

Values of Siva's Constant "K" for All Fundamental Forces—A Review on Spin, Threshold Time and Quantum Entanglement

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Abstract

Siva's constant "K" has been explained in brief. Its numerical values have been calculated for each fundamental force of nature. Spin of quantum mechanics has been interpreted in terms of Sivas constant "K". Thus limitation to velocity of light and interrelation between relativity and quantum mechanics has been explained in a novel and profound way. Involvement of "physics of consciousness" in synchronizing relativity and quantum mechanics has been emphasized. Concept of "bio force" as fifth fundamental force in addition to other four fundamental forces, strong, weak, electromagnetic and gravitational forces also has been emphasized. Consciousness has been explained as entanglement between bio force particle named as "jeeton" and gravitational force particle "graviton". Thus frequency mediated consciousness has been explained.

Keywords

Siva's Constant "K", Bio Force Particle, Jeeton, Spin, Grand Unification, Quantum Mechanics, Relativity, Quantum Entanglement

1. Introduction

Sivas constant "K" is introduced in "Double relativity Effect". In that, it is postulated that the universe is existed with absolute velocities. There is an absolute velocity at a distance "d" from any point of observation in space time and it is proportional to distance "d". Proportionality constant is "Hubble's constant" "H" and follows by an equation $V = Hd$. It represents the "expansion" explained by the Hubble's concept of "expanding universe". Due to "Double Relativity Effect", as the velocity increases with distance the same force of expansion will be ex-

pressed as gravity force and will be denoted by $Vd = K$, where “ K ” is Siva’s constant. In both the cases, absolute velocity is observed as “observed velocity” due to the fact that universe is existed as films as explained in the papers [1] [2] [3].

By considering the diameter of the universe as diameter of hydrogen atom which is the smallest atom representing matter, Siva’s Constant has been calculated as 2×10^2 sqmt/sec [2]. Later when it is applied to relativity and quantum mechanics it is realized that it is a major mistake with erroneous calculations and reconsidered the concept that all the relative velocities are consequences of absolute velocities and explained as films explained in “film theory of the universe” [3]. As per this concept, the events of this universe are part of “film change” of this universe. It is postulated that the duration of film change is “plank time”. This has been elaborated in the paper [3]. Thus it is explained that absolute velocity associated to a film will be converted into acceleration during film change of the universe. This acceleration is the cause for gravitational force. Thus the postulated equation $Vd = K$ is applied to the concept of gravitation and derived an equation for gravitation with Siva’s constant “ K ” [4]. The same principle has been adopted to define other three fundamental forces. The concept has been elaborated in the paper [5]. It is explained that “space time” is the main cause for all fundamental forces and can be explained by same equations and achieved grand unification. But “ K ” is not a constant. It will vary with density of “space time” and the fundamental force. These grand unification equations described an equation relating “space-time diameter” and “coupling constant” of fundamental forces. “Space-time diameter” is dependent on parameter “ K ”.

But in lot of previous works “ K ” has been considered as a non varying constant *i.e.* 2×10^2 sqmt/sec [1] [2] [6] [7] [8] [9] [10]. All those concepts have been reconsidered and concluded the concepts with recalculated values according to the change of “ K ”. Application of these corrections to the paper [6] has concluded that “bio-force” which is a force existed in all living things is also a fundamental force. Example for this force is the force utilized to lift the parts of the body against to gravity. It can be claimed as “fifth force”. The other four fundamental forces are strong force, weak interaction, electromagnetic force and gravitational force. Research is in process to unify all these fundamental forces. Already a new approach has been explained the paper “Plank Scale with Siva’s Constant “ K ”—A New Road to Grand Unification” [5] based on space, time and “space-time” concepts. In All these forces and their interactions Siva’s constant “ K ” plays a crucial role. “ K ” value for all fundamental forces including “bio force” has been calculated and tabulated along with the concerned coupling constants mentioned in “standard model”. Now “ K ” will become a necessary parameter in addition to G , c , h and \hbar to understand the “plank scale” in a full pledged manner.

Inter relation between these parameters will explain the five fundamental

forces including “bio force” and their unification. Surprisingly these equations with interchange of these parameters showed a path way to explain most fundamental concepts of quantum mechanics such as “spin”, “threshold time” and “quantum entanglement” between two separate force particles.

2. Calculation of “K” Values for All Fundamental Forces

Siva’s constant “K” can be calculated by Siva’s equations for grand unification. The third equation shows the relation between “space time diameter” of quantum of fundamental force and the coupling constant with respect to electromagnetic force. We have coupling constants for three fundamental forces *i.e.* strong force, electromagnetic force and weak interactions as per “standard model”. We do not have perfect grand unification theory for unification of gravity with other three forces. So from the fundamentals we have calculated the coupling constant for “gravitational force”. But it is relative to electromagnetic force. As per the standard model, the coupling constants for other three are relative to strong force. “Space-time diameter” equation contains “coupling constant relative to electromagnetic force”. We have to change all the coupling constants relative to “electromagnetic force” and can find “space time diameter” for each fundamental force. With this “space time diameter” as per the first equation *i.e.* Equation (1), we can find the value of “Siva’s constant “K” for all fundamental forces. The same is applicable to the newly introduced fundamental force called “bio force” [6]. Its quantum particle is named as “jeeton” similar to that of a “graviton” as a quantum particle of gravitational force. “Jeeton” is a newly introduced name in this paper. The value of “K” for each fundamental force has been calculated and tabulated in **Table 1**.

2.1. Coupling Constant for Gravitation

We have Siva’s Grand unification equations [5]

$$cd = K \quad (1)$$

$$cd^2 = Gt_p m \quad (2)$$

$$d_x^4 = 2.116991 \times 10^{-77} \times \alpha_x^3 \quad (3)$$

where d_x is space time diameter of fundamental force and α_x is coupling constant with respect to electromagnetic force.

Once again if we review the calculation for quantum of gravity,

$$d_g^4 = 2.116991 \times 10^{-77} \times \alpha_g^3 \quad (4)$$

where d_g is “space time diameter” of gravity force quantum particle *i.e.* graviton and α_g is coupling constant with respect to electromagnetic quantum particle *i.e.* photon.

2.1.1. Space Time Diameter “ d_g ” for Gravity

Siva’s classical equations for space time [7] after considering final revision (The equation mentioned in the paper [7] has been revised due to the change of

Table 1. Values of Siva's Constant "K" for All Fundamental Forces

S.no	Force	Coupling Constant (α)	Coupling Constant with respect to electromagnetic force (α)	Space-time diameter d (as per equation $d_g^4 = 2.116991 \times 10^{-77} \times \alpha_g^3$) (mts)	Siva's constant K as per equation $Cd = K$ (sqmts/sec)
1	Strong Force	1	137	2.716253×10^{-18}	8.143122×10^{-10}
2	Electromagnetic Force	$\frac{1}{137}$	1	6.783124×10^{-20}	2.033529×10^{-11}
3	Weak interaction	10^{-6}	1.37×10^{-4}	8.58955×10^{-23}	2.5751×10^{-14}
4	Gravitation	1.016788×10^{-39}	1.393×10^{-37}	$1.5466374059 \times 10^{-47}$	4.636702×10^{-39}
5	Bio-Force (related to interactions of consciousness)	$6.3995777 \times 10^{-40}$	$8.7674215287 \times 10^{-38}$	$1.09290816 \times 10^{-47}$	$3.276456237 \times 10^{-39}$

"K" as explained in "Section. 1. introduction". The proof has not been provided here)

$$m = 7.9905778 \times 10^{-17} \times d^{1/3} \quad (5)$$

$$\gamma d^{8/3} = 1.526087946 \times 10^{-16} \quad (6)$$

where "m" is the fundamental particle with energy equivalent to mc^2 created by space time of any fundamental force. "d" is diameter of its own space. "γ" is its space time density. Siva's gravity equation can be used for any fundamental force. Here let us consider gravity only for our convenience since "m" is nothing but basic building block of mass.

As per Double relativity Effect [1] [2] [3],

$$Vd = K \quad (7)$$

where "V" is velocity of the body existed due to force of gravity at a point at distance "d" from any observer. "K" is Siva's constant and follows the gravity equation $K = Gt_p \left(\frac{m}{d} \right)$ [4]. It is obvious that velocity of light *i.e.* 2.99792458×10^8 mt/sec is the maximum signal velocity in our conventional four dimensional space time. This space time contains density also. We can compare it with any mass density as explained in Siva's classical space time equations [7].

We have equations for quantum of energy

$$E = hv \quad (8)$$

$$E = mc^2 \quad (9)$$

As per Equation (7), "d" will be maximum when "V = c". This is the stage of the universe contains a signal velocity "c" and the space time density representing space time diameter d_g .

So the diameter of the universe at diameter of graviton *i.e.* d_g . Mathematically,

$$d_g = d_{ug} = \frac{K}{c} \quad (10)$$

We have Siva's constant "K" as explained in paper [4]

$$K = Gt_p \left(\frac{m}{d} \right) \quad (11)$$

And velocity of light $c = 2.99792458 \times 10^8$ mt/sec

$$\therefore d_{ug} = \frac{K}{c} = \frac{Gt_p m}{cd} = \frac{Gt_p \times 7.9905778 \times 10^{-17} \times (d_g)^{1/3}}{c \times d}$$

Substitute the following values [11] in it.

$$G = 6.67408 \times 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{sec}^{-2}$$

$$t_p = 5.39116 \times 10^{-44} \text{ sec}$$

$$c = 2.99792458 \times 10^8 \text{ m/sec in}$$

$$m = 7.9905778 \times 10^{-17} (d_{ug})^{1/3} \text{ as per Equation (5)}$$

$$d = d_g = d_{ug}$$

$$\therefore d_g = \frac{6.67408 \times 10^{-11} \times 5.39116 \times 10^{-44} \times 7.9905778 \times 10^{-17} \times d_g^{1/3}}{2.99792458 \times 10^8 \times d_{ug}}$$

$$\therefore d_g^{5/3} = 96.009494375 \times 10^{-80}$$

$$\therefore d_g = 15.466374059 \times 10^{-48}$$

$$\therefore d_g = 1.5466374059 \times 10^{-47} \text{ mts} \quad (12)$$

Therefore the coupling constant for gravity as per Equation (4)

$$d_g^4 = 2.116991 \times 10^{-77} \times \alpha_g^3 \quad (13)$$

As per Equation (12) space time diameter for gravity space time $d_g = 1.5466374059 \times 10^{-47}$ mts .

Substitute $d_g = 1.5466374059 \times 10^{-47}$ in Equation (13)

$$(1.5466374059 \times 10^{-47})^4 = 2.116991 \times 10^{-77} \times \alpha_g^3$$

$$5.7220814849 \times 10^{-188} = 2.116991 \times 10^{-77} \times \alpha_g^3$$

$$\alpha_g^3 = \frac{5.7220814849 \times 10^{-188}}{2.116991 \times 10^{-77}}$$

$$\alpha_g^3 = 2.7029314177 \times 10^{-111}$$

$$\alpha_g = 1.39298040988 \times 10^{-37} \quad (14)$$

Thus as per Equation (14) Coupling constant for gravitational force “ α_g ” is 1.393×10^{-37} .

Note: in paper [4] the calculation has been done by mistake with space time radius. It must be space time diameter. In this paper it is rectified and the calculation has been revised. It will not affect any other calculations.

2.1.2. Space Time Diameter “ d_b ” for “Bio Force”

“Bio-force” is a newly introduced fundamental force. It is introduced in the paper [6]. We have to define it from the fundamentals. Bio force is the force whose

presence and absence shows the difference between living and non living things. In “Super theory of relativity” [8] it is explained that consciousness is an effect of bio force in living things [8]. At this stage involvement of “Super theory of Relativity” and “film theory of the universe” clearly defined the terms “observer” and “observation”. This concept emphasized the formation of consciousness which is an affect of “bio-force” which is just like other four fundamental forces. As per its conclusions, we cannot avoid the importance of “consciousness” which is the main constituent that differentiates the “living” and “non-living” things of the universe. In order to incorporate “consciousness” in to physics “Super theory of Relativity” [8] has been introduced to physics. Special theory of Relativity explains the transformations between physical objects or frames where as “Super Theory of Relativity” explains the interactions between living things and the physical universe by “Film Theory of the Universe” [8]. As per this concept the universe in which we are living is a result of slide show of films changing in minute fraction of second. There is no link between these films. The events are prefixed and programmed. Universal films are also similar to movie films. All the films are separate. But universe as a whole is a continuous flow of events. The continuity is due to consciousness which is a direct consequence of “bio-force”.

We know the maximum signal velocities for “gravity space time” *i.e.* velocity of light “ c ” and for “bio-force” (source of consciousness) “ $\sqrt{2}c$ ” as per Super theory of relativity [8].

This “classical space time equation” is used to find out the quantum nature of gravity just like other natural forces and emphasized that all natural fundamental forces are outcome of space time density for which “ K ” is a parameter. In common, all fundamental particles are formed by contraction of their space time and named as a particle called “ K -Suryon” [5]. K -Suryon appears as a fundamental particle of concerned force. Thus for Gravity, K -Suryon is graviton. For electromagnetic force, K -Suryon is a photon.

If we consider the same Equations (1)-(3) to the K -Suryon of bio-force but with a signal velocity $\sqrt{2}c$ [6] [8] we can calculate value of Siva’s constant “ K ” for “bio-force”.

So equations for quantum of bio-force *i.e.* K -suryon of bio force are

$$\sqrt{2}cd_b = K_b \quad (15)$$

$$K_b = Gt_p \left(\frac{m}{d_b} \right) \quad (16)$$

$$\sqrt{2}cd_b^2 = Gt_p m \quad (17)$$

where d_b is space time diameter and K_b is siva’s constant for bio force particle “jeeton”.

We have Equation (5) we can apply it to “bio force” and re write it as

$$m = 7.9905778 \times 10^{-17} \times d_b^{1/3} \quad (18)$$

$$\sqrt{2}c \times d_b^2 = G \times t_p \times 7.9905778 \times 10^{-17} \times d_b^{1/3}$$

Substitute the following values [11] in (18)

$$G = 6.67408 \times 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{sec}^{-2}$$

$$t_p = 5.39116 \times 10^{-44} \text{ sec}$$

$$c = 2.99792458 \times 10^8 \text{ m/sec in}$$

$$m = 7.9905778 \times 10^{-17} (d_b)^{1/3}$$

$$\therefore d_b = \frac{6.67408 \times 10^{-11} \times 5.39116 \times 10^{-44} \times 7.9905778 \times 10^{-17} \times d_b^{1/3}}{\sqrt{2} \times 2.99792458 \times 10^8 \times d_b}$$

$$\therefore d_b^{5/3} = 67.81349277 \times 10^{-80}$$

$$\therefore d_b = 12.554218 \times 10^{-48}$$

$$\therefore d_b = 1.2554218 \times 10^{-47} \text{ mts} \quad (19)$$

Similar to Equation (4)

$$d_b^4 = 2.116991 \times 10^{-77} \times \alpha_b^3 \quad (20)$$

As per Equation (19) space time diameter for bio force space time $d_b = 1.2554218 \times 10^{-47}$.

Substitute $d_b = 1.2554218 \times 10^{-47}$ in

$$(1.2554218 \times 10^{-47})^4 = 2.116991 \times 10^{-77} \times \alpha_b^3$$

$$2.4840405 \times 10^{-188} = 2.116991 \times 10^{-77} \times \alpha_b^3$$

$$\alpha_b^3 = \frac{2.4840405 \times 10^{-188}}{2.116991 \times 10^{-77}}$$

$$\alpha_b^3 = 1.17338265 \times 10^{-111}$$

$$\alpha_b = 1.05474276 \times 10^{-37} \quad (21)$$

Thus as per (21) Coupling constant for bio force “ α_b ” is 1.055×10^{-37} .

3. Siva's Constant “K” for All Fundamental Forces

As explained in Section 2, Siva's constant “K” for each fundamental force has been calculated and tabulated in Table 1.

4. Applications of Siva's Constant “K” and Space Time Diameter d_x

4.1. Spin & Siva's Constant “K”

We have Equation (1) *i.e.* $Cd = k$.

“ d ” varies for each fundamental force. So “K” will be different for each fundamental force.

If we take photon, “space time diameter” will exist. But as per special theory of

relativity its space must be zero since it is moving with velocity of light. So due to limitation to its velocity *i.e.* c , reduces its “space time diameter” and finally will be reduced to zero, as per space time equivalence principle [9], at this point it will have time only. And can be converted to time as per the equation

$$t = 1.44224957 \times r^{2/3}$$

where “ r ” is space time radius. And space time diameter is “ d ”.

The equation can be written as

$$t = 1.44224957 \times (d/2)^{2/3} \quad (22)$$

where “ d ” is space time diameter.

Thus at velocity of light it will be totally time “ t ” only. It means, the flow of time inside photon will be there but the duration between two events will be zero (duration will not exist). In other words time can not be divisible inside photon. It is a quantum of electromagnetic force. In all respects it will not be divisible.

Due to the reduction in “ d ”, the value of “ K ” will be reduced as per the Equation (1) *i.e.* $cd = K$ where “ c ” is constant.

Again “ K ” is related to \hbar as per [5] $K = \sqrt{\frac{\hbar G}{c}}$.

If “ K ” reduces, \hbar will be increased to compensate it.

\hbar is spin related aspect. Thus spin is related to Sivas constant “ K ”.

Physically it means that a quantum particle moves with velocity of light, its space time diameter will be zero but the space time diameter to be existed for that quantum particle will be reduced to zero and the reduction will cause to change its \hbar and the spin is the equivalent effect of its rotation on its own axis as if it will have a space time diameter “ d ”.

4.2. Gravitational Binding Energy with Space Time Diameter “ d_g ”

Equation for Gravitational binding energy is [12] [13]

$$E_G = \frac{3GM^2}{5R} \quad (23)$$

where G is Newton’s Gravitational constant.

“ M ” is mass of any spherical body.

“ R ” is radius of that massive body.

Quantum particle of Gravitational field *i.e.* graviton is a K -suryon created by gravity space time. It is the minimum energy which keeps it as gravitational quantum particle. It is equal to a mass “ m ” and space time diameter “ d ”.

We have Siva’s classical equation as per Equation (5)

$$m = 7.9905778 \times 10^{-17} \times d^{1/3}$$

where “ m ” is mass of any body and “ d ” is space time diameter.

We can rewrite the Equation (23) with mass “ m ” and space time diameter “ d ”

$$E_G = \frac{3Gm^2}{5\left(\frac{d}{2}\right)}$$

$$E_G = \frac{6Gm^2}{5d}$$

Substitute Equation (4) in Equation (23)

$$E_G = \frac{6G \left(7.9905778 \times 10^{-17} \times d^{\frac{1}{3}} \right)^2}{5d}$$

$$E_G = \frac{6G \left(7.9905778 \times 10^{-17} \right)^2 \times d^{2/3}}{5d}$$

$$E_G = \frac{6 \times 6.67408 \times 10^{-11} \times \left(7.9905778 \times 10^{-17} \right)^2 \times d^{2/3}}{5d}$$

$$E_G = \frac{511.362672294 \times 10^{-45}}{d^{1/3}}$$

We have space time diameter for gravity space time as per (12)

$$d = 1.5466374059 \times 10^{-47} \text{ mts}$$

Therefore

$$E_G = \frac{511.362672294 \times 10^{-45}}{\left(1.5466374059 \times 10^{-47} \right)^{1/3}}$$

$$E_G = \frac{5.11362672294 \times 10^2 \times 10^{-45}}{\left(15.466374059 \times 10^{-48} \right)^{1/3}}$$

$$E_G = \frac{5.11362672294 \times 10^2 \times 10^{-45}}{\left(15.466374059 \right)^{1/3} \times 10^{-16}}$$

$$E_G = \frac{5.11362672294 \times 10^{-43}}{\left(15.466374059 \right)^{1/3} \times 10^{-16}}$$

$$E_G = \frac{5.11362672294 \times 10^{-43}}{2.491511158 \times 10^{-16}}$$

$$E_G = 2.052419755986 \times 10^{-27} \text{ Jouls} \quad (24)$$

We have equation for threshold time

$$\tau = \frac{\hbar}{E_G} \quad (25)$$

Substitute values of \hbar as per [11] and E_G as per Equation (24)

$$\tau = \frac{1.0545718 \times 10^{-34}}{2.052419755986 \times 10^{-27}}$$

$$\tau = \frac{1.0545718 \times 10^{-34}}{2.052419755986 \times 10^{-27}}$$

$$\tau = 5.13818773 \times 10^{-8} \text{ sec}$$

4.3. Explanation to Quantum Entanglement and Origin of Consciousness

- We have concluded two fundamental force particles. One is gravitational force particle “graviton” and another is bio force particle “jeeton” and their space time diameters. One represents material object another represents conscious object.
- “Super Theory of Relativity” [8] explains the interactions between living things and the physical universe by “Film Theory of the Universe” [3] as an interaction between “jeeton” and “graviton”.
- These two are separate force particles. Consciousness is an effect of interaction between these two particles. “Super Theory of Relativity” is an application of “Double Relativity Effect”. Thus “double relativity effect” is a phenomenon explained in terms of “entanglement” for processing of information between “two consecutive films” of “film theory of the universe” [3]. This process is part of “observation” defined by physics. This can be interpreted in quantum information processing. This must obey quantum de coherence while processing. Based on this concept, it is estimated that minimum processing speed of a conscious brain should be 144 qubits per second. This may be useful for the research on “Hard Problem” of consciousness.

5. Conclusions

1) Space time diameters and their coupling constants for “gravitational force”, “bio force” have been calculated from the fundamentals by Siva’s “grand unification equation”.

2) Siva’s constant “ K ” for all five fundamental forces has been calculated and tabulated in **Table 1**.

3) Spin of quantum mechanics has been interpreted with Siva’s constant “ K ”. It will be used in “mathematical modeling” of consciousness.

4) Threshold frequency or binding energy of “gravity space time” which plays a role in the phenomenon of “observation” has been calculated by its space time diameter.

“Quantum entanglement” has been interpreted as an effect of relativity and consciousness. It is an effect of “entanglement between “bio force particle” *i.e.* “jeeton” and “graviton”.

Conflicts of Interest

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

References

- [1] Kodukula, S.P. (2009) Double Relativity Effect & Film Theory of the Universe. ISBN 978-0-557-07712-0, Raleigh, NC, 5-6, 7, 12-38.
- [2] Kodukula, S.P. (2013) *IJoART*, **2**.

- <http://www.ijoart.org/docs/Derivation-of-Sivas-Constant-K-of-Physics.pdf>
- [3] Kodukula, S.P. (2017) *International Journal of Physics*, **5**, 99-109.
<http://pubs.sciepub.com/ijp/5/4/1>
- [4] Kodukula, S.P. (2017) *International Journal of Theoretical and Mathematical Physics*, **7**, 155-158. <http://article.sapub.org/10.5923.j.ijtmp.20170706.01.html>
- [5] Kodukula, S.P. (2018) *Journal of Modern Physics*, **9**, 1179-1194.
<https://doi.org/10.4236/jmp.2018.96071>
- [6] Kodukula, S.P. (2016) *International Journal of High Energy Physics*, **3**, 18-24.
<http://www.sciencepublishinggroup.com/ijhep>
- [7] Kodukula, S.P. (2013) *International Journal of Advancements in Research & Technology*, **2**, 4. <http://www.IJoART.org>
- [8] Kodukula, S.P. (2014) *American Journal of Modern Physics*, **3**, 232-239.
<http://article.sciencepublishinggroup.com/pdf/10.11648.j.ajmp.20140306.15.pdf>
- [9] Kodukula, S.P. (2012) *International Journal of Scientific Research and Publications*, **2**, 1-3. <http://www.ijsrp.org/research-paper-1012/ijsrp-p1005.pdf>
- [10] Kodukula, S.P. (2016) *Open Journal of Biophysics*, **6**, 34-37.
<https://doi.org/10.4236/ojbiphy.2016.62005>
- [11] Mohr, P.J., Newell, D.B. and Taylor, B.N. (2016) *Journal of Physical and Chemical Reference Data*, **45**, Article ID: 043102.
- [12] Chandrasekhar, S. (1939) *An Introduction to the Study of Stellar Structure*. University of Chicago, Chicago, 101.
- [13] Lang, K.R. (1980) *Astrophysical Formulae*. Springer Verlag, Berlin, 272.
<https://doi.org/10.1007/978-3-662-21642-2>