Higgs Boson Mass Relations and Hole Superconductivity

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Abstract

We suggest relationships between the experimentally measured *Higgs* boson mass and the mass of elementary particles like electron or proton by scaling with *Sommerfeld*'s α constant and the golden mean.The depressed quartic potential of the *Higgs* field is governed by the golden mean, because every quartic polynomial is a golden one. The *Higgs* boson with zero spin, considered as composite particle like the *Cooper* pair, could be associated with properties of superconductivity. However, when superconductivity is exclusively caused by interacting holes, the *Higgs* boson should be related to any paired holes of matter. Furthermore, the *Higgs* field can be related to *Bhandari*'s energy field that is believed to come from an extern energy source, and this field is related to gravity.

Keywords: Higgs Boson, Higgs Field, Golden Mean, Electron Mass, Proton Mass, Galactic Velocity, Hole Superconductivity, Gravity, Mass Asymmetry.

1. Introduction

The *Higgs* field is suspected to be responsible for the mass of elementary particles. In this contribution we tried to relate the experimentally recorded mass of the *Higgs* boson to the mass of other elementary particles by scaling with *Sommerfeld*'s constant assisted with the golden mean. In harmony with nature's hierarchical pairing strategies, the spin-less *Higgs* boson may be tentatively considered as a composite particle. Due to the obvious analogy to superconductivity, it could be assumed that this composite boson is accompanied by paired holes. Furthermore, we can draw a line from superconductivity to human consciousness. The all-pervading *Higgs* field or related energy fields may also be related to gravity. We present some different approaches to explain the boson mass. More precisely experimentally recorded *Higgs* mass will show, which of these are best suited.

2. Suggested Mass Relationships between Higgs Boson and Elementary Particles

The *Higgs* boson mass was recently obtained by the *ATLAS* experiments at *CERN* with record precision giving [1]

$$m_H = (125.22 \pm 0.14)\ GeV/c^2 \tag{1}$$

For the evaluation of the *Higgs* boson mass we start with *Guynn*'s formula relating the proton mass m_p to the electron mass m_e, which confirmed m_p to about seven digits [2]

$$m_p = \frac{1}{k_1}\left(\frac{1}{2}m_e c^2(1 - \frac{5}{8}|\beta_g|)^2\right)^2 = 0.938272188\ GeV/c^2 \tag{2}$$

where $\beta_g = -0.000739437964740$ is *Guynn*'s galactic difference velocity between rotation velocity and *Thomas* precession and *c* is the speed of light. The factor $k_1 \equiv \frac{kg \cdot m^4}{s^4}$ transforms physical units [2]. The work of *Guinn* doesn't resort to the *QED* construct.
Equation (2) presents the proton mass almost proportional to the square of the kinetic energy of the electron [2].

Now we want to relate the *Higgs* boson mass to the proton mass in a first step by dividing it simply with *Sommerfeld*'s structure constant α [3]

$$m_H \approx \frac{m_p}{\alpha} = 128.58\ GeV/c^2 \tag{3}$$

The precisely determined *CODATA* values for α and m_p are [4]

$$\alpha = 7.2973525693(11) \cdot 10^{-3}$$

$$m_p = 0.93827207208816(29)\ GeV/c^2$$

By rescaling relation (3) with an additional factor one gets finally a better adapted value to the experimental value for m_H

$$m_H \approx \frac{\varphi}{2}\frac{\pi}{\alpha}m_p = 124.82\ GeV/c^2 \tag{4}$$

where $\varphi = \frac{\sqrt{5}-1}{2} = 0.6180339887\ ...$ is the golden mean respectively π the circle constant.

When applying a reciprocity relation given by the present author [5]

$$\frac{\pi}{\alpha} = \frac{1}{\pi \cdot \beta_g} \tag{5}$$

and combining the relations (2) and (4), one obtains for m_H in relation to m_e

$$m_H = \frac{1}{k_1}\frac{\varphi}{2}\frac{\pi}{\alpha}\left(\frac{1}{2}m_e c^2(1 - \frac{5}{8}\frac{\alpha}{\pi^2})^2\right)^2 \tag{6}$$

or alternatively

$$m_H = \frac{1}{k_1}\frac{\varphi}{2\pi|\beta_g|}\left(\frac{1}{2}m_e c^2(1 - \frac{5}{8}|\beta_g|)^2\right)^2 \tag{7}$$

Replacing the term $\frac{\pi}{\alpha}$ in the pre-factor of relation (6) by $\frac{1}{\Delta g_e}$ yields

$$m_H = 125.01\ GeV/c^2 \tag{8}$$

where $2 + \Delta g_e = 2.00231930436122$ is the gyromagnetic factor of the electron [2] [4].

The golden mean φ respectively its fifth power φ^5 is intimately connected to the mass constituents of the universe [6] [7]. Therefore it would be not even surprising to find this number in a formula for the *Higgs* boson mass. The *Higgs* potential is represented by a quartic double well potential (pot cake mold form), and every quartic polynomial is golden, meaning connected with the golden mean [8]. The reader may study the contribution 'Golden Quartic Polynomial and *Moebius*-Ball Electron' published by the present author [9].

Another purely numerical approximation using φ^5 yields

$$m_H \approx \frac{12}{\varphi^5} m_p = 124.87 GeV/c^2 \tag{9}$$

respectively

$$m_H \approx \frac{3}{k_1 \varphi^5} \left(m_e c^2 (1 - \frac{5}{8} |\beta_g|)^2 \right)^2 GeV/c^2 \tag{10}$$

A simple approximation for m_e that we derived from *Guynn*'s formulas reads [5]

$$m_e \approx k_1 \frac{\sqrt{3} \cdot \pi}{c^4 |\beta_g|} = 9.1101587 \cdot 10^{-31} kg \tag{11}$$

With this result we can write down a relationship for the *Higgs* boson mass as

$$m_H \approx k_1 \frac{3\pi\varphi}{8c^4 |\beta_g|^3} \left(1 - \frac{5}{8} |\beta_g| \right)^4 = 124.83\, GeV/c^2 \tag{12}$$

respectively

$$m_H \approx k_1 \frac{3\pi\varphi |\beta_g|}{8 {v_g}^4} \left(1 - \frac{5}{8} |\beta_g| \right)^4 \tag{13}$$

Interestingly, with respect to k_1 as well as c^4 we find reciprocity compared to relation (7) respectively relation (10). Such reciprocity relations are frequently observed in physics and point to the ever-present dual property of our universe [5] [10] [11].

In this way the mass of the *Higgs* boson is associated with the galactic difference velocity $\beta_g = \frac{v_g}{c} = \frac{\alpha}{\pi^2}$ first introduces by *Guynn* [2] [10] [11].

But also the maximum of the difference velocity β_m can be used to approximate m_H

$$m_H \approx \frac{60}{\beta_m} m_p = 125.048\, GeV/c^2 \tag{14}$$

where $\beta_m = 0.450196 \ldots$ [2]. Number 60 may be associated with the order of the icosahedral group *I*.

Another calculation proposal for m_H uses the angle θ_{ea}in *Guyn*n's approach [2] and the anomalous part of the gyromagnetic factor of the electron Δg_e

$$m_H \approx \frac{2\theta_{ea}^2}{\Delta g_e} m_p = 125.136\, GeV/c^2 \tag{15}$$

The angle $\theta_{ea} \approx \frac{\pi}{8}$ is given by the integral of the *Lorentz* transform between the limits β_0 and β_1 of *Guynn*'s matter and space approach (*ea* means electron anomalous) [2]. β_0 is the relative difference velocity of the electron, where rotation velocity and precession velocity are equal, and β_1 is the maximum difference velocity. Then it yields [2]

$$\theta_{ea} = \int_{\beta_1}^{\beta_0} \frac{1}{\sqrt{1-\beta^2}} d\beta = \arcsin(\beta_0) - \arcsin(\beta_1) = 0.3932696 \ldots \tag{16}$$

The term $\frac{2\theta_{ea}^2}{\Delta g_e} = 133.36844$ in relation (15) is numerically nearly equal to the square root of the product of reciprocal numbers of α respectively the constant N_{sn} for small numbers [12]

$$\sqrt{\alpha^{-1} \cdot N_{sn}} = \sqrt{137.0360098 \cdot 129.85250805} = 133.3959128 \tag{17}$$

The constant N_{sn} can be approximated by

$$\frac{2\theta_{ea}^2}{\Delta g_e} = 133.36844 \ldots \tag{18}$$

3. Charge Neutrality

Whereas the *Cooper* pair of electrons is a charged entity, the *Higgs* boson is considered to be charge-neutral. Therefore, the *Higgs* boson could be assembled of two clusters of protons + electrons or alternatively of two neutron clusters to achieve charge neutrality. The formulas for the resulting effective mass can be altered accordingly. The sum of proton and electron mass is

$$m_p + m_e = 0.93878307103151(44)\ GeV, \tag{19}$$

$$\frac{m_p + m_e}{m_p} = 1.0005446 \tag{20}$$

and the neutron mass is [4]

$$m_n = 0.93956542052(54) GeV, \tag{21}$$

$$\frac{m_n}{m_p} = 1.0013784 \tag{22}$$

4. Beyond Kosinov's Fractal Theory of the Proton Structure

When dealing with the proton mass and its connection to the mass of the *Higgs* boson, then *Kosinov*'s recommended fractal theory of proton mass baryogenesis enables new insights into the understanding of the dubious baryonic asymmetry of the universe and possibly paws the way to another different derivation of the *Higgs* boson mass [12]. *Kosinov* solved the question of baryonic asymmetry once and for all time by confirming that there is no such dubious asymmetry. The proton is according to *Kosinov* build up by magic $P_p = 2047$ matter-antimatter (electron/positron) entities, and with an added electron to maintain charge neutrality we get a number of 2048. This number can be recast into

$$P_p + 1 = 2048 = 2^{11} \tag{23}$$

However, a little larger number of entities such as 2052 can be cut into

$$P_p + 5 = 2052 = 12 \cdot 171 \tag{24}$$

This would point to icosahedral symmetry. An icosahedral shell structure is thinkable, and as in icosahedral metal clusters the centrum may be vacant while placing an additional electron/positron in the surface shell [13] [14].

Integer number 11 as exponent of the basis 2 in relation (38) is a *Lucas* number: L_n = {1,3,4,7,11,18,29,…}[15]. If we use the next number of the *Lucas* number sequence, we get a suggestion of the possible proton number of the next 'stable' proton cluster

$$2^{18} = 262144 \tag{25}$$

The quotient $2^{18-11} = 2^7 = 128 = 2 \cdot 64$ may be compared with the following result for the assumed *Higgs* boson mass of about 133 protons by correction with the *Lucas* number quotient $\frac{7 \cdot 18}{11 \cdot 11} = 1.04132231$ resulting in

$$2^7 \cdot \frac{7 \cdot 18}{11 \cdot 11} = 133.289256 \tag{26}$$

However, with relations (17) we can express the mass of the *Higgs* boson quite precisely as

$$m_H \approx 133.3959128\, m_p = 125.162\ GeV/c^2 \tag{27}$$

respectively

$$m_H \approx 133.3959128\,(m_p + m_e) = 125.2298\ GeV/c^2 \tag{28}$$

The last relation matches the experimental value of the *Higgs* boson mass very well. In this way, the proton fractal as a self-similar geometric construct [12] may be applicable to the *Higgs* boson mass determination. However, what can a number around 133 or 2·67 tell us about the structure of the *Higgs* boson paired entity? We should wait for an even more precise experimental determination of m_H to decide which of the suggested approaches can be the most likely one.

5. Relation to Superconductivity

We associated before phase transitions and superconductivity with the fundamental number of φ^5 that for the first time insinuate superconductivity being a property of energy fields of cosmic scale [16] [17]. Nowadays researchers connect superconductivity with the properties of the all-pervading *Higgs* field, where the associated fundamental *Higgs* boson represents an oscillating excitation of this field [18]. I wonder, where does the basic idea come from, leading mainstreamers suddenly to associate superconductivity with the *Higgs* field properties?

The charge-neutral *Higgs* mode collective oscillation of superconductors represents the condensed-matter analog of a *Higgs* boson. The elusive *Higgs* particle with zero spin could indeed be a composite particle like the *Cooper* pair. The effective mass of such a composite can be marginally higher than the mass of the particle sum as was recently experimentally verified for a *Cooper* pair giving $2m_{eff} = 1.00084 \cdot 2m_e$ [19]. When multiplying the m_H value given in relation (8) with this factor together with the factor given in relation (15), we get a value of $m_H = 125.18\, GeV/c^2$ very near to its experimental value. However, if we conjecture that superconductivity is caused exclusively by holes and hardly by electrons, an exciting insight first postulated by *Hirsch* [20], then we must work with the effective hole mass. By analogy with *Hirsch*'s assumption, could the *Higgs* boson be related to any paired holes of matter? Pairing is the very essence of our existence. Following such 'pairing law', invisible hole pairs of heavy effective mass could constitute the energy field and medium that allows any waves to travel. The speed of light, for instance, should depend on the hole pair density. Remembering, the photon can be decomposed into a couple of electron – positron fields.

In previous publications the present author connected the optimal concentration of superconducting carriers σ_0 with the fundamental number of the fifth power of the golden mean φ documenting the fractal nature of the electronic response in superconductors by the relation [16] [17]

$$\sigma_0 \approx \frac{8}{\pi}\varphi^5 = 0.2296 \approx \frac{3}{13} \tag{29}$$

However, we can also approximate σ_0 by the following relation using properties of the electron

$$\sigma_0 \approx \frac{\varphi^5}{\theta_{ea}} = 0.22928 \ldots \tag{30}$$

Also the quotient of the *Fermi* speed v_F to the *Klitzing* speed v_K in superconductors gives a very simple approximation [16]

$$\frac{v_F}{v_K} \approx \frac{2}{\pi}\varphi^5 = 0.0571 \tag{31}$$

In addition, the superconducting transition temperature $T_{co}(K)$ is connected with the magic α constant (*Sommerfeld*'s constant) and the mean cationic charge $< q_c >$ by the simple relation

$$T_{co}(K) \propto 2740 \, < q_c >^{-4} \approx \frac{20}{\alpha} < q_c >^{-4} \tag{32}$$

6. Fundamental Number of φ^5

The fundamental number φ^5 governs phase transitions from particle to cosmic scale and is represented by the infinitely continued fraction representation of integer number eleven [21]

$$\varphi^5 = \cfrac{1}{11 + \cfrac{1}{11 + \cfrac{1}{11 + \cdots}}}. \tag{33}$$

$$= 0.090169943\ldots$$

but can also be computed by the relation

$$\varphi^5 = \frac{\sqrt{125}-11}{2} \qquad (34)$$

In this context we should remember that *Witten*'s *M* theory as a feasible not yet experimentally verified mathematical theory of everything has a dimensionality of 11 [22]. Number φ^5 is also the basic number in *El Naschies* golden mean transfinite corrections to calculate masses of elementary particles [23] [24].

We quote with respect to the fundamental number of φ^5 [13] [14] also the result of *Hardy* [25] [26]. *Hardy*'s maximum quantum probability of two quantum particles exactly equals the fifth power of φ. This asymmetric probability distribution function P with p_τ as entanglement variable, running from not entangled states to completely entangled ones, is given by

$$P = p_\tau^2 \frac{1-p_\tau}{1+p_\tau} \qquad (35)$$

The maximum of P yielded

$$P_{max} = \frac{1-\varphi}{1+\varphi}\varphi^2 = \varphi^5 = 0.090169943\ \ldots \qquad (36)$$

The *Hardy* function turns out to be a central topic of the scale-free *Information Relativity* theory (*IRT*) of *Suleiman* [27] by mapping the transformation of his relative matter energy density. *Suleiman* characterized the behavior at the critical recession velocity $\beta_{cr} = \varphi$ as phase criticality at cosmic scale [27].
When dealing with polynomial representations, *Hardy*'s function (relation (36)) can be approximated quite exactly in the range of physical relevance by the polynomial equation [28]

$$\tilde{h}(x) \approx \sum_{n=1}^{\infty} x^2 \cdot \left(\frac{1-x}{2}\right)^n = x^2\left(\frac{(1-x)}{2} + \frac{(1-x)^2}{4} + \frac{(1-x)^3}{8} + \frac{(1-x)^4}{16} + \frac{(1-x)^5}{32} + \cdots\right). \qquad (37)$$

By limiting n to 2 members of this series, we get a quartic polynomial approximation.

As a resume we may ask, what value is a contribution about *Higgs* mechanism and superconductivity, no matter how impressive and simple, if it does not take all the outlined aspects into account [29]? See also the **Appendix**.

7. Mass Constituents of the Universe

In recent contributions we derived relations between the mass constituents of the universe and the fifth power of the golden mean [6] [11]. We thereby clarified previous assumptions [30].

We use the following mass constituent designations: Ω_M for baryonic matter, Ω_{DM} for dark matter, Ω_{DE} for dark energy. The result is

$$\frac{\Omega_M}{\Omega_{DM}} \approx 2\varphi^5 \tag{38}$$

$$\frac{\Omega_M}{\Omega_M+\Omega_{DM}} \approx \frac{\varphi}{4} \tag{39}$$

$$\frac{\Omega_M+\Omega_{DM}}{\Omega_{EM}} \approx 5\varphi^5 \tag{40}$$

It should not just be mere coincidence that a very simple numerical relationship exists between $\frac{v_F}{v_K}$ (see relation 25) and the mass constituents of the Universe including dark matter

$$\frac{v_F}{v_K} \approx \frac{1}{\pi} \cdot \frac{\Omega_M}{\Omega_{DM}} \tag{41}$$

Such interrelations may help to understand, why obscure dark matter, which is strongly and golden mean coupled to moving baryonic matter, may be explained by the speed dependent 'viscous' drag exerted on moving objects by the repressed otherwise invisible (superluminal) construct of energy lines from an external energy source, similar to the recently successfully verified effect of gravitomagnetism as kinetic effect caused by mass 'currents' (charge is replaced by mass) on gravity [31] [32].

8. Higgs Field and Alternative Energy Field Approach

Remarkably, the *Higgs* field shows similarities to *Bhandari*'s approach of 'transparent' energy lines generated from an extern energy source that is assumed to powers our universe [33] [34]. This assumption leads the present author to develop an alternative gravity formula [10]. By this analogy, the *Higgs* field respectively the *Bhandari* field should be coupled with gravity. The reader may also evaluate comparatively a contribution about dynamic aether from spin-2 bosons published by *Zinserling* [35].

9. Yukawa Coupling

The mass of elementary particles can be obtained by applying the *Yukawa* coupling approach

$$m = \frac{v_{vev}}{\sqrt{2}} \cdot \Lambda \tag{42}$$

where v_{vev} is the vacuum expectation value of the *Higgs* field and Λ is the coupling. However, the present author doesn't become aware about detailed and precise calculations of masses of elementary particles along this route.

10. Superconductivity and Human Consciousness

Superconductivity under ambient conditions is a dream for a technological revolution. If superconductivity is an omnipresent property of the universe as is also the *Higgs* field, it may not be unreasonable to connect superconducting information transport and storage under ambient conditions with human consciousness, in order to continue with a holistic approach.
Recently, *Mikheenko* set out to demonstrate that carrier transport without dissipation is obviously an intrinsic property of living cells. He stated that structured water inside microtubule systems may be responsible for the mechanism of superconductivity [36]. Hole superconductivity along helically twisted 'liquid' water within human microtubules or inorganic microtubules as candidate systems should be intensively investigated in future [37] [38] [39].

11. Golden $\boldsymbol{\varphi^5}$ Enigma of the Great Pyramid

When dealing with the fundamental number φ^5in connection with mass and energy of the cosmos, the surprise is perfect to find this number imprinted in the geometry of the Great Pyramid at *Giza* by relating the in-sphere volume of the pyramid to its pyramidal volume, which also holds for the surface ratio and connects the circle constant with this fundamental number [40] [41] [42].

$$\frac{\boldsymbol{V_{sph}}}{\boldsymbol{V_{pyr}}} = \boldsymbol{\pi} \cdot \boldsymbol{\varphi^5} = 0.283277 \tag{43}$$

We constantly underestimate the abilities of deep ancient civilizations and overestimate our own abilities.

12. Conclusion

When relating the mass of the *Higgs* boson to that of elementary particles as massive as proton + electron respectively neutron to achieve charge neutrality, one could imagine from what the *Higgs* field really originated and how it is associated with properties such as superconductivity, avoiding any *QED* construct. The quartic potential of the omnipresent *Higgs* field is golden, and so the golden mean is omnipresent in all domains of the cosmos, of science and of life. However, we ask the heretical question, whether the *Higgs* boson is related to any paired holes of matter, an approach that can be simply implemented in existing mainstream theories. Such considerations that seems strange at first may also show the way to the baryogenesis of the universe, where matter besides hole matter 'crystallizes' during the early stages of the poly-singular universe. However, *Kosinov*'s fractal theory for the structure of the proton is very encouraging. The mass of the *Higg*s boson m_H can be traces back to the simple relation $m_H \approx 133.3959128 \cdot (m_p + m_e) = 125.2298\ GeV/c^2$, where the pre-factor is given by $\sqrt{\alpha^{-1} \cdot N_{sn}} = \sqrt{137.03601 \cdot 129.852508}$ with *Sommerfeld*'s structure constant α and the small number constant N_{sn}. The universe is simpler as dubious mainstream theories suggests.

Conflicts of Interests

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix

From the *LGW* theory (*Landau-Ginzburg-Wilson*) features of critical transitions at the critical temperature T_c can be obtained by writing down the most general quartic polynomial of the *Hamiltonian*, which can be specialized for superconductor transitions using for instance the *Anderson-Higgs* approach. If $\Psi(r) = |\Psi(r)| \cdot \exp(i\Theta(r))$ represents the wave function, a depressed quartic in $|\Psi(r)|$ is derived for the potential by *Sudbø*'s resulting in [29]

$$V(|\Psi(r)|) = k\left(\frac{T-T_c}{2T_c}\right)|\Psi(r)|^2 + \frac{U}{4!}|\Psi(r)|^4 \quad (44)$$

However, every quartic is golden and in this way is associated with the golden mean, which can be further derived from this result.