	6	m
Xi(c)'	144	-0.82	2575.7	14.67	2569.799	1	5	6	m
Xi(c)'	145	-0.91	2578	14.45	2587.242	1	5	7	m
Lambda(c)(2595)	146	0.19	2595.4	0.02	2604.685	1	5	8	b
Xi(c)(2645)	147	-0.06	2645.9	0.01	2657.013	1	5	11	m
Xi(c)(2645)	148	0.45	2645.9	9.76	2657.013	1	5	11	m
Omega(c)	149	-0.18	2695.2	0.15	2693.771	1	6	2	b
Omega(c)(2770)	150	-0.09	2765.9	0.00	2763.542	1	6	6	b
eta(c)(1S)	151	0.52	2980.3	1.03	2974.727	1	7	7	m
J/psi(1S)	152	-0.01	3096.916	4.20	3097.518	2	0	6	m
chi(c0)(1P)	153	0.19	3414.75	7.44	3415.232	2	2	2	m
chi(c1)(1P)	154	-0.03	3510.66	6.59	3519.888	2	2	8	m
h(c)(1P)	155	-0.16	3525.41	0.00	3519.888	2	2	8	m
chi(c2)(1P)	156	0.00	3556.18	0.27	3554.774	2	2	10	m
eta(c)(2S)	157	1.78	3637	13.49	3643.86	2	3	4	m
psi(2S)	158	0.01	3686.09	45.18	3696.188	2	3	7	m
psi(3770)	159	0.19	3769.92	0.47	3765.959	2	3	11	m
chi(c2)(2P)	160	-0.24	3927.2	0.72	3924.816	2	4	9	m
psi(4040)	161	-0.36	4039	8.06	4048.788	2	5	5	m
psi(4160)	162	0.67	4153	13.37	4153.444	2	5	11	m
b	163	0.20	4190	0.00	4190.202	2	6	2	m
psi(4415)	164	-2.17	4421	4.84	4418.83	2	7	4	m
B	165	-0.13	5279	21.87	5281.705	3	4	1	m
B	166	0.17	5279.17	17.01	5281.705	3	4	1	m
B*	167	-0.20	5325.1	0.00	5334.033	3	4	4	m
B(s)	168	0.39	5366.3	14.03	5368.919	3	4	6	m
B(s)*	169	0.77	5415.4	0.00	5421.247	3	4	9	m
Lambda(b)	170	0.09	5620.2	7.84	5614.989	3	5	9	b
B(2)*(5747)	171	0.54	5743	0.67	5756.404	3	6	6	m
Xi(b)	172	0.79	5790.5	23.98	5791.289	3	6	8	m
Xi(b)	173	-1.70	5790.5	0.96	5791.289	3	6	8	m
Sigma(b)	174	0.93	5807.8	0.00	5808.732	3	6	9	b
Sigma(b)	175	0.82	5815.2	0.00	5826.174	3	6	10	b
Sigma(b)*	176	-2.83	5829	0.00	5826.174	3	6	10	b
Sigma(b)*	177	-2.83	5829	0.00	5826.174	3	6	10	b
Sigma(b)*	178	-1.91	5836.4	0.00	5843.617	3	6	11	b
B(s2)*(5840)	179	0.10	5836.4	0.00	5843.617	3	6	11	m
Omega(b)	180	4.34	6070	0.03	6074.117	3	8	2	b
B(c)	181	-1.85	6277	26.10	6285.303	3	9	3	m
Upsilon(1S)	182	-0.09	9460.3	38.76	9454.464	5	10	2	m
chi(b0)(1P)	183	-0.44	9859.9	0.25	9858.211	6	4	6	m
chi(b1)(1P)	184	0.01	9892.8	0.25	9893.097	6	4	8	m
chi(b2)(1P)	185	-0.19	9912.2	0.25	9910.539	6	4	9	m
Upsilon(2S)	186	0.13	10023.26	27.20	10017.07	6	5	4	m
chi(b0)(2P)	187	0.03	10232.5	0.25	10228.25	6	6	5	m
chi(b1)(2P)	188	-0.37	10255.5	0.25	10263.14	6	6	7	m
chi(b2)(2P)	189	0.01	10268.6	0.25	10280.58	6	6	8	m
Upsilon(3S)	190	-0.07	10355.2	10.94	10352.22	6	7	1	m
Upsilon(4S)	191	-0.20	10579.4	0.53	10579.67	7	0	6	m
Upsilon(10860)	192	4.17	10876	3.81	10879.94	7	2	1	m
Upsilon(11020)	193	0.71	11019	7.86	11019.49	7	2	9	m

Mu and Tau

The Mu and Tau are part of the electron family in the same way that the down, strange and bottom are family members. The mu and tau appear to be heavy electrons from the standpoint of spin and charge. The present analysis treats these particles as combinations of natural frequencies just like the mesons and baryons. However, interestingly, the mu and tau contain no quarks. The mu contains an electron and a field of 27.2e-6 mev, like the electron, but is apparently not a double particle. The tau appears to be a double particle with a field of 27.2e-6 mev. It is possible that for a brief time the potential quarks are exactly balanced at zero as suggested below. The quark pairs could be attracted to their fields and orbit in pairs, again colliding in the cross-over zone. The decay of the tau into a mu, kaon and neutrino suggest that quarks are produced in the decay process.



	maintable	Calculatec	Spin		0.5		0	0.5	0.5			0.5	0.5								
		Meson	N	15.4	15.4			13.4	13.4			11.4	11.4	10.3	10.1	12.4		10.3		0.10	average ac
	PDG	Energy	particle	strang	strang	down	anhil ke	down	down	up ke	anhil ke	up	up	anil k	elect	repris	neutri	ke plu	ke plus		
Name	MEV	MEV	calculation	102	102	####	13.8	13.8	13.8	11.9	1.87	1.87	1.87	0.62	0.51	5.08	0.67	0.6	0.11	Eaccurac	E meas
mu	105.658367	105.66	105.66			1.00				2.00	0			6.00	1				-4	-0.0004	0.000004
tao	1776.82	1776.922	888.46			2.00	7.00			0.00	0			0.00	-1				2.5	0.10	0.16

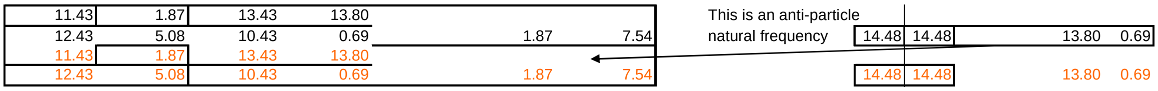
Summary

Baryon and meson masses, with a few exceptions, were simulated within experimental error using the concept of fundamental frequencies. The overall averages and standard deviations were well within the accuracy of measurements. In addition, all decays times were simulated with reasonable accuracy, although a few individual particle decay times fell slightly outside of experimental error. The average ratio of predicted decay time/actual decay time for all the mesons and baryons was 0.11 and the standard deviation was 1.2. Another feature of the theory is that it may indicate how mesons decay and why there are numerous decay modes.

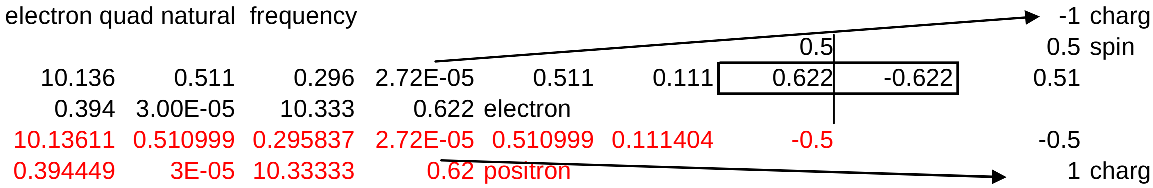
Overall, consideration of meson and baryon properties supports the theme of reference [1].

Appendix 1 Illustrations of anti-particles

The concept of an anti-particle is fundamental to the understanding of mesons. Mesons are thought to be comprised of particle/anti-particle pairs. At the natural frequency, the fields and mass plus kinetic energy are exactly balanced. It is proposed that the energy of the fields can be borrowed for a short amount of time and that the energy borrowed includes the anti-particle. The diagram below shows the up quark (1.87 mev) and below it the anti-up quark (1.87 mev).



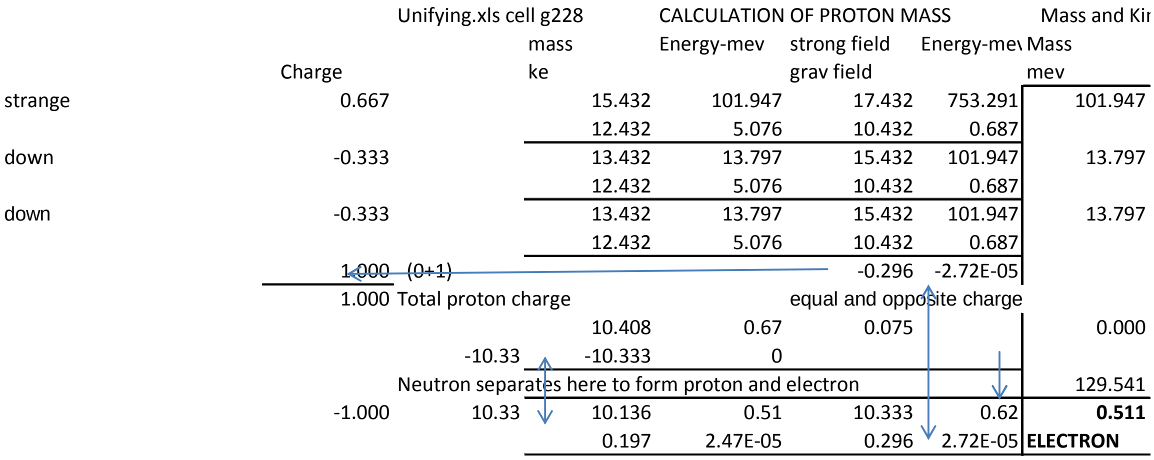
11.43	1.87	13.43	13.80			This is an anti-particle				
12.43	5.08	10.43	0.69	1.87	7.54	natural frequency	14.48	14.48	13.80	0.69
11.43	1.87	13.43	13.80							
12.43	5.08	10.43	0.69	1.87	7.54		14.48	14.48	13.80	0.69



electron quad natural frequency								-1 charg
						0.5		0.5 spin
10.136	0.511	0.296	2.72E-05	0.511	0.111	0.622	-0.622	0.51
0.394	3.00E-05	10.333	0.622	electron				
10.13611	0.510999	0.295837	2.72E-05	0.510999	0.111404	-0.5		-0.5
0.394449	3E-05	10.33333	0.62	positron				1 charg

Charge separation for Protons and Neutrons

An alternate charge separation process identified for the proton and electron is reviewed below. Recall from reference 1 that the proton and neutron contain a third quad. This quad is evident because the energy value -0.679 mev is subtracted to give the exact mass of the proton instead of the value -0.689. It is possible that the quad is active for other baryons.



		Unifying.xls cell g228		CALCULATION OF PROTON MASS			Mass and Kir
			mass	Energy-mev	strong field	Energy-mev	Mass
	Charge		ke		grav field		mev
strange	0.667		15.432	101.947	17.432	753.291	101.947
			12.432	5.076	10.432	0.687	
down	-0.333		13.432	13.797	15.432	101.947	13.797
			12.432	5.076	10.432	0.687	
down	-0.333		13.432	13.797	15.432	101.947	13.797
			12.432	5.076	10.432	0.687	
	1.000	(0+1)			-0.296	-2.72E-05	
	1.000	Total proton charge			equal and opposite charge		
			10.408	0.67	0.075		0.000
		-10.33	-10.333	0			
		Neutron separates here to form proton and electron					129.541
	-1.000	10.33	10.136	0.51	10.333	0.62	**0.511**
			0.197	2.47E-05	0.296	2.72E-05	**ELECTRON**

Mesons are composed of quark pairs but each pair must be balanced. Pairs of quarks and anti-quarks can have zero charge, or positive one charge or negative one charge. (0=-0.33+0.33) (0=-.66+.66) or (1=0.66+.33), (-1=-0.66-.33).

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