Deep Jyoti Dutta
American Physical Society

Theoretical Measurements of Mass and Charge of W bosons,

And Possible Elementary Fractional Charge Gauge and Elementary Integer Charge Scalar Bosons

By Deep Jyoti Dutta

* Division of Nuclear Physics (DNP), American Physical Society, One Physics Ellipse, College Park, Maryland, United States of America

Abstract

The nature's beautiful symmetry defines its original scenery which is very simple if one can grasp the mathematical idea associated with it. The first purpose of this note is to present the abstract mathematical methodology (not abstract as nature's beautiful symmetry arrangements) can also be called as mathematical scheme which justifies the charge, spin and mass of electroweak bosons which is our original choice. The second primary fundamental essence of this note is to attempt the prediction of fractional charged boson that might exist in nature with definite spin basically spin equivalent to gauge boson and a scalar boson of integer charge with an approximate mass. The mass mentioned in this note is our mass calculation limit which may change. Both particles are predicted as elementary. For this note we have taken only elementary gauge boson with charge i.e. w boson to develop mathematical rules to predict another new gauge charged boson.

Keywords: Gauge Bosons, BEH Mechanism, Fractional Charge.

Brief Introduction

The crucial operative structure of standard model of particle physics is concentrated on two pillars; works of Sir Abdus Salam [1], Steven Weinberg [2] and Sheldon Lee Glashow independent of each other, their seminal contribution shows the unification of two fundamental forces of nature electromagnetism and weak interaction. The electroweak model also called Weinberg Salam model is one of the core mechanisms in expressing particle physics, the carrier of weak force was discovered by Carlo Rubbia [3], the other is the quark model proposed by Murray Gell-Mann [4] in 1964. The zoo of the elementary particles are in fact composite is very disturbing to hear but that's the truth, first suggested by Gell-Mann in the form of mathematical patterns. In 1968 Stanford Linear Accelerator Centre discovered that protons are made of three quarks basically the down quark was discovered. The study of decay of these six quarks (all later discovered) revealed many fascinating outcomes including the "quark-quark" interaction mediated by massless gluon. The recent discovery Higgs boson is the jewel in the crown for particle physics. Although many authors previously treated the mass of w boson with its charge and spin, but our way which will be discussed here seems much strange and simple and of different flavor far from perceived way of calculation and also relatively exciting in theoretically discussed frame.

Mathematical Methodology or Scheme

Deep Jyoti Dutta
American Physical Society

Part A

In this ongoing note our first primary aim is to deduce a mathematical method of different flavor to compute the charge, mass and spin of w+ boson. Our second primary goal is to show that how this methods reveals other two fundamental bosons, in other words the possibility of new bosons will be presented. For the first aim we need to devise basic calculation schemes and associated parameters in mathematical form which is as follows.

Let the mathematical model be defined called “fundamental boson mathematical sketch” or “constant boson sketch” be

$$\nabla\psi = \begin{pmatrix} Q_1 & Q_2 & Q_3 \\ Q_6 & Q_5 & Q_4 \end{pmatrix} = \begin{pmatrix} \phi_1 & \phi_2 & \phi_3 \\ \phi_6 & \phi_5 & \phi_4 \end{pmatrix}$$

Where ϕ are the components of the sketch may be defined as “constant boson components”. The system has six such components.

Where $Q_1 = \phi_1$and so on

The followed pattern will be

$$\phi_1 \leftrightarrow \phi_{4,}\phi_3 \leftrightarrow \phi_6 \; and \; \phi_2 \leftrightarrow \phi_5$$

The components must satisfy the equations in order to configure our requirements

Constant boson sketch must satisfy ground equations as in the form

Properties must obey

$$\frac{1}{Q_4}\,[Q_2 + Q_3] = \frac{1}{Q_2 Q_4}[Q_5 + Q_3] \; eq \; I$$

$$Q_6[1 - Q_2] = -[Q_3 + Q_5 - Q_2] \;\; eq \; II$$

This equations is for $\nabla\psi$ other $\; III \; and \; IV \; will \; be \; for \; \nabla\psi_x$. This boson sketch has two primary parts described by relation with boson components which will be explained a bit later in this note.

Such that the components in our mathematical model satisfying properties must and must be given by the function

$\phi_1 = \frac{1}{2(BI+\frac{e^+}{e})}\varphi_{1,}\, \phi_2 = \frac{1}{2(BI+\frac{e^+}{e})}\varphi_2$ And so on

Where $\varphi_{1,}, \varphi_{2,} \; are$ the numerical representations of the constant boson components of the sketch are described above which will be applied based on defined rules.

Our sketch thus becomes

Deep Jyoti Dutta
American Physical Society

$$\nabla\psi = \frac{1}{2(BI + \frac{e^+}{e})}\begin{pmatrix}\varphi_1 & \varphi_2 & \varphi_3 \\ \varphi_6 & \varphi_5 & \varphi_4\end{pmatrix}$$

By simple multiplication with each representation it follows

$$\nabla\psi = \begin{pmatrix}\frac{1}{2(BI + \frac{e^+}{e})}\varphi_1 & \frac{1}{2(BI + \frac{e^+}{e})}\varphi_2 & \frac{1}{2(BI + \frac{e^+}{e})}\varphi_3 \\ \frac{1}{2(BI + \frac{e^+}{e})}\varphi_6 & \frac{1}{2(BI + \frac{e^+}{e})}\varphi_5 & \frac{1}{2(BI + \frac{e^+}{e})}\varphi_4\end{pmatrix}$$

The selection equations of each boson component's representation must be given as a function of (sec A)

$$\varphi_1 = \left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''} \times A\right]$$

$$\varphi_2 = \left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''} + \varphi_1\right]$$

$$\varphi_3 = \left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''} + \varphi_2\right]$$

$$\varphi_4 = \left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''} + \varphi_3\right]$$

$$\varphi_5 = \left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''} + \varphi_4\right]$$

$$\varphi_6 = \left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''} + \varphi_5\right]$$

From above definitions the components of sketch must look

Deep Jyoti Dutta
American Physical Society

$$\nabla\psi = \begin{pmatrix} \frac{1}{2(BI+\frac{e^+}{e})}\left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''}\times A\right] & \frac{1}{2(BI+\frac{e^+}{e})}\left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''}+\varphi_1\right] & \frac{1}{2(BI+\frac{e^+}{e})}\left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''}+\varphi_2\right] \\ \frac{1}{2(BI+\frac{e^+}{e})}\left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''}+\varphi_5\right] & \frac{1}{2(BI+\frac{e^+}{e})}\left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''}+\varphi_4\right] & \frac{1}{2(BI+\frac{e^+}{e})}\left[\frac{1}{\frac{q^+}{e}.\frac{J}{\hbar}.A''}+\varphi_3\right] \end{pmatrix}$$

B is the baryon number of quarks, I is the spin parameter of 3/2 fermions, q^+ is the quark of positive charge +2/3, $I^u{}_3$ is the isospin of up quark, J is the total angular momentum of quarks and $e^+$is the charge of positron (+1e) or positive electron like fermions integer positive charge (taking e^+=+1). These parameters in a defined function form a crucial part in our mathematical model.

The spin parameter J will later be configured in a separate way to obtain the spin of w boson.

By assuming the isospin of first generation quarks, i.e. up and down quark and their baryon number we arrive that $A \; and \; A''$ must be given by

$$A = -\{[I^u{}_3 - I^d{}_3] - [\frac{q^+}{e} + B]\}$$

$$A'' = B[1 + I^d{}_3] - \frac{q^-}{e}$$

Where $I^u{}_3$ is the isospin of up quark $I^d{}_3$ is the isospin of down quark, q^+ is the any quark of charge +2/3.

However this assumption of first generation quarks and above component's function in this form is required which will be taken into account for simply synthesizing which in terms predicts particles as follows

This equation can be also used to predict the particles of spin ½ or spin 3/2 basically baryons and spin 1 mesons, for this we will take account of four light scalar mesons whose parity is odd and contains at least one first generation quarks- positive pion, negative pion, K^+ and K^- which suitably satisfies. For prediction we need all four key scalar meson, pion was predicted by Yukawa and Kaon was discovered unexpectedly. This four scalar quarks constitutes quarks which has both type of charge

$$J^* = -[\{I^{q_1}{}_3 - I^{q_2}{}_3\} - (\frac{q^+}{e} + B + j)]$$

This equation relates the isospin of two composed quarks in spin 0 mesons (positive pion, negative pion, K^+ and K^-), baryon number of quark (+1/3) and any quark of charge +2/3 and the total angular momentum (j spin) of pseudoscalar meson to the total angular momentum of required Hadron J*.

Since mesons and baryons are hadrons, on putting each quark composition of mesons taken independently on equation one gets fermions (baryons) and spin 1 mesons (composite bosons)

Deep Jyoti Dutta
American Physical Society

Note: all fermions (baryon) or mesons (spin 1) predicted must have at least one quark of charge 2/3 in them as because our equation has q^+ $(essentially\ a\ quark\ of\ charge + \frac{2}{3})$ parameter and our choice from which we obtained predictions is the scalar meson which contains at least one positive charge quark (2/3). In other words we showed with the above pattern that spin 1 meson or spin ½, 3/2, baryon must have one quark of charge (2/3) as its fundamental constituents like scalar meson.

For example let us take first scalar meson positive pi of quark composition ud' where d' is antidown quark, putting necessary requirement in

$$J^* = -\{[I^{q_1}{}_3 - I^{q_2}{}_3] - \left[\frac{q^+}{e} + B + j\right]\}$$

We get J (total angular momentum) = 1 which posses a quark of charge 2/3 in it. Similarly second, third and fourth scalar meson will also give fruitful outcomes.

However few of these hadrons of spin 3/2 and spin ½ and spin 1 mesons containing quark of charge 2/3 have been discovered. Let this formula or pattern be called as "Positive Quark-Hadron Pattern" or "PQHP". This formula is essential pattern which is deduced to show theoretically the existence of spin 1 hadrons (mesons) and baryons of spin ½ and 3/2 whose constituents are at least one quark of charge 2/3 similar to scalar meson.

Consider the equation pattern 2 as a simple possibility

$$J^* = -\{[I^{q_1}{}_3 - I^{q_2}{}_3] - \left[\frac{q^+}{e} + \frac{q^-}{e} + 2B + j\right]\}$$

This pattern has both charge parameters which simply means that it can also be showed that spin 1 meson, ½ and 3/2 spin baryon must contain quarks of two kinds of charges (2/3 and -1/3) similar to scalar mesons above described.

Exception from pattern 1- the hadrons (spin 1 meson and both spin baryons) composed of only -1/3 charged quarks may exist.

Exception from pattern 2- the hadrons composed of only one kind of charge (either 2/3 or -1/3) may exist

For instance let us consider the vector meson called K*+ with isospin ½ constituted with us' up quark and antistrange quark, such that the equation must became

$$J^* = [I^{q_1}{}_3 - I^{q_2}{}_3] + \left[\frac{q^+}{e} + \frac{q^-}{e} + 2B + j\right] for\ two\ charged\ quark$$

$$J^* = [I^{q_1}{}_3 - I^{q_2}{}_3] + \left[\frac{q^+}{e} + B + j\right]\ for\ positive\ charged\ quark$$

Deep Jyoti Dutta
American Physical Society

Clearly by calculation (isospin of up quark is ½) we thus obtain spin of +5/2 therefore the particle of mentioned spin constituting of positive charged (+2/3) or both charged (+2/3 and -1/3) must exist and experiments are therefore suggested to detect this fermions.

We shall now return in our path to construct a mathematical scheme to obtain charge and mass of w+ boson. From (sec A) it is clear that the first numerical representation which is taken here in this note, by adopting $\varphi_1 = 0$ for possible mathematical treatments here advanced.

Considering two independent to each other, fundamental boson local charge parameters given by simple relation which must be satisfied

By convincing

$$\psi + \psi' \neq 0$$

$$\psi - \psi' \neq 0$$

And as both parameters are described as fundamental boson local charge parameters its relation to fundamental bosons spin must obey

$$P = 0\ (elementary\ scalar\ boson)$$

$$P = 1\ (elementary\ gauge\ boson)$$

However we will not take graviton into account as because it is not yet discovered.

Here P denotes the overall fundamental boson in terms of two local charge parameters ($\psi and\ \psi'$).

Both 0 and 1 are spin.

These expressions describes that fundamental boson (described as local charge parameters) will be of spin 1 and spin 0.

The local charge parameters are in the units of "e" and satisfy the component choice and ground equations of the scheme as because this parameter forms a strict relation with above six components.

Therefore definition is given by

$$\psi + \psi' = [2(Q_1 + Q_2 + Q_3)]e$$

The mathematical setting of local charge parameters must satisfy boson components ground equations I and II

$$\psi = [(Q_3 + Q_6) + (Q_1 + Q_4) + (Q_2 + Q_5)]e$$

$$\psi' = [(Q_3 - Q_6) + (Q_1 - Q_4) + (Q_2 - Q_5)]e$$

By introducing second setup which must satisfy ground equations

Deep Jyoti Dutta
American Physical Society

$$\frac{1}{Q_4}\left[Q_2 + Q_3\right] = -\{\frac{1}{Q_2 Q_4}[Q_5 + Q_3]\} \ eq\ III$$

$$Q_6[1 + Q_2] = -[Q_3 + Q_5 - Q_2] \quad eq\ IV$$

The second setup must be according to eq III and IV

$$\nabla\psi_x = \begin{pmatrix} Q_1 & Q_2 & Q_3 \\ Q_6 & Q_5 & Q_4 \end{pmatrix} = \begin{pmatrix} -\phi_1 & -\phi_2 & -\phi_3 \\ -\phi_6 & -\phi_5 & -\phi_4 \end{pmatrix}$$

Where $Q_1 = -\phi_1$and so on

Or in the form

$$\nabla\psi_x = \begin{pmatrix} Q_1 & Q_2 & Q_3 \\ Q_6 & Q_5 & Q_4 \end{pmatrix} = \begin{pmatrix} -\frac{1}{2(BI + \frac{e^+}{e})}\varphi_1 & -\frac{1}{2(BI + \frac{e^+}{e})}\varphi_2 & -\frac{1}{2(BI + \frac{e^+}{e})}\varphi_3 \\ -\frac{1}{2(BI + \frac{e^+}{e})}\varphi_6 & -\frac{1}{2(BI + \frac{e^+}{e})}\varphi_5 & -\frac{1}{2(BI + \frac{e^+}{e})}\varphi_4 \end{pmatrix}$$

The equations of the components must be same as mentioned above

Considering defined relation between four components (two charges and two mass)

By convincing mathematical treatments satisfying III and IV

$$[\psi - \psi_x] = 0 \ eq\ V$$

$$[\psi' - \psi'_x] = 0 \ eq\ VI$$

ψ_x And ψ'_x are local mass parameter (GeV) allowed to available for second setup. This parameter also satisfies on choice.

For spin it convinces

$$P_0 = 0\ (elementary\ scalar\ boson)$$

$$P_0 = 1\ (elementary\ gauge\ boson)$$

Here P_0 denotes the overall fundamental boson in terms of two local mass parameters ($\psi_x and\ \psi'_x$).

These expressions describes that fundamental boson (described as local mass parameters) will be of spin 1 and spin 0

It simply follows from V and VI

$$\psi = \psi_x$$

$$\psi' = \psi'_x$$

Deep Jyoti Dutta
American Physical Society

Setting the further equations as solutions we get two simple forms

$$[\psi_x + \psi] = 0$$

$$[\psi' + \psi'_x] = 0$$

Consequently

$$-\psi = \psi_x$$

$$-\psi' = \psi'_x$$

Extending solutions based on pure components one can simply show that if defining equations $(I and\ II)$ are truly obeyed then

$$[Q_2 + Q_5] = Q_6$$

$$Q_3 Q_2 = Q_5$$

Must obey in our sketch in terms of mathematical scheme

Consequently we arrive

$$[Q_3 Q_2 - Q_6 + Q_2] = 0$$

Also

$$\frac{1}{Q_4}\left[Q_3 Q_5 + Q_6\right] - \left[Q_5 - 1\right] = 0$$

From III and IV if truly obeyed by second sketch we simply notice and obtain that

$$[Q_2 + Q_5] = Q_6$$

$$Q_3 Q_2 = -Q_5$$

Must obey in order to carry required operations

Further we thus obtain

$$[Q_3 Q_2 + Q_6 - Q_2] = 0$$

Also

$$\frac{1}{Q_4}\left[Q_3 Q_5 - Q_6\right] - \left[Q_5 + 1\right] = 0$$

Considering two more local mass parameters which satisfies ground equations and also frames a strict relation with components

Deep Jyoti Dutta
American Physical Society

Convincing that

$$[V_x - V'_x] \neq 0$$

$$[V_x + V'_x] \neq 0$$

The definition must hold

$$V_x = [(Q_3Q_6) + (Q_1Q_4) + (Q_2Q_5)]\ GeV$$

$$V'_x = [(Q_3Q_6) - (Q_1Q_4) - (Q_2Q_5)]\ GeV$$

As our previous consideration of scheme it obeys that

$$[\phi_1 - \varphi_1] = 0$$

Further calculations, we arrive at charge relation

$$Q_{w+} - \log[(\psi + \psi') - Q_2] = 0$$

Or simply the charge must be

$$Q_{w+} = \log[(\psi + \psi') - Q_2]$$

By convincing spin criteria in boson sketch $\nabla\psi$ and $\nabla\psi_x$

Equation must convince (hold)

$$[\psi + \psi'] - [Q_2 + S'] = 0 \qquad Eq\ a\ for\ charge - spin\ relation$$

$$[\psi_x + \psi'_x] - [Q_2 + S'] = 0 \quad Eq\ \ b\ for\ mass - spin\ relation$$

S' is the introduced spin parameter.

As we have denoted spin in terms of two parameters therefore satisfying spin conditions we have

Spin equation will be

$$S' = [(Q_3 + Q_6) + (Q_1 + Q_4) + (-Q_2 - Q_5)]\ for\ \nabla\psi$$

Using mass-parameter spin relation we thus obtain

$$S' = -[(Q_3 + Q_6) + (Q_1 + Q_4) + (-Q_2 - Q_5)]\ for\ \nabla\psi_x$$

Such that spin of w boson must be

$$S = log\ S'$$

There can be another process to obtain spin which is as follows

Simply for spin we need to equalize the six relevant boson components

Deep Jyoti Dutta
American Physical Society

$$\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6$$

As we have taken into account that elementary bosons must be of spin 0 and 1

Then it must satisfy

$$\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 \neq 0$$

Also

$$\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 > 0$$

And

$$\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 < 1$$

Therefore for requirement and satisfying spin criteria of boson components; our choice in above equation is the spin of the elementary particle quarks to obtain the spin of elementary gauge boson.

Such that simply putting

$$\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 = J$$

Sketch therefore looks

$$\nabla\psi = \begin{pmatrix} Q_1 & Q_2 & Q_3 \\ Q_6 & Q_5 & Q_4 \end{pmatrix} = \begin{pmatrix} \phi_1 & \phi_2 & \phi_3 \\ \phi_6 & \phi_5 & \phi_4 \end{pmatrix} = \begin{pmatrix} J & J & J \\ J & J & J \end{pmatrix}$$

For second setup considering mass spin relation

$$\nabla\psi_x = \begin{pmatrix} Q_1 & Q_2 & Q_3 \\ Q_6 & Q_5 & Q_4 \end{pmatrix} = \begin{pmatrix} -\phi_1 & -\phi_2 & -\phi_3 \\ -\phi_6 & -\phi_5 & -\phi_4 \end{pmatrix} = \begin{pmatrix} -J & -J & -J \\ -J & -J & -J \end{pmatrix}$$

For this case simply

$$S = S'$$

Spin is in the unit of $\hbar$

Furthermore mass relation for w+ boson is given by

$$[Q_3\{Q_5 + Q_6\} + \{\psi_x - \psi'_x\} + V_x + \{\psi_x - \psi'_x\} - \{V_x - V'_x\}] = 0$$

Consequently

$$[M_{W+} + \{\psi_x - \psi'_x\} - \{V_x - V'_x\}] = 0$$

$$[M_{W+} - Q_3\{Q_5 + Q_6\} - V_x - \{\psi_x - \psi'_x\}] = 0$$

Furthermore it simply follows

Deep Jyoti Dutta
American Physical Society

$$M_{W+} = -\{\psi_x - \psi'_x\} + \{V_x - V'_x\}GeV$$

$$M_{W+} = Q_3\{Q_5 + Q_6\} + V_x + \{\psi_x - \psi'_x\}GeV$$

From above rules one can calculate the necessary requirements of w+ bosons by numerical or number calculation based on local charge and mass parameters introduced above.

** Both local charge and local mass parameters are mathematical entry as an operative part of constant boson sketch which is taken into account to deduce the mass and charge relations.

Part 2

The second primary task in this part is to present the prediction of two fundamental bosons in terms of mathematical rhythm mentioned above. However we do give flavor of such particles but its existence must be confirmed with high energy accelerators. The basic requirement in this part is the first mathematical setup given by

$$\nabla\psi = \begin{pmatrix} Q_1 & Q_2 & Q_3 \\ Q_6 & Q_5 & Q_4 \end{pmatrix} = \begin{pmatrix} \phi_1 & \phi_2 & \phi_3 \\ \phi_6 & \phi_5 & \phi_4 \end{pmatrix}$$

In this part of this present note we will use two general equations, general in sense we will use it throughout based on charge, spin and mass choices.

$$G_0 = S' = (\phi_3 + \phi_6) + (\phi_1 + \phi_4) + (-\phi_2 - \phi_5)\ above\ symbolized\ by\ "Q"$$

$$G_1 = (\phi_3 - \phi_6) + (\phi_1 + \phi_4) + (-\phi_2 - \phi_5)$$

For mass choices there will be a change in sign.

Allowing the choice to be fit in $\nabla\psi$

$$\phi_1 = q_+, \phi_2 = q_-$$

Where q are quarks of respective charges (+2/3) and (-1/3).

$$\phi_1 = \phi_3 = \phi_5 = q_+$$

$$\phi_2 = \phi_4 = \phi_6 = q_-$$

So that it forms

$$\nabla\psi = \begin{pmatrix} q_+ & q_- & q_+ \\ q_- & q_+ & q_- \end{pmatrix} = \begin{pmatrix} u & d & c \\ b & t & s \end{pmatrix}$$

The choice is based on following pattern

$\phi_1 and \phi_2\ are\ first\ generation\ quarks, \phi_3 and \phi_4 are\ second\ generation\ quarks\ and$

$\phi_5 and\ \phi_6\ are\ third\ generation\ quarks$

Deep Jyoti Dutta
American Physical Society

Considering with spin choices by taking

$$\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 = J$$

Or

$$u = d = c = s = t = b = J$$

$$\nabla\psi = \begin{pmatrix} u & d & c \\ b & t & s \end{pmatrix} = \begin{pmatrix} J & J & J \\ J & J & J \end{pmatrix}$$

Such that spin of particle must be given by G_0

$$G_0 = (\phi_3 + \phi_6) + (\phi_1 + \phi_4) + (-\phi_2 - \phi_5)\ here\ for\ spin\ use$$

By calculation we obtain spin 1

Considering charge of quarks in specific manner in sketch i.e.

$$\nabla\psi = \begin{pmatrix} u & d & c \\ b & t & s \end{pmatrix}$$

Putting the choice in sketch

$$\phi_1 = \phi_3 = \phi_5 = +$$

$$\phi_2 = \phi_4 = \phi_6 = -$$

$$\nabla\psi = \begin{pmatrix} + & - & + \\ - & + & - \end{pmatrix}$$

Placing specific charges of quarks on place and calculating with $G_0\ (for\ charge)$

we thus obtain +1/3

Putting mass of each quarks in GeV in sketch

$$\nabla\psi = \begin{pmatrix} u & d & c \\ b & t & s \end{pmatrix} = \begin{pmatrix} M_u & M_d & M_c \\ M_b & M_t & M_s \end{pmatrix}$$

Using G_0 for mass calculation

$$G_0 = -[(\phi_3 + \phi_6) + (\phi_1 + \phi_4) + (-\phi_2 - \phi_5)]\ GeV$$

We thus obtain mass around $166.60\ GeV$

First achievement we get a particle P_B

$$spin = 1$$

$$charge = +\frac{1}{3}$$

$$mass \cong 166.60\ GeV\ or > 166.60\ GeV\ or < 166.60\ GeV$$

Clearly mass of P_B seems greater than w boson (which is our only choice of gauge boson with charge)

$$M_{P_B} > -\{\psi_x - \psi'_x\} + \{V_x - V'_x\} GeV$$

$$M_{P_B} > Q_3\{Q_5 + Q_6\} + V_x + \{\psi_x - \psi'_x\} GeV$$

According to component spin of P_B will simply be

$$S = log\ S'$$

And charge will be

$$Q_{P_B} = \frac{Q_{w+}}{\log[\{(\psi + \psi') - Q_2\}^3]} = \frac{Q_{w+}}{3Q_{w+}}$$

For second case we will use same conditions but we will use equation G_1

$$G_1 = (\phi_3 - \phi_6) + (\phi_1 + \phi_4) + (-\phi_2 - \phi_5)$$

From all independent calculations of mass, charge and spin we obtain achievement 2

For mass

$$G_1 = -[(\phi_3 - \phi_6) + (\phi_1 + \phi_4) + (-\phi_2 - \phi_5)]$$

Second achievement we get a particle P_A

$$spin = 0$$

$$charge = +1$$

$$mass \cong 175.91\ GeV\ or > 175.91\ GeV\ or < 175.91\ GeV$$

The mass that we stated above is the mass calculation limit in our model which may differ based on <, > sign.

Both predicted particle seems fundamental in nature.

It clearly seems that both particles' mass is heavier than Higgs boson and our choice w boson

$$M_H < M_{P_B}\ (experiments\ required)$$

$$M_W < M_{P_B}\ (experiments\ required)$$

$$M_H < M_{P_A}\ (experiments\ required)$$

Deep Jyoti Dutta
American Physical Society

$$M_W < M_{P_A}\ (experiments\ required)$$

Possible decay outcomes, typically based on mass of particles

$$P_A \rightarrow t\ and\ its\ antiparticle(experiments\ required)$$

$$P_A \rightarrow b\ and\ its\ antiparticle\ (experiments\ required)$$

$$P_A \rightarrow c\ and\ its\ antiparticle\ (experiments\ required)$$

$$P_B \rightarrow b\ and\ its\ antiparticle\ (experiments\ required)$$

$$P_B \rightarrow c\ and\ its\ antiparticle\ (experiments\ required)$$

It may decay in other quarks up, strange and down with their antiparticles

Or simply both particles decays in quarks

$$P_B \rightarrow qq'$$
$$P_A \rightarrow qq'$$

$qq'\ are\ the\ quarks\ and\ antiquarks$

$$P_A \rightarrow w^{\pm}\ (experiments\ required)$$

$$P_B \rightarrow w^{\pm}\ or\ may\ not\ (experiments\ required)$$

These both bosons may also decay in z bosons and photons and in other fermions, may be leptons and may be some other decays. Possibility of decay in mesons is not neglected.

For P_B top quark decay seems not possible, or may be possible (experimental test required)

All decay is based on mass of bosons.

And may be

$$P_A \rightarrow H^0$$

$$P_B \rightarrow H^0$$

Both bosons may decay into Higgs boson; depending on mass, it may also decay in top quark and bottom quark. The decay of these predicted bosons to Higgs Boson is strictly restricted if the condition is

$$M_H > M_{P_B}$$

$$M_H > M_{P_A}$$

In addition a vector boson (gauge boson spin 1) of charge +2e might exist and a boson of spin 2 charge +1e also might exist.

The most favored explanation for the origin of mass is the BEH mechanism [5]; the scalar particle associated with it was discovered [6]. But the rigorous experimental observation of this mechanism giving mass is not confirmed. It may be also possible that there are other mechanisms which might be responsible for generating mass in which these above predicted bosons may play important role in this “coupling” with different particles to give their very specific mass. These particles (predicted) due to their huge mass (approximately) may be very super unstable and spontaneously decay to other particles in a very super rapid rate. The fractional charge bosons may exist in universe.

However these particles of spin 1 elementary fractional charged boson (P_B) may not play crucial role in other mass generating mechanism. But elementary scalar boson somehow may play or may not.

The search for these fractional charged gauge boson and integer charged scalar boson with approximate mass limit and <,> is suggested. The decay of these particles must be observed based on possibilities here advanced. However in this model it is not clear how many fundamental fractional charged gauge bosons and fundamental scalar charged bosons exists, may be it exist more than one and may differ by mass as approximated.

References

[1] A. Salam, J.C.Ward Nuovo Cimento 1959, 11, 568.

[2] S. Weinberg, Phys. Rev. Lett 1967, 19, 1264.

[3] Nobel Prize 1984 Nobel Prize website (Nobel lecture)

[4] Murray Gell-Mann phys. Lett. 1964, 8, 214

[5] Peter W. Higgs Phys. Rev. Lett 1964, 13, 508

[6] ATLAS Collaboration. Observation of a new particle in the search for the standard model Higgs boson with the ATLAS detector at the LHC. Phys. Lett. B, 716, 1-29, 2012.