Empirical Formulas for Masses of Subatomic Particles, Part 2- A Closer Look

Abstract

In my prior article, Empirical formulas for Rest-Mass Energies of Sub -Atomic Particles (http://vixra.org/abs/1604.0192), 74 subatomic particles were studied and assigned simple formulas that closely approximated the current measured masses. A closer examination of these formulas reveals that most of the particle masses can be grouped around factors containing 7 times the reciprocal of the fine-structure constant.

by Roger N. Weller (proton3@gmail.com) April 17, 2016

Report

There is still no theory that accurately predicts the masses of subatomic particles. Consequently, one path towards understanding the process that generates these masses would be to discover mathematical relationships between these particles. My initial study indicated that the masses of most of the 74 subatomic particles could be described by the following formula.

$$[X(A+Y)+Z\}m_e$$

A is the reciprocal of the fine-structure constant, X is the primary factor, Y is a multiple of the primary factor, and Z is a small number of electron masses needed to complete the formula. X can either be an integer or half-integer, Y and Z are either positive or negative integers or half integers, and m_e is the mass of the electron.

The resulting formulas produced calculated mass values that were very close to current measured mass values. As measurements of particles will still improve, small changes in the formulas of particles are expected

The next step was to use these new formulas to see if there is a mathematical pattern that connected these formulas.

An unusual pattern emerged. The particle masses tended to group around integer and half-integer multiples of 7 times the fine-structure constant. Most of these factors were full integers. Only two factors were half-integers (1.5 and 5.5). Also, there were no particles that grouped around 8(7A), 9(7A), or 10(7A). These are probably prohibited values.

Tables 1 to 13- Groupings of Particle Masses

Group 1 (7x1) Region of 7A Masses

particle	measured mass MeV	proposed formula m_e
kaon: +	493.677	7(A+1)
kaon: 0	497.614	7(A+2)
eta: 0	547.862	8(A-3)

Group 2 (7x1.5) Region of 10.5A Masses

particle	Measured mass MeV	Proposed formula m_e
rho: +	775.11	11(A+1)-1.5
rho: 0	775.26	11(A+1)-1
omega: 0	782.65	11(A+2)+2

Group 3 (7x2) Region of 14A Masses

particle	measured mass MeV	proposed formula m_e
kaon*: +	891.66	13(A-3)+2.5
kaon*: 0	895.81	13(A-2)-2.5
proton: +	938.2720	13.5(A-1)-0.5
neutron: 0	939.5654	13.5(A-1)+2

Group 4 (7x2.5) Region of 17.5A Masses

particle	measured mass MeV	proposed formula m_e
lambda: 0	1115.81	16(A-0.5)
sigma: +	1189.37	17A-2
sigma: 0	1192.642	17A+4
sigma: 1	1197.449	17(A+1)-3
delta: ++	1232	18(A-3)-2
delta: +	1232	18(A-3)-2
delta: 0	1232	18(A-3)-2
delta: -	1232	18(A-3)-2
Xi: 0	1314.86	18.5(A+2)-6
Xi: -	1321.71	19(A-1)+2

Group 5 (7x3) Region of 21A Masses

particle	measured mass MeV	proposed formula m_e
sigma*: +	1382.8	19.5(A+2)-5
sigma*: 0	1383.7	19.5(A+2)-3
sigma*: -	1387.2	19.5(A+2)+4
Xi *: 0	1531.80	22(A-1)+5
Xi *: -	1535.0	22(A-0.5)+5
omega: -	1672.42	23.5(A+2)+5.5

Group 6 (7x4) Region of 28A Masses

particle	measured mass MeV	proposed formula m_e
D: 0	1864.84	27(A-2)+3.5
D: +	1869.61	27(A-1.5)-1
Ds: +	1968.30	28(A+0.5)+1
D*: 0	2006.96	28.5(A+1)-6.5
D*: +	2010.26	28.5(A+1)
Ds*: +	2112.1	29.5(A+3)+2

Group 7 (7x5) Region of 35A Masses

particle	measured mass MeV	proposed formula m_e
charmed lambda: +	2286.46	33(A-1.5)+2
charmed sigma: +	2452.9	35A+4
charmed sigma: 0	2453.74	35A+5.5
charmed sigma: ++	2453.98	35A+6
charmed Xi prime: +	2575.6	36(A+3)+2
charmed Xi prime: 0	2577.9	36(A+3)+3.5
charmed sigma*: +	2517.5	36A-7
charmed sigma*: ++	2517.9	36A--6
charmed sigma*: 0	2518.8	36A-4

Group 8 (7x5.5) Region of 38.5A Masses

particle	measured mass MeV	proposed formula m_e
charmed Xi*: 0	2645.9	37.5(A+1)+1.5
charmed Xi*: +	2645.9	37.5(A+1)+1.5
charmed omega: -	2765.9	39(A+2)-10

Group 9 (7x6) Region of 42A Masses

particle	Measured mass MeV	Proposed formula m_e
charmed eta: 0	2983.6	42(A+2)-1
J/psi: 0	3096.916	43(A+4)-4

Group 10 (7x7) Region of 49A Masses

particle	measured mass MeV	proposed formula m_e
Double charmed Xi: +	3518.9	49.5(A+2)+4

Currently, there are no particle groups for (7x8)A, (7x9)A, or (7x10)A.

Group 11 (7x11) Region of 77A Masses

particle	measured mass MeV	proposed formula m_e
B*: +	5325.2	75(A+2)-6.5
B*: 0	5325.2	75(A+2)-6.5
Bs: 0	53666.77	75(A+2)+5
B: +	5279.26	76(A-1)-7.5
B: 0	5279.26	76(A-1)-7
Bs*: 0	5415.4	76.5(A+1.5)

Group 12 (7x12) Region of 84A Masses

particle	measured mass MeV	proposed formula m_e
bottom lambda: 0	5619.4	80(A-0.5)+-6
bottom Xi: 0	5787.8	81.5(A+2)-5
bottom Xi: -	5791.1	81.5(A+2)+1.5
bottom sigma: +	5811.3	83A-1.5
bottom sigma: -	5815.5	83A+6.5
bottom omega: -	6071	87(A-0.5)+2

Group 13 (7x13) Region of 91A Masses

particle	measured mass MeV	proposed formula m_e
charmed B: +	6275.6	89(A+1)-4

Particles that do not appear to belong to any of these groups are:

particle	measured mass MeV	proposed formula m_e
muon: -	105.658 MeV	1.5A +1
pion: 0	134.9766 MeV	2A-10
pion: -	139.7018 MeV	2A-1
bottom eta: 0	9398 MeV	10 protons + 30 electrons
Upsilon : 0		A(A-2)+8.5
Tau : -		25(A+2)+1

As a curious point, if the masses of the $muon^-$ and $pion^+$ were to be combined together as a single particle and also with a $muon^-$ and $pion^0$ in a similar manner, the new particles would create a new group that would fill a position of (7 X 0.5) or 3.5A masses. This combination of some of the simplest particle masses might be tied into the factor 7A found in the 13 listed groupings. Perhaps the 3.5A represents a particular type of bonding within a particle,

hypothetical particle	Hypothetical mass MeV	hypothetical formula m_e
$muon^-$ + $pion^+$	245.36	3.5A
$muon^-$ + $pion^0$	240.64	3.5(A-3)+1.5

Discussion

The groupings of certain factors appear to have strong relationships between their constituent particles. This implies some validity to the grouping process.

28A- just D mesons
35A- just charmed particles
38.5-just charmed particles
77A- just B mesons
84A- just bottom particles

The grouping process suggests that the diverse particles within each group from Group 1 to Group 5 are probably in some way structurally related to each other within their grouping.

There is still no good answer as to why each particle has its own distinct mass. However, there are now new mathematical relationships which will help guide research along new lines of inquiry.

References

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