

The Grand Unification: 2-The Nuclear (F_N) and Weak (F_W) Forces

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ARTICLE INFO	ABSTRACT
Published Online: 21 November 2018	A formula, generating the Spinning Magnetic Field (SMF) has been derived, the interaction of two SMF by two protons, using the recently derived unified formula of fields, produced Spinning Magnetic Force ($SMFs$); while at each step, the mutual electrostatic force by both protons is subtracted from the relevant Spinning Magnetic Force ($SMFs$), this resulted in the nuclear strong force; this paper is a modified version of previous $SMFs$, it established and replicated the nuclear force as computed from potential graph; while the Weak Spinning Magnetic Force (F_W) which is the reverse of the Spinning Magnetic Force ($SMFs$), is produced as a result of an internal repulsive force caused by an agitation of two SMF, forming spiral rotation inside neutron leading to an internal instability, ended by the disconnection of both the electron and the proton; the knowledge of this mechanism will help in understanding both phenomena, and the production of the nuclear fusion, that may help to envision other forms of the most needed alternative renewable energy.
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1.0 Introduction

The four types of force existed in nature are, the gravity which stabilized objects on planets and around the stars, discovered by Sir Isaac Newton in 1687 [1], then the weak force, responsible for radioactivity or the decay of atomic nuclei [2], third is the electromagnetic force, which bonds atoms and molecules [3], the fourth is the nuclear force, which is the strongest, its responsible of the structure of nucleus [4], the gravitational force is also interpreted by Einstein's general theory of relativity [5]. Both the electromagnetic and the weak forces were unified as electroweak, as suggested by Abdus Salam, Steven Weinberg and Sheldon Glashow [6], based on the Standard Model (SM), the model is a quantum field theory; it's basic ingredients are fields, including the electric and magnetic fields of the 19th century electromagnetic; little ripples in these fields carry energy and momentum, and according to quantum mechanics, these ripples come in bundles, or quanta, that are recognized in the laboratory as elementary particles, the quantum of the electromagnetic field is photon [7]; both the theory of Quantum Chromodynamics (QCD), which is the theory for quark interactions, constructed by analogy with Quantum Electrodynamics (QED), postulated the existence of massless particles called gluons by which the quarks are held or glued together, and the theory of electroweak, form the standard model (SM) of elementary

particles, which aimed at unifying the strong, electromagnetic and weak forces [5]. Unifications in the Standard Model is thought to be possible, where particles of matter, known as fermions, do not directly interacted with each other, rather they carry a charge, and exchange virtual particles, as gauge bosons, which is the interaction carriers or force mediators, where the massive gauge bosons called the W and Z bosons mediate weak force, gluons mediate the interaction of color charges in the strong interaction, and photon mediates the electromagnetic interaction [8]; while string theorists hoped to unify the fundamental forces of nature [5]; thus in SM, within the development of quantum mechanics in early stages, a relation has been created between electromagnetic radiation and force, such development led to many created characterization, among which the redefinition of the orbital angular momentum operators as "the quantum-mechanical counterpart to the classical angular momentum of orbital revolution and appears when there is periodic structure to its wavefunction as the angle varies" [9], such interpretation necessitate specific line of thought and solution that can accommodate the framework of newly developed quantum mechanics, although spin "is a vector quantity; and it has a definite magnitude, and a "direction," but quantization makes this "direction" different from the direction of an ordinary vector" and all elementary particles of a given kind have the same

magnitude of spin angular momentum, which is indicated by assigning the particle a spin quantum number which was finally derived by Paul Dirac as relativistic quantum mechanics [9].

Although the graph of the strong force had been derived using a formula based on experimental studies and analysis [10], and the distance-dependent potential energy decay of the strong nuclear force follows a complex pattern, which features three phases [11], and the theory of nuclear structure is less complete than the theory of atomic structure [12], and although the really formula causing the nuclear strong force is not properly understood, thus the nuclear force is not well understood as the electromagnetic force, and such oddness should have questioned the credibility of the current fundamental physics, and whether this model express the nature of the physical world?

Our recent findings showed that, the failure to properly understand the four forces of nature and their mechanism, resulted from the failure in early nineteen century to realize both the mechanism and the formula necessary for field's interaction; instead the Ampere concept of force was adopted [13], the Ampere' law, was derived by Ampere, it followed the concept of action at distance, thus consolidated Newton's gravitational force, Coulomb's electrostatic force and Coulomb's force due to magnetic poles, and although the Ampere law was opposed by Ørsted, Biot, Savart Faraday and later by Grassmann [14], but they couldn't derived acceptable alternative formula.

In “*The Magnetic Interaction*,” we first established the formula for the interaction of magnetic fields [15], which recently solved the electrostatic fields and different forms of magnetic forces [13], the formula which is based on Field's Interaction; is given by

$$Force (F) = F_1(r)F_2(r)r^2 k \quad (A)$$

Where, $F_1(r)$ is the first Field, $F_2(r)$ is the second field, r is the radial distance between the two fields and their sources, k is constant, the value of which differs from case to other and the force F in Newton.

While in “*The Magnetic Interaction*,” we suggested the production of the Spinning Magnetic Field (SMF) as a dipole fields produced on poles of protons, the interaction of two opposite fields of protons was derived as Spinning Magnetic Force (SMFs), with a graph of the force [15], while the formula of Spinning Magnetic Field (SMF) for electron, proton and neutron was derived, then the mutual interaction of two of these three particles, (electron-electron, electron-proton, proton-proton, proton-neutron and neutron-neutron) was derived with a graph for each interaction giving the Spinning Magnetic Force (SMFs), the SMFs for the interaction of electron-proton is suggested to produce the particle neutron, and nucleus mass deficiency due to interaction between nucleons was derived [16].

In this paper, the magnitude of the formula of the Spinning Magnetic Field (SMF) for proton is doubled, while the

procedures to derive the Spinning Magnetic Force (SMFs) has been slightly changed, and the effects of electrostatic force which was neglected in previous paper is included, with a different solution procedure which bring the graph of the nuclear force identical to the current model [10], as computed from Reid potential [11], the weak force, is dealt with as instability of the SMF, leading to the disintegration of particle such as neutron into an electron and proton, a subject resolved before in the Weak Spinning Magnetic Force (F_W) (The Weak Interaction) [17], with slight change to accommodate the change in the magnitude of the SMFs.

In our last paper, titled “*The Unified Force of Nature: 1-The Electric & Magnetic Forces*,” we unified both the electrostatic force and magnetic forces using a single formula given by Eq. (A) [13], while in this paper, the same Eq. (A) is used to solve both the Spinning Magnetic Force and the Weak Spinning Magnetic Force (F_W), therefore, by unifying the magnetic force, electrostatic force, the Spinning Magnetic Force and the Weak Spinning Magnetic Force (F_W), using a single formula, we can claim this is the Grand Unification of forces of nature within the interaction of fields. Understanding the interaction of particles could clarify the mechanism behind atomic structure, molecules formations, production of external magnetic field and nuclear fusion leading to better understanding of the building blocks for various higher mechanisms, particular the fusion in stars and planets, it allowed for the understanding of the mechanism behind the alternative renewable energy, at a crucial time, during which the world is starting feeling the direct effects of the global warming, and a different type of energy is greatly needed.

2.0 The Nuclear Force (Strong Force)

2.1 The Spinning Magnetic Field

The magnetic field produced above the poles of the spinning nucleons [18] is suggested to resulted from the Total Spinning Magnetic Field (B_T), identified as the Spinning Magnetic Field (SMF) [15, 16], for proton, the Total Field (B_T) is suggested to be produced with two polarities poles above the two proton's spinning poles as shown in Fig. 1-A, the magnitude of the Proton's Total Spinning Magnetic Field (B_{TP}) shown in Fig.1-A, is derived from Newton's second law, Coulomb's electrostatic law and Biot-Savart law for magnetic field outside a loop [19], the formula was first introduced in the “*Magnetic Interaction (MI)*” [15] and the Spinning Magnetic Force [16], its modified by changing the value 4 on the RHS denominator in Eq. (9) [15] into 2 as given bellow by Eq. (1), and the value of r_o increased from 0.45fm to 0.53fm, the formula and its magnitude is given by

$$B_{TP} = B_{1P}r_r^2 = \frac{\mu_0 q}{2 \pi} \sqrt{\frac{q^2 r_o}{\epsilon_0 f_{PS} m_P r_P^2}} = 3.11283418310993 \times 10^{-18} \quad (1)$$

Where, B_{Tp} is proton's SMF (B_{IU} for nucleus hydrogen atom), f_{ps} is the proton's spinning frequency ($f_{ps} = 0.079577471$ S), r_o is the radial distance from proton surface to a point at which B_{TP} is produced ($r_o=0.53$ fm), r_r

is distance from proton's surface along the magnetic field, μ_o is the permeability of the free space, ϵ_o is the permittivity of free space, and B_{TP} is the produced magnetic moment in T.m².

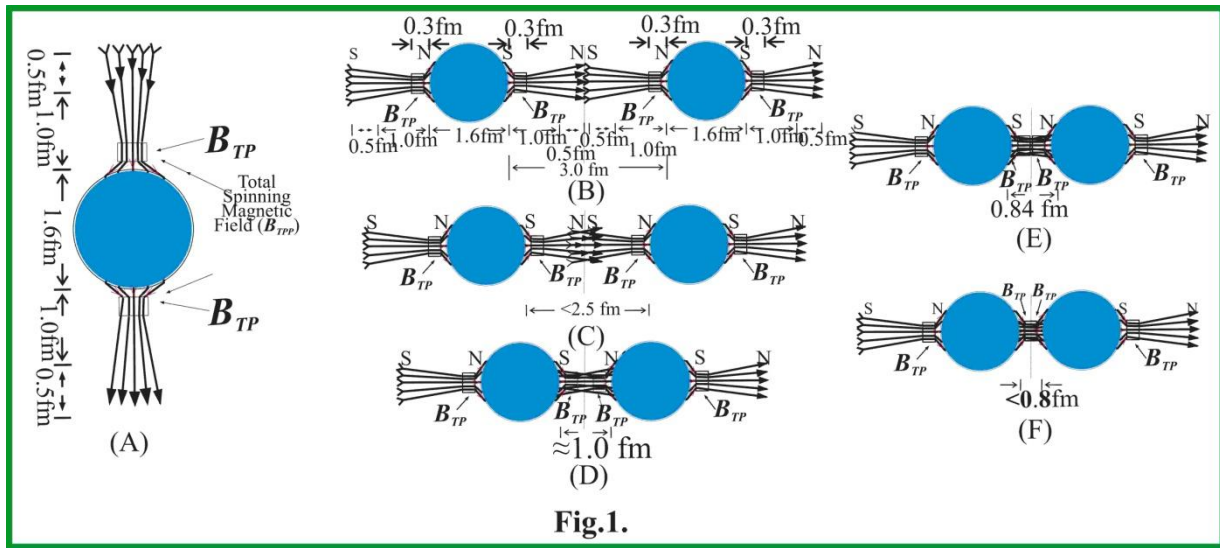


Fig.1.

Fig.1. The proposed structure of a proton in (A) producing the Total Spinning Magnetic Field (B_{TP}). The Interaction of two B_{TP} , shown in (B) produced attractive force, by shortened magnetic lines of force given by point 1 in Table.1; at (C) the distance decreased, increasing the strength increment-1, the B_{TP} and the force as given by points 2-16 in Table.1; at around 1fm in (D), the force decreased with strength increment-2, given by 16-20 in Table.1, then at zero in No 21 the nucleons are stable in (E) at 0.8fm; after <0.8 strong repulsive force is formed in (F) governed by points 22-23 in Table.1.

2.2 The Spinning Magnetic Force (SMFs) and The Nuclear Force

It was thought, the string theory could be as useful as QCD in explaining the strong nuclear forces involved in quark-gluon plasma [20], that was suggested due to the complication of the nuclear force, both the weak and strong interactions that also govern elementary particles are more complicated and were not really understood until relatively recently [12], and that it's not a straight forward one or two formulas, rather there are many variables which complicated the nature of the force, the distance-dependent potential energy decay of the strong nuclear force follows a complex pattern, which features three phases: 1- Repulsion at very short distances less than 0.7 fem (femtometers), 2- Attraction at 0.7 to 1.0 fem, and 3- A gradual, asymptotic decay above 1 fem [11], generally the range of the force is short, up to a separation of about 3 fm [12]; compounded by the derailed of the nature and concept of force by Ampere's law [13]; but the most important factor is how to get the base upon which the force can be derived; hence the following is a modified version to the previous works [15, 16], although all are based on the Unified Forces of Nature [13].

Since the short-range attractive forces between nucleons arise from the strong interaction [12], and the Proton's Total Spinning Magnetic Field (B_{Tp}) shown in Fig.1-A, is the magnetic field produced on the two poles of a proton, therefore when nucleons like two Proton's Spinning Magnetic Field ($PSMF$) of opposite polarities comes under

the mutual influence of another Proton's Spinning magnetic field ($PSMF$) as shown in Fig. 1-B, an attractive Spinning Magnetic Force ($SMFs$) is established, thus initiated the start of Spinning Magnetic Force (F_s), using field's interaction formula Eq. (A), and as two fields with equal magnitudes and distances derived from the L.H.S. of Eq. (1), the force is given by [15]

$$F_{SC} = \left(\frac{B_{TP}^2}{r_r^2} \right) c \quad (2)$$

Where, F_{SC} is the Spinning Magnetic Force in Newton, in accordance to the given characteristics [11, 21]. When the force and distance r_r are known, hence from Eq. (2), the Total Spinning Magnetic Field (B_{TP}) can be derived by

$$B_{TP} = \sqrt{\frac{F_{SC} r_r^2}{c}} \quad (3)$$

But since the interaction of both protons produced repulsive electrostatic force, opposing the initial nuclear force, thus the interaction of both SMF increase or decreased the Total Spinning Magnetic Field (B_{Tp}) given by Eq. (1) by a certain magnitude, therefore as the distance between the two protons decreased, at each stage, the internal mechanism increased the strength which increased the previous Total Spinning Magnetic Field (B_{Tp}), which should be multiplied by specific amount related to the interaction of the two

stage is step No. 21 in Table. 1, when both protons shown in Fig.1-E, produced minimum attractive nuclear force equal to the electrostatic repulsive force, giving net zero force, from Eq. (4), this is given by

$$B_{TP-0}^2 = \frac{k_e q^2 r_r^2}{r_e^2 c} \quad (7)$$

From Eq. (7), the magnitude of the Proton Total Spinning Magnetic Field (B_{TPP}), equal to the electrostatic force to give zero force in stage No. 21, is given by

$$B_{TP-0} = \sqrt{\frac{k_e q^2}{c}} \quad (8)$$

Driving the Total Spinning Magnetic Field (B_{TPP}) which can derive the force, when subtracted from the electrostatic force, give zero, the formula for this is

$$F_{N-4} = \left(\frac{B_{TP-0}^2}{r_r^2} c \right) - \left(k_e \frac{q^2}{r_e^2} \right) \quad (9)$$

The zero state is shown by the green number {IV} in Fig. 2, while the last stage is shown in Fig. 1-F, where the advanced lines of magnetic force of each proton interacts with an opposed Total Spinning Magnetic Field (B_{TPP}), while moving from <0.8 fm, and approaching the 0.7 fm, where the opposite B_{TPP} is produced as shown in Fig. 1-F, the produced intense positive nuclear forces are given in the last fifth stage of Table. 1, by No. 22 and 23, where the previous Total Spinning Magnetic Field (B_{TPP}) is multiplied by +increment₃, the field is given by

$$F_{N-5} = \left(\frac{(+Increment_3) B_{TPP}^2}{r_r^2} c \right) - \left(k_e \frac{q^2}{r_e^2} \right) \quad (10)$$

Where, +Increment₃ range between 6.8541027952376160589283332040201 and 1.3711671678174927732203044754336, the value of which is shown by the red number {V} in Fig. 2.

Table.1. The mechanism generating the Nuclear Force (F_N); using the Total Spinning Magnetic Field (B_{Tp}) given by Eq. (1) in the first row to derive the attractive Spinning Magnetic Force (F_{SC}) using the distance (r) in the second column, then subtracting the negative Electrostatic Force (F_e) in the six column from it, to give the Resultant Nuclear Force (F_N); specific *Increment (Inc.)* in the third column is multiplied by B_{Tp} to give the new Proton Total Spinning Magnetic Field (B_{TPP}) in the next step; the usage of *Increment (Inc.)* in the third row is carried in the rest of the rows; the 23 Resultant Nuclear Force (F_R) plotted graphically in Fig.2 [10].

No	Distance (r)	Increment ($Inc.$)	$B_{TPP} = \sqrt{\frac{F_{SC} r_r^2}{c}}$	Spinning Magnetic Force (F_{SC})	Electrostatic Force (F_e)	Resultant Nuclear Force (F_N)
1	2.7×10^{-15}	-	$3.11283418310993 \times 10^{-18}$	398.7545947134841 6512289977797942	31.64715160872573 3727503107098765	0.03671074431 0475843139539 667088066×10^4
2	2.6×10^{-15}	1.07	$3.3307325759276251 \times 10^{-18}$	492.3274922638523 4771194171565754	34.12836319935068 030673042170858	0.04581991290 6450166740521 12939489×10^4
3	2.5×10^{-15}	1.0041339998 818237894593 283088536	$3.34450182400289654 \times 10^{-18}$	536.9132376364176 9581975962412	36.91323763641769 581975962412	0.05×10^4 (500)
4	2.4×10^{-15}	1.1645212225 141730801514 418085958	$3.89474335278873482 \times 10^{-18}$	790.0534262547935 0674887111992188	40.05342625479350 6748871119921875	0.075×10^4 (750)
5	2.3×10^{-15}	1.1014325480 684138654739 204064721	$4.28979709513461355 \times 10^{-18}$	1043.612048247185 3684070884027883	43.61204824718536 840708840278828	0.1×10^4 (1,000)
6	2.2×10^{-15}	1.1648340253 854255604178 493348955	$4.99690161841235726 \times 10^{-18}$	1547.666887443721 19811435901875	47.66688744372119 811435901875	0.15×10^4 (1,500)
7	2.1×10^{-15}	1.0720937848 122744599365 015596918	$5.35714716841828373 \times 10^{-18}$	1952.314679189934 3761617908505102	52.31467918993437 6161790850510204	0.19×10^4 (1,900)
8	2.0×10^{-15}	1.0900806599 100776713873 326783888	$5.83972252058480674 \times 10^{-18}$	2557.676933806902 6497183744126875	57.67693380690264 97183744126875	0.25×10^4 (2500)

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9	1.9x10 ⁻¹⁵	1.0731729403 810256744530 258477777	6.26703218842529178 82144535639366x10 ⁻¹⁸	3263.907959896845 0412391960251385	63.90795989684504 1239196025138504	0.32x10 ⁴ (3,200)
10	1.8x10 ⁻¹⁵	1.0963534658 479418299788 27129197	6.87088246036068028 80345180022424x10 ⁻¹⁸	4371.206091119632 9008868819909722	71.20609111963290 0886881990972222	0.43x10 ⁴ (4,300)
11	1.7x10 ⁻¹⁵	1.0906959683 168951517624 608355246	7.49404379829466315 59143555057265x10 ⁻¹⁸	5829.829666168723 3906136670071799	79.82966616872339 0613667007179931	0.575x10 ⁴ (5,750)
12	1.6x10 ⁻¹⁵	1.0781452168 153984970799 080895668	8.07966747573649209 00609987177274x10 ⁻¹⁸	7650.120295133683 3590074607199219	90.12029513368335 9007460719921875	0.756x10 ⁴ (7,560)
13	1.5x10 ⁻¹⁵	1.0773389564 632176468092 231831836	8.70454052687975227 45202485509099x10 ⁻¹⁸	10102.53677121227 1377277110067	102.5367712122713 77277110067	1.0x10 ⁴ (10,000)
14	1.4x10 ⁻¹⁵	1.0836114014 189066679390 118534977	9.43233935903983658 8781110804216x10 ⁻¹⁸	13617.70802817735 2346364029413648	117.7080281773523 4636402941364796	1.35x10 ⁴ (13,500)
15	1.3x10 ⁻¹⁵	1.0416565295 367582634289 901125487	9.82525788215040704 82280685795138x10 ⁻¹⁸	17136.51345279740 2721226921686834	136.5134527974027 2122692168683432	1.7x10 ⁴ (17,000)
16	1.2x10 ⁻¹⁵	1.0329842071 886731202162 156729299	1.01493362238173997 40995366528509x10 ⁻¹⁸	21460.21370501917 4026995484479688	160.2137050191740 269954844796875	2.13x10 ⁴ (21,300)
17	1.1x10 ⁻¹⁵	0.9812497907 034189303012 0884767272	9.95903404539945172 40227035068846x10 ⁻¹⁸	24590.66754977488 4792457436075	190.6675497748847 92457436075	2.44x10 ⁴ (24,400)
18	1.05x10 ⁻¹⁵	0.9584207577 398465138689 6495747721	9.54494495614867150 87139142261596x10 ⁻¹⁸	24790.74128324026 2495352836597959	209.2587167597375 0464716340204082	2.5x10 ⁴ (25,000)
19	1.0x10 ⁻¹⁵	0.9512271050 081224630113 0728720375	9.07941035809918121 118120054336 x10 ⁻¹⁸	24730.70773522761 059887349765075	230.7077352276105 9887349765075	2.45x10 ⁴ (24,500)
20	0.9e-15	0.7524137481 107122042856 2713364991	6.83147317817262862 51949421662696x10 ⁻¹⁸	17284.82436447853 1603547527963889	284.8243644785316 0354752796388889	1.7x10 ⁴ (17,000)
21	0.84x10 ⁻¹⁵	0.1283677955 164744645156 1760729271	8.76941152011943917 51966889411885x10 ⁻¹⁸	326.9667449370898 5101119281568878	326.9667449370898 5101119281568878	0
22	0.8x10 ⁻¹⁵	6.5277169478 453486275507 935276382	5.72442362025139045 61028214348924x10 ⁻¹⁸	15360.48083629314 1560739840079297	360.4808362931415 6073984007929688	+1.5x10 ⁴ (15,000)
23	0.78x10 ⁻¹⁵	1.3711671678 174927732203 044754336	7.84914172276765781 99124678114729x10 ⁻¹⁸	30379.20403554834 0892297004685651	379.2040355483408 9229700468565089	+3x10 ⁴ (30,000)
No	Distance (r)	Increment (Inc.)	$B_{TPP} = \sqrt{\frac{F_{SC} r^2}{c}}$	Spinning Magnetic Force (F _{SC})	Electrostatic Force (F _e)	Resultant Nuclear Force (F _N)

3.0 The Weak Spinning Magnetic Force (F_W)-(The Weak Interaction)

In the Spinning Magnetic Force ($SMFs$) [16], it was suggested that, the interaction of the Spinning Magnetic Field (SMF) for a proton and an electron, interacted the fields of both particles, in a sequences leading finally to the merger of both particles within each other [16], in a process similar to protons interaction, as shown in Fig. 3-A, leading to the formation of neutron as shown in Fig. 3-B, where in experiments such as carried by Robson’s [22] in beta decay, which indicated that the process that separated the two particles will impart a separation velocity and corresponding energy whose maximum value is equal to 1.294×10^{-13} Joules, and called “beta decay energy” [23], and since the formation of a neutron is the reverse process of beta decays [23], and that, as an isolated neutron, after disintegrated from the nucleus is no longer stable, with half-life of 885.7 ± 0.8 seconds (14.76 minutes) [24], decaying into beta [21], and that neutrons, possess major characteristics of both electrons and protons, except elementary charge, and it disintegrates into an electron and a proton [21], that it exist in cosmic rays by being liberated from atomic nuclei [25], it spins like the other fundamental particles [26], it produced spinning magnetic field (SMF) that would be caused by spinning point charge with negative charge of about 1.9 times the fundamental unite [21], the name “weak interaction” arose because the other short-range force affecting nucleons is extremely strong, as the high binding energies of nuclei attest [12].

Therefore, when neutron is in nucleus as shown in Fig.3-C, the combined electron’ and proton’ SMF which spins oppositely inside the neutron, are forced to act as a unified single SMF by the proton’s SMF , or forced to exist by the strong nuclear force (F_N) [17], but when neutron is ejected from nucleus, the neutron constituent been deprived from the nucleus’s strong SMF joining its two similar fields together as shown in Fig. 3-B, thus only the electrostatic force combined it, hence the similar electron’s and proton’s SMF become agitated under intense SMF repulsion fields, the similar non-coherent two SMF created a state of agitation and an imbalance, thus initiating spiral force while the neutron is spinning and moving energetically foreword, finally the spiral force leads to state it start disintegrating as shown in Fig.3-D, hence the electron start retained its normal SMF , hence the state of spiral is ended, as the buildup repulsive force, exceeding the attractive electrostatic force between both particles, given by

$$F_W \gg F_{W1} - F_e \quad (11)$$

Where, F_{W1} is the first weak force to counter the electrostatic force, F_e is electrostatic force and F_W is the weak Spinning Magnetic Force in Newton, these can be related to Eq. (9), given as

$$F_W \gg \left(\frac{B_{TP-0}^2}{r_r^2} c \right) - \left(k_e \frac{q^2}{r_e^2} \right) \quad (12)$$

During this process, the forward positive parts of Electron Positive Spinning Magnetic Force ($+ESMF$) pole diverted sideways due to the spiral rotational mechanism as shown in Fig.3-D, the repulsive force between electron’s SMF and proton’s SMF , caused *the electron to emerged with forwards force as shown in Fig. 3-E, determined by both SMF ($B_{S1\&S2}$)* [17], the radius r_r between the points of interaction, which also determined the field strength, angle θ at which both fields interacted and c , this repulsive force is the Weak Spinning Magnetic Force (F_W), its greater than the force given by Eq. (12), and given by

$$F_W = B_{S1} B_{S2} r_r^2 c \sin\theta \quad (13)$$

Where, B_{S1} is the south-pole of the major charged particle the particle that moving forward in Tesla, B_{S2} is the south-pole of the minor charged particle the particle that disintegrated and diverted from the major one given in Tesla, r_r is the radius between the centers of both fields during the interaction in meter, c is the speed of light in meter per second, θ is the angle between the two fields in degree, the Weak Spinning Magnetic Force (F_W) is given in Newton. Since the weak force was estimated as 10^{-4} of the strong force, this can be expressed as

$$F_W = F_N \times 10^{-4} \quad (14)$$

Where, F_N is the Nuclear force as given by Eq. (4) in Newton [16], thus 10^{-4} represents the ratio between the weak and the strong force, the weak force F_W is given in Newton, and F_N in Eq. (14) is given by

$$F_N = F_W \times 10^4 \quad (15)$$

If both proton’s and electron’s SMF have the same magnitude $B_{S1\&S2}$ while disintegrating, hence from both Eq. (13) and Eq. (14), the following is obtained

$$B_{S1(S2)}^2 = \frac{F_N \times 10^{-4}}{r_r^2 c \sin\theta} \quad (16)$$

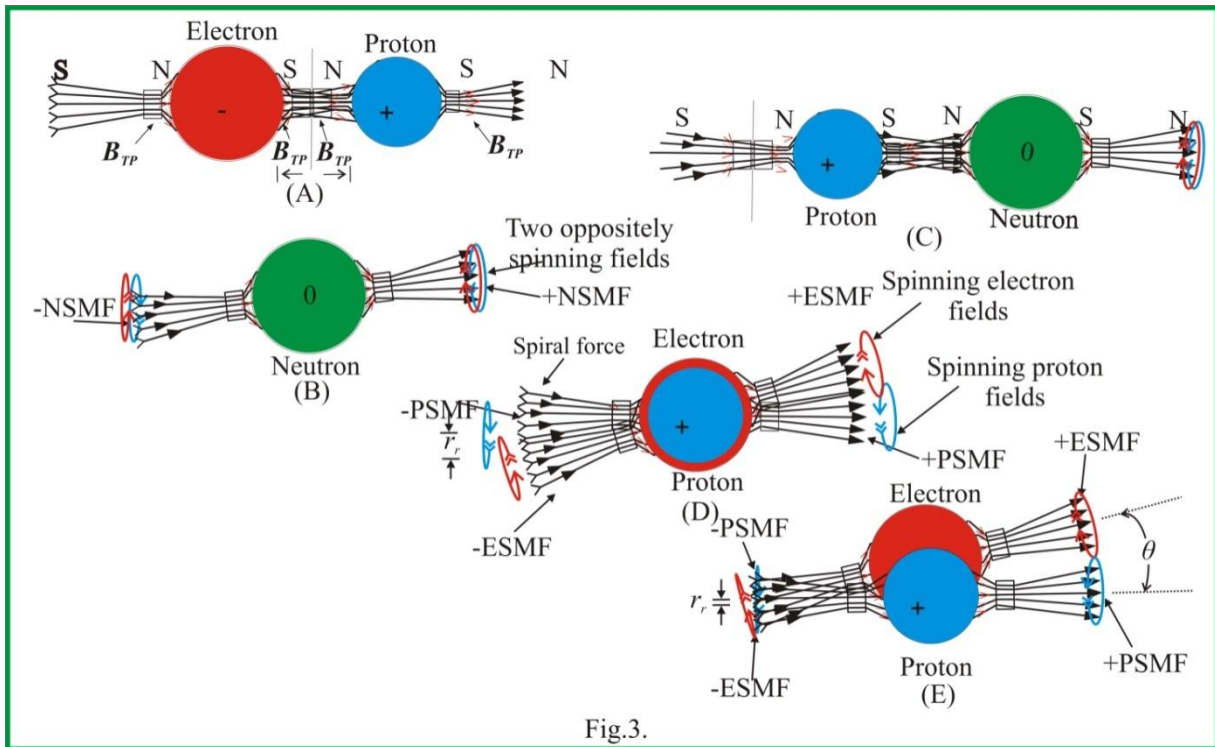


Fig.3.

Fig.3. The formation of neutron from proton and electron in (A) [16] with neutron shown in (B), its stable when connected with nucleon like proton in (C), but when disintegrated it will generate an internal instability of spiral as in (D), leading to the disintegration of the neutron and the ejection of electron as shown in (E).

From Eq. (16), the magnitude of the field is given by:

$$B_{S1(S2)} = \sqrt{\frac{F_N \times 10^{-4}}{r_r^2 c \sin\theta}} \quad (17)$$

Where, B_{S2} or B_{S1} are given in Tesla. If the value of r_r is known, the field B_S can be derived from strong field [16], and given by:

$$B_{S1(S2)} = \frac{B_{TP}}{r_r^2} \quad (18)$$

Where, B_{TP} is the Total Spinning Magnetic Field given by Eq. (1) produced by SMF the magnitude of which depends

on the nuclide in Tesla, r_r is the point at which the field is measured in meter, and the magnitudes of B_{S1} or B_{S2} are given in Tesla, while the angle θ is

$$\sin\theta = \frac{F_W}{B_{S1(S2)}^2 r_r^2 c} \quad (19)$$

The Weak Spinning Magnetic Force (F_W) is of extremely short range [22], and since theories suggest the range of the weak interaction is on the order of 10^{-16} , -10^{-17} m [27], Table.2, give the values of weak force as related from specific value of the strong force, at the distance of 6.5×10^{-15} , 50% of 1.3×10^{-15} , which is the average distance between two nucleons) [21], as given in Table.1, and shown in Fig. 2.

Table.2 Results for the Weak Spinning Magnetic Force(F_W), with separation of 6.5×10^{-16} m. as given by point No.15 in Table. 1.

No	Nuclear Force (F_N)	Interaction Radius (r_r)	Weak Spinning Magnetic Force (F_W)	Spinning Magnetic Field (B_S)	Angle θ
1	17,000	6.5×10^{-16}	1.7	5.81376206044402783 $91882062600673 \times 10^{12}$	6.925702212505289 $9410156464 \times 10^{-6}$

From all these discussion, it can be stated that:

“The Weak Spinning Magnetic Force (F_W) is the reverse process through which the previously captured and integrated particles through the Strong Spinning Magnetic Force (F_S) and Nuclear Force (F_N), released the particle as a consequences of the repulsive two similar Spinning Magnetic Field (SMF) of the combined particle, the degree

of weakness associated with this force is due to the small angle involved in the repulsion mechanism.”

4.0 Results and Discussion

- Although the finding on this paper represents an independent structural unit that can be understood independently, but in general, it’s just adding to the

previous three papers, which dealt with Spinning Magnetic Field (SMF), Spinning magnetic Force (SMFs) and Spinning Weak Force (F_W), they are: “The Magnetic Interaction” [15], “THE SPINNING MAGNETIC FORCE” [16], “The Weak Spinning Magnetic Force (F_w) (The Weak Interaction)” [17]

- The inverse square law of gravity by Newton in 1665 was the bases for Augustin Coulomb’s two laws in 1785 for electrostatic and magnetic poles forces and *André-Marie* Ampère's law in 1821, these four laws, formed the base for the current fundamental physics, and they are defined as action at distance [14].
- The debate on the nature of Ampere force and the mechanism of how the force is achieved led to the emergence of the concept of *action at a distance* [14].
- Action at a distance necessitates the need for an imaginary force carrier to mediate between particles.
- A new formula for field’s interaction, had been derived, as given by Eq. (A) [13], the formula opened a new insights into different phenomena.
- The spinning of charged particles been defined, and suggested to produce polar magnetic fields.
- The Spinning Magnetic Field (SMF) is produced by electron, proton and neutrons.
- The formula for the SMF is modified from earlier version [15] with a slight increase in magnitude.
- Interaction of two SMF created a force designated as Spinning Magnetic Force (SMFs) derived by a modified version of Eq. (A) and the L.H.S. of the formula of the SMF.
- A characteristic of SMF of a proton is given, showing the SMF is restricted within small distance from the surface.
- The interaction of two protons’ SMF created a force and the internal mechanism increased the strength of the field, which increases the magnitude of the Proton’s Total Spinning Magnetic Field (B_{Tp}), which affected the next stage of the force.
- The nuclear force is the resultant subtraction of electrostatic force from the SMFs.
- The graph of the nuclear force in Fig. 2 is derived by the formulas and is the true representation of the force of the 1S0 state of nuclear force [10] as computed according to equation by local phenomenological nuclear-nuclear potential [11].
- As the nuclear force is powerful enough to overcome the electrostatic repulsion of the positively charged protons [12], and as shown in Table. 1 and Fig. 2, the magnitude of the nuclear force is greater than the electrostatic force.

- The nuclear attraction between two protons thought to be about 100 times stronger than the electric repulsion between them [12], but as shown in Table. 1, this is variable, the minimum is zero at 0.84×10^{-15} meters, to 12 times at 2.7×10^{-15} and maximum of 80 times at 0.78×10^{-15} m.
- The derived SMFs is a true representation of the sequences through which the interaction of the two fields undergoes with an increase in the SMF.
- The previous paper on weak force [17] is the base upon which this paper is derived; hence this is just an addition.
- The weak force is the reverse of the strong force.
- The weak force only occurred when instability took place between the nucleons.
- The weak force given in Table.2 to be added to the electrostatic force to give the true weak force.
- As both the electrostatic force and magnetic forces were unified using a single formula [13], the unification of both the Spinning Magnetic Force and the Weak Spinning Magnetic Force (F_W), with the same formula, thus this is the Grand Unification of forces of nature, using a single formula.
- Our next target is to get the Universal Interaction, by “The Interaction Between Both the Earth’ and Solar’ Magnetic Fields” [28].

5.0 Conclusion

The spinning of charged particles such as electron and proton is suggested to produce Total Spinning Magnetic Field (B_T), the magnitude of the B_T is doubled from the previous formula [15], while the new formula for the interaction of fields [13], allowed for a formula to be derived for the interaction of two Total Spinning Magnetic Field (B_T), the formula that allowed the interaction of two B_T is the Spinning Magnetic Force (SMFs), the interaction of B_T is carried in such manner that part of the previous field is added to the B_T , as the internal mechanism increased the strength of the SMF, which increased or decreased the magnitude of the field, thus the resulted Spinning Magnetic Force (SMFs); is either increased or decreased, as the interaction of two similar charges like protons, produced electrostatic force, hence this electrostatic force is subtracted from the Spinning Magnetic Force (SMFs), thus resulted in the nuclear force. The interaction of two Spinning Magnetic Field (SMF) by an electron and proton created a particle neutron [17], which is stable while in nucleus, but if disintegrated from atom, it usually disintegrated into an electron and proton, hence the force resulted from this disintegration is the weak force as derived and explained in this paper.

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