Quantum Space and Origin of Mass

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March 4, 2025

Keywords: ATLAS, CMS, Dark energy, H boson, Quantum space

Abstract The compressive strength of three generation quantum spaces makes the three generation particles and gives it a quantum mass. Since quantum space has a logarithmic property, the total mass of particles must be calculated as the logarithmic value. In PDG 2024 data, W boson, Z boson, and H boson were presented as 80.3692 GeV, 91.1880 GeV, and 125.20 GeV. In previous study, dark energy ratio was calculated to be 72.916% (or 1/2/72.916% = 68.572%). When the value of Z 91.1880 GeV divided by H is 72.916%, the H boson mass is calculated to be 125.06 GeV. Applying the log-parabolic equation to the above values, the W boson mass is calculated to be 80.365 GeV. The values of Run 1 and Run 2 measured by ATLAS are 125.38 GeV and 125.10 GeV. However, applying 72.916% to the ATLAS measurements, both Run 1 and Run 2 are calculated to be 125.06 GeV. The values of Run 1 and 2016 measured by CMS are 125.07 GeV and 125.46 GeV. From the values, the value of 72.916% is derived. W, Z, and H bosons are 1st, 2nd, and 3rd generation particles located in 4D, 5D, and 6D of quantum space, respectively.

1. Introduction

The mass of H boson presented by PDG (Particle Data Group) 2024 [1] is 125.20 GeV. In previous study, the dark energy ratio of 72.916% was calculated [2]. The purpose of this study is to suggest the origin of mass, to calculate the mass of H boson using PDG 2022 & PDG 2024 data, and to derive the values of 125.06 GeV and 72.916% from the measurement data of ATLAS and CMS.

2. Origin of Mass

2.1 Space = Empty + Brane + Gap

Space is called 'Gong-Gan' in Korean. Gong means empty, and Gan means gap. The author judges that our space consists of 'Heo-Gong' and 'Mak-Gan' in Korean. Heo means empty, Gong means empty also, Mak means that there are branes that we cannot understand, and Gan means that there are gaps between them. As shown in Fig. 1, based on the XYZ linear space, the quantum space is composed of Gan(gap) closed by two Mak(brane), Heo is left space(up, -) and Gong is right space(down, +).

2.2 Shape of quantum space

In Fig. 1, (a) There was 4-dimensional space of straight lines. (b) Unknown something quantized the 4D with extreme force in Big Bang. (c) This created quantum spaces to the left L and right R of the straight XYZ space. (d) Various quantum phenomena occur in the quantum space. In (e), the XYZ extends in a straight line, and the red spring abc space of vertical dimension is less than atomic thickness. Therefore, the mass of quantum particles must be calculated as logarithmic value.

2.3 Open particle = Particle & Wave

Particles collide outside the brane. Because of this, a line falls off from the brane. When the line curls inside of the red spring of (e), it turns into an open particle. When the particle pops out of the red spring (e), it turns into a wave.

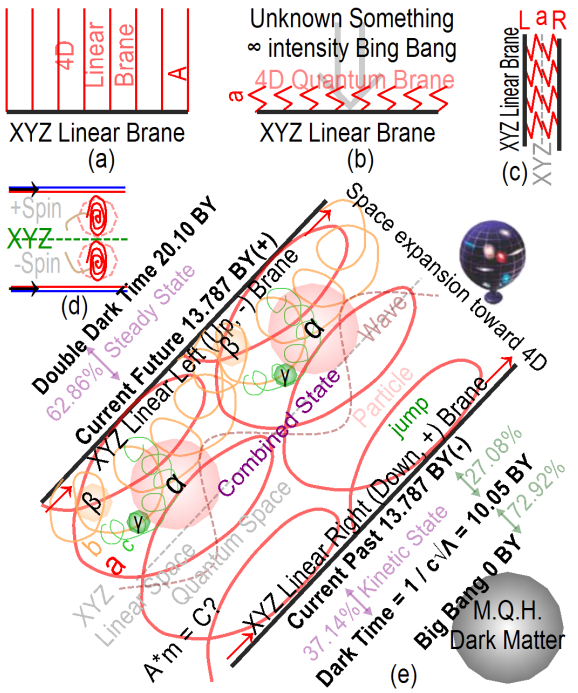


Fig. 1 Shape of quantum space

2.4 Strict integer multiples

In Fig. 1, a means 4D, b means 5D, c means 6D quantum space, and α means 4D, β means 5D, γ means 6D particle. Space a has weak intensity, space b has medium intensity, and space c has strong intensity. Because of this, α has weak mass, β has medium mass, and γ has strong mass. As can be seen from the figure, the quantum space abc has the characteristic of strict integer multiple. This causes that particle moves as jump.

2.5 Observer effect

When a line is located inside of abc quantum space, it turns into an open particle, and when the open particle is located on XYZ space, it turns into a wave line. When an external influence exerts on the wave line, it hides into quantum space and turns into a particle.

2.6 Oscillation

When α particle is located on space a, it has weak standard mass, when it is located on space b, it has intermediate oscillation mass similar to β particle, and when it is located on space c, it has strong oscillation mass similar to γ particle. β particle and γ particle are also the same situation. This is the cause of neutrino oscillation phenomenon. All particles are divided into normal particle and oscillating particle.

2.7 Spin

XYZ space in Fig. 1 is divided into XYZup and XYZdown. A universal magnetic force flows from left to right along the surface of branes. As the result, the particle located on XYZup has clockwise spin, and the particle located on XYZdown has counterclockwise spin.

Table 1 W, Z, and H masses [GeV] presented by PDG

Year	W	Z	H
2024	80.3692	91.1880	125.20
2022	80.377	91.1876	125.25
2020	80.379	91.1876	125.10
2018	80.379	91.1876	125.18
2016	80.385	91.1876	125.09
2014	80.385	91.1876	

2.8 Superposition

In the same XYZ space, only two α particles can be located on space a, many β particles can be located on space b, and innumerable γ particles can be located on space c.

2.9 Origin of mass

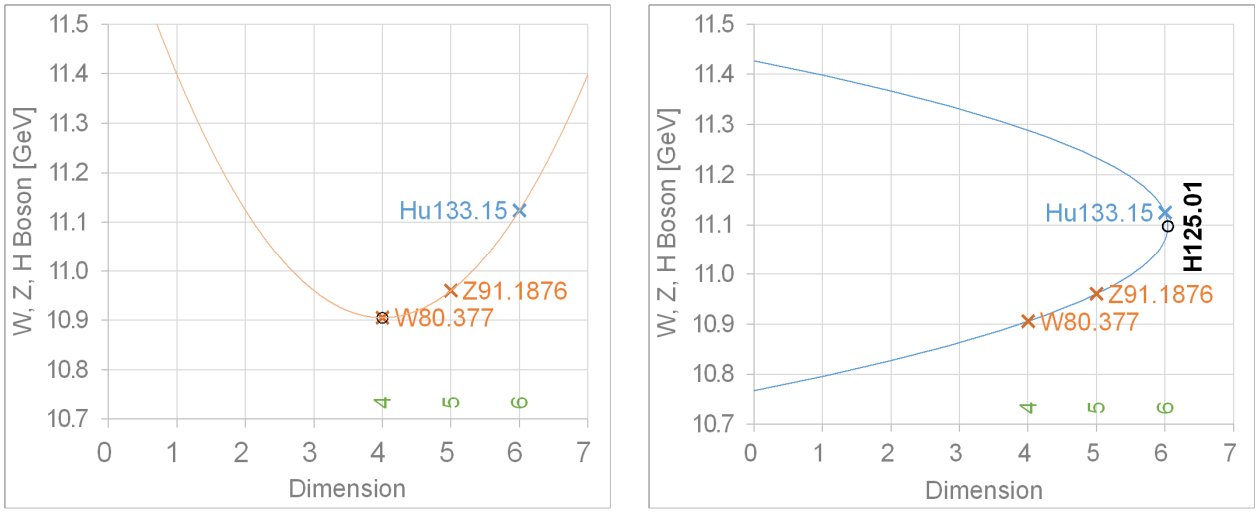
Particles do not have proper mass. The intensity of quantum space gives mass to particles.

2.10 Three generation of standard model

The three generation quantum spaces give properties to particles. Therefore, particles have three generations, and the fourth generation does not exist in our universe.

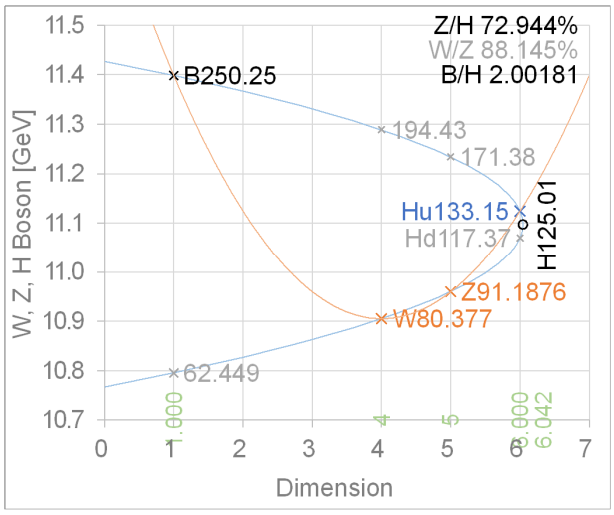
2.11 Elementary particle and Mixed particle

Three generation of neutrinos (electron, muon, tau) that make the shape of particle and three generation of gravinos (graviton, photon, gluon) that occur the force of particle are the elementary particles of all things. All other particles are mixed particles composed of above six particles. Here, gravino is the word suggested by the author.

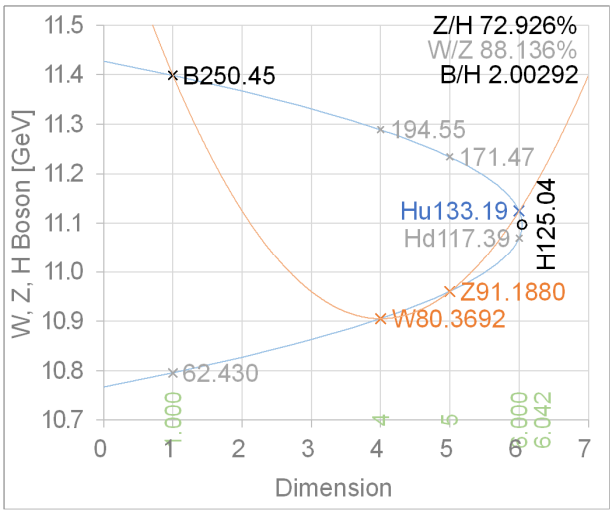


(a) Log-parabola equation (b) Log-inverse parabola equation

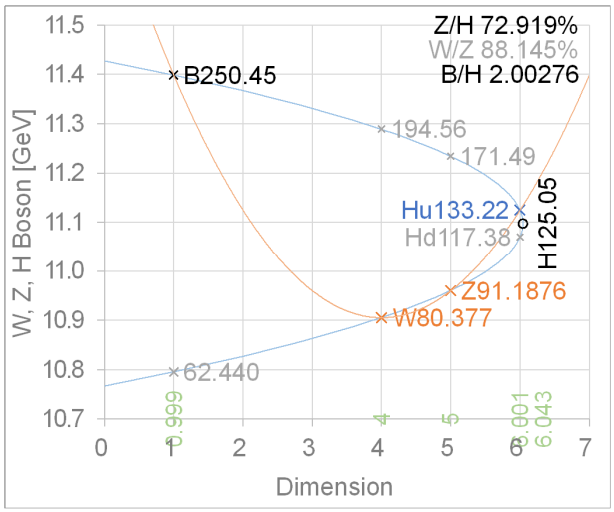
Fig. 2 Mass of H boson calculated from log and log inverse parabolic equations



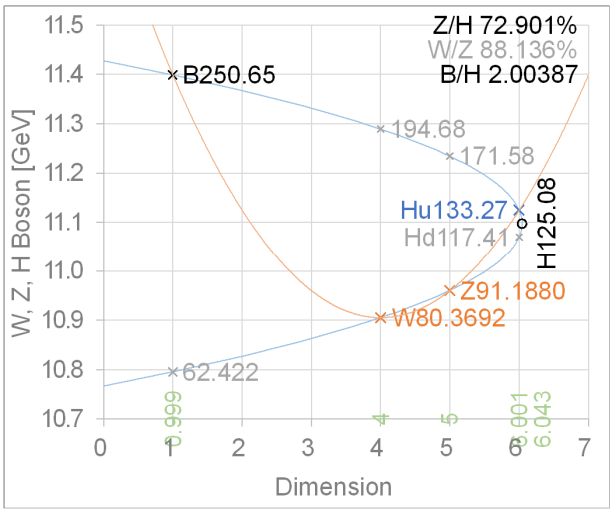
(a) PDG 2022 & 6D



(b) PDG 2024 & 6D



(c) PDG 2022 & 6.001D



(d) PDG 2024 & 6.001D

Fig. 3 Mass of H boson calculated from W boson and Z boson

2.12 Gravity

Weak, electromagnetic, and strong force act at the inside of quantum space. Gravity is the force that acts toward 4D empty space which is outside of quantum space.

2.13 Absolute Something

The final question is what made our universe so perfectly beautiful. Absolute something created our strict universal space as shown in Fig. 1. The author calls it Mommy Quantum Hole (MQH). All multi-universes are very beautiful such as our universe.

3. Log-Parabolic Equation

3.1 Masses of W, Z, H

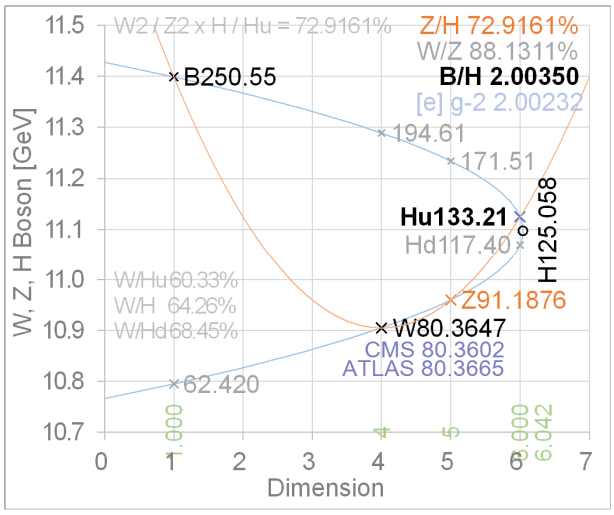
In Table 1, the masses of W, Z, and H presented by Particle Data Group are presented.

3.2 Log-parabola equation

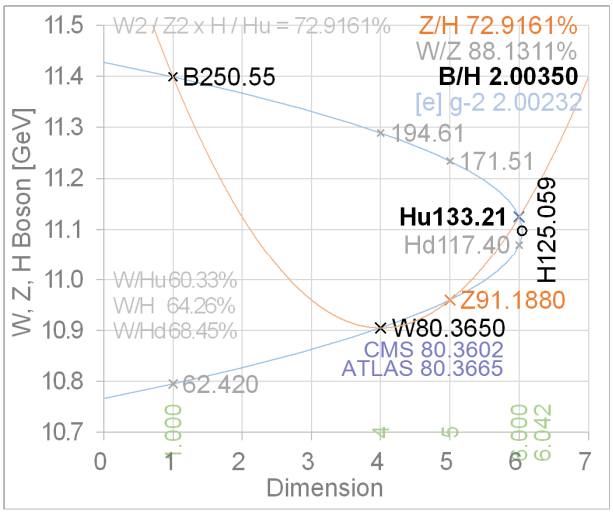
In the chart of Fig. 2, the horizontal axis is the dimension of space, and the vertical axis is the logarithm of particle mass. The core of this interpretation is that quantum mass should be calculated as logarithmic values. The values of W and Z masses in Fig. 2 is PDG 2022 data. In (a), drawing the log-parabola with (4D, 80.377W), (5D, 91.1876Z) and the vertex 4D, the value of Hu 133.15 GeV is calculated at 6D.

3.3 Log-inverse parabola equation

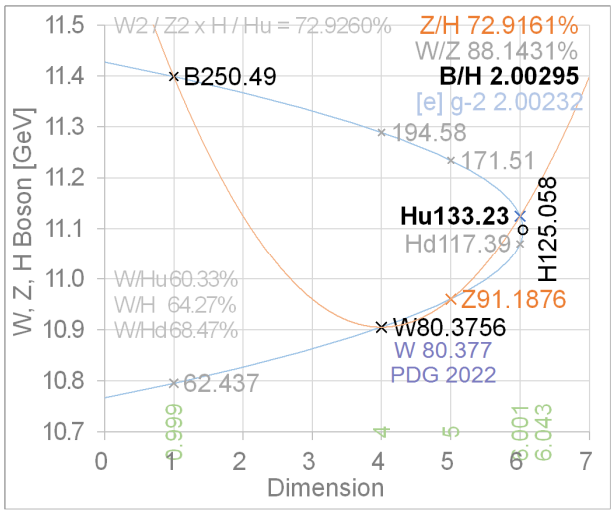
In Fig. 2(b), when the log inverse parabola is plotted for the three points (80.377W, 4D), (91.1876Z, 5D), and (133.15Hu,



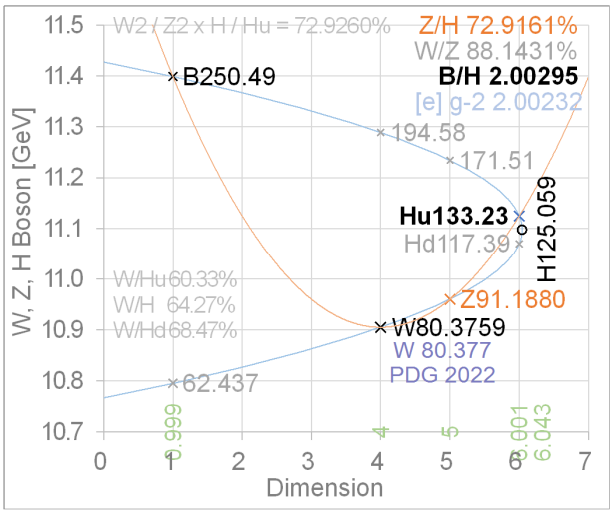
(a) Z is PDG 2022 & 6D



(b) Z is PDG 2024 & 6D



(c) Z is PDG 2022 & 6.001D



(d) Z is PDG 2024 & 6.001D

Fig. 4 Mass of H boson and W boson calculated from dark energy 72.9161% and Z boson

6D), the value of 125.01 GeV is calculated at its vertex, which is almost the same as the mass 125 GeV of H boson.

3.4 H boson calculated from W and Z

Fig. 3(a) is the result of Fig. 2 applied with PDG 2022, and (b) is the result of applied with PDG 2024. From electron 510.999 keV, muon 105.658 MeV, and tau 1776.86 MeV, 6.00108D [3] is calculated. The results of applying this value are (c) and (d). It is not clear which value is correct in Fig. 3. However, it is very peculiar that the Z/H value is about 72.92% and the B/H value is about 2.002.

3.5 H boson mass 125.06 GeV

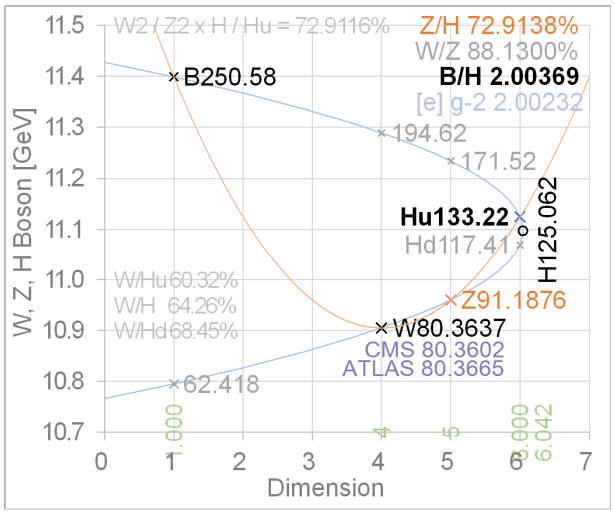
In previous study [2], the ratio of dark energy was calculated to be 72.9138% or 72.9161%, which is similar to 72.8% of Before Planck. The value of 1/2/72.91_% is 68.57%, which is similar to about 68.4% of Planck 2018. If the value of Z / H is the dark energy ratio, the value of H is calculated to be 125.06 GeV, as shown in Fig. 4 and Fig. 5.

3.6 Down & Up H boson

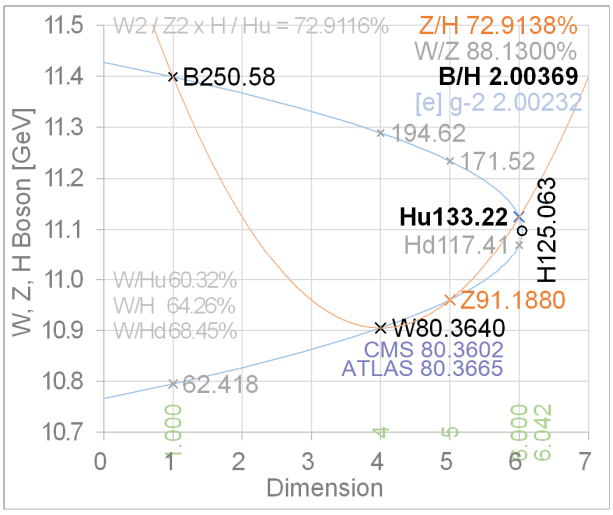
There are down and up the vertex 125 GeV of the inverse parabola. The down is the region of 4ℓ, and the above is the region of γγ.

3.7 W boson mass 80.3650 GeV

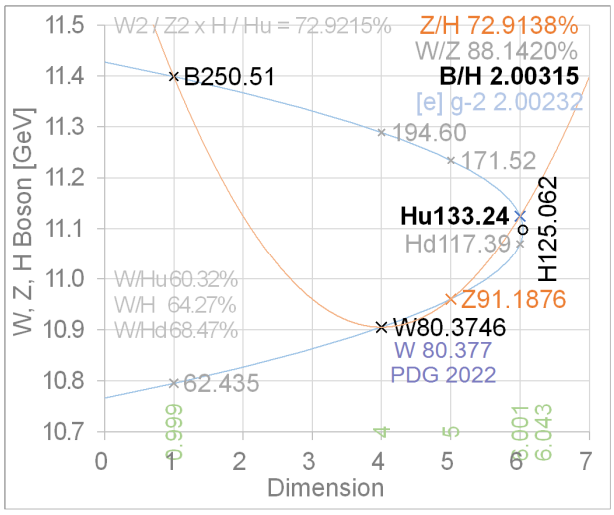
In Fig. 4 and Fig. 5, the masses of W boson are calculated, and there are some differences. The author has so far judged the interpretation of 6.001D to be correct. However, the calculated value of W^2 / Z^2 x H / Hu is presented at the top of each chart, and in Fig. 4(a, b), this value exactly matches the



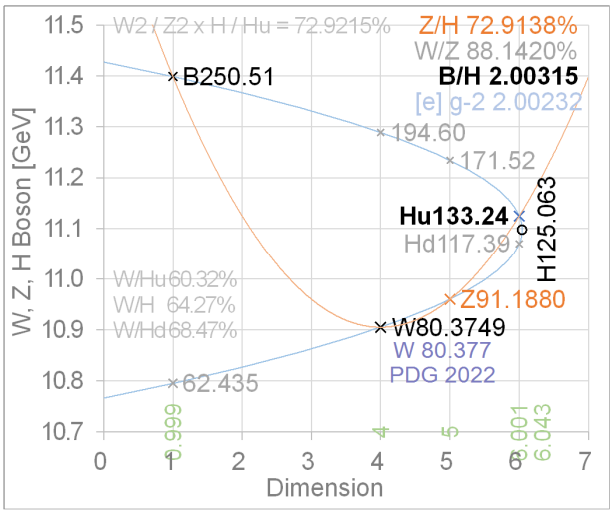
(a) Z is PDG 2022 & 6D



(b) Z is PDG 2024 & 6D



(c) Z is PDG 2022 & 6.001D



(d) Z is PDG 2024 & 6.001D

Fig. 5 Mass of H boson and W boson calculated from dark energy 72.9138% and Z boson

value of Z / H 72.9161%. The probability that this value coincides by chance is considered to be zero. From this, the mass of the W boson would be 80.3650 GeV. The value presented by CMS 2024 is 80.3602 GeV [4], the value presented by ATLAS 2024 is 80.3665 GeV [5], and the value of 80.3650 GeV in Fig. 4(b) is located between the two.

Here, Fig. 4(b) of 6D is too perfectly calculated. If it is too perfect, there will be no change in the universe. Something must be slightly off for the universe to change. If the above interpretation is correct, the value of 6.001D in Fig. 4(d) may be correct.

4.4 W- & W+ boson

W boson is located at the vertex of 4D. Therefore, W- and W+ exist based on the vertex. From the left-right & top-bottom symmetry of the charts, new values can be discovered.

3.9 Dark energy : 72.9161% vs 72.9138%

So far, all the author's calculations have applied 72.9161% as the dark energy ratio. However, 72.9138% may be correct for the neutrino series, and 72.9161% may be correct for the force series. Since W, Z, and H bosons are in the force series, it would be correct to apply 72.9161%.

3.10 Various numerical values

Besides the H and W boson masses, various other numerical values are calculated in Fig. 4 and Fig. 5. All numbers probably have a physical meaning that we have not yet discovered. As an example, the value of B/H is calculated to be about 2.003. The value of electron g-2 factor is 2.00232. The two values are shown to be very similar.

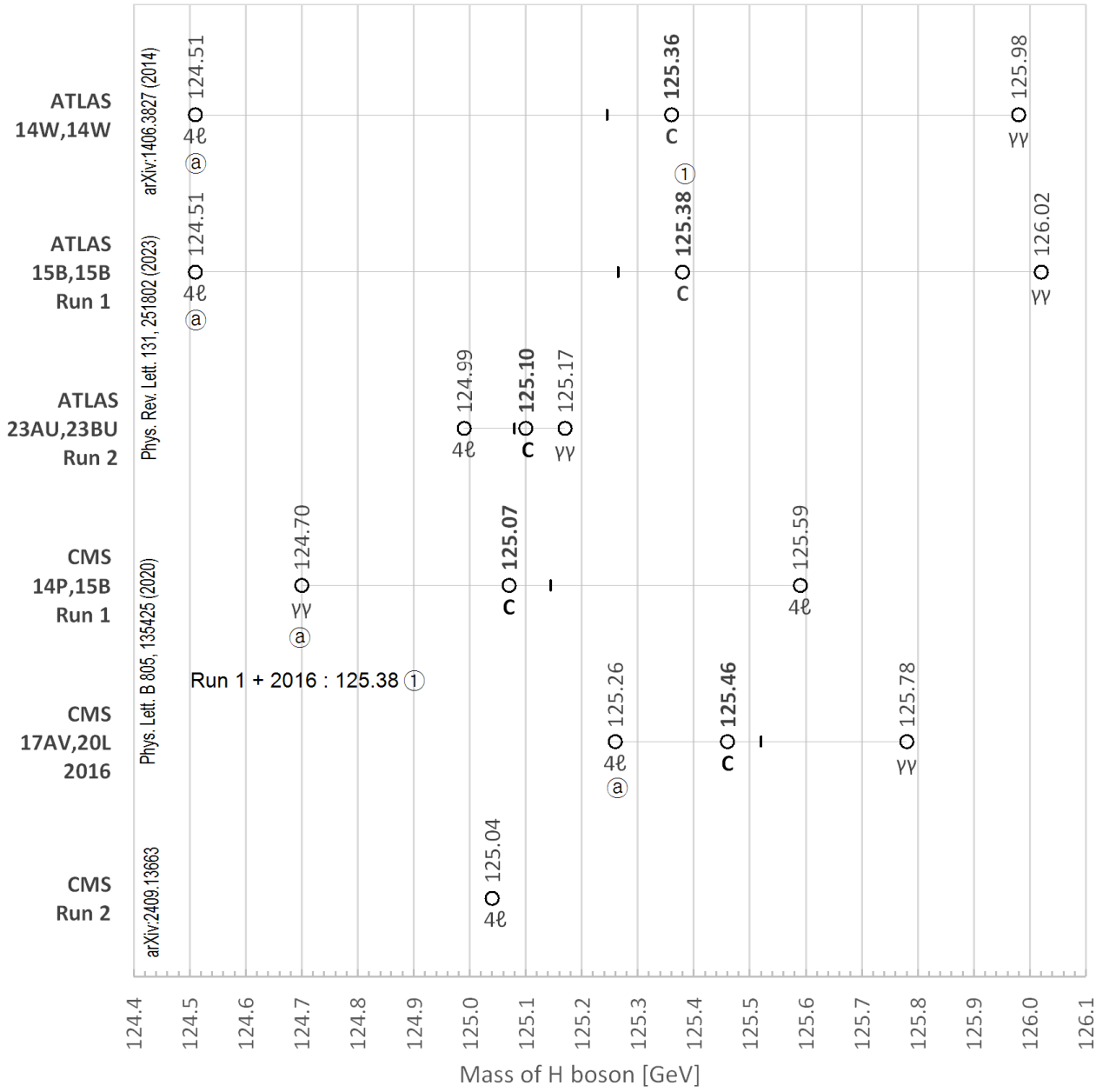


Fig. 6 The measured H boson masses [GeV]

4. ATLAS and CMS

4.1 Measurement values

The mass values of H boson measured by ATLAS and CMS are shown in Fig. 6. The combined value of ATLAS 2014 is 125.36 GeV [6]. The combined value of ATLAS Run 1 is 125.38 GeV, and the combined value of Run 2 is 125.10 GeV [7]. The combined value of CMS Run 1 is 125.07 GeV, and the combined value of 2016 is 125.46 GeV [8]. Recently, CMS measured 125.04 GeV at 4ℓ [9].

Let's see ⓐ in Fig. 6. The small value is 4ℓ In ATLAS Run 1, the small value is γγ in CMS Run 1, and the small value is 4ℓ in CMS 2016. It is peculiar that the values of 4ℓ and γγ are opposite to each other. Let's see mean value. The combined values of ATLAS are located to the right of mean value, while the combined values of CMS are located to the left of mean value. Let's see ①. CMS presented the value of Run 1 + 2016 as 125.38 GeV. This value is equivalent to 125.38 GeV in ATLAS Run1.

4.2 Kinetic state, steady state, combined state

In all the author's calculations, particles are divided into the kinetic state of 37.144% (= 1 / 72.9161% – 1), steady state of 62.856% (= 2 – 1 / 72.9161%), and the combined state of above two. The formulas and their meanings for the above

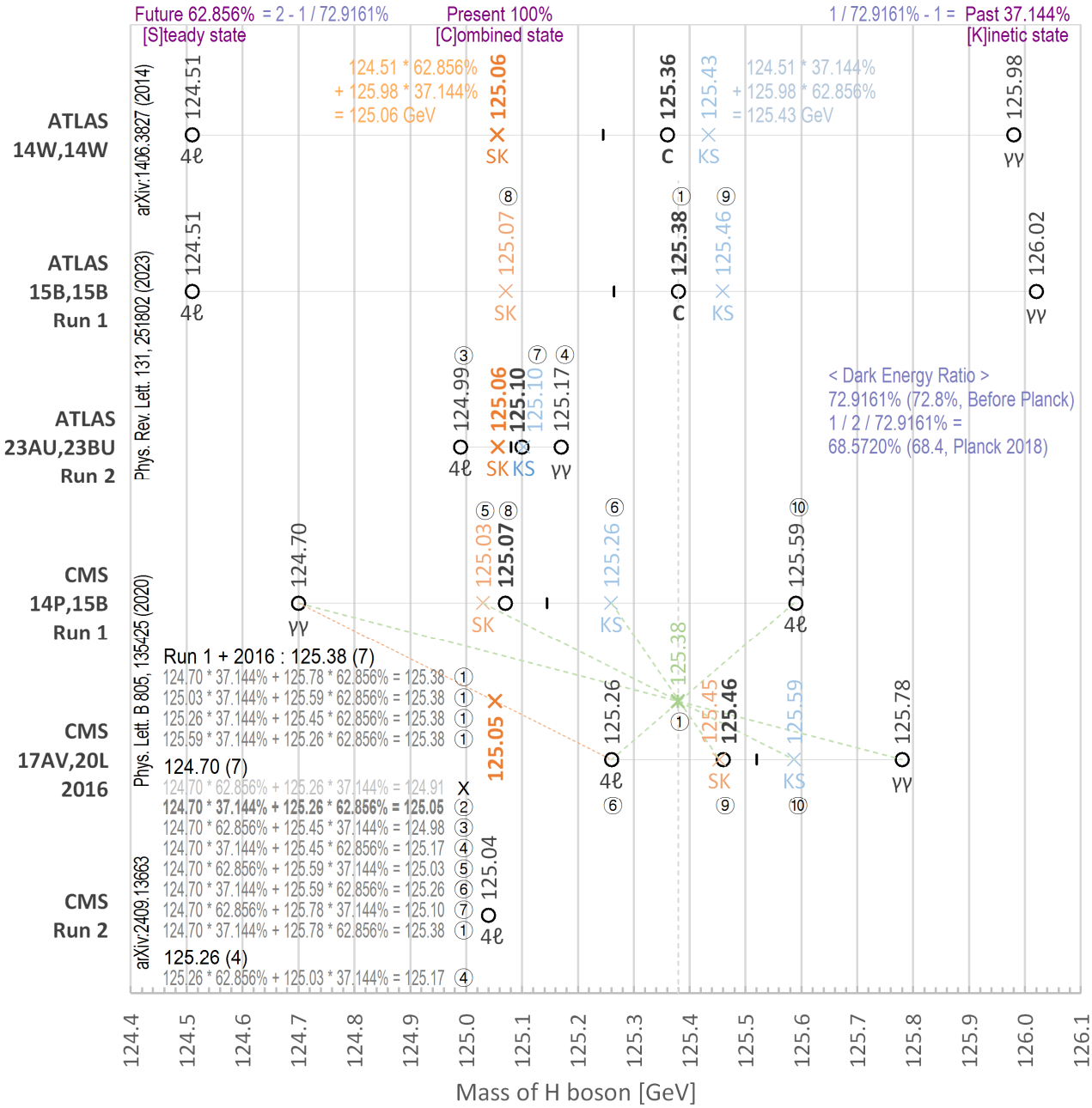


Fig. 7 Reinterpretation of the measured H boson masses [GeV]

values are described in detail in previous study [2]. For example, how should we define the present? The author argues that present is the combination of past (kinetic state) 37.144% and future (steady state) 62.856%.

4.3 ATLAS : 125.06 GeV

At ATLAS's 14W,14W of Fig. 7, multiplying 4ℓ 124.51 by [S] 62.856% and γγ 125.98 by [K] 37.144%, the combined value is calculated to be 125.06 GeV, which exactly matches the H boson mass calculated in Fig. 4 and 5. Multiplying this inversely, 125.43 GeV is calculated, which is similar to 125.36 suggested by ATLAS. Calculating in the same method, Run 1 is calculated to be 125.07 GeV, and Run 2 is calculated to be 125.06 GeV.

In Fig. 7, the values presented by ATLAS are on the right based on the middle mean value, and the values presented in this study are on the left. If interpreted to the right, the deviation between 125.38 GeV of Run 1 and 125.10 GeV of Run 2 is too large, but if interpreted to the left, ATLAS measurements are consistent with 125.06 GeV. The core value in this calculation is 37.144%, which is the dark energy ratio of 72.9161%.

4.4 CMS : 72.9161%

The values of Run 1 and Run 2 presented by CMS are 125.07 GeV and 125.46 GeV, and the values calculated in this study are 125.03 GeV and 125.45 GeV, which are very similar to CMS. However, Run 1 can be said to be similar to 125.06 GeV, but Run 2 is a different value.

Let's see ①. The value of ATLAS Run 1 was 125.38 GeV, and the value of CMS Run 1 + 2016 was also 125.38 GeV. As shown in Fig. 7, let's combine the values of Run 1 and 2016 of CMS by applying 37.144%. All the combined values are calculated as 125.38 GeV. That is, 125.38 GeV is calculated in a total of 7 cases.

The γγ 124.70 GeV of CMS Run 1 is very characteristic. Let's see ②. The combination of 124.70 and 125.26 is calculated as 125.05 GeV. From ② to ⑦ and again ①, the same numbers are found in all combinations.

The 4ℓ 125.26 GeV of CMS 2016 is also characteristic. Let's see ④, The 4ℓ 125.26 of 2016 and the SK 125.03 of Run 1 are also calculated to be the γγ 125.17 GeV of ATLAS Run 2. The combination of the two characteristic numbers 124.70 and 125.26 is calculated to be 125.05 GeV.

Let's see ⑧. The combined value of CMS Run 1 is 125.07 GeV, and the SK value of ATLAS Run 1 is also calculated to be 125.07 GeV. Let's see ⑨. The combined value of CMS 2016 is 125.46 GeV, and the KS value of ATLAS Run 1 is also calculated to be 125.46 GeV. Let's see ⑩. The 4ℓ value of CMS Run 1 is 125.59 GeV, and the KS value of CMS 2016 is also calculated to be 125.59 GeV.

The core value in the above consistency is 72.9161%.

5. Composition of Quarks

5.1 Shape of quarks

The shapes of up, charm, top, down, strange, and bottom quarks are shown in Fig. 8. Where, α is electron neutrino, β is muon neutrino, γ is tau neutrino, f is fermion in 4D 5D 6D, b is boson in 10D 11D 12D, n is neutrino, s is anti-neutrino, g is gravino, t is anti-gravino, and N is the oscillating particle.

5.2 Particle and anti-particle

As can be seen in Fig. 8, down, strange, bottom are particles, and up, charm, top are anti-particles. The difference is standard and oscillation.

5.3 w z h bosons inside of down, strange, bottom

Quark is a combined particle which is composed of shell fermion and inside boson in Fig. 8. There is a w boson of 10D in down quark. When down quark is collided, αN shell is peeled off and it turns into strange quark. At that time, the w boson in it changes to z boson of 11D. When the strange quark is collided, βN is peeled off and it turned into bottom

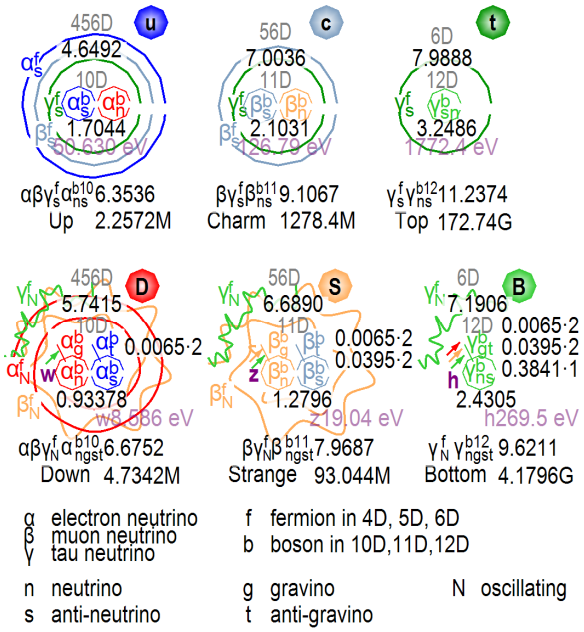


Fig. 8 Shape of quarks

quark. At that time, the z boson in it changes to h boson of 12D.

5.4 Oscillation of H Z W bosons

When the bottom quark is broken by very large energy, it is divided into 6D tau neutrino γN and 12D boson h. The boson h immediately moves into the quantum space of 6D, and its mass changes to H boson. The mass change also follows the logarithmic parabolic equation. The H boson located on 6D space of Fig. 4 moves into 5D space due to the oscillation phenomenon. This is Z boson. It also moves into 4D space. This is W boson. That is, W Z H are all the same particles. The mass of three generation boson is determined by the quantum space where the particle is located. This phenomenon is the below area of the vertex on the inverse parabola of Fig. 4, and it is the 4ℓ.

5.5 Collapse of H boson

If the collision energy is stronger, the h boson inside of bottom quark of Fig. 8 is broken. This phenomenon is the above area of the vertex on the inverse parabola of Fig. 4, and it is the γγ. The h Boson is composed of tau neutrino γn, gluon γg, tau anti-neutrino γs, and anti-gluon γt. The boson gluon and boson anti-gluon on 6D space move into 5D space. It is boson photon and boson anti-photon. They move into 4D space. It is boson graviton and boson anti-graviton. Here, the measurement of photon is easy, and the others are difficult to measure.

5.6 Dark energy

From the outside of our universe, three generation dark

forces are affecting our universe. Dark energy is judged to be the sum of three generation dark forces. They affect graviton, photon, and gluon. Therefore, it is assumed that W, Z, and H bosons are affected by the dark forces. Also, gravity force, weak force, electromagnetic force, and strong force are all affected by the three generation dark forces.

5.7 Neutrino inside of up, charm, top

There are boson neutrino pairs in up, charm, and top quarks. These do not respond to force, so they would be difficult to observe.

6. Conclusions

The intensity of the compressed quantum space gives the particle mass. In reverse, when a particle receives or loses quantum energy, the particle is moved to one of the three generations of quantum space that matches the energy. The core is that their relationship is established by log mass.

From the Z boson mass of 91.1880 GeV and the dark energy ratio of 72.9161%, the mass of H boson was calculated to be 125.06 GeV, and from the log-parabolic equation, the mass of W boson was calculated to be 80.3650 GeV. The result of reinterpreting ATLAS' Run 1 and Run 2 was also calculated to be 125.06 GeV. A core value of 72.916% (or 1/2/72.916% = 68.572%) was found from the Run 1 and 2016 of CMS, and the value is dark energy ratio.

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