

The Tetraquark and Proton Are the 248th Plus 2nd Different Particle and Antiparticle in Our E8 x U(1) Broken Symmetry Universe

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Abstract: A very careful count of the different particles and antiparticles in our universe confirms and extends a similar conclusion made on 8-22-2014; namely, the exotic 4-quark tetraquark particle is the sole marker for E8 symmetry in our universe and also marks the existence of the extremely long-lived proton particle.

The author has undertaken a more careful count of the number of different particles and antiparticles in our universe that differ in:

1. no-quark composition (lepton) – 6 + 6 anti = 12. All stable (6 neutrinos cycle through 3 masses).
2. no-quark composition (gauge boson) – 8 . no anti. All stable. Our E8 x U(1) broken symmetry has 3 new gauge bosons (undetactable), for 8 in all, (My finding).
3. A 3-quark composition (baryon) -51 + 51 anti = 102. All but one (the proton) is unstable.
4. A 2-quark composition, 1 + 1 anti (meson) – 51 + 51 anti = 102. All unstable.
5. QCD strong force particles and gluons – 14 + 14 anti = 28

Totals: 12 leptons
 8 gauge bosons
 204 hadrons
 28 QCD particles

This gives a grand total of 248 + 4. The 4 extra hadrons signify 2 extra particles: the tetraquark and the extremely long-lived proton.

The count of 51 each for the baryons and mesons requires further explanation. The count would be 50 for both but nature has provided 2 extra hadrons:

1. The tetraquark as a 248th +1 particle marker for E8 symmetry.
2. The long-lived (probably infinite) proton (3-quark particle) for the containment of living matter building blocks.

Calculation of the number of baryons:

The basic quark list and charges is:

-1/3 d +2/3 U

-1/3 s +2/3 C

-1/3 b +2/3 T

Initially, we have antiparticles of all these non-composite particles which we include in forming the composite particle set.

The 3-quark charge groupings of the composite particle set are:

+2/3	+2/3	-1/3	net charge 1
-2/3	-2/3	+1/3	-1
+2/3	-1/3	-1/3	0
-2/3	+1/3	+1/3	0
+2/3	+2/3	+2/3	2
-2/3	-2/3	-2/3	-2

Note that negative net charges are acceptable for the composite particle set (they only need to be integer).

Acceptable 3-quark groupings are:

UC x	CT x	TU x
d	d	d
s	s	s
b	b	b

Partial total = 9.

ds x	sb x	db x
U	U	U
C	C	C
T	T	T

Partial total $9 \times 2 = 18$, or 27 overall.

For the UCT groups: $3 \times 2 = 6$ each $\times 2$ net charge each = 12×2 polarity each = 24 overall. Grand total $27 + 24 = 51$ for the all the baryons.

For the mesons:

For 6 different quarks taken 2 at a time:

$$6 \times 5 = 30$$

Using reference Wikipedia List of Mesons:

2 quarks at a time same = 5

Meson mixed state = $8 \times 2 = 16$

Grand total = 51 for the mesons