Top Quark Mass Confusion

D. G. Grossman
May 17, 2025

From 2011 to 2024 physicists at the LHC measured the top quark's mass 29 times, and got 29 different measurements over a range of about 6.5 GeV. Why weren't they able to zero in on it? Were they even measuring the top quark's mass? What were they measuring?

Is It the Top Quark's Mass or Just a Large Hadron's Mass?

The top quark's mass measurements, in units of MeV, determined by the CMS Collaboration over the 13 year period from 2011 to 2024 are listed in a table on the next page from smallest to largest. Are they measurements of the top quark's mass or something else? As you can see from the table, many of the masses can be factored as *integer multiples of* **S10h**, or as an integer and a half, quarter, or eighth times **S10h**. For instance, the 18th top quark mass measurement listed in the table is 173,060 MeV, which matches **1024 S10h** very closely. What is **1024 S10h**?

1024 S10h Signifies Higher Dimensional Matter

S10 represents the value of the unit radius surface volume formula of a 10-sphere, **S10**=$(1/12)\pi^5 r^9$, and **h** is Planck's constant's coefficient, **h**= 6.62607015 MeV. (Yes, this **h** is in units of MeV, not J-s, and there is no 10^{-34} factor. See the derivation of **m = (xSn)h** on page 3). Particle physicists haven't seemed to realize it yet, but particle accelerators have been creating higher dimensional matter for decades. There is evidence that all hadrons are made of higher dimensional matter (see the examples on page 4), which means that all quarks are made of higher dimensional matter as well, since they are what makes a hadron. Hadrons exist mainly in higher dimensional space, so to speak (there is actually no higher dimensional space, only higher dimensional matter.). What we experience of them is their *intersection* with our 3D "space" (the Higgs field). But if quarks are made of higher dimensional matter, and exist mainly in higher dimensional space, can they exist completely in our 3D "space" (the Higgs field)? No they can't. That's why quarks cannot be isolated. They can't exist entirely in our 3D "space", even for an instant because they are higher dimensional things, therefore the masses observed by the CMS Collaboration cannot be quark masses, top or otherwise. Besides that, quarks don't appear to have a fixed mass. They appear to have fixed shapes - that of n-sphere surface volumes - but not fixed masses. For those reasons, the CMS Collaboration's top quark measurements must be measurements of the masses of large hadrons, specifically, as the factorings in the table show, they are hadrons of dimension 9/10, that is, they are composed of 9-dimensional matter (quarks) that circulate in the surface of a 10-sphere. The specific hadron they seem to be zeroing in on, because it's right near the middle of all their measurements and because of its power of two multiple (which may imply greater stability), is the one that factors as **1024 S10h**, which has a mass of **173,031.074** MeV.

CMS Physicists Did a Great Job Measuring

The masses measured by the CMS Collaboration's physicists were more accurate than they thought they were if **S10h** factoring is the correct factoring of the masses measured. Of the 24 factorings in the table, twenty of those theoretical masses were within 9 MeV of the corresponding experimental mass. Ten were within 3 MeV of the corresponding experimental mass. Their experimental errors (+/-) were much higher **-** in the hundreds and even thousands of MeV. Comparing experimental errors to actual errors, shows that the experimentalists were much too conservative in assigning experimental errors. The *average experimental error* is probably at least 20 times larger than the *average actual error*, so the CMS physicists' accuracy is about 20 times greater than they presumed it was.

29 Top Quark Mass Measurements

(From smallest to largest)

Made by the CMS Collaboration from 2011 to 2024
and
Hypersphere Surface Volume Factorings of 24 of Them
(Masses are in units of MeV)

#	Top Quark ExpMass	+/-	Top Quark ThrMass		HSS Volume Factoring		ExpM-ThrM MassDiff
1	170,500	800	170,496.43	=	**1009.000**	**S10h**	dm = 3.57
2	170,600	2700	170,602.04	=	**1009.625**	**S10h**	dm = 2.04
3	170,900	6000	170,897.75	=	**1011.375**	**S10h**	dm = 2.25
4	171,770	40	171,763.75	=	**1016.500**	**S10h**	dm = 6.25
5	172,130	320					
6	172,220	180	172,228.43	=	**1019.250**	**S10h**	dm = 8.43
7	172,250	80	172,249.56	=	**1019.375**	**S10h**	dm = .44
8	172,320	250					
9	172,330	140	172,334.04	=	**1019.875**	**S10h**	dm = 4.04
10	172,340	200					
11	172,350	160	172,355.17	=	**1020**	**S10h**	dm = 5.17
12	172,440	130	172,439.65	**=**	**1020.500**	**S10h**	dm = .35
13	172,500	400	172,503.02	=	**1020.875**	**S10h**	dm = 3.02
14	172,520	140	172,524.14	=	**1021**	**S10h**	dm = 4.14
15	172,600	400	172,608.63	=	**1021.500**	**S10h**	dm = 8.63
16	172,820	190	172,819.85	**=**	**1022.750**	**S10h**	dm = .14
17	172,950	770	172,946.58	=	**1023.500**	**S10h**	dm = 3.42
18	173,060	240	**173,031.07**	=	**1024**	**S10h**	dm = 28.93
19	173,200	1600	173,200.04	=	**1025**	**S10h**	dm = .04
20	173,400	1800	173,400.70	=	**1026.1875**	**S10h**	dm = .70
21	173,490	430	173,495.75	=	**1026.750**	**S10h**	dm = 5.75
22	173,500	3000					
23	173,540	330	173,538.00	=	**1027**	**S10h**	dm = 2.00
24	173,680	200	173,675.29	=	**1027.8125**	**S10h**	dm = 4.70
25	173,700	2100	173,706.97	=	**1028**	**S10h**	dm = 6.97
26	173,900	900	173,897.07	=	**1029.125**	**S10h**	dm = 2.93
27	174,300	2100	174,298.39	=	**1031.500**	**S10h**	dm = 1.60
28	175,500	4600	175,502.34	=	**1038.625**	**S10h**	dm = 2.34
29	177,000	3600	177,002.00	=	**1047.500**	**S10h**	dm = 2.00

Note: 0.125 **S10h =** 21.12 MeV

Source of Top Quark Mass Data: arXiv.org:2403.01313v1 "Review of Top Quark Mass Measurements in CMS"

Derivation of the *Hypersphere Surface Volume* Factoring Formula

$$\mathbf{m}_{\mathrm{MeV}} = \mathbf{h}_{\mathrm{MeV}}(\mathbf{xSn})$$

The HSSV factoring formula, **m = h** (**xSn**), which is used to discover hadron dimensions and exact masses, can be derived from Planck's Energy-Frequency Relation: **E = hf.** The key to the derivation is associating a frequency with a unit of hypervolume. A main benefit of the derivation is that it explains how the (10^{-34}) factor was removed from **h**, and its units changed from J-s to MeV.

If **m = h (xSn**) is correct, (and the factorings of hundreds of hadrons says it is) then a frequency of ($1.602176634 \times 10^{21}$ Hz) is associated with each unit of hypervolume (each unit of **Sn**) of a hadron, no matter the dimension. In the example with **Ds** (See next page), **Ds'**s hypervolume is **10.000 S9**, which equals 1967.053/**h** = 296.8657 hypervolume units. Multiplying 296.8657 by ($1.602176634 \times 10^{21}$ Hz/vol) - the frequency per unit hypervolume constant - will give you a frequency of $4.75631288 \times 10^{23}$ Hz as the frequency associated with the entire particle, which is correct. (Putting that frequency in Planck's energy-frequency law, **E=hf,** will give you the particle's mass in Joules.) So in terms of particle *hypervolume*, Planck's energy-frequency law can be rewritten as:

$$\mathbf{E}_{J} = \mathbf{h}_{J\text{-}s}\,(\mathbf{xSn}_{vol})\,(\mathbf{1.602176634 \times 10^{21}}\ \mathrm{Hz/vol}) \qquad (\text{here } \mathbf{h} = 6.62607015 \times 10^{-34}\ \mathrm{J\text{-}s})$$

Which says a frequency (and therefore energy) is associated with a volume. To convert **h** to units of MeV divide the right hand side by $1.602176634 \times 10^{-13}$ Joules/MeV (the Joules to MeV conversion factor). The result is **h** in units of MeV and a factor of (1×10^{34}) times **h(xSn)** on the right . (**E** on the left hand side of the equation then has units of MeV by default.) When that factor, (1×10^{34}), is multiplied by Planck's constant, ($6.62607015 \times 10^{-34}$ MeV), you are left with just Planck's constant's coefficient (6.62607015 MeV) for **h**. The result is:

$$\mathbf{m}_{\mathrm{MeV}} = \mathbf{h}_{\mathrm{MeV}}\,(\mathbf{xSn}) \qquad (\text{So, here } \mathbf{h} = 6.62607015\ \mathrm{MeV}, \textbf{ not } 6.62607015 \times 10^{-34}\ \mathrm{J\text{-}s.})$$

Where **m** is in units of MeV, **h** = 6.62607015 MeV, and **Sn** is the hypervolume calculated from the surface volume formula for an n-sphere using a radius of one (a unit radius). (**Snh** values are given in an appendix for all **n** from dimensions 2 to 21.) That formula seems to work on any dimension of hadron, *which implies that the mass density of the hypervolume of hadrons remains the same over all dimensions*. What is the density of the hypervolume of any hadron? It is 6.62607015 MeV per unit hypervolume. That's what the formula says if it is rearranged.

$$\mathbf{h}_{\mathrm{MeV}} = \mathbf{m}_{\mathrm{MeV}} / (\mathbf{xSn})$$

So, if m=h(xSn) is valid, it means that if a correct factoring can be found for a hadron then, a dimension and a precise mass can be assigned to it.

Evidence That Hadrons Are Made of Higher Dimensional Matter

Examples of Hadron Masses Factorted with Snh

(Masses in units of MeV)

HSS Volume Factoring		Hadron's ThrMass	TM-EM	Hadron's ExpMass	ExpErr	Hadron's Name	
4.4444	**S5h** =	775.071	0.051	**775.02**	.35	**ρ(775)**	
6.0000	**S6h =**	1232.698	0.202	**1232.9**	1.2	**Δ(1232)**	
2.5000	**S7h** =	547.866	0.001	**547.865**	0.031	**η**	
25/7	**S7h =**	782.665	0.015	**782.65**	0.12	**ω**	
6.00000	**S7h** =	1314.878	0.018	**1314.86**	0.20	**Xi°**	
6.03125	**S7h =**	1321.726	0.016	**1321.71**	0.07	**Xi⁻**	
26.6666	**S8h** =	5737.239	0.039	**5737.2**	0.7	**B1(5747)**	
10.0000	**S9h** =	1967.053	0.053	**1967.0**	1.0	**Ds**	
15.0000	**S10h** =	2534.634	0.034	**2534.6**	0.3	**Ds1(2536)**	
16.0000	**S11h =**	2197.219	0.181	**2197.4**	4.4	**Xc0(1P)**	
29.0000	**S11h =**	3982.461	0.039	**3982.5**	1.8	**Zcs(3982)**	
4096/7	**S11h =**	80355.47	1.473	**80354**	23	**W Boson**	[3]
4100/7	**S11h =**	80433.94	0.445	**80433.5**	9.4	**W boson**	[3]
26.0000	**S12h** =	2760.433	0.333	**2760.1**	1.1	**D3*(2750)**	
27.0000	**S12h** =	2866.605	0.005	**2866.6**	AVG	**Ds3(2860)⁺**	
28.0000	**S12h =**	2972.775	0.975	**2971.8**	8.7	**D(3000)⁰**	
50.0000	**S13h** =	3922.028	0.013	**3922.15**	1.2	**X(3930)**	
61.4400	**S14h =**	3415.496	0.004	**3415.5**	0.4	**Xc0(1P)**	
64.0000	**S14h =**	3557.808	0.008	**3557.8**	1.2	**Xc2(1P)**	
93.0000	**S15h =**	3525.820	0.020	**3525.8**	0.2	**h1(1P)**	
2^{17} /900	**S16h =**	3633.472	0.128	**3633.6**	1.7	**nc(2s)**	
2^{17}**+128** /900	**S16h** =	3637.020	0.020	**3637.0**	5.7	**nc(2s)**	
2^{17}**+256** /900	**S16h =**	3640.569	0.069	**3640.5**	3.2	**nc(2s)**	
17160/70	**S17h =**	3893.006	0.006	**3893.0**	2.3	**Zc(3900)**	
18304/70	**S17h =**	4152.540	0.040	**4152.5**	1.7	**Xc1(4140)**	
20736/70	**S17h =**	4704.049		**4704**	10	**Xc0(4700)**	
222.0000	**S17h =**	3525.484	0.084	**3525.40**	0.13	**hc(1P)**	
384.0000	**S17h =**	6098.135	0.135	**6098.0**	1.7	**Σb(6097)**	
100.5000	**S18h =**	984.646	0.054	**984.7**	0.4	**fo(980)**	
280.0000	**S20h** =	957.590	0.090	**957.5**	0.2	**η'(958)**	
(2^{16} – 2^{10})	**S21h =**	125217.08	2.920	**125220**	110	**Higgs Boson**	

Note: **17160** = 16384 + 512 + 256 + 8
18304 = 16384 + 1024 + 512 + 256 + 128
20736 = 16384 + 4096 + 2048 + 256

Source of Mass Data: P.A. Zylaet al.(Particle Data Group), Prog. Theor. Exp. Phys.2020, 083C01 (2020) and 2021 update

APPENDIX A

Quark Assignments
to
n-Sphere Surface Volume Formulae

Sphere Dimension	Quark Names Old	Quark Names New		Corresponding n-Sphere Surface Formula
2	**u**	q1	=	$2\ \pi^1 r^1$
3	**d**	q2	=	$4\ \pi^1 r^2$
4	**s**	q3	=	$2\ \pi^2 r^3$
5	**c**	q4	=	$8/3\ \pi^2 r^4$
6	**b**	q5	=	$\pi^3 r^5$
7	**t**	q6	=	$16/15\ \pi^3 r^6$
8	------	q7	=	$1/3\ \pi^4 r^7$
9	------	q8	=	$32/105\ \pi^4 r^8$
10	------	q9	=	$1/12\ \pi^5 r^9$
11	------	q10	=	$64 / 945\ \pi^5 r^{10}$
12	------	q11	=	$1 / 60\ \pi^6 r^{11}$
13	------	q12	=	$128 / 10395\ \pi^6 r^{12}$
14	------	q13	=	$1 / 360\ \pi^7 r^{13}$
15	------	q14	=	$256 / 135135\ \pi^7 r^{14}$
16	------	q15	=	$1 / 2520\ \pi^8 r^{15}$
17	------	q16	=	$512 / 2027025\ \pi^8 r^{16}$
18	------	q17	=	$1 / 20160\ \pi^9 r^{17}$
19	------	q18	=	$1024 / 34459425\ \pi^9 r^{18}$
20	------	q19	=	$1 / 181440\ \pi^{10} r^{19}$
21	------	q20	=	$2048 / 654729075\ \pi^{10} r^{20}$

APPENDIX B

n-Sphere Surface Volume Formulae

(Dimension 2 - Dimension 21)

Sphere Dimension	Sn		Surface Volume Formula	(π, r) Powers
2	**S2**	=	2 $\pi^1 r^1$	(1, 1)
3	**S3**	=	4 $\pi^1 r^2$	(1, 2)
4	**S4**	=	2 $\pi^2 r^3$	(2, 3)
5	**S5**	=	8/3 $\pi^2 r^4$	(2, 4)
6	**S6**	=	$\pi^3 r^5$	(3, 5)
7	**S7**	=	16/15 $\pi^3 r^6$	(3, 6)
8	**S8**	=	1/3 $\pi^4 r^7$	(4, 7)
9	**S9**	=	32/105 $\pi^4 r^8$	(4, 8)
10	**S10**	=	1/12 $\pi^5 r^9$	(5, 9)
11	**S11**	=	64 / 945 $\pi^5 r^{10}$	(5, 10)
12	**S12**	=	1 / 60 $\pi^6 r^{11}$	(6, 11)
13	**S13**	=	128 / 10395 $\pi^6 r^{12}$	(6, 12)
14	**S14**	=	1 / 360 $\pi^7 r^{13}$	(7, 13)
15	**S15**	=	256 / 135135 $\pi^7 r^{14}$	(7, 14)
16	**S16**	=	1 / 2520 $\pi^8 r^{15}$	(8, 15)
17	**S17**	=	512 / 2027025 $\pi^8 r^{16}$	(8, 16)
18	**S18**	=	1 / 20160 $\pi^9 r^{17}$	(9, 17)
19	**S19**	=	1024 / 34459425 $\pi^9 r^{18}$	(9, 18)
20	**S20**	=	1 / 181440 $\pi^{10} r^{19}$	(10, 19)
21	**S21**	=	2048 / 654729075 $\pi^{10} r^{20}$	(10, 20)

APPENDIX C

Values of n-Sphere Surface Volume
Units of Factorization

(Below **h** = 6.62607015 MeV, **not** 6.62607015 x 10^{-34} J-s)

(Dimension 2 - Dimension 21)

Sphere Dimension	Unit of Factorization		Formula		Value (MeV)
2	**S2h**	=	2 $\pi^1 r^1 h$	=	41.63282661
3	**S3h**	=	4 $\pi^1 r^2 h$	=	83.26565322
4	**S4h**	=	2 $\pi^2 r^3 h$	=	130.7933822
5	**S5h**	=	8/3 $\pi^2 r^4 h$	=	174.3911763
6	**S6h**	=	$\pi^3 r^5 h$	=	205.4497644
7	**S7h**	=	16/15 $\pi^3 r^6 h$	=	219.1464153
8	**S8h**	=	1/3 $\pi^4 r^7 h$	=	215.1464901
9	**S9h**	=	32/105 $\pi^4 r^8 h$	=	196.7053624
10	**S10h**	=	1/12 $\pi^5 r^9 h$	=	168.9756582
11	**S11h**	=	64 / 945 $\pi^5 r^{10} h$	=	137.3262492
12	**S12h**	=	1 / 60 $\pi^6 r^{11} h$	=	106.1705373
13	**S13h**	=	128 / 10395 $\pi^6 r^{12} h$	=	78.44057013
14	**S14h**	=	1 / 360 $\pi^7 r^{13} h$	=	55.59076334
15	**S15h**	=	256 / 135135 $\pi^7 r^{14} h$	=	37.91204905
16	**S16h**	=	1 / 2520 $\pi^8 r^{15} h$	=	24.94907624
17	**S17h**	=	512 / 2027025 $\pi^8 r^{16} h$	=	15.88056197
18	**S18h**	=	1 / 20160 $\pi^9 r^{17} h$	=	9.797479330
19	**S19h**	=	1024 / 34459425 $\pi^9 r^{18} h$	=	5.869441980
20	**S20h**	=	1 / 181440 $\pi^{10} r^{19} h$	=	3.419965454
21	**S21h**	=	2048 / 654729075 $\pi^{10} r^{20} h$	=	1.940989032

APPENDIX D

Smallest Formation Quarks per n-Sphere

(Dimension 2 - Dimension 21)

Sphere Dimension	Sn	Surface Volume Formula	(π, r) Powers	Formation Quarks
2	**S2** =	$2\ \pi^1 r^1$	(1, 1)	u
3	**S3** =	$4\ \pi^1 r^2$	(1, 2)	d
4	**S4** =	$2\ \pi^2 r^3$	(2, 3)	du = $8\ \pi^2 r^3$ = 4 **S4**
5	**S5** =	$8/3\ \pi^2 r^4$	(2, 4)	dd = $64\ \pi^2 r^4$ = 24 **S5**
6	**S6** =	$\pi^3 r^5$	(3, 5)	ddu = $32\ \pi^3 r^5$ = 32 **S6**
7	**S7** =	$16/15\ \pi^3 r^6$	(3, 6)	ddd = $256\ \pi^3 r^6$ = 273..**S7**
8	**S8** =	$1/3\ \pi^4 r^7$	(4, 7)	dddu = $128\ \pi^4 r^7$ = 384 **S8**
9	**S9** =	$32/105\ \pi^4 r^8$	(4, 8)	dddd = $1024\ \pi^4 r^8$ = 312..**S9**
10	**S10** =	$1/12\ \pi^5 r^9$	(5, 9)	ddddu
11	**S11** =	$64 / 945\ \pi^5 r^{10}$	(5, 10)	ddddd
12	**S12** =	$1 / 60\ \pi^6 r^{11}$	(6, 11)	dddddu
13	**S13** =	$128 / 10395\ \pi^6 r^{12}$	(6, 12)	dddddd
14	**S14** =	$1 / 360\ \pi^7 r^{13}$	(7, 13)	ddddddu
15	**S15** =	$256 / 135135\ \pi^7 r^{14}$	(7, 14)	ddddddd
16	**S16** =	$1 / 2520\ \pi^8 r^{15}$	(8, 15)	dddddddu
17	**S17** =	$512 / 2027025\ \pi^8 r^{16}$	(8, 16)	dddddddd
18	**S18** =	$1 / 20160\ \pi^9 r^{17}$	(9, 17)	ddddddddu
19	**S19** =	$1024 / 34459425\ \pi^9 r^{18}$	(9, 18)	ddddddddd
20	**S20** =	$1 / 181440\ \pi^{10} r^{19}$	(10, 19)	dddddddddu
21	**S21** =	$2048 / 654729075\ \pi^{10} r^{20}$	(10, 20)	dddddddddd

Current quark theory of particle reactions assumes that when a 'ddddd' particle forms during a collision in an accelerator, the masses of the 'd' quarks just add together (Total Mass = 5d + KE), and the dimension of the *product matter* remains the same as the *reactant matter's* dimension. In *higher dimension quark mass theory* the masses of the colliding quarks also add together (Total Mass= 5d + KE), but they also change their dimension, in this case from 2-dimentional matter to 10-dimensional matter. In general, the dimension of the collision reaction's product matter is determined by the dimension of the *surface volume formula that results from* multiplying together all the surface volume formulae associated with each of the reacting quarks. In the 'ddddd' case, multiplying S3 = $4\ \pi^1 r^2$, together five times gives you S11, the formula for the surface volume of an 11-sphere, the surface of which is 10 dimensional. So, the resultant particle is made of 10-dimensional matter circulating in the surface of an 11-sphere.

References

1. arXiv.org:2403.01313v1 "Review of Top Quark Mass Measurements in CMS"
2. P.A. Zylaet al.(Particle Data Group), Prog. Theor. Exp. Phys.2020, 083C01 (2020) and 2021 update
3. S. Navaset al.(Particle Data Group), Phys. Rev. D110, 030001 (2024)