Baryon and Meson Mass and Decay Time Correlations

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Abstract

Experiments at high energy labs have resulted in a large volume of data regarding approximately 200 unstable baryon and meson particles. Experimenters gather this information with the goal of understanding the basic principles that give these particles their masses, decay times and other properties.

This paper extends a theory that accurately matches the neutron and proton mass to the remainder of the baryons and mesons. It is shown that baryons and mesons are composed of quarks and kinetic energy components that make up the proton and neutron. The goals of this study are to:

- Calculate the meson and baryon masses and compare calculations with Particle Data Group listed particle masses.
- Explain the basic energies that form mesons and baryons and relate them to a entropy (N), defined by N=ln(E/eo) where e0 is a constant for all fundamental particles.
- Show diagrams of the baryons and mesons.
- Explain the process that allows transition to new combinations of mesons and baryons and ultimately to protons, neutrons, electrons, neutrinos and energy.
- Explain the mechanism for decay and correlate all the particle decay times.
- Explain why some mesons and baryons have comparatively slow decay times.
- Identify the quarks in the mesons and baryons and compare their properties with Particle Data Group iso-spin, spin and charge.
- Suggest a mechanism for decay modes and correlate branching for a few example particles.

Results: Mesons and baryons masses are matched within experimental error except for three low mass mesons that are matched within 0.02 MeV. All decay times agree with measured decay times within experimental error.

The neutron mass model

All mesons and baryons are simple combinations of energy values found in the model of the proton. A review of the neutron model is presented below to help understand their origin.

The formal definition of information is attributed to Claude Shannon. Information (N) = -ln P (Inversely, P=1/exp(N) where exp(N) means the natural number 2.718 to the power N). Probabilities are the chance of one event divided by all possibilities. He used natural logarithmic relationships because probabilities (P) multiply but information is additive. The negative sign tells us that information is high when probabilities are low.

Can energy (E) be related to information? Using the right probability, the answer is yes. Probability P=e0/E where e0 is an energy constant that forms an energy ratio. Quantum mechanics deals with the square root of P (a complex number called psi). This is tied to wave/particle duality but the relationships of interest are described by probability P=e0/E=1/exp(N) and E=e0*exp(N).

N for fundamental energy values

The relationship E=e0*exp(N) will be used extensively. N is a logarithmic number. The key to N values for energy was correlation of data gathered by high energy labs [6]. Comparing N values for particles and knowing that the 0.511 Million Electron Volts (MeV) electron has a field equal to 2.72e-5 MeV, allowed the author to deduce that the electron N was 10.136 and its electromagnetic field energy N was 0.296=3*0.0986=3*ln(3/e) where e is the natural number 2.718. The energy constant e0=2.02e-5 MeV is calculated below from Particle Data Group [6] data for the electron mass. The universal equation for energy is E=2.02e-5*exp(N) MeV.

Electron N	**10.136**	**(10.3333-0.0986*2)**					
Electron mass (mev)		**mass of electron (MeV)**		**0.51100024**	**MeV**		
Find the value e0 by solving the above equation with E=.511						**e0=E/exp(N)**	
						e0= 0.511/exp(10.136)	
						2.025E-05	**mev**
Note that 3*.0986=.296				**E=eo*exp(.296)=2.72e-5 mev**		**2.722E-05**	**mev**
The electric field energy of the electron is known to be: (MeV)						**2.72E-05**	**mev**

Data showing an N value for fundamental energy observations is listed in Appendix 5. The data is from either from NIST, (National Institute of Standards and Technology), the Particle Data Group (PDG) [6] maintained by UC Berkeley or other reported values [5][7]. There are three quarks confined in a neutron (and proton) but they are not observed individually. The higher energy bosons are variations of N=22.5 and the Higgs particle measured in July 2010 agrees well with the author's N value of 22.575. Time for fundamental particles is simply reciprocal time (1/time=frequency).

Neutron components

The author found N values for neutron components based on the way three quark masses and their kinetic energies add to the neutron mass. The related information components total N=90 for the neutron. They are listed in Table 1 below.

	Neutron particle and kinetic energy N			Neutron field energy N		
Quad 1	15.43	quark 1	17.43	strong field 1		
	12.43	kinetic energy	10.43	gravitational field component		
Quad 2	13.43	quark 2	15.43	strong field 2		
	12.43	kinetic energy	10.43	gravitational field component		
Quad 3	13.43	quark 3	15.43	strong field 3		
	12.43	kinetic energy	10.43	gravitational field component		
Quad 4	10.41		-10.33			
	-10.33		10.41	gravitational field component		
Quad 4'	10.33	pre-electron	10.33			
	0.00		0.00			
	90.00	Total	90.00	Total		
	Table 1		Table 2			

Table 2 is similar to Table 1 except it contains N values for field energies of the neutron. Since the neutron does not carry charge, the electromagnetic field is absent but appears as a separation once the neutron decays to a proton (quads 4 and 4'). The strong residual field energy is part of a total energy balance. Sets of four N values labelled quads are involved in an information operation.

Table 1 represents mass plus kinetic energy and Table 2 represents field energy. Set 1 will be used as an example for a quad that contains four values. The N values 15.43+12.43 are separated into 17.43+10.43. This operation conserves N but energy is also conserved. After these operations mass is imbedded in field energy quantum orbits. Each N has a specific place and a specific energy described below. N1 always gives a mass, N2 always represents a kinetic energy value, N3 always specifies strong field energy and N4 always specifies a second field energy (associated with gravity).

E1 will be identified as a mass (a quark for the strong interaction)
E2 is identified as a kinetic energy (ke) addition to energy E1.
E3 is identified as strong field energy.
E4 is identified as a gravitational field energy component.

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

							641.88	= 753+.69-101.95-5.08-5.08			
	N for Neutron Energy Interactions							**Residual ke**	**Expansion**		**Field**
	mass	**Energy**	**S field**	**Energy**	**Mass**	**Difference KE**			**KE**	**Strong field**	
	ke	**MeV**	**G field**	**MeV**	**mev**	**mev**		**mev**	**mev**	**MeV**	**MeV**
Quad 1	15.43	101.95	17.43	753.29	101.95	641.88		10.15		-753.29	
	12.43	5.08	10.43	0.69							-0.69

The table above shows quad 1 values to the left of a vertical line. Fundamental N values (15.431, 12.431, 17.431 and 10.431) are shown in this area. These N values are the source of the energies (E=e0*exp(N)). The right side of the table displays the results of an information operation on the quad values. The kinetic energy operator N=12.431 gives mass N=15.43 kinetic energy. It's associated energy=2.025e-5*exp(12.431)=5.01 MeV. The right hand side of the table shows the quark mass (101.95 MeV) and its kinetic energy. The value of the quarks kinetic energy is equal to 641.88 MeV =E3+E4-E1-E2= 753.29+0.69-101.95-5.08-5.08 MeV. The right hand side of the table also shows the value 10.15 MeV. This is also a kinetic energy but represents the weak kinetic energy of the quark. The fields are shown on the far right. There are two fields, one is the strong field energy that captures the quark and holds the quark in a tight orbit. The second field is a portion of the gravitational field. This will become clear when the other quads are described below. The operation preserves zero energy with mass plus kinetic energy positive and field energy negative. Mass plus kinetic energy = 101.95 MeV+ 641.88+10.15= 753.98. Field energy = -753.29-0.69= -753.98. This means that the information operation conserves zero energy with mass plus kinetic energy (753.98 MeV) separated from field energy (753.98).

	Neutron particle and kinetic energy N		Neutron field energy N
Quad 1	**15.43**	quark 1	**17.43**	strong field 1
	12.43	kinetic energy	**10.43**	gravitational field component
Quad 2	**13.43**	quark 2	**15.43**	strong field 2
	12.43	kinetic energy	**10.43**	gravitational field component
Quad 3	**13.43**	quark 3	**15.43**	strong field 3
	12.43	kinetic energy	**10.43**	gravitational field component
Quad 4	**10.41**		**-10.33**	
	-10.33		**10.41**	gravitational field component
Quad 4'	**10.33**	pre-electron	**10.33**	
	0.00		**0.00**	
	90.00	Total	**90.00**	Total
	Table 1		Table 2	

Next assemble the components (5 quads) into a model of the proton. Information (N) values from the neutron component table model the neutron's known mass, 939.5654 MeV within NIST experimental error. The neutron (after transition discussed below) contains one strange quark (mass=101.95 MeV) and two up quarks (mass=1.87 MeV). The remainder of the proton mass is kinetic energy. Below, the numbers in bold type originate from the left side quads. The exact neutron mass is 939.5654 MeV = 105.6813 mass+823.7328 ke+10.1513 ke. The table below contains the same overall energy balance of zero but components have been rearranged to help explain mesons and baryons. It will be shown below that the highlighted quanta (651.34, 88.15, 11.93 and 1.87 MeV) are used in simple combinations to give all meson and baryon masses.

Unified.xls cell g191				Mass and Kinetic Energy						Field Energy
mass	Energy-mev	S field	Energy	Mass	Difference KE	strong residual ke	Neutrino	Expansion	Strong field	Gravitational
ke		G field	mev	mev	mev	mev	mev	KE or PE	energy mev	Energy mev
15.432	101.95	17.432	753.29	**101.95**	**651.34**				**-753.29**	
12.432	5.08	10.432	0.69		**2.06**					**-0.69**
11.432	1.87	13.432	13.80	**1.87**	**88.15**				**-101.95**	
12.432	5.08	10.432	0.69		**11.93**					**-0.69**
11.432	1.87	13.432	13.80	**1.87**	**88.15**			**10.15**	**-101.95**	
12.432	5.08	10.432	0.69		**11.93**			**10.15**		**-0.69**
					-30.45	**10.15**				
-10.333	0.00E+00	-10.333	0.00E+00	**0.00**	**0.00**		**0.67**	**t neut ke**	**0.0E+00**	**-0.67**
10.408	0.67	10.408	0.67				**0.0**	**neut m**		
10.33	0.62	10.333	0.62	**0.00**	**0.62**				**-0.62**	
0.000	0.000E+00	0	0.00E+00							**0.00**
				105.6813	**823.733**	**939.5654133**	**0.67**	**20.30**	**-957.807**	**-2.73**
90.000 sum		90.000 sum				**NEUTRON MASS**		**Total m+ke**	**Total fields**	
								Total positive	**Total negative**	
								960.539	**-960.539**	**0.00E+00**

Nature re-arranges the neutron energy by separating [9] kinetic energy that originates in the quads for two special purposes. The value 10.15 MeV becomes the weak kinetic energy in the neutron that changes and causes the binding energy change during fusion [2]. Also, kinetic energy (20.30 MeV) is separated from the neutron and become expansion kinetic energy and expansion potential energy. The gravitational field energy - 2.732 MeV and expansion kinetic energy 10.15 MeV play crucial roles in cosmology. The bottom quad is for the electron after it has decayed from the neutron [9].

Tables 1 and 2 above each sum to the value N=90 but are separated opposites. This separates zero energy into two types of energy. Mass plus kinetic energy is positive and field energy is negative. The total energy for each neutron (939.56 MeV) plus the external kinetic energy that drives expansion is 960.54 MeV but the fields are negative 960.54 MeV. This conserves the other initial condition; zero energy.

Energy (MeV) = 960.54-960.54=0.

Literature indicates that there are three quarks in the proton. One quark is a strange quark with 101.95 MeV but the other two could be two up quarks or one up and one down quark. The table below shows transitions that result in the same mass with different quarks.

Total Mass of Neutron after transition to 2 up		Total Mass of Neutron possible transition to 1 up & 1 down	
101.95	quark	101.95	quark
651.34	ke	651.34	ke
88.15	ke	88.15	ke
88.15	ke	88.15	ke
11.93	ke	21.99	2*11.93-1.87
11.93	ke	1.87	up quark
3.73	(2 up quarks 2*1.87)	3.73	down quark
2.06	(3*0.687)	2.06	(3*0.687)
0.62	neutrino	0.62	neutrino
-20.30	expansion ke	-20.30	expansion ke
939.57		939.57	

The above neutron mass agrees with the mass reported by the particle data group within 7e-9 MeV (NIST data).

931.4940281	nist		0.510998946	0.510998946	0.5109989		0		1.30E-07
931.4940282	pdg	548.579909	0.51099893		0.5110003		-1.34958E-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)	(mev)				
Neutron	pdg	1.00866492	939.5653799	939.5653457	939.5654133	1.008665	-3.339281E-05	-7.2522E-08	
Proton	pdg	1.00727647	938.2720460	938.2720136	938.2720733	1.0072765	-2.732227E-05	-6.4104E-08	
Neutron/electron	1838.683662		939.5654133	nist	939.5654133		7.1858040E-09		6.20E-09
Proton/electron	1836.152674		938.2720814	nist	938.2720733		8.0357328E-06		6.2E-09

The author believes that nature is a manifestation of the neutron model. It was shown in previous documents to unify the four fundamental interactions [1]. The weak kinetic energy value 10.15 MeV was used to accurately model the binding energy curve for fusion [2] and 10.15 MeV of expansion energy was used in a cosmology model [3][10] that agrees with WMAP [8][11] data.

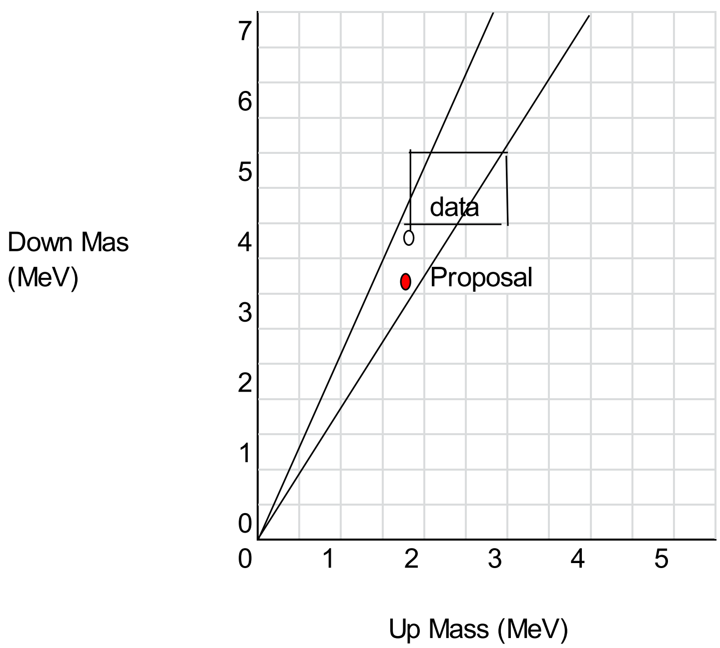
Particle Data Group data comparison

There are differences between the proton/neutrons and the other baryons. The above neutron diagram is based on zero energy and zero entropy as an initial condition. Mesons and baryons conserve zero in a slightly different way that protons and neutrons. There is no reference to N=10.43 (0.69 MeV) and another difference is their decay times. The neutron decays in 881 seconds and no proton decays have been observed. It will be shown that all the baryon and meson masses will be combinations of 651.34, 88.15, 11.93, and 1.87 MeV and the quarks they form. These values are quanta similar to the way electronic shells describe electromagnetic energy. The other values we carry forward from the proton mass model are the field energies that correspond to the N series 11.43, 13.43, 15.43 and 17.43.

Recent (2017 PDG) quark mass data was reviewed. Comparison masses from the neutron mass model are shown.

	cell h6 2017 PDG Data MeV	N quark	Comparison masses Quark Mas energy MeV	PDG charge
UP	**2.30**	11.43	**1.87**	0.67
1.87 in range		12.43	5.08	
			2X	
decays to down		13.43	13.80	-0.33
DOWN	**4.60**		**3.73**	
STRANGE	**102.00**	15.43	**101.95**	-0.33
CHARM	**1275.00**	17.98	**1302.69**	0.67
1302 in range				
BOTTOM	**4180.00**	19.14	**4172.51**	-0.33

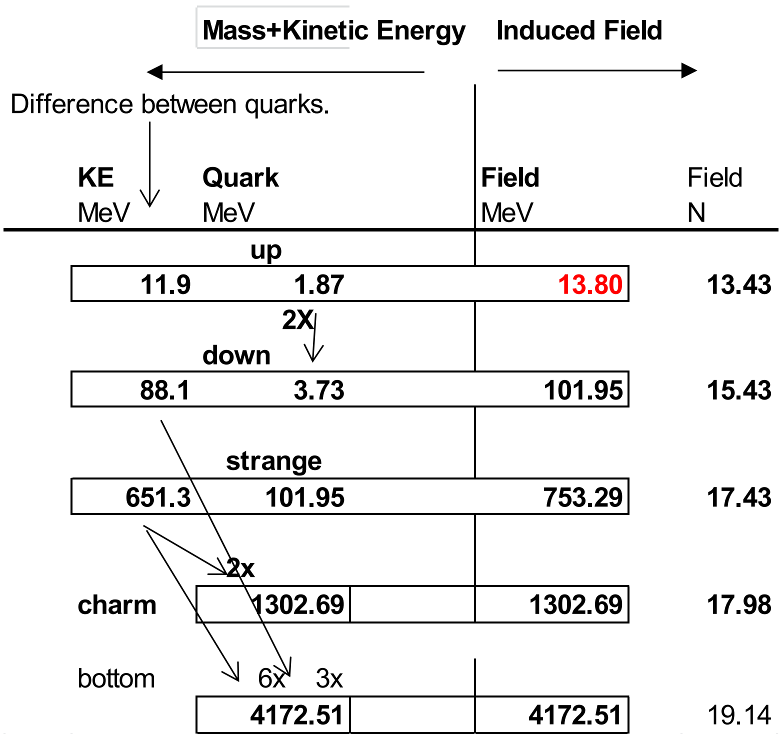
Note: There is a mass N series (11.43+2=13.43+2=15.43) that suggests there should be a quark at (13.8 MeV). It is not observed, perhaps because it decays to a 2*1.87 =3.73 MeV down quark. The proton/neutron mass model above contains this transition. The PDG data for the up and down masses is shown below. There is data close to the proposal above.



rpp2014-rev-quarkmasses.pdf
Figure 2

Balanced mass, kinetic energy and field energy

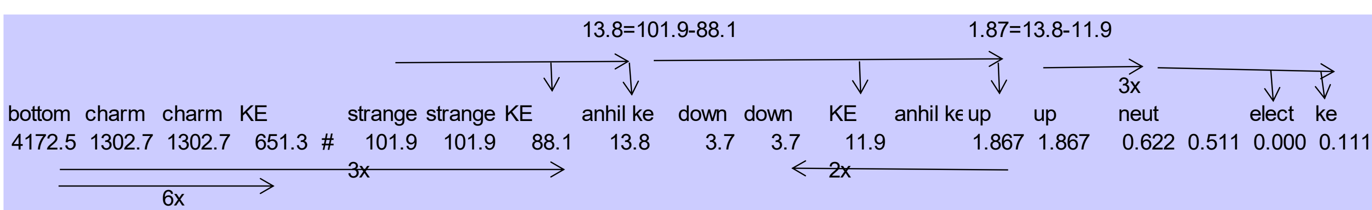
The diagram below shows the relationships between mass, kinetic energy and field energy. The sum is zero for each line considering mass + kinetic energy as positive and the fields as negative except the down mass is 3.73, not 13.8 MeV. Reference 9 describes “separations from zero” as a unifying principle of nature.



19.14=LN(4172.51/2.02e-5)
17.98=LN(1302.7/2.02e-5)

Decay Paths

There is a relationship between energy values that allows quarks to decay because each lower energy quanta is a subtraction of immediately higher energy quanta.



The bottom quark 4172.5 decay path is KE values 6* 651.3 + 3*88.1 MeV.
The charm quark 1302.7 decay path is 2* 651.3 MeV.

The strange quark 101.9 decay path is KE values 88.1+13.8 MeV but 13.8=11.93+1.87 MeV (the up quark) or 2*1.87 (the down quark).
The down quark 3.7 decay path is 2*1.87 MeV
The up quark 1.87 decay path is exactly 3*0.622 MeV (three neutrinos).
The 0.622 neutrino can decay into the electron 0.511+0.111 MeV of kinetic energy.

Each decay path can end in a lower energy quark as follows (quark number is conserved by re-arrangement of energy quanta).

The charm quark is 2x 651.3, (a portion of the bottom quark).
The strange quark 101.9=88.1+13.8 but 13.8=11.93+1.87 MeV (the up quark).
The down quark is 2x the up quark.

Mesons finally decay into neutrinos (0.622 MeV), electrons (0.511 MeV) or gamma rays (created when anti X and X opposites decay) and kinetic energy but 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 decay paths described above means that all the baryon and meson energies will be multiples of 651.34, 88.15, 11.93 MeV. In addition there should be low multiples of 1.87 MeV included in the meson or baryon mass. Sometimes this mass is missing from the measured values because it has been ejected as neutrinos, electrons or fractions or multiples of 0.111 MeV. The following table compares PDG listed meson mass with multiples of the quanta listed above. The numbers in the table multiply the MeV values in the header columns and are added across to the calculated MeV. This table forms the basis of the mass calculations in Appendix 1. The numbers in the table are those required to keep kinetic energy positive in the column when the quarks form and re-arrange where the energy resides.

	KE MeV	Quark MeV	
	11.93	1.87	up
	88.15	3.73	down
	651.34	101.95	strange

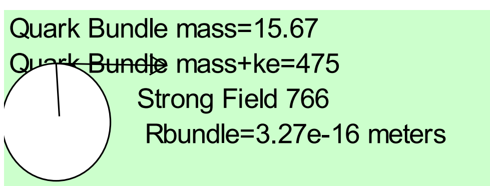
Name PDG	difference calc-data MeV	Particle Data Group MeV	4 energy calculation MEV -->	651.34	88.15	11.93	1.87
mu	0.02	105.65837	105.68		1	1	3
pi0	-0.01	134.9766	134.96			11	2
pi	0.03	139.57018	139.60		1	4	2
f(0)(500)	1.54	475	476.54		5	3	0
K	-0.69	493.677	492.98		3	19	1
K(S)0	0.01	497.614	497.62		4	12	1
K0	0.01	497.614	497.62		4	12	1
K(L)0	0.01	497.614	497.62		4	12	1
eta0	-0.64	547.853	547.21		4	16	2
rho(770)	-0.21	775.49	775.28	1	1	3	
K*(892)	-0.63	891.66	891.03	1	2	5	2
K*(892)	0.27	895.81	896.08		8	16	
eta'(958)	1.09	957.78	958.87	1	2	11	
a(0)(980)	-0.82	980	979.18	1	3	5	2
f(0)(980)	-0.82	980	979.18	1	3	5	2
phi(1020)	-0.93	1019.455	1018.52	1	2	16	
h(1)(1170)	0.96	1170	1170.96	1	4	14	
b(1)(1235)	0.33	1229.5	1229.83	1	6	4	1
a(1)(1260)	-0.17	1230	1229.83	1	6	4	1
K(1)(1270)	-3.61	1272	1268.39	1	7		
f(2)(1270)	-6.71	1275.1	1268.39	1	7		
f(1)(1285)	-1.48	1281.8	1280.32	1	7	1	
eta(1295)	-1.75	1294	1292.25	1	7	2	
pi(1300)	-7.75	1300	1292.25	1	7	2	

The column labelled 4 energy calculated energy adds multiples of the values in the header to form a series. The sample above is typical of 196 mesons and baryons. The calculated value is typically larger than the measured value because energy can exit the particle after it forms. The kinetic energy above is converted into pairs of quarks in mesons and 3 quarks in baryons. Multiples of 0.622 MeV neutrinos, 0.511 MeV electrons and multiples of 0.111 MeV are ejected as final decay occurs.

Steps in forming mesons from accelerator collisions

Mass plus kinetic energy is positive and field energy is negative in this work. The first step is production of kinetic energy from the accelerator. It is quantized into multiples of 651.34, 88.15, 11.93 and 1.87 MeV. Nature tries to maintain energy zero and when the kinetic energy forms, opposing fields form. The fields have N=13.43, 15.43, 17.43 and 19.14. The energy associated with these fields is too negative and mass fills in the gap to re-establish zero (or near zero). This follows the separation theme developed in reference 9. Quark mass pairs form (often of different values) from the kinetic energy available. The concept of an anti-particle is fundamental to the understanding of mesons. Mesons are thought to be comprised of one quark and one anti-quark. Anti-particles are particles moving backward in time (but mass is always positive). There is a third property called parity that conjugates with charge and time. Step 4 results in a “quark bundle” that contains both quarks plus their kinetic energy held into a tight orbit (approx. 2e-16 meters radius) by strong fields. The entire bundle has a small amount of kinetic (units or fractions of 0.111 MeV) and is held into a larger radius (approx. 1e-15 meters) by weak field energy. The weak field energy for all mesons and baryons (including the proton and neutron) is 4*5.08=20.3 MeV (this is a field energy because it is “missing energy” with fields overall more negative than the neutron mass). The N values for the strong fields are involved in meson decay. After decay, the quarks form jets of other mesons. The decay process is repeated and again, the 20.3 MeV field contains the quark bundle and subsequent decays occurs. Often the second decay involves pi, muon or K mesons. Finally, all the mesons decay into electrons, neutrinos and kinetic energy.

The quark pairs and their kinetic energy orbiting in a combined strong field (a quark bundle) are diagrammed below. Most of the mass and kinetic energy in the baryon or meson is concentrated in this orbit. For the fo(500) meson, this orbit has radius 3.27e-16 meters.



R= (HC/2pi)/(mass/gamma*field)^0.5=1.973e-13/(15.67/(0.033*766))=3.27e-16 meters
Where HC/2pi=1.973e-13 MeV-meters.

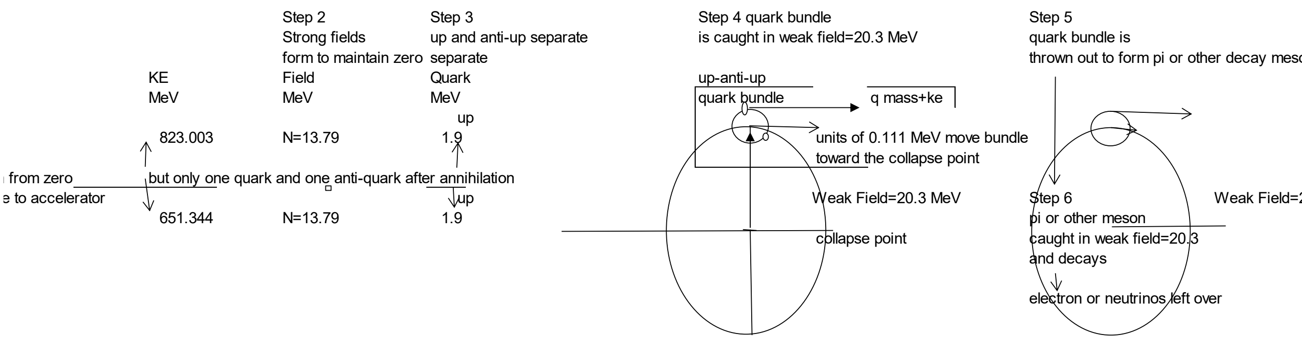
Example: mu and tauon

Below, the mu and tauon component multiples of 651.34, 88.15, 11.94 and 1.87 MeV (labelled KE before) are converted into quark pairs with kinetic energy. Each particle mass is calculated after quark formation by re-arranging the components multiples (re-arrangement is possible through the decay paths described above). The mass is calculated by adding the table values with the header masses across the width of the table. After quark formation, the right side of the table shows the electron (0.511 MeV) and neutrino (0.622 MeV). The formation of one electron means that the tauon(1776) has charge of minus 1 but a neutrino has been ejected (negative). Both calculated masses are within experimental error (labelled E measured in the table below).

Appendix 1 shows all the meson and baryon mass calculations. There are two columns for each quark, the left side designating the anti-quark which has opposite spin, parity, charge, etc. All masses are within experimental error with the exception of the mu and pi which are within 0.02 MeV.

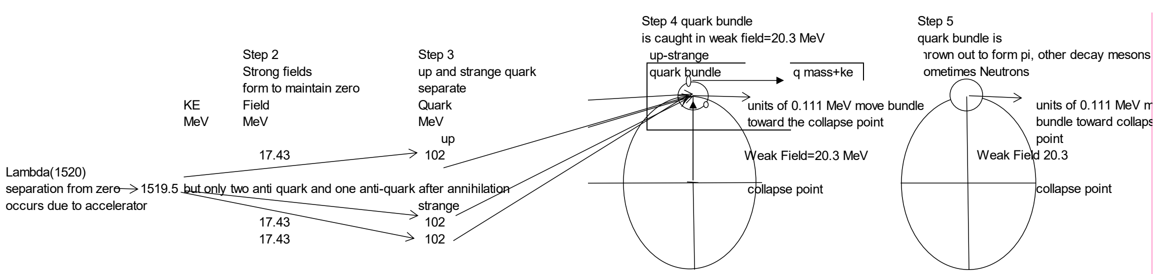
																			Electrons, neutrinos a		
				Fields	19.14	17.98	17.98		17.43	17.43			17.43	17.4			13.4	13.4	subtract from Meson		
				parity		-1	1.00		-1	1			-1	1			-1	1			
			Particle	iso-spin I	0	0	0.00						-0.5	0.5			-0.5	0.5			
			Mass	Charge		-0.667	0.667		-0.333	0.3333			-0.33	0.33			-0.67	0.67	-1		weak
			Calculated	spin		-0.5	0.5		-0.5	0.5			-0.5	0.5			-0.5	0.5	0.5		ke
	PDG		Meson		19.14	17.98	17.98	difference	15.432	15.432	difference		13.43	13.4	diff		11.4	11.4	10.14	10.43	
	MEV		Energy		bottom	charm	charm	KE	strange	strange	KE	anhil ke	down	down	KE	anhil ke	up	up	elect	neut	ke
Meson	PDG		MEV	0.00	4172.5	1302.7	1302.7	651.34	101.95	101.95	88.15	13.80	3.73	3.73	11.93	1.87	1.87	1.87	0.51	0.622	0.11
ke components	105.6584	0.02	105.68					0			1				1	3					
mu	105.6584	0.02	105.68								1			1	1		1		1	-1	1
ke components	1776.00	0.45	1776.45					2			4				10	1					
Tauon	1776.82	-0.83	1776.45			1.00				1.00	3.00				9.00				1.00	-1.00	1.00

This meson formation/decay process is diagrammed below for the a0(1450):



Steps in forming Baryons: example Lambda(1520)

The accelerator excites multiple difference energies but baryons consist of 3 quarks and kinetic energy when they are measured. A diagram is shown below for the Lambda(1520) baryon.



When the collisions occur opposing fields develop to maintain zero. Quarks are separated from each other, taking energy from the difference kinetic energy quanta. The quarks take on fractional charge. Baryons decay is similar to mesons except sometimes other baryons are in the decay products. This is possible again due to the kinetic energy and quark decay paths. Literature lists “branching fractions” describing the intermediate states but all baryons eventually decay to protons, neutrons electrons/positrons, neutrinos and kinetic energy. The 1.87 MeV quark equals 0.622*3. This provides a path for the quarks to decay. The 0.622 MeV energy is a neutrino and a mass that decays to an electron. The 0.622 MeV neutrino can release a 0.511 MeV electron and 0.111 MeV of kinetic energy.

Mass simulations for mesons and baryons

The above table represented multiples of 651.34, 88.15, 11.94 and 1.87. Subtract or add one electron mass from the above table depending on whether the meson or baryon is a charged particle. In addition adjust the above table for multiples of 0.11 MeV but these multiples must predict the decay time. This means that the resulting energies are highly constrained because they must meet match both the mass measurements and the decay measurements. The table below shows the results. The number of multiples of 651.34, 88.15, 11.94 is the same as the previous table but quark energies are added (and subtracted just like nature does) to arrive at a final energy. Compare the energy to measured values and the listed experimental accuracy. Notably, all baryons add to the measured value within the measurement error (Measured Accuracy).

				Field N	19.14	17.98	17.98		17.43	17.43			15.43	15.43			13.4	13.4	Electrons, neutrinos a		
				parity		-1	1		-1	1			-1	1			-1	1	subtract from Meson		
				iso-spin I	0	0	0						-0.5	0.5			-0.5	0.5			
				Charge		-0.67	0.67		-0.33	0.33			-0.33	0.33			-0.67	0.67	-1	10.33	weak
				spin		-0.5	0.5		-0.5	0.5			-0.5	0.5			-0.5	0.5	0.50	0.62	ke
	Data	Delta	Meson	Quark N	19.14	17.98	17.98	difference	15.43	15.43	difference		11.43	11.43	diff		11.43	11.43	10.14	8.43	
name	PDG	accuracy	Energy	MeV	bottom	charm	charm	KE	strange	strange	KE	anhil ke	down	down	KE	anil ke	up	up	elect	neut	ke
	MEV	MeV	MEV	Measured	4172.5	1302.7	1302.7	651.3	101.9	101.9	88.15	13.8	3.73	3.73	11.93	1.87	1.87	1.87	0.51	0.62	0.11
				Accuracy																	
mu	105.6584	0.02	105.7	0.00				0.00			1	0		1	1	0	1		1	-1	1
pi0	134.9766	0.03	135.0	0.00				0.00			0	0		1	11	-1		1		-1	6
pi	139.5702	0.03	139.6	0.00				0.00			1	0	1	1	4	-2			1	-1	1
f(0)(500)	475	1.65	476.7	150.00				0.00			5	0	1	1	3	-4					1
K	493.677	0.04	493.7	0.03				0.00	1	1	1	0			17	-1			1		2
K(S)0	497.614	0.01	497.6	0.05				0.00			4	0		1	12	-2		1			
K0	497.614	0.01	497.6	0.05				0.00	1	1	2	0			10	-1					
K(L)0	497.614	0.01	497.6	0.05				0.00	1		3	0		1	11	-2					
eta0	547.853	-0.02	547.8	0.04				0.00	1	1	2	0			14	0				1	
rho(770)	775.49	-0.10	775.4	0.50				1.00			1	0		1	3	-3		1			1
K*(892)	891.66	0.44	892.1	0.52				1.00	1		1	0			4	0		1	1		5
K*(892)	895.81	0.27	896.1	0.38				0.00	1		7	0			15	-2		1			
eta'(958)	957.78	-0.04	957.7	0.12				1.00			2	0	1	1	11	-4				-2	1
a(0)(980)	980	-0.71	979.3	40.00				1.00			3	0		1	5	-1		1			1
f(0)(980)	980	-0.71	979.3	40.00				1.00			3	0	1		5	-1		1			1
phi(1020)	1019.455	-0.04	1019.4	0.04				1.00			2	0	1	1	16	-4					8
h(1)(1170)	1170	1.07	1171.1	40.00				1.00			4	0	1		14	-3		1			1
b(1)(1235)	1229.5	0.44	1229.9	6.40				1.00			6	0		1	4	-2		1			1
a(1)(1260)	1230	-0.06	1229.9	80.00				1.00			6	0		1	4	-2		1			1
K(1)(1270)	1272	-0.85	1271.2	14.00				1.00	1		4	0		1	14	-3					1
f(2)(1270)	1275.1	0.80	1275.9	2.40				1.00			6	0	1		8	-3		1			2
f(1)(1285)	1281.8	0.66	1282.5	1.00				1.00			5	0	1		16	-3		1		-1	1
eta(1295)	1294	1.01	1295.0	8.00				1.00			5	0	1	1	17	-4					1
pi(1300)	1300	-0.35	1299.7	200.00				1.00			6	0		1	10	-3	1				1
Xi	1314.86	0.35	1315.2	0.40				1.00		1	5	0			10	0		1			
a(2)(1320)	1318.3	-0.32	1318.0	1.10				1.00			7	0		1	4	-2		1			
Xi	1321.71	-0.02	1321.7	0.14				1.00			5	0		1	19	-1		1	-1	-1	3
f(0)(1370)	1350	2.01	1352.0	300.00				1.00			7	0	1	1	7	-4					1
pi(1)(1400)	1354	0.25	1354.3	50.00				2.00			0	0		1	4	-1		1			1
K(1)(1400)	1403	0.47	1403.5	14.00				1.00	1		6	0		1	10	-1					1

Mass simulations for 196 mesons and baryons are in Appendix 1. All masses compare favorably with PDG experimental errors except the mu and pi (within 0.02 MeV).

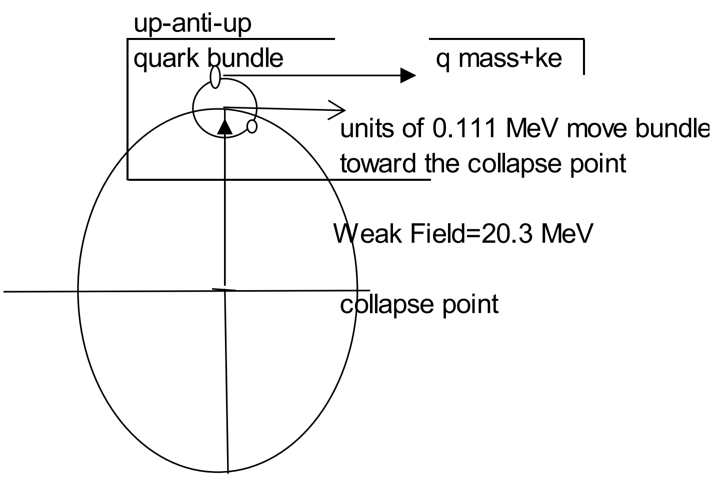
Meson Decay Time Correlations

The Particle Data Group lists the full width (in MeV) for some particles and the decay time in seconds for other particles. All data was translated to decay time by using time=Heisenberg's reduced constant/full width.

The quark bundle orbits in a weak field shown in the diagram below. A small amount of kinetic energy is associated with velocity around the large orbit. This kinetic energy is small multiples (or bits and pieces) of 0.11 MeV for mesons.

Step 1: Calculate the time around the large circle

The meson decay time is correlated by the time for the quark bundle to travel one time around meson or baryon circumference (the large circle below). The circumference is determined by a weak field and the meson mass. The weak field is 4*5.08=20.3 MeV. The circumference is 2 pi R, where R= (HC/(2pi))/(bundle mass*20.3)^0.5.



The kinetic energy that propels the quark bundle toward the weak field energy collapse point is multiples of 0.111 MeV.

Example: Decay of Meson K*(890)

891.66			0.56	0.0353	0.999	**1.47E-15**	8.70E-22

Weak Field energy=20.3 MeV

Weak kinetic energy=0.56 MeV (5 units of 0.111 MeV kinetic energy)
Mass=892 MeV
Calculate V: V=C*(1-((892/(892+0.56))^2)^.5=0.0353*3e8 meters/sec
Calculate gamma: g=m/(m+ke)=892/(892+0.56)=0.999
Calculate R:
R=1.97e-13*1/(892*20.15)^.5=1.47e-15 meters
Calculate time around circle=2 pi*1.47e-15/(0.0353*3e8)=8.7e-22 sec

Step 2: Determine decay N and adjust the time around the above circle

The meson decay times are either accelerated or retarded by an adjustment equal to exp(decay N).

Decay N for mesons equals Nsum for the two quarks minus N sum for the two strong field energies. Decay N is calculated for the K*(892).

Decay N=N for strange and up quark- N for the strange field-N for the up field.

Decay N=(15.43+11.43)-(17.43-13.43)= -4. This is shown below with field N at the top of the table. There is one strange quark (N=15.43) and one up quark (N=11.43) and their fields are 17.43 and 13.43.

	anti-quarks are -1					anti-quarks are -1					anti-quarks ar	
	17.43	17.43				15.4	15.43				13.4	13.4
	-1	1				-1	1				-1	1
						-0.5	0.5				-0.5	0.5
	-0.333	0.3333				-0.33	0.33				-0.67	0.67
	-0.5	0.5				-0.5	0.5				-0.5	0.5
ce	15.43	15.43	difference			11.43	11.43	diff			11.43	11.43
	strange	strange	KE	anhil ke		down	down	KE	anil ke		up	up
	101.9	101.9	88.15	13.8		3.73	3.73	11.93	1.87		1.87	1.87
	1		1.00	0.00				4.00	0			1

Calculate decay time=8.7e-22*exp(-4)=1.3e-23 sec
Compare to PDG data 1.3e-23. This value has been measured to within 3.54 percent. With 0.84 MeV as the kinetic energy that propels the quark bundle to the collapse point the calculated decay is exactly matched.

Baryon decay time correlation

Baryon decay time calculation is the same as mesons. Decay N for baryons equals Nsum for the three quarks in that baryon minus the sum of strong field energy for the quarks. The lambda (1405) baryon N decay is calculated below.

Decay N=N for three strange quarks- N for three strange fields.
Decay N= (15.43+15.43+15.43)-(17.43-17.43-17.43)= -6

inetic energy	Field N	19.14	17.98	17.98			17.43	17.43				15.4	15.43				13.4	13.4
ıts of 0.11 adı	parity		-1	1			-1	1				-1	1				-1	1
Particle	iso-spin I	0	0	0								-0.5	0.5				-0.5	0.5
Mass	Charge		-0.667	0.667			-0.333	0.3333				-0.33	0.33				-0.67	0.67
Calculated	spin		-0.5	0.5			-0.5	0.5				-0.5	0.5				-0.5	0.5
Meson	Quark N	19.14	17.98	17.98	difference		15.43	15.43	difference			11.43	11.43	diff			11.43	11.43
Energy		bottom	charm	charm	KE		strange	strange	KE	anhil ke		down	down	KE	anil ke		up	up
MEV		4173	1302.7	1302.7	651.34		101.9	101.9	88.15	13.8		3.73	3.73	11.93	1.87		1.87	1.87
1404.4					1.00		2	1	5.00	0.00				1.00	-3			

Neutron Decay

For the neutron, velocity around the circumference is determined by weak kinetic energy 2*2.02e-5*exp(12.43)=5.08 MeV=10.15 MeV (review the proton mass model above). The proton has an N value 12.43 that other baryons do not. It produces kinetic energy and the value 10.15 MeV is the value that changes during fusion. This kinetic energy propels the quark bundle around the weak radius of approximately 1e-15 meters radius where the particle decays after one revolution. The decay adjustment is circle travel time*exp(decay N) where decay N is normally the difference between the N values for the quarks and N for the fields that contain the quarks but for the neutron it is simply the N sum for the strong fields plus 12.43.

Decay N (entropy):

Quark	17.431
Quark	13.431
Quark	13.431
Weak N	12.431
Decay N	56.724

Mass (m)= 939.57-10.15=929.41 MeV
Calculate V: V=C*(1-(m/(m+ke))^2)^.5=C*(1-(929.41/(929.41+10.15))^2)^.5=0.1466
Calculate gamma: g=m/(m+ke)=929.41/(929.41+10.15)=0.989
Calculate R:
R=1.97e-13*1/(929.41*10.15)^.5=1.43e-15 meters
Calculate time around circle=2 pi*1.43e-15/(0.1466*3e8)=2.04e-22 sec
Calculate decay time=2.04e-22*exp(56.72)=884 sec
Compare to 881. This value has been measured to within 0.17 percent.
Calculate decay accuracy ratio= (100*(884-881/881)))= 0.34 percent.
The above calculation is exactly 881 seconds if kinetic energy is 10.18 MeV.

Decay Time Results

It was found that mesons and baryon decay times are exactly matched with fractions or multiples of 0.111 MeV. The weak energy range for the entire 196 particles was between zero and 1 and average 0.27.

	Planck's reduced h					R=Const/(mass*field)^.5			Decay t=2 pi R/(V)*exp(decay N)				
	Time =h/full width						time around=2 pi hreduced/width			52.3		-29.43	
	time--seconds		Average			1.97327E-13	4.136E-21			3x17.432=52.3			Field mev
2013	2013		0.28			R	3.0E+08	1	Predicted	Calculated			4
PDG Data	PDG Data	mev			(1-(v/c)^2)^.5		t=2 pi R/(V)	Decay N	Decay Time	Decay N		1	12.43
percent	sec	mass in quark bundle		V/C	gamma	cons/(m*f)^.5	sec	P=1/exp(N)	Decay=t/P	-0.1			5.1
delta			weak ke	(1-(m/(m+ke))^2)^		1.9e-13/(field*m/gamma)^0		back calculated			Strong Fields		Weak Fiel
7.63	5.02E-19	547.85	0.005	0.0043	1.000	**1.87E-15**	9.21E-21	4.00	5.03E-19	4.00	13.432	13.43	2.0E+01
1.07	4.41E-24	775.49	0.13	0.0185	1.000	**1.57E-15**	1.78E-21	-6.00	4.42E-24	-6.00	15.431946	13.43	2.0E+01
3.54	1.30E-23	891.66	0.84	0.0434	0.999	**1.47E-15**	7.08E-22	-4.00	1.30E-23	-4.00	17.431946	13.43	2.0E+01
2.53	1.39E-23	895.81	0.73	0.0404	0.999	**1.46E-15**	7.59E-22	-4.00	1.39E-23	-4.00	17.431946	13.43	2.0E+01
9.09	3.32E-21	957.78	0.04	0.0089	1.000	**1.42E-15**	3.33E-21	0.00	3.33E-21	0.00	11.431946	11.43	2.0E+01
66.67	8.78E-24	980.00	0.03	0.0083	1.000	**1.40E-15**	3.54E-21	-6.00	8.78E-24	-6.00	15.431946	13.43	2.0E+01
85.71	9.40E-24	980.00	0.03	0.0077	1.000	**1.40E-15**	3.80E-21	-6.00	9.41E-24	-6.00	15.431946	13.43	2.0E+01
1.88	1.55E-22	1019.46	0.00	0.0001	1.000	**1.37E-15**	4.61E-19	-8.00	1.55E-22	-8.00	15.431946	15.43	2.0E+01
22.22	1.83E-24	1170.00	0.77	0.0363	0.999	**1.28E-15**	7.38E-22	-6.00	1.83E-24	-6.00	15.431946	13.43	2.0E+01
12.68	4.64E-24	1229.50	0.12	0.0140	1.000	**1.25E-15**	1.87E-21	-6.00	4.64E-24	-6.00	15.431946	13.43	2.0E+01
85.71	1.57E-24	1230.00	0.02	0.0056	1.000	**1.25E-15**	4.67E-21	-8.00	1.57E-24	-8.00	15.431946	15.43	2.0E+01
44.44	7.31E-24	1272.00	0.05	0.0087	1.000	**1.23E-15**	2.95E-21	-6.00	7.32E-24	-6.00	17.431946	15.43	2.0E+01
2.86	3.56E-24	1275.10	0.20	0.0179	1.000	**1.23E-15**	1.44E-21	-6.00	3.56E-24	-6.00	15.431946	13.43	2.0E+01
9.09	2.72E-23	1281.80	0.003	0.0023	1.000	**1.22E-15**	1.10E-20	-6.00	2.72E-23	-6.00	15.431946	13.43	2.0E+01
18.18	1.20E-23	1294.00	0.0003	0.0007	1.000	**1.22E-15**	3.57E-20	-8.00	1.20E-23	-8.00	15.431946	15.43	2.0E+01
100.00	1.65E-24	1300.00	0.95	0.0383	0.999	**1.21E-15**	6.64E-22	-6.00	1.65E-24	-6.00	15.431946	13.43	2.0E+01
6.17	2.90E-10	1314.86	1.08	0.0405	0.999	**1.21E-15**	6.25E-22	26.86	2.90E-10	26.86			2.0E+01
9.35	6.15E-24	1318.30	0.07	0.0102	1.000	**1.21E-15**	2.48E-21	-6.00	6.16E-24	-6.00	15.431946	13.43	2.0E+01
1.99	1.64E-10	1321.71	0.001	0.0013	1.000	**1.20E-15**	1.93E-20	22.86	1.64E-10	22.86			2.0E+01
85.71	1.88E-24	1350.00	0.01	0.0045	1.000	**1.19E-15**	5.61E-21	-8.00	1.88E-24	-8.00	15.431946	15.43	2.0E+01
21.21	1.99E-24	1354.00	0.65	0.0310	1.000	**1.19E-15**	8.05E-22	-6.00	2.00E-24	-6.00	15.431946	13.43	2.0E+01
14.94	3.78E-24	1403.00	0.18	0.0160	1.000	**1.17E-15**	1.53E-21	-6.00	3.79E-24	-6.00	15.431946	17.43	2.0E+01
11.37	1.29E-23	1409.80	0.02	0.0047	1.000	**1.17E-15**	5.21E-21	-6.00	1.29E-23	-6.00	17.431946	11.43	2.0E+01
18.10	2.84E-24	1414.00	0.32	0.0213	1.000	**1.16E-15**	1.15E-21	-6.00	2.84E-24	-6.00	15.431946	17.43	2.0E+01
5.48	6.68E-24	1425.60	0.06	0.0090	1.000	**1.16E-15**	2.70E-21	-6.00	6.69E-24	-6.00	15.431946	17.43	2.0E+01
9.47	1.20E-23	1426.40	0.02	0.0050	1.000	**1.16E-15**	4.84E-21	-6.00	1.20E-23	-6.00	15.431946	13.43	2.0E+01
59.26	2.44E-24	1430.00	0.43	0.0247	1.000	**1.16E-15**	9.84E-22	-6.00	2.44E-24	-6.00	17.432	15.43	2.0E+01
9.17	6.04E-24	1432.40	0.07	0.0099	1.000	**1.16E-15**	2.44E-21	-6.00	6.04E-24	-6.00	15.431946	17.43	2.0E+01
30.00	1.65E-24	1465.00	0.95	0.0361	0.999	**1.14E-15**	6.64E-22	-6.00	1.65E-24	-6.00	15.431946	13.43	2.0E+01
9.81	2.48E-24	1474.00	0.42	0.0238	1.000	**1.14E-15**	1.00E-21	-6.00	2.49E-24	-6.00	15.431946	13.43	2.0E+01
21.18	7.74E-24	1476.00	0.04	0.0076	1.000	**1.14E-15**	3.13E-21	-6.00	7.75E-24	-6.00	17.431946	11.43	2.0E+01
12.84	6.04E-24	1505.00	0.07	0.0097	1.000	**1.13E-15**	2.44E-21	-6.00	6.04E-24	-6.00	15.431946	13.43	2.0E+01
15.07	9.02E-24	1525.00	0.03	0.0065	1.000	**1.12E-15**	3.64E-21	-6.00	9.02E-24	-6.00	15.431946	13.43	2.0E+01
10.99	7.23E-23	1531.80	0.03	0.0059	1.000	**1.12E-15**	3.95E-21	-4.00	7.24E-23	-4.00	15.431946	15.43	2.0E+01
33.33	4.39E-24	1535.00	0.002	0.0018	1.000	**1.12E-15**	1.31E-20	-8.00	4.39E-24	-8.00	15.431946	15.43	2.0E+01
36.36	6.65E-23	1535.00	0.001	0.0009	1.000	**1.12E-15**	2.68E-20	-6.00	6.65E-23	-6.00	15.431946	13.43	2.0E+01
12.15	3.64E-24	1617.00	0.20	0.0155	1.000	**1.09E-15**	1.47E-21	-6.00	3.64E-24	-6.00	17.431946	11.43	2.0E+01
33.33	2.74E-24	1662.00	0.34	0.0203	1.000	**1.07E-15**	1.11E-21	-6.00	2.74E-24	-6.00	15.431946	13.43	2.0E+01
6.92	2.53E-24	1672.20	0.40	0.0220	1.000	**1.07E-15**	1.02E-21	-6.00	2.53E-24	-6.00	15.431946	13.43	2.0E+01
66.67	4.39E-24	1680.00	0.13	0.0126	1.000	**1.07E-15**	1.77E-21	-6.00	4.39E-24	-6.00	15.431946	13.43	2.0E+01
12.42	4.09E-24	1688.80	0.15	0.0135	1.000	**1.07E-15**	1.65E-21	-6.00	4.09E-24	-6.00	15.431946	13.43	2.0E+01

The energy required was back-calculated for an exact match of decay time. See appendix 2 and 3 that focus on slowly decaying particles. The mu and pions are slight exceptions and but they have been measured very accurately. Based on these results it appears that only fractions or multiples of 0.11 MeV (the energy left over from decay of neutrinos) is involved in decay time.

Identifying the quarks involved in the baryons and mesons

Decay N is a good tool to verify which quarks are involved in each baryon or meson. For mesons, decay N is simply the subtraction of the quark N values from strong field N values. The value is sometimes as low -8, sometimes positive as large as 30 but averages about zero. The neutron is an exception at 56.72. Decay N has a large effect on decay time and the quarks involved in each particle determines the iso-spin, spin and other properties. Matching everything at once supports the overall thesis presented.

Comparison of charge, iso-spin and spin with PDG values

The PDG particle listings include charge, iso-spin and spin. Each quark has been assigned a specific value and combinations of quarks give different overall properties. Spin (J), momentum (l) is listed for each combination and once the spin additions for two quarks known, J falls between (l+s) and (l-s). To match the PDG iso-spin and spin, the quarks must occupy a given position so that the spins add and subtract to the PDG values.

The following quark spin and iso-spin values are used in this work:

Field N	19.14	17.98	17.98			17.43	17.43			15.43	15.43			13.4	13.4	Electro
parity		-1	1			-1	1			-1	1			-1	1	subtrac
iso-spin I	0	0	0							-0.5	0.5			-0.5	0.5	
Charge		-0.67	0.67			-0.33	0.33			-0.33	0.33			-0.67	0.67	-1
spin		-0.5	0.5			-0.5	0.5			-0.5	0.5			-0.5	0.5	0.50
Quark N	19.14	17.98	17.98	difference		15.43	15.43	difference		11.43	11.43	diff		11.43	11.43	10.14
MeV	bottom	charm	charm	KE		strange	strange	KE	anhil ke	down	down	KE	anil ke	up	up	elect
Measured	4172.5	1302.7	1302.7	651.3		101.9	101.9	88.15	13.8	3.73	3.73	11.93	1.87	1.87	1.87	0.51

All the meson and baryon PDG iso-spin values are matched when quarks are positioned in the respective columns labelled with the quark iso-spin values above. This is not a trivial matter. The quark positions must also give the total mass and decay N. An out of position quark either gives a faulty spin, iso-spin or an incorrect decay time.

The PDG spin values are matched in most cases however there are mesons that have spins 2, 3 and 4. There are other spin values in the meson that are apparently not associated with the native spin of the quarks.

Decay modes

All mesons eventually decay to pi mesons and muons, although there are several intermediate combinations. The pi mesons and muons decay to electrons, gamma rays and neutrinos. 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.

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

The topic above entitled "Decay Paths" explains decay paths. Transitions simply do not completely annihilate the original kinetic energy and transition to new combinations of quarks and kinetic energy. The path downward is left incomplete and new mesons appear while some of the kinetic energy is turned into gamma rays. Pi mesons and muons are prevalent in decays because there are many ways for the quad energies to cascade down to these particles. Some decay modes are more prevalent because they have a higher probability as explained below.

Branching Ratios

Branching Percentage= (mass involved in decay*Probability of decay)/(sum M*P)*100%
Where Probability of decay=exp(dominant N).

Appendix 4 contains example calculations for branching ratio. The results compared with measured values show that the particle N again gives a probability involved in determining which decay particles are more prevalent in decay fragments. Each meson or baryon has a dominant N determined by the highest N in the particle. (N values are 11.43,13,43,15.43,17.98 and 19.14).

	Comparison masses	
	Quark Ma	PDG
N quark	energy MeV	charge
11.43	**1.87**	0.67
12.43	5.08	
	2X ↓	
13.43	13.80	-0.33
	3.73	
15.43	**101.95**	-0.33
17.98	**1302.69**	0.67
19.14	**4172.51**	-0.33

For example, the pi+ mesons has a dominant N value of 13.43. When it appears in decay products 13.43 is used. The probability of decay is P=exp(Dominant N). Mass for the calculation is simply the sum of the decay product mass. If the decay is pi-pi+ the mass is 139+139=278 MeV. The branching percentage is 278*exp(13.431)/(sum M*P)*100% for the pi+ meson. The N value associated with electrons is zero.

Summary

Baryon and meson masses, with the exception of three low mass mesons (within 0.02 MeV), were simulated within experimental error using the quark energies and difference energies listed in the section entitled "Particle Data Group data comparison". In addition, all decays times were simulated within experimental error with weak kinetic energy values between zero and 1 MeV. Simultaneous mass, decay time and property matches clearly identify particle N, decay N and quark combinations. Overall, consideration of meson and baryon properties supports the concept that the proton mass model underlies a new unifying theory. The energies in the neutron mass model (651.34, 88.15, 11.93 and 1.87 MeV) occur in different combinations in all particles.

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Appendix 1 Mass Comparisons

The following 3 pages are from spreadsheet mesonbaryonone2017down.xls. Again, the numbers in the table are multiplied by the header values and added across to estimate mass. This table takes energy out of the 651.34, 88.15, 11.93 and 1.87 MeV to form quarks. Quarks are in the colored columns (two for mesons, three for baryons). Kinetic energy propels the quark bundles around the small circle defined by the fields at the top of the table. Kinetic energy taken out of the columns labelled difference kinetic energy cannot be negative but the column labelled annihilation kinetic energy can be negative because it represents 3 neutrinos ejected for each unit of negative 1.87 MeV. Again 1.87=3 x 0.622 MeV, where 0.622 is a neutrino. The calculated mass can be compared with the listed measured mass and measured accuracy.

				Field N	19.14	17.98	17.98		17.43	17.43			15.43	15.43			13.4	13.4	Electrons, neutrinos a		
				parity		-1	1		-1	1			-1	1			-1	1	subtract from Meson		
				iso-spin I	0	0	0						-0.5	0.5			-0.5	0.5			
				Charge		-0.67	0.67		-0.33	0.33			-0.33	0.33			-0.67	0.67	-1	10.33	weak
				spin		-0.5	0.5		-0.5	0.5			-0.5	0.5			-0.5	0.5	0.50	0.62	ke
	Data	Delta	Meson	Quark N	19.14	17.98	17.98	difference	15.43	15.43	difference		11.43	11.43	diff		11.43	11.43	10.14	8.43	
name	PDG	accuracy	Energy	MeV	bottom	charm	charm	KE	strange	strange	KE	anhil ke	down	down	KE	anil ke	up	up	elect	neut	ke
	MEV	MeV	MEV	Measured	4172.5	1302.7	1302.7	651.3	101.9	101.9	88.15	13.8	3.73	3.73	11.93	1.87	1.87	1.87	0.51	0.62	0.11
				Accuracy																	
mu	105.6584	0.02	105.7	0.00				0.00			1	0		1	1	0	1		1	-1	1
pi0	134.9766	0.03	135.0	0.00				0.00			0	0		1	11	-1		1		-1	6
pi	139.5702	0.03	139.6	0.00				0.00			1	0	1	1	4	-2			1	-1	1
f(0)(500)	475	1.65	476.7	150.00				0.00			5	0	1	1	3	-4					1
K	493.677	0.04	493.7	0.03				0.00	1	1	1	0			17	-1			1		2
K(S)0	497.614	0.01	497.6	0.05				0.00			4	0		1	12	-2		1			
K0	497.614	0.01	497.6	0.05				0.00	1	1	2	0			10	-1					
K(L)0	497.614	0.01	497.6	0.05				0.00	1		3	0		1	11	-2					
eta0	547.853	-0.02	547.8	0.04				0.00	1	1	2	0			14	0				1	
rho(770)	775.49	-0.10	775.4	0.50				1.00			1	0		1	3	-3		1			1
K*(892)	891.66	0.44	892.1	0.52				1.00	1		1	0			4	0		1	1		5
K*(892)	895.81	0.27	896.1	0.38				0.00	1		7	0			15	-2		1			
eta'(958)	957.78	-0.04	957.7	0.12				1.00			2	0	1	1	11	-4				-2	1
a(0)(980)	980	-0.71	979.3	40.00				1.00			3	0		1	5	-1		1			1
f(0)(980)	980	-0.71	979.3	40.00				1.00			3	0	1		5	-1		1			1
phi(1020)	1019.455	-0.04	1019.4	0.04				1.00			2	0	1	1	16	-4					8
h(1)(1170)	1170	1.07	1171.1	40.00				1.00			4	0	1		14	-3		1			1
b(1)(1235)	1229.5	0.44	1229.9	6.40				1.00			6	0		1	4	-2		1			1
a(1)(1260)	1230	-0.06	1229.9	80.00				1.00			6	0		1	4	-2		1			1
K(1)(1270)	1272	-0.85	1271.2	14.00				1.00	1		4	0		1	14	-3					1
f(2)(1270)	1275.1	0.80	1275.9	2.40				1.00			6	0	1		8	-3		1			2
f(1)(1285)	1281.8	0.66	1282.5	1.00				1.00			5	0	1		16	-3		1		-1	1
eta(1295)	1294	1.01	1295.0	8.00				1.00			5	0	1	1	17	-4					1
pi(1300)	1300	-0.35	1299.7	200.00				1.00			6	0		1	10	-3	1				1
Xi	1314.86	0.35	1315.2	0.40				1.00		1	5	0			10	0		1			
a(2)(1320)	1318.3	-0.32	1318.0	1.10				1.00			7	0		1	4	-2		1			
Xi	1321.71	-0.02	1321.7	0.14				1.00			5	0		1	19	-1		1	-1	-1	3
f(0)(1370)	1350	2.01	1352.0	300.00				1.00			7	0	1	1	7	-4					1
pi(1)(1400)	1354	0.25	1354.3	50.00				2.00			0	0		1	4	-1		1			1
K(1)(1400)	1403	0.47	1403.5	14.00				1.00	1		6	0		1	10	-1					1
eta(1405)	1409.8	1.86	1411.7	3.60				1.00			7	0	1		12	-3		1			1
K*(1410)	1414	-0.47	1413.5	30.00				1.00	1		6	0		1	11	-2					1
K(2)*(1430)	1425.6	0.37	1426.0	3.00				1.00	1		6	0		1	12	-2			1		1
f(1)(1420)	1426.4	0.34	1426.7	1.80				2.00			1	0	1		3	-3		1			1
K(0)*(1430)	1430	0.47	1430.5	100.00				2.00	1		0	0		1	2	-1					1
K(2)*(1430)	1432.4	-0.43	1432.0	2.60				1.00	1		7	0	1		5	-1					1
rho(1450)	1465	-2.47	1462.5	50.00				2.00			1	0		1	6	-3		1			1
a(0)(1450)	1474	0.46	1474.5	38.00				2.00			1	0		1	7	-3		1			1
eta(1475)	1476	0.33	1476.3	8.00				2.00			1	0	1		7	-2		1			1
f(0)(1500)	1505	-2.04	1503.0	12.00				2.00			2	0		1	2	-3	1				1
f(2)'(1525)	1525	1.82	1526.8	10.00				2.00			2	0	1		4	-3		1			1
Xi(1530)	1531.8	0.62	1532.4	0.64				2.00		1	1	0			3	1		1			1
Xi(1530)	1535	-0.89	1534.1	20.00				2.00			1	0	1	1	12	-4					1
Xi(1530)	1535	0.46	1535.5	1.20				2.00			1	0	1		12	-2		1	-1		1
eta(2)(1645)	1617	-0.16	1616.8	10.00				2.00			3	0	1		4	-2		1			1
pi(1)(1600)	1662	0.69	1662.7	17.00				2.00			3	0		1	8	-3		1			1
pi(2)(1670)	1672.2	-0.36	1671.8	6.00				2.00			2	0		1	16	-2		1			1
phi(1680)	1680	0.22	1680.2	40.00				2.00			3	0	1		9	0		1			1
rho(3)(1690)	1688.8	-0.39	1688.4	4.20				2.00			3	0	1		10	-2	1				1
Xi(1690)	1690	-0.23	1689.8	20.00		1		0.00			3	0		1	10	0			-1		1
K*(1680)	1717	-0.08	1716.9	54.00				2.00	1		3	0		1	4	-2					1
f(0)(1710)	1720	1.18	1721.2	50.00				1.00			12	0	1		1	-3		1			1
rho(1700)	1720	0.65	1720.6	12.00				2.00			4	0		1	5	0		1			1
K(2)(1770)	1773	1.70	1774.7	16.00				2.00	1		3	0		1	9	-3					1
K(3)*(1780)	1776	0.56	1776.6	14.00				2.00	1		3	0		1	9	-2					1
Tauon	1776.82	-0.14	1776.7	0.32		1		0.00		1	3	0			9	0			-1	1	1
pi(1800)	1812	0.35	1812.4	24.00				2.00			4	0		1	13	-2		1			1
K(2)(1820)	1816	-0.87	1815.1	26.00				2.00	1		4	0		1	5	-3					1
Xi(1820)	1823	-1.09	1821.9	10.00		1		0.00			4	0		1	14	-2			-1		1
phi(3)(1850)	1854	0.65	1854.7	14.00				2.00			5	0		1	9	-1	1				1
D	1864.8	-0.09	1864.7	0.26		1		0.00			5	0		1	10	-1					1
D	1869.57	0.30	1869.9	0.30		1		0.00			6	0		1	3	-1			1		1
f(2)(1950)	1944	-0.29	1943.7	24.00				2.00			7	0	1	1	2	-4					1
Xi(1950)	1950	0.49	1950.5	30.00				2.00			6	0		1	10	-3		1	-1		1
D(s)	1968.45	-0.37	1968.1	0.64		1		0.00	1		6	0			3	-1			1		1
a(4)(2040)	1996	-0.84	1995.2	19.00				2.00			7	0		1	6	-1		1			1
D*(2007)	2006.99	0.10	2007.1	0.30		1		0.00			7	0		1	7	0					1
f(2)(2010)	2010	0.65	2010.6	140.00				2.00			6	0	1		15	-3		1			1
D*(2010)	2010.29	0.13	2010.4	0.26		1		0.00			6	0			15	-1		1	1	-1	
f(4)(2050)	2018	-0.47	2017.5	22.00				3.00			0	0	1		5	-1		1			1
Sigma(2030)	2030	0.44	2030.4	10.00				2.00			7	0			9	0	1	1	-1		1
K(4)*(2045)	2045	0.14	2045.1	15.00				2.00	1		7	0		1	2	-2			-1		1
D(s)*	2112.3	0.80	2113.1	1.00		1		0.00	1		6	0			15	0			1		1
f(2)(2300)	2297	-6.83	2290.2	56.00				3.00			3	0	1		6	-3		1			1
D(s0)*(2317)	2317.8	0.10	2317.9	1.20		1		0.00		1	9	0			10	0			1		1
D(0)*(2400)	2318	0.67	2318.7	58.00		1		1.00			4	0		1	1	-2					1
f(2)(2340)	2340	-0.86	2339.1	120.00				3.00			3	0		1	10	-2	1			-1	1
D(1)(2420)	2421.3	-0.68	2420.6	1.20		1		1.00			5	0	1		2	-1					1
D(s1)(2460)	2459.5	0.78	2460.3	1.20		1		0.00		1	11	0			7	1			1		1
D(2)*(2460)	2462.6	-0.77	2461.8	1.20		1		1.00			4	0	1		13	-2					1
D(2)*(2460)	2464.4	2.58	2467.0	3.20		1		1.00			5	0	1		6	-2			1		1

				Field N	19.14	17.98	17.98			17.43	17.43			15.43	15.43			13.4	13.4	Electrons, neutrinos and weak				
				parity		-1	1			-1	1			-1	1			-1	1	subtract from Meson or Baryo				
				iso-spin I	0	0	0							-0.5	0.5			-0.5	0.5					3 out .0
				Charge		-0.67	0.67			-0.33	0.33			-0.33	0.33			-0.67	0.67	-1	10.33	weak		
				spin		-0.5	0.5			-0.5	0.5			-0.5	0.5			-0.5	0.5	0.50	0.62	ke		
	Data	Delta	Meson	Quark N	19.14	17.98	17.98	difference		15.43	15.43	difference		11.43	11.43	diff		11.43	11.43	10.14	8.43			
name	PDG	accuracy	Energy	MeV	bottom	charm	charm	KE		strange	strange	KE	anhil ke	down	down	KE	anil ke	up	up	elect	neut	ke		
	MEV	MeV	MEV	Measured	4172.5	1302.7	1302.7	651.3		101.9	101.9	88.15	13.8	3.73	3.73	11.93	1.87	1.87	1.87	0.51	0.62	0.11		
D(2)*(2460)	2462.6	-0.77	2461.8	1.20		1		1.00				4	0	1		13	-2					1	m	
D(2)*(2460)	2464.4	2.58	2467.0	3.20		1		1.00				5	0	1		6	-2			1		1	m	
Xi(c)	2467.8	0.83	2468.6	1.00		1		1.00			1	4	0			5	0			1		-1	m	
Xi(c)	2470.88	-0.67	2470.2	1.14		1		1.00				5	0		1	6	0					1	m	
D(s1)(2536)	2535.12	-0.11	2535.0	0.26		1		1.00			1	5	0			3	1			1		1	m	
D(s2)*(2573)	2571.9	1.21	2573.1	1.60		1		1.00				5	0		1	15	-2			1	-2	1	m	
Xi(c)'	2575.7	0.52	2576.2	6.20		1		1.00			1	4	0			14	0			1		1	m	
Xi(c)'	2577.9	-0.33	2577.6	5.80		1		1.00			1	4	0			14	1					1	m	
Xi(c)(2645)	2628.11	0.28	2628.4	0.38		1	1	0.00				0	0			2	0			1	-2	-1	m	
Xi(c)(2645)	2645.9	-0.89	2645.0	1.00		1	1	0.00				0	0			3	2					1	m	
Xi(c)(2645)	2645.9	-0.49	2645.4	1.10		1	1	0.00				0	0			3	2			1			m	
Xi(c)(2790)	2791.8	-0.86	2790.9	6.60		1	1	0.00				1	0			8	1					1	m	
Xi(c)(2790)	2816.6	1.49	2818.1	1.80		1	1	0.00				2	0			3	0			1		1	m	
Xi(c)(2815)	2819.6	-0.16	2819.4	2.40		1	1	0.00				2	0			3	1					1	m	
Xi(c)(2815)	2881.53	-0.06	2881.5	0.70		1	1	0.00				2	0			8	2			1		1	m	
J/psi(1S)	3096.916	0.04	3097.0	0.02		1	1	0.00				5	0			4	2				-1		m	
chi(c0)(1P)	3414.75	-0.25	3414.5	0.62		1	1	0.00				9	0			1	2					1	m	
chi(c1)(1P)	3510.66	0.09	3510.8	0.14		1	1	1.00				1	0			14	0				-2	1	m	
h(c)(1P)	3525.38	-0.14	3525.2	0.22		1	1	1.00				3	0			0	2					3	m	
chi(c2)(1P)	3556.2	0.14	3556.3	0.18		1	1	1.00				3	0			3	0				-1		m	
eta(c)(2S)	3639.4	1.18	3640.6	2.60		1	1	1.00				3	0			10	0					1	m	
psi(2S)	3686.109	-0.01	3686.1	0.03		1	1	1.00				4	0			6	3				-1	2	m	
psi(3770)	3773.15	-0.26	3772.9	0.66		1	1	1.00				5	0			6	2					1	m	
chi(c2)(2P)	3927.2	1.69	3928.9	5.20		1	1	1.00				6	0			12	0					1	m	
psi(4040)	4039	0.40	4039.4	2.00		1	1	2.00				0	0			11	0					1	m	
psi(4160)	4153	0.28	4153.3	6.00	1		1	-2.00				-2	0			13	1					1	m	
b	4180	-0.09	4179.9	60.00	1			0.00				-1	0			8	-1		1			1	m	
psi(4415)	4421	-0.50	4420.5	8.00		1	1	2.00				5	0			6	0					1	m	
B	5279.26	-0.07	5279.2	0.34	1			1.00				3	0			16	-1		1	1	-1	1	m	
B	5279.58	0.18	5279.8	0.34	1			1.00				5	0			1	1		1		-1	1	m	
B*	5325.2	-0.61	5324.6	0.80	1			1.00		1		4	0			4	-1					3	m	
B(s)	5366.77	0.05	5366.8	0.48	1			1.00		1		3	0			15	-1				-1	1	m	
B(s)*	5415.4	0.85	5416.3	4.50	1			1.00		1		5	0			4	1					1	m	
B(2)*(5747)	5743.00	-0.59	5742.4	10.00	1			2.00				1	0		1	15	-2					1	m	
Xi(b)	5788	-0.52	5787.5	10.00	1	1		0.00				3	0			4	0					1	m	
Xi(b)	5791.1	-0.39	5790.7	4.40	1	1		0.00				3	0			4	2			-1		1	m	
B(s2)*(5840)	5839.96	-0.13	5839.8	0.40	1			2.00		1		2	0			7	1					9	m	
B(c)	6274.5	0.47	6275.0	3.60	1			3.00		1		0	0			4	-1			1		1	m	
Upsilon(1S)	9460.3	0.46	9460.8	0.52	2			1.00				5	0			2	0					-2	m	
chi(b0)(1P)	9859.4	-0.39	9859.0	1.00	2			2.00				1	0			10	2					1	m	
chi(b1)(1P)	9892.8	0.13	9892.9	0.80	2			2.00				1	0			13	1					1	m	
h(b)(1P)	9899.3	0.14	9899.4	2.00	1	1		6.00				5	0			6	2					1	m	
chi(b2)(1P)	9912.2	-0.38	9911.8	0.80	2			2.00				2	0			7	2					5	m	
Upsilon(2S)	10023.26	0.12	10023.4	0.62	2			2.00				3	0			9	2					1	m	
Upsilon(1D)	10163.7	0.08	10163.8	2.80	2			2.00				5	0			6	2						m	
chi(b0)(2P)	10232.5	-0.76	10231.7	1.20	2			2.00				5	0			12	0					1	m	
chi(b1)(2P)	10255.5	0.10	10255.6	1.00	2			2.00				5	0			14	0					1	m	
Upsilon(3S)	10355.2	0.48	10355.7	1.00	2			2.00				6	0			15	0					1	m	
Upsilon(4S)	10579.4	0.67	10580.1	2.40	1			9.00				4	0		1	16	-1					1	m	
Upsilon(10860)	10876	-0.21	10875.8	22.00	1			9.00				9	0		1	4	-2					1	m	
Upsilon(11020)	11019	-0.83	11018.2	16.00	2			3.00				8	0			1	1					1	m	

				Field N	19.14	17.98	17.98		17.43	17.43			15.43	15.43			13.4	13.4	Electrons, neutrinos a		
				parity		-1	1		-1	1			-1	1			-1	1	subtract from Meson		
				iso-spin I	0	0	0						-0.5	0.5			-0.5	0.5			
				Charge		-0.67	0.67		-0.33	0.33			-0.33	0.33			-0.67	0.67	-1	10.33	weak
				spin		-0.5	0.5		-0.5	0.5			-0.5	0.5			-0.5	0.5	0.50	0.62	ke
	Data	Delta	Meson	Quark N	19.14	17.98	17.98	difference	15.43	15.43	difference		11.43	11.43	diff		11.43	11.43	10.14	8.43	
name	PDG	accuracy	Energy	MeV	bottom	charm	charm	KE	strange	strange	KE	anhil ke	down	down	KE	anil ke	up	up	elect	neut	ke
	MEV	MeV	MEV	Measured	4172.5	1302.7	1302.7	651.3	101.9	101.9	88.15	13.8	3.73	3.73	11.93	1.87	1.87	1.87	0.51	0.62	0.11
omega(782)	782.65	-0.12	782.5	0.24				0.00		3	4	0			11	-3				-3	3
proton	938.272			0.00				1.00	1		2	0			1	-3	1	1	-1		1
neutron	939.5653			0.00				1.00	1		2	0			1	-3	1	1			1
Lambda	1115.683	0.03	1115.7	0.01				1.00	1		3	0		2	8	-3					6
Sigma	1189.37	0.03	1189.4	0.14				1.00	1		4	0		2	7	-4			1	-1	1
Sigma	1192.642	0.02	1192.7	0.05				1.00	1	2	1	0			13	-3				-4	3
Sigma	1197.449	-0.03	1197.4	0.06				1.00	1		4	0		2	8	-5			-1	-3	3
Delta(1232)	1232	-0.70	1231.3	4.00		1		-1.00		1	5	0		1	3	-1			-1		1
Sigma(1385)	1382.8	0.25	1383.0	0.70				1.00	1	2	3	0			14	-3			1	-1	1
Sigma(1385)	1383.7	-0.54	1383.2	2.00				1.00	1	2	3	0			14	-3					1
Sigma(1385)	1387.2	-0.02	1387.2	1.00				1.00	1	2	4	0			7	-2			-1	-3	
Lambda(1405)	1405.1	-0.73	1404.4	2.30				1.00	2	1	5	0			1	-3					1
omega(1420)	1425	0.46	1425.5	50.00				1.00	3		4	0			10	-2					1
N(1440)	1440	0.54	1440.5	50.00		1		0.00			1	0		2	4	-3					1
Lambda(1520)	1519.5	0.62	1520.1	2.00				1.00	1	2	6	0			3	-1					1
N(1520)	1520	2.18	1522.2	10.00		1		0.00			1	0	2		11	-4					1
Delta(1600) -,	1600	-0.25	1599.8	200.00		1		0.00			2	0		2	10	-3			-1		1
Lambda(1600)	1600	-0.11	1599.9	140.00				1.00	2	1	6	0			10	-3					1
Delta(1620) -,	1630	0.12	1630.1	60.00		1		0.00			3	0		2	5	-2			-1		1
N(1650)	1655	-0.51	1654.5	25.00		1		0.00			3	0	2		7	-2					1
Sigma(1660)	1660	-1.75	1658.2	60.00				1.00	1	2	8	0			0	-2			-1		1
omega(3)(1670	1667	-0.58	1666.4	8.00				2.00	3		0	0			5	-1					1
omega(1650)	1670	-1.18	1668.8	60.00				1.00	3		8	0			1	-3					1
Sigma(1670)	1670	-1.69	1668.3	20.00				1.00	1	2	8	0			1	-3			-1		1
Lambda(1670)	1670	-1.18	1668.8	20.00				1.00	2	1	8	0			1	-3					1
Omega	1672.45	0.41	1672.9	0.58				2.00	3		0	0			6	-3			-1	-2	1
N(1675)	1675	-0.38	1674.6	10.00			1	0.00			3	0		2	9	-4					1
N(1680)	1685	1.55	1686.5	10.00		1		0.00			3	0	2		10	-4					1
Lambda(1690)	1690	0.28	1690.3	10.00				2.00	1	2	0	0			7	-1					1
Delta(1700) -,	1700	-0.17	1699.8	80.00		1		0.00			3	0		2	11	-3			-1		1
N(1700)	1700	0.34	1700.3	100.00		1		0.00			3	0	2		11	-3					1
N(1710)	1710	0.41	1710.4	60.00		1		0.00			3	0	2		12	-4					1
N(1720)	1720	2.34	1722.3	40.00		1		0.00			3	0	2		13	-4					1
Sigma(1750)	1750	0.33	1750.3	70.00				2.00	1	2	1	0			5	-3			-1		1
Sigma(1775)	1775	-0.81	1774.2	10.00				2.00	1	2	1	0			7	-3			-1		1
Lambda(1800)	1800	0.42	1800.4	130.00				2.00	2	1	1	0			9	-2					1
Lambda(1810)	1810	0.49	1810.5	100.00				2.00	2	1	1	0			10	-3					1
Lambda(1820)	1820	2.42	1822.4	10.00				2.00	1	2	1	0			11	-3					1
Lambda(1830)	1830	0.79	1830.8	20.00				2.00	1	2	2	0			4	-1					1
Lambda(1890)	1880	-1.09	1878.9	55.00				2.00	1	2	3	0			1	-3			-1		1
Delta(1905)	1905	-0.37	1904.6	50.00		1		0.00			6	0		2	6	-3			-1		1
Delta(1910)	1910	0.57	1910.6	60.00		1		0.00			5	0		2	14	-4					1
Sigma(1915)	1915	-0.30	1914.7	35.00				2.00	1	2	3	0			4	-3			-1		1
Delta(1920)	1920	-0.66	1919.3	70.00		1		0.00			7	0		2	0	-4			-1		1
Delta(1930)	1930	0.36	1930.4	35.00		1		0.00			6	0		2	8	-2			-1		1
Sigma(1940)	1940	0.42	1940.4	50.00				2.00	1	2	3	0			6	-2			-1		1
Delta(1950)	1950	0.49	1950.5	100.00		1		0.00			6	0		2	10	-4			-1		1
Lambda(2100)	2100	0.66	2100.7	18.00				2.00	1	2	4	0			12	-2					1
Lambda(2110)	2110	0.73	2110.7	50.00				2.00	2	1	4	0			13	-3					1
Lambda(2110)	2110	0.73	2110.7	20.00				2.00	2	1	4	0			13	-3					1
N(2190)	2190	0.09	2190.1	100.00		1		1.00			2	0	2		5	-4					1
Omega(2250)	2252	-1.28	2250.7	18.00				2.00	3		6	0			10	-3			-1		1
Lambda(c)	2286.46	-0.20	2286.3	0.28		1		1.00	1	1	0	0			11	-2			1		3
Sigma(c)(2455	2452.9	0.80	2453.7	0.80		1		1.00		1	4	0		1	4	-3			1	-2	
Sigma(c)(2455	2453.74	-0.10	2453.6	0.32		1		1.00		1	3	0		1	11	-1					1
Sigma(c)(2455	2453.98	0.05	2454.0	0.32		1		1.00	1	1	2	0			10	0			2	-1	1
Sigma(c)(2520	2517.5	0.94	2518.4	4.60		1		1.00	1	1	3	0			8	0			1		1
Sigma(c)(2520	2517.9	0.71	2518.6	1.20		1		1.00	1	1	4	0			1	-2			2	-2	1
Sigma(c)(2520	2518.4	0.43	2518.8	1.20		1		1.00	1	1	4	0			1	-2					1
Lambda(c)(259	2595.25	0.31	2595.6	0.56		1		1.00		1	6	0			1	-2		1	1		1
Omega(c)	2695.2	-0.07	2695.1	3.40		1		1.00	1	1	6	0			1	-2					1
Omega(c)(277	2765.9	-0.68	2765.2	4.00		1		2.00		1	0	0		1	5	-3					1
Omega(c)(277	2789.1	0.49	2789.6	6.40		1		2.00		1	0	0		1	7	-3			1		1
Lambda (2880)	2983.7	0.11	2983.8	1.40		1		2.00	1	1	2	0			0	-1					1
Lambda(b)	5619.4	-0.93	5618.5	1.20	1	1		0.00			0	0		1	12	-2					1
Sigma(b)	5811.3	0.55	5811.9	3.80	1	1		0.00			3	0		1	6	-2			1		1
Sigma(b)	5815.2	-0.63	5814.6	3.60	1	1		0.00			3	0		1	6	0			-1		1
Sigma(b)*	5832.1	0.84	5832.9	3.80	1	1		0.00			2	0		1	15	-1			1		1
Sigma(b)*	5835.1	-0.41	5834.7	3.80	1	1		0.00			3	0		1	8	-2			-1		1
Omega(b)	6070	-6.65	6063.4	80.00	1	1		0.00		1.00	5	0			4	-1			-1		1

Appendix 2: Decay times comparisons for slow decaying mesons

Most mesons decay between 1e-24 and 1e-19 seconds but there are 2 that decay in about 1e-18 seconds, 13 that decay in about 1e-12 seconds and still another that decay in only 1e-8 seconds. Using N as an adjustment for decay time it was shown that for particles that decay slower than 1e-21 seconds, strong field are missing (normally there are two strong N fields but sometimes N for one field is missing and very slow decaying particles are missing two fields). The mu and pi have only an electromagnetic field.

		Time =h/full width			time around=2 pi hreduced/width			52.3		-60.30			
		time--secor	Average	1.97327E-13	4.136E-21			3x17.432=52.3					Field mev
	2013	2013	0.24	**R**	**3.0E+08**	1	Predicted	Calculated			Missing		4
	PDG Data	PDG Data			t=2 pi R/(V)	Decay N	Decay Time	Decay N		1	slows decay		12.43
Particle	percent	sec		cons/(m*f)^.5	sec	P=1/exp(N)	Decay=t/P	52.3			5.08	0.69	5.1
	delta		weak ke	**1.9e-13/(field*m/gamma)^0**	back calculated				Strong Fields	Strong Fields			Weak Fiel
D*(2010)	45.83	6.86E-21	0.00	**9.77E-16**	3.75E-19	-4.00	6.86E-21	-4.00	17.979679	15.43			2.0E+01
J/psi(1S)	6.03	7.09E-21	0.01	**7.87E-16**	7.09E-21	0.00	7.09E-21	0.00	17.979679	17.98			2.0E+01
Upsilon(1S)	4.81	1.22E-20	0.003	**4.50E-16**	1.22E-20	0.00	1.22E-20	0.00	19.143768	19.14			2.0E+01
Upsilon(2S)	16.25	2.06E-20	0.001	**4.37E-16**	2.06E-20	0.00	2.06E-20	0.00	19.143768	19.14			2.0E+01
Upsilon(3S)	18.72	3.24E-20	0.0004	**4.30E-16**	3.24E-20	0.00	3.24E-20	0.00	19.143768	19.14			2.0E+01
eta0	7.63	5.02E-19	0.005	**1.87E-15**	9.21E-21	4.00	5.03E-19	4.00	13.432	13.43			2.0E+01
pi0	4.40	8.52E-17	0.49	**3.76E-15**	9.24E-22	11.43	8.52E-17	11.43	11.432				2.0E+01
Xi(c)	20.34	1.12E-13	0.14	**8.81E-16**	1.73E-21	17.98	1.12E-13	17.98	11.430				2.0E+01
tau	0.71	2.91E-13	0.02	**1.04E-15**	4.52E-21	17.98	2.91E-13	17.98	15.432				2.0E+01
D	0.75	4.10E-13	0.11	**1.01E-15**	1.99E-21	19.14	4.11E-13	19.14	11.432				2.0E+01
Xi(c)	12.08	4.42E-13	0.49	**8.81E-16**	9.30E-22	19.98	4.42E-13	19.98	13.432				2.0E+01
B(c)	14.38	4.51E-13	0.002	**5.53E-16**	1.62E-20	17.14	4.51E-13	17.14	17.432				2.0E+01
D(s)	2.89	5.00E-13	0.38	**9.87E-16**	1.05E-21	19.98	5.00E-13	19.98	13.432				2.0E+01
D	1.26	1.04E-12	0.00	**1.01E-15**	1.62E-20	17.98	1.04E-12	17.98	11.432				2.0E+01
Xi(b)	25.00	1.50E-12	0.02	**5.76E-16**	4.20E-21	19.69	1.50E-12	19.69	17.432				2.0E+01
B(s)	1.47	1.52E-12	0.01	**5.98E-16**	7.28E-21	19.15	1.50E-12	19.14	15.432				2.0E+01
B(s)*	1.47	1.52E-12	0.10	**5.95E-16**	2.06E-21	20.42	4.24E-13	19.14	15.432				2.0E+01
B	0.92	1.52E-12	0.01	**6.03E-16**	7.38E-21	19.14	1.52E-12	19.14	11.432				2.0E+01
Xi(b)	33.33	1.57E-12	0.02	**5.75E-16**	4.40E-21	19.69	1.57E-12	19.69	17.432				2.0E+01
B	1.00	1.64E-12	0.01	**6.03E-16**	7.95E-21	19.15	1.64E-12	19.15	11.430				2.0E+01
K(S)0	0.08	8.95E-11	0.004	**1.96E-15**	1.05E-20	22.86	8.96E-11	22.86					2.0E+01
Xi	1.99	1.64E-10	0.001	**1.20E-15**	1.93E-20	22.86	1.64E-10	22.86					2.0E+01
Xi	6.17	2.90E-10	1.08	**1.21E-15**	6.25E-22	26.86	2.90E-10	26.86					2.0E+01
K	0.34	1.24E-08	0.10	**1.97E-15**	2.09E-21	29.41	1.24E-08	29.41					2.0E+01
pi	0.04	2.60E-08	0.03	**3.20E-12**	3.06E-18	22.86	2.60E-08	22.86					2.7E-05
K0	0.78	5.11E-08	0.10	**1.96E-15**	2.02E-21	30.86	5.12E-08	30.86					2.0E+01
mu	0.00	2.20E-06	0.01	**3.68E-12**	4.73E-18	26.86	2.20E-06	26.86					2.7E-05

Appendix 3: Decay time comparisons for slow decaying baryons

Again, most baryons decay in around 1e-24 to 1e-20 seconds. But there are 4 that decay in approximately 1e-12 seconds, two that decay in 1e-10 and the neutron that decays in 881 seconds. Again, the columns of the right show the difference. Baryons normally have three fields but the slower decaying baryons have fields missing. The neutron decay time adjustment is 56.73 based on three quarks and a 12.43 field (2*15.43+13.43+12.43).

Sigma(b)*	61.33	8.78E-23	0.02	4.79E-21	-4.00	8.78E-23	-4.00	19.144	17.98	15.43
Sigma(b)	116.33	1.34E-22	0.01	7.34E-21	-4.00	1.34E-22	-4.00	19.144	17.98	15.43
Lambda(c)(2	46.15	2.53E-22	0.00	1.38E-20	-4.00	2.53E-22	-4.00	17.980	15.43	15.43
Sigma(c)(24	22.12	2.91E-22	0.09	2.15E-21	-2.00	2.91E-22	-2.00	17.980	17.98	17.43
Sigma(c)(24	24.07	3.05E-22	0.248	1.30E-21	-1.45	3.05E-22	-1.45	17.980	17.43	13.43
Sigma	19.10	7.40E-20	0.23	1.36E-21	4.00	7.40E-20	4.00	15.432	13.43	13.43
Omega(c)	36.46	6.86E-14	0.37	1.07E-21	17.98	6.86E-14	17.98	15.432	15.43	
Lambda(c)	5.45	1.99E-13	2.40	4.19E-22	19.98	2.00E-13	19.98	15.43	13.43	
Omega(b)	87.93	1.13E-12	0.07	2.39E-21	19.98	1.14E-12	19.98	19.144	13.43	
Lambda(b)	3.47	1.43E-12	1.44	5.42E-22	21.69	1.43E-12	21.69	15.430	11.43	
Sigma	0.66	8.02E-11	0.26	1.28E-21	24.86	8.02E-11	24.86	13.432		
Sigma	1.44	1.48E-10	0.08	2.36E-21	24.86	1.48E-10	24.86	13.432		
Lambda	1.52	2.63E-10	0.02	4.18E-21	24.87	2.63E-10	24.87	13.430		
neutron	0.19	8.81E+02	10.18	2.04E-22	56.73	881.61	56.73	12.43	extra	

Appendix 4 Branching Ratios

Example calculations for branching percentages.

First two modes are shown below with the next two modes shown in the table below this one *for the same particles*. The table continues in the third page for the same particles.

				Leptonic													
					neutral mode												
					Measured	Calculated						Measure	Calculated				
				Decay	Branching	Branchi	Mass	M*P	N delta	P	Decay	Branchin	Branching	Mass	M*P	N to ma	P
Dominant N																	
boxes in columns au-bi																	
13.431	mu	e gg	105.65837	e gg													
11.431	pi0	eeg	134.9766	gg	98.8	99.6	120	8.E+07	13.4	7.E+05	eeg	1.20	0.4	12	3.E+05	10.1	3.E+04
13.431	pi	mu v	139.57018	mu vu	99.98	100.0	105	7.E+07	13.4	7.E+05	e ve	1.E-04	2.E-02	1	1.E+04	10.1	3.E+04
15.431	K	mus- v	493.677	`	64	58	105	5.E+08	15.4	5.E+06	pi0 e+ ve	5	10	135	9.E+07	13.4	7.E+05
15.431	K(L)0	0	497.614														
15.431	K(S)0	pi+pi-	497.614	pi+pi-	69	73	274	5.E+08	14.4	2.E+06	pi0pi0pi0	3.E-05	6.E-05	405	4.E+02	0.0	1.E+00
15.431	K0	pi0pi0pi0	497.614														
13.431	eta0	pi+pi-pi0	547.853	2g	39	36	547	5.E+07	11.4	9.E+04	pi0pi0pi0	32	27	405	4.E+07	11.4	9.E+04
13.431	rho(770)																
17.431	omega(782	pi+pi-pi0	782.65	pi+pi-pi0	89	92	413	3.E+08	13.4	7.E+05	pi0g	9	4	135	1.E+07	11.4	9.E+04
15.431	K*(892)	493pi	891.66	Kpi	100.0	100.0	632	4.E+08	13.4	7.E+05	K0 g	2.E-03	1.E-04	497	497	0.0	1
			895.81														
17.431	eta'(958)	pi+pi-eta	957.78	pi pi eta	45	37	825	6.E+08	13.4	7.E+05	rho g	29	34	775	5.E+08	13.4	680784
15.431	f(0)(980)	pi pi	980														
17.431	phi(1020)	493 493	1019.455	pipi	49	59	278	2.E+08	13.4	7.E+05	KK	34	29	986	9.E+07	11.4	92134
17.431	Lambda	n pi0	1115.683	p pi-	64	62	139	1.E+09	15.9	8.E+06	n pi0	36	38	139	7.E+08	15.4	5.E+06

											Hadronic						
					charged mode												
					Measured	Calculated						Measured	Calculated				
				Decay	Branching	Branching	Mass	M*P	N to ma	P	Decay	Branching	Branching	Mass	M*P	N to ma	P
Dominant N																	
boxes in columns au-bi																	
13.431	mu	e gg	105.65837	e ve avu													
11.431	pi0	eeg	134.9766	e+e+e-e+	3.E-05	3.E-06	2	2	0.0	1	e+e-	6.E-08	1.E-06	1	1	0	1
13.431	pi	mu v	139.57018	e ve pi0op	1.E-08	7.E-07	1	1	0.0	1	e ve e+e	3.E-09	7.E-07	1	1	0	1
15.431	K	mus- v	493.677	pi0 mu+ v	3	2	244	2.E+07	11.4	9.E+04	pi+pi0	21	21	274	2.E+08	13.4	680784
15.431	K(L)0	0	497.614														
15.431	K(S)0	pi+pi-	497.614	pi+pi-	31	27	278	2.E+08	13.4	7.E+05							
15.431	K0	pi0pi0pi0	497.614														
13.431	eta0	pi+pi-pi0	547.853	pipip0	23	27	412	4.E+07	11.4	9.E+04	pipig	5	9	139	1.E+07	11.4	92134
13.431	rho(770)																
17.431	omega(782	pi+pi-pi0	782.65	pipi0	2	4	139	1.E+07	11.4	9.E+04	g	7.E-04	3.E-02	1	9.E+04	11.4	92134
15.431	K*(892)	493pi	891.66														
			895.81														
17.431	eta'(958)	pi+pi-eta	957.78	pi0pi0eta	21	24	547	4.E+08	13.4	7.E+05	omega	3	4.7	782	7.E+07	11.4	92134
15.431	f(0)(980)	pi pi	980														
17.431	phi(1020)	493 493	1019.455	pi pi p0	16	12	417	4.E+07	11.4	9.E+04							
17.431	Lambda	n pi0	1115.683	ng	2.E-03	6.E-04	0	10264	11	9.E+04							

Remaining modes are shown below for the same particles. The sum(M*P) is shown on the right. Dividing all the M*P values in the table by sum(M*P) and multiplying by 100 makes all the calculated branching ratios percentages like the data.

					Measured	Calculated						Measured	Calculated						
				Decay	Branching	Branching	Mass	M*P	N to ma	P	Decay	Branching	Branching	Mass	M*P	N to ma	P	Total	
Dominant N																		perce	sum(M*P)
boxes in columns au-bi																			
13.431	mu	e gg	105.65837	which pi?															
11.431	pi0	eeg	134.9766	4g	2.E-08	3.E-06	2	2	0	1	w	8.E-08	1.E-05	10	10	0	1	100	8.E+07
13.431	pi	mu v	139.57018	e+ve w	5.E-06	7.E-07	1	1	0	1	mu ve	2.E-03	2.E-04	110	110	0	1	100	7.E+07
15.431	K	mus- v	493.677	pi+pi+p	6	4	417	4.E+07	11	92134	pi+pi0 p	2	4	409	######	11	92134	100	9.E+08
15.431	K(L)0	0	497.614																
15.431	K(S)0	pi+pi-	497.614															100	7.E+08
15.431	K0	pi0pi0pi0	497.614																
13.431	eta0	pi+pi-pi0	547.853															100	1.E+08
13.431	rho(770)																		
17.431	omega(782	pi+pi-pi0	782.65															100	3.E+08
15.431	K*(892)	493pi	891.66															100	4.E+08

Appendix 5 N values for fundamental particles

Reference 1 contained a chart, reproduced below, that helps to identify the N values that anchor the quark masses.

unifying concepts.xls cell aw48			Proposed	IS Hughes
		Particle Data	Energy	Bergstrom
		Group energy	E=eo*exp	Randall
Identifier	N	(Mev)	(Mev)	energy
			e0=2.02e-	(Mev)
0.0986	0.0986			
e neutrinc	0.197	2.00E-06	2.47E-05	3.00E-06
E/M Field	0.296	0.0000272	2.72E-05	
	(3*.0986=.296)			
ELECTRO	10.136	0.51099891	0.511	
mu neutri	10.408	0.19	0.671	less than 0.2
Graviton*		1.75E-26	2.732	
Up Quark	11.432	1.5 to 3	1.867	1.5 to 4.5
E Op	12.432		5.076	
Down Qua	13.432	3 to 7	13.797	5 to 8.5
Strange q	15.432	95+/-25	101.947	80 to 155
Charmed	17.432	1200+/-90	753.29	1000 to1400
Bottom Qu	19.432	4200+/-70	5566.11	4220
Top Quarl	21.432		41128.30	40000
W+,w- bos	22.099	80399	80106.98	81000
Z	22.235	91188	91787.1	91182
HIGGS	22.575	125300	128992.0	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	
0.87275	0.509993	0.48817152	0.23831	

Based on the sequence in the above table the quarks important to mesons and baryons are associated with a logarithmic sequence. These are identified as a 1.87 MeV up quark, a 13.8 MeV down quark, a 101.95 MeV strange quark, a 753.3 MeV charmed quark and a 5566 MeV bottom quark.